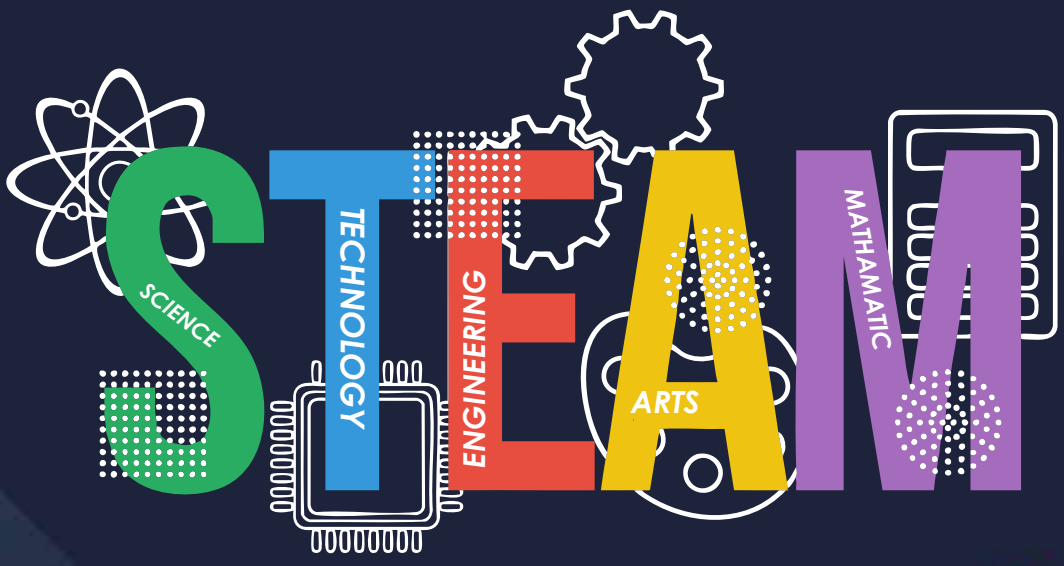
USMANIAN EXPO 2025



USMAN PUBLIC SCHOOL SYSTEM

usman.edu.pk @UsmanSchool usmanpublicschoolsystem

VISION

Nurturing generations to serve the role as leaders of Ummah

MISSION

To motivate the students in becoming future leaders, capable of providing guidance to the Muslim Ummah in all spheres of life and lead the contemporary world in accordance with the teachings of Islam.

CORE VALUES

- Taqwa (Fear of Allah)
- Following Prophet Muhammad ﷺ as Role Model
- Enjoining good and forbidding evil
- Research and Explore
- Service of Mankind
- Protection of Ideology of Pakistan

ABOUT THE MAGAZINE

Alhumdulillah ! This year we present the UPSS STEAM Expo Magazine, a reflection of our students' commitment to inquiry, innovation, and meaningful learning. At UPSS, we recognize that true education extends beyond the acquisition of knowledge. It is rooted in curiosity, critical thinking, and the courage to explore the unknown.

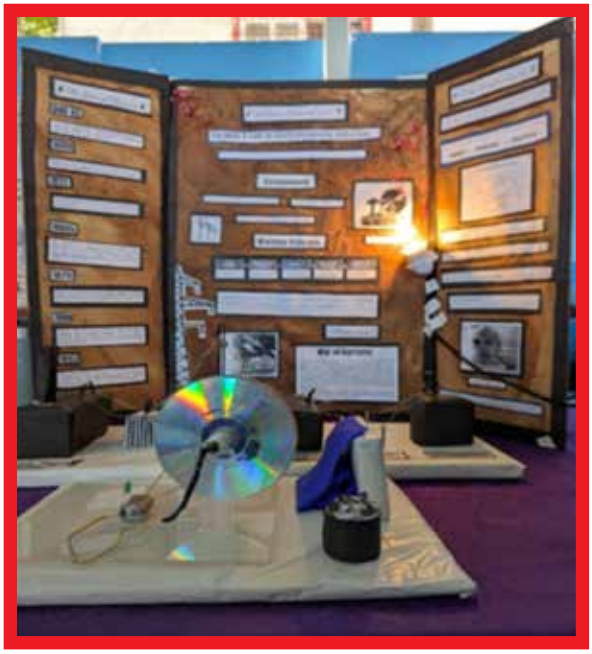
This year's Expo is guided by our system's core value: Research and Exploration. Each project and initiative reflects the perseverance of young minds determined to question, investigate, and create. From sustainable solutions to modern technological applications, our students have embraced the challenge of moving from ideas to discovery.

We remain committed to nurturing learners who view research as a habit of mind and exploration as a pathway to progress. As you read through this edition, you will find evidence of the intellectual rigor, creativity, and collaborative spirit that define the UPSS learning environment.

Together, let us reaffirm our belief that research and exploration are not only academic pursuits but also the driving forces of innovation and growth.

SPIN TO SPARK

This simple classroom model helps students connect science theory to real-world power generation, sparking curiosity about renewable energy and sustainable solutions. It also lays the foundation for understanding larger systems like hydropower plants, wind farms, and electricity grids.



This fascinating classroom experiment shows how mechanical energy can be transformed into electrical energy using a basic pulley-motor system. Students not only get hands-on experience but also learn the principle behind how thousands of megawatts of electricity are produced around the world.

HOW IT WORKS

Mechanical Input – The experiment begins with a pulley that is rotated by hand (or by pedaling). Shaft Rotation – This motion spins the shaft of a small DC motor. Motor as Generator – Acting as a generator, the motor converts this rotational motion into electrical energy through electromagnetic induction. Lighting the LED – The generated electricity travels through a simple circuit and lights up an LED, creating a visible result for learners.

The Real World Application

Wind Energy (Wind Turbines)
Bicycle-Powered Electricity

Participant's names (Class IX) :
Abiha Adnan | Anabia Hasan

Carbon Purification Process
Cleaning the Air We Breathe

If industries, vehicles, power plants, and waste management facilities adopt such carbon purification systems, we can drastically cut air pollution — resulting in healthier communities, cleaner cities, and a greener Earth.


USMAN PUBLIC SCHOOL SYSTEM
Campus - 01
CARBON PURIFICATION PROCESS
ABSTRACT:
METHOD:
FUTURE SCOPE:
CONCLUSION:

This model demonstrates how polluted air can be cleaned using charcoal, paper, cardboard, and other waste materials. The aim is to reduce harmful smoke and gases before they are released into the environment — promoting cleaner air and a healthier planet.

HOW IT WORKS

In this model, polluted air is pushed by a blower into a chamber filled with activated charcoal. The charcoal adsorbs harmful gases, smoke, and carbon particles, while a cotton layer may trap dust. As a result, thepollutants remain inside the chamber, and cleaner air exits through the outlet tube.If industries and other majorpollution sources like vehicles, power plants, agriculture and waste management adopt the carbon purificationprocess we will have cleaner air, better health, and a greener earth

The Real World Application

Factories and Industries
Power Plants, Automobiles
Air Purifiers, Water Treatment Plants
Medical Use

Participant's names (Class XI-XII) :
Syeda Azka Ahmed | Subrum Gohar
Manahil Khan | Madiha Jabeen

TRADITIONAL WATER WHEEL A RENEWABLE ENERGY SYSTEM

The traditional water wheel project demonstrates how rural communities can harness the natural flow of rivers to generate renewable energy. By using a simple yet effective mechanical system, water wheels convert flowing water into rotational energy.This energy can be used for irrigation, rice milling, and even small- scale electricity generation. The process is eco-friendly, low-cost, and has been in practice for centuries, making it highly relevant in today's search for sustainable solutions.

This project aims to demonstrate that how free electricity can be generated through water.Demonstrating that how mechanical energy can be converted into electrical energy. Furthermore, this model is cost-friendly to establish in villages ,rural areas or in such cities which are located below to the sea level.

HOW IT WORKS

This model is the visual representation of converting mechanical energy into electrical energy.In this model the water in the tub is being suckedup through the motor to the bottle. When the water in the bottle overflows from it, it fallson the wheel and it starts rotating.The dynamo attachedwith the wheelconverts the mechanical energy produced by the spinning of wheel into electrical energydue to which the lightsare being lighten up.

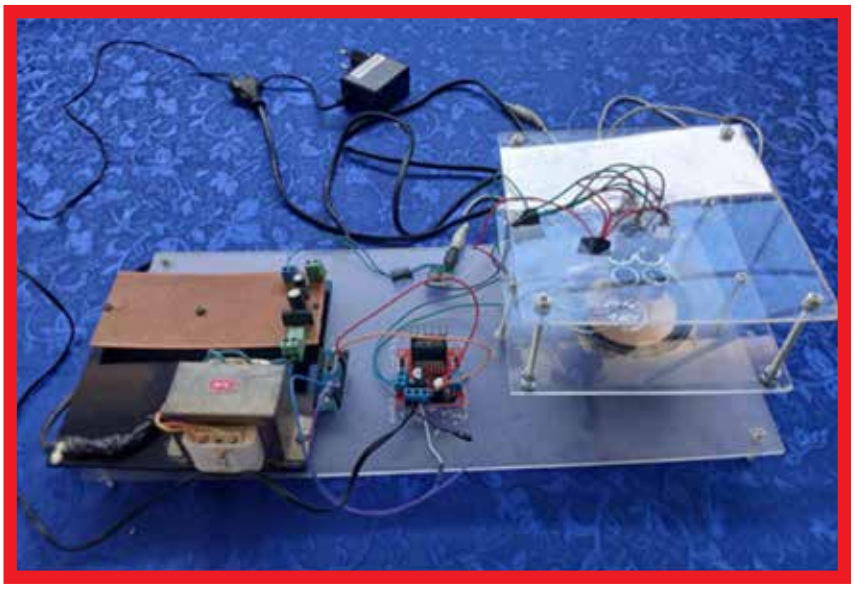
The Real World Application

Micro-hydropower systems for rural electricity. Modern hybrid water wheels using steel & bamboo for durability. Sustainable irrigation systems for larger agricultural lands. Integration with pumps and turbines for improved efficiency

Participant's names(Class IX) :
Afra Imran | Afra Hashmi
Amal Saleem | Meerab Fatima

ULTRASONIC ACOUSTIC LEVITATION

Beyond being a fascinating classroom experiment, it unlocks the deeper potential of sound, not just as something we hear, but as a practical tool to manipulate matter.



This project aims to demonstrate how high-frequency ultrasonic waves can create acoustic pressure powerful enough to suspend small objects in mid-air.

HOW IT WORKS

The setup uses ultrasonic transducers placed face-to-face, emitting sound waves at a high frequency. When these waves collide, they form "pressure nodes," points where the force is strong enough to trap and suspend objects. To the eye, it looks like magic. In reality, it's the power of physics that paves the way for futuristic applications in medicine, technology, transportation, and even space research.

The Real World Application

Currently, this levitation system can lift droplets or tiny particles. But its future applications are nothing short of revolutionary:

Medicine: Contact-free surgeries and drug delivery.

Safety: Handling toxic or hazardous materials without risk.

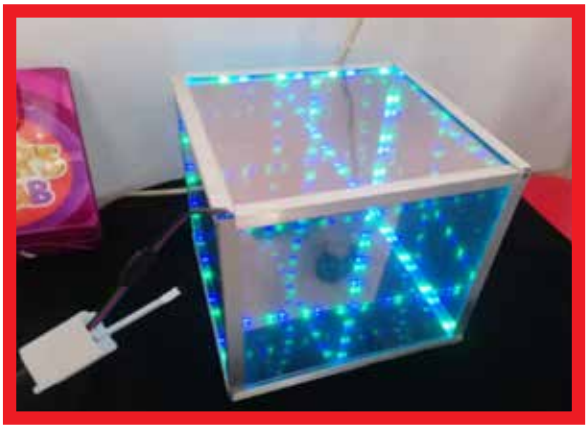
Technology: Precision robotics and microchip manufacturing.

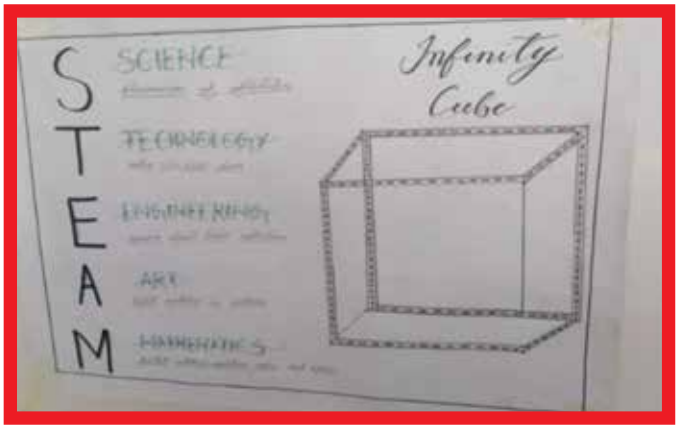
Space Exploration: Assisting astronauts with tools in zero gravity.

Participant's names(Class XII) :
Durdana Kanwal | Fizza Usman Khuwaja
Satwat Masud Al Hasan | Hoorain Haseeb Khan

Infinity Cube – Where Science Meets Mindfulness

Beyond being a fascinating classroom experiment, it unlocks the deeper potential of sound, not just as something we hear, but as a practical tool to manipulate matter.





The Infinity Cube project aims to teach students about the laws of reflection and refraction, while also touching upon geometry, psychology, and neuroscience. Beyond science, it explores how the brain forms patterns through lights and reflections — combining physics with the study of human perception.

HOW IT WORKS

Leds On The Inside Reflect Off The Reflective Side Of The Film, Bouncing Back And Forth Between The Walls Of The Cube Creating An Illusion Of Infinite Depth.

The Real World Application

While the infinity cube may not have direct daily-life applications, it offers a therapeutic sensory experience with a calming effect on the brain. It is often used in therapy for ADHD and autism patients, helping to improve focus and reduce stress.

Participant's names (Class X) :
Amna Salman | Wajeeha Saeed

Laser Security Alarm – Invisible Protection for Safer Spaces

The Laser Security Alarm is simple, reliable, and cost-effective, making it an ideal choice for homes, schools, and even high-security environments where quick response to intrusion is critical.

The Laser Security Alarm is designed to detect unauthorized intrusions by creating an invisible barrier of light. When someone crosses the beam, the system immediately triggers an alarm, alerting occupants or security personnel — offering a precise, high-accuracy way to protect any space.

HOW IT WORKS

Invisible Barrier: A laser transmitter projects a narrow, invisible laser beam across a protected space.Continuous Monitoring:A light-dependent resistor (LDR) or similar sensor continuously measures the light intensity from the laser beam. Intrusion Detection: If any object or person crosses the beam, the light reaching the LDR is blocked, causing a change in its resistance. Alarm Activation: This change in resistance is detected by a connected electronic circuit, which then activates an alarm, such as a buzzer, to signal the intrusion.
WiFi switch

The Real World Application

The Laser Security Alarm is simple, reliable, and cost-effective, making it an ideal choice for homes, schools, and even high-security environments where quick response to intrusion is critical

Participant's names: (class XII)
MEERAB FAISAL | SUHAIRA KHAN
FATIMA MUJAID | SOHA TEHREEM

Smart Waste Management – A Cleaner Greener Karachi

This smart waste management approach will:
Reduce pollution and improve public health.
Encourage recycling and eco-friendly urban practices.
Generate renewable energy and compost, promoting a circular economy. Help Karachi take a major step toward becoming a sustainable, smart city.

To transform Karachi into a clean and sustainable city by introducing smart waste collection systems and modern waste management techniques. This project aims to reduce pollution, promote recycling, and convert waste into valuable resources such as compost fertilizer, renewable energy, and clean fuel.

HOW IT WORKS

Smart Collection: Sensor-equipped bins detect when they are full and signal the collection unit. Waste Segregation: Collected waste is separated into organic and inorganic parts. Composting: Organic waste is biologically decomposed into nutrient-rich compost for soil improvement. Energy Recovery: Non-recyclable waste is processed in incineration plants to generate heat and reduce landfill volume. Renewable Power: Part of the organic waste is fed into MFCs, producing eco-friendly electricity.

Participant's names(Class XII) :
Humera Talat | Syeda Umna Atif
Syeda Umaima Fatima | Bushra Waqar

Wi-Fi Switch Control – Smart Home Automation with ESP32

The system is globally applicable for smart homes, energy management, accessibility for the disabled, and industrial automation. Its use of both Wi-Fi and Bluetooth makes it reliable in areas with limited or no internet access.

This project demonstrates how to design and build a remote-controlled home automation system using the ESP32 microcontroller. The aim is to improve energy efficiency, enhance accessibility, and build practical skills in coding and electronics.

HOW IT WORKS

Sense & Process: The ESP32 microcontroller collects sensor data and processes user commands.

Communicate:

Wi-Fi: Connects to the Adafruit IO cloud platform for global remote control.

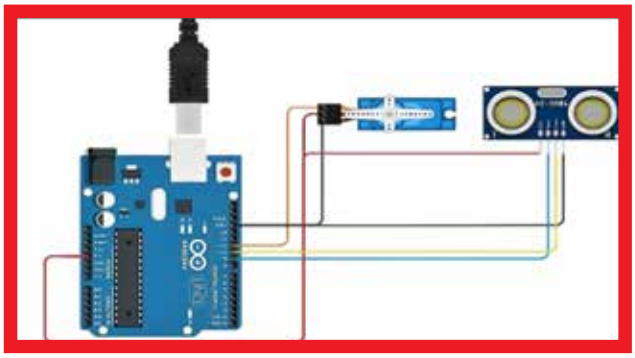
Bluetooth: Provides local control through a mobile app, even without internet.

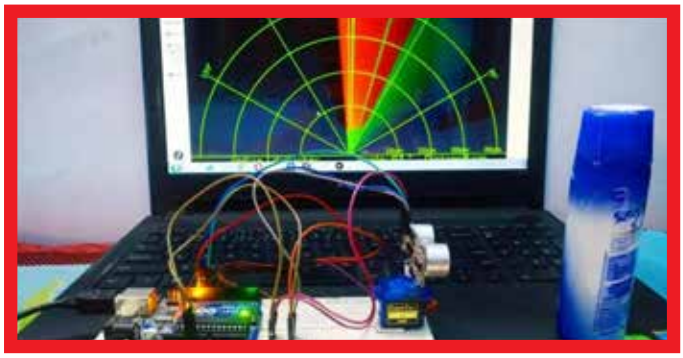
Control: The ESP32 sends signals to a relay module, which switches appliances on or off as instructed.

Participant's names: (class XI)
MAARIJ SIDDIQUI | HANIA ABID
SUMMAYA REHMAN | SOHA TEHREEM

Arduino-Based Radar Defense System

The Radar Defence System uses radio waves to detect and track objects like aircraft and missiles. It plays a key role in national security by providing early warning and real-time surveillance. This project explains its working, types, and importance in modern defense





To simulate radar operations using affordable hardware and provide students with hands-on experience in microcontrollers, sensors, and automation — strengthening their understanding of modern defence technology.

HOW IT WORKS

The system is built around an Arduino Uno microcontroller. An ultrasonic sensor is mounted on a servo motor, scanning the environment from 0° to 180°. Ultrasonic waves are emitted continuously, and the time taken for echoes to return is measured to calculate object distance. The Arduino processes this data, correlates it with the angular position, and transmits it to a computer. A radar-style graphical interface (created with Processing software) displays detected objects in real-time — just like a real defence radar screen

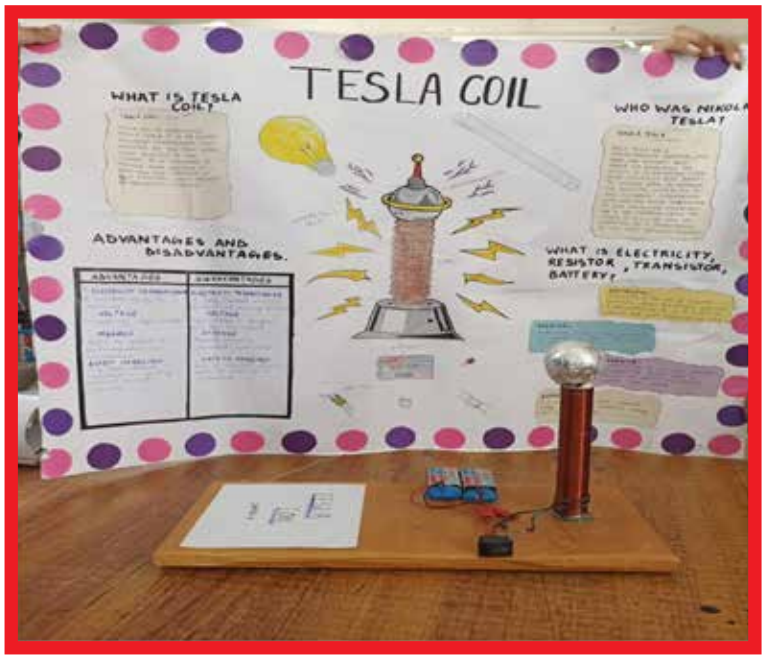
The Real World Application

This project is inspired by Operation Bunyan Al Marsoos, launched by the Pakistan Air Force during the May 2025 war, where radar technology played a critical role in the national defense and strategic success of Pakistan

Participant's names:
ABEERA NOOR - IX | SYEDA MAHA - IX
MUZAKKA AFTAB - X | MANAIEM ASLAM - X
ZAINAB ASIF - X | EMAAN NAZ - X

Tesla Coil – The Spark of Wireless Power

TThe Tesla Coil is more than a scientific device — it's a window into Nikola Tesla's dream of a world powered by wireless energy. From classroom demonstrations to modern-day innovations, it continues to spark curiosity and imagination in learners and scientists alike



The Tesla Coil is a fascinating invention that demonstrates how electricity can be transmitted without wires. It showcases the principles of resonance and electromagnetic induction, creating both science and spectacle

HOW IT WORKS

Primary Coil Current – When current flows through the primary coil, it generates a strong magnetic field.

Induction – This magnetic field induces a very high voltage in the secondary coil.

High Voltage Output – The secondary coil produces spectacular sparks and allows energy to transfer wirelessly

The Real World Application

Wireless Power Transmission
Radio Technology
Medical Devices
Antennas & Communication –

Participant's names(Class X) :
Zainab Fatima | Zimal Fatima
Areesha Adil

Wastewater Treatment Model Turning Dirty Water Clean

This simple model helps students understand the science behind wastewater management. It also builds awareness about the global water crisis and inspires practical solutions for a sustainable future.

This model demonstrates how wastewater can be treated step by step to make it safe for reuse. It highlights the importance of water conservation and pollution control — key lessons for students in today's world.

HOW IT WORKS

Sedimentation – Wastewater is allowed to stand so that heavy particles settle at the bottom.

Absorption – Charcoal or similar materials absorb dissolved impurities and odors.

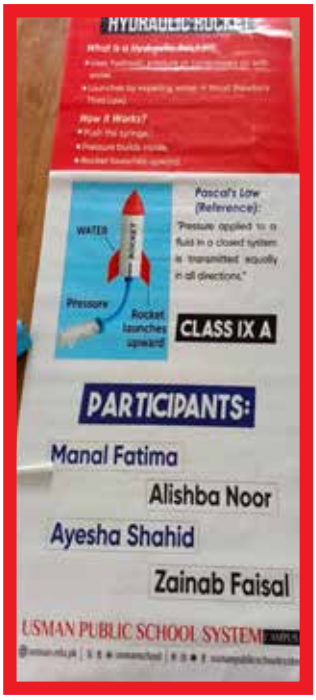
Filtration – The water passes through layers of sand, gravel, and cotton to remove remaining particles.

Clean Output – The process results in visibility of cleaner water, showing students how treatment works in real life.

Participant's names (Class X) :
Syeda Hooriya Fatima | Sarah Khan

Hydraulic Rocket – Bringing Pascal's Law to Life

A visual, hands-on experiment that turns theory into an exciting event. Reinforces two major physics principles — Pascal's Law & Newton's Third Law (action-reaction). Encourages curiosity about real-world applications in engineering, automobiles, and fluid mechanics.



The hydraulic rocket is a fun and exciting way to demonstrate Pascal's Law, which states: "A change in pressure applied at any point in a confined fluid is transmitted equally in all directions throughout the fluid." This simple yet powerful concept helps students see how pressure in fluids can be used to generate motion.

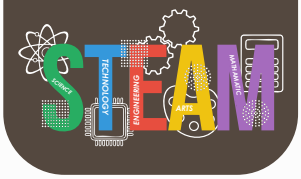
HOW IT WORKS

Pressure Application – When you press the plunger of the syringe, you apply pressure to the liquid inside. Equal Pressure Transmission According to Pascal's Law, this pressure spreads equally throughout the liquid.

Force Generation – The force pushes on the opposite side of the system, causing water to shoot out. Rocket Launch – The reaction force propels the rocket (or object) upward — an exciting application of physics in action!

The Real World Application

Hydraulic Brakes in Vehicles
Hydraulic Lifts
Hydraulic Presses
Medical Syringes



Participant's names(Class IX) :
Ayesha Shahid | Alishba Noor
Menal Fatima Saeed | Zainab Faisal

Solar Desalination – Turning Sunlight into Freshwater

Ideal for Remote Islands: Eliminates the need for costly water transportation. Sustainable & Clean: Uses renewable solar power instead of fossil fuels, reducing carbon emissions.

Future-Ready: A reliable solution for regions facing droughts, climate change, and freshwater shortages.

To provide clean drinking water by using renewable energy, making it a sustainable solution for areas where water is scarce and transporting freshwater is expensive.

HOW IT WORKS

A solar desalination plant uses solar energy to convert salty seawater into fresh, drinkable water.

Solar Heat: The sun's energy heats seawater.

Evaporation & Condensation: The water vapor is collected and condensed into pure freshwater.

Storage: The fresh water is stored for drinking, cooking, or irrigation.

Participant's names(Class X) :
Hafsa Faisal | Fatima Rehman
Fatima Abid | Fatima Umer
Umamah Ahmed

Application of Fleming's Right-Hand Rule

Understanding Fleming's Right-Hand Rule builds the foundation for learning electromagnetism and electromechanical systems. It bridges the gap between theory and real-world technology—showing how a simple hand gesture represents the science behind the movement of machines that power our daily lives.

To understand the effect of a magnetic field on a current-carrying conductor and how the direction of motion (force) can be determined using Fleming's Right-Hand Rule.

HOW IT WORKS

When an electric current passes through a conductor placed in a magnetic field, it experiences a force.According to Fleming's Right-Hand Rule, if you stretch the thumb, forefinger, and middle finger of your right hand so that they are mutually perpendicular, then: The forefinger represents the direction of the magnetic field, The middle finger shows the direction of current, and The thumb points in the direction of motion (force) experienced by the conductor. This simple rule helps predict how electric energy converts into mechanical motion—forming the basic working principle of many electrical devices.

Participant's names(Class X) :
KAMRAN ASHRAF | ALIYAN MUHAMMAD EBADULLAH

Test Your Skills with Triangles

Triangles play a vital role in real-world designs —

Construction and Architecture: Used in bridges, towers, and roof trusses to ensure strong and stable structures.

Engineering and Design: Applied in robotics, vehicles, and machinery for support and precision.

Safety and Navigation: Seen in road signs and design elements where visibility and strength are key.

To help students explore and understand the properties, angles, and symmetry of triangles through observation and problem-solving activities. This hands-on experience strengthens conceptual understanding of geometry while enhancing analytical and creative thinking skills.

HOW IT WORKS

Students engage in interactive exercises where they identify, draw, and construct triangles of different types. Through guided observation, they explore how changing the sides and angles affects the triangle's shape and stability.By experimenting with patterns, models, and puzzles, learners visualize the mathematical relationships that make triangles one of the most reliable structural forms.

Participant's names(Class X) :
Hassan Sami | Ammar Imran

Popsicle Bridge – Big Strength from Small Sticks

The Popsicle Bridge project proves that good design can turn weak materials into strong structures. It encourages creativity, teamwork, and problem-solving while giving students a hands-on introduction to engineering and physics

To demonstrate how shape and design affect strength in structures, showing that even light materials like popsicle sticks can support heavy loads when arranged correctly.

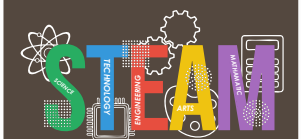
HOW IT WORKS

Design Principle: The bridge is built using pyramidal and triangular shapes that distribute weight evenly across a larger area.

Strength Demonstration: When weight is applied, the structure channels force efficiently, allowing even lightweight popsicle sticks to hold impressive loads — even the weight of a person

The Real World Application

Civil Engineering: Teaches the principles of bridge design, weight distribution, and structural stability.
STEM Education: Inspires students to explore physics, math, and engineering concepts through hands-on learning.
Practical Insight: Shows how engineers use shapes like triangles and pyramids to build strong, stable bridges in the real world.



Participant's names(Class IX) :
Yalish | Abdullah Amanullah
Ahmed Raza Faisal | Abdul Hannan

Vertical Axis Wind Turbine – Turning Traffic into Power

This project uses existing traffic flow as a free energy source, producing low-cost electricity and improving road safety — especially in areas where power outages cause accidents. It's a creative step toward clean energy and smart infrastructure.

Safety First: Reduce highway accidents by ensuring uninterrupted power for streetlights and traffic signals.

Affordable Power: Generate cheap, eco-friendly electricity using wind created by moving vehicles.

HOW IT WORKS

Wind Generation: As heavy trucks and cars pass, they create strong wind currents.

Rotation: This wind spins the vertical axis wind turbine installed on the road median.

Power Production: The spinning turbine generates electricity, which is stored or directly used for:

Streetlight illumination

Traffic signal operation

The Real World Application

Highways & Expressways
Traffic Signals & Streetlights
Green Energy

Participant's names(Class IX):
Shahan Shahab
Musab Bin Mansoor | Yaseen Bilal

Environmental Protection Project Keeping Our Planet Safe

This project focuses on proactive environmental care, helping protect forests, soil health, and air quality while encouraging industries to adopt sustainable waste management practices. It is a step toward a cleaner, greener future for all.

To prevent damage to forests, soil, and the environment by controlling harmful waste before it is released into nature

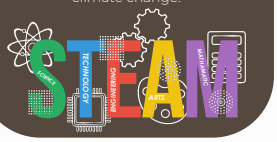
HOW IT WORKS

Waste Storage: Factories are required to store waste materials, especially harmful gases, instead of releasing them directly into the atmosphere.

Reuse & Conversion: Collected waste is treated or converted into useful by-products that can be used by other industries — reducing pollution and promoting a circular economy.

The Real World Application

Environmental Institutes: Provides actionable data and recommendations for government policy-making.
Industrial Zones: Ensures factories manage waste responsibly.
Sustainability Efforts: Supports global initiatives to combat pollution and climate change.



Participant's names(Class IX) :
Bilal Abid | Nabeel Farooq
Mirza Hamdan

Optical Illusion – The Power of Triangles

Optical illusions combine art, psychology, and science, helping learners appreciate how the human brain processes images. This understanding enhances creativity, critical thinking, and observation skills, showing that science is not just about facts—it's about how we see the world

To explore how optical illusions work and how they can deceive the human brain by creating images that differ from reality. The activity helps students understand visual perception, reflection, and pattern recognition, connecting art with science

HOW IT WORKS

Optical illusions occur when our eyes and brain interpret visual information incorrectly. Certain patterns, colors, or angles cause the brain to perceive motion, depth, or shapes that don't actually exist.

Through simple classroom demonstrations—like mirror illusions, shape patterns, or light reflections—students learn how light, symmetry, and geometry affect what we see.

Participant's names(Class IX) :
Hassan Sami | Ammar Imran

Variable DC Power Supply Module
Power at Your Fingertips

This project builds core electronics skills, giving students confidence to work with real-world circuits, troubleshoot power issues, and design projects that require precise voltage and current control — a critical foundation for robotics, IoT, and automation

EXplore how ultrasonic and IR sensors detect obstacles and interface with microcontrollers.

·Gain hands-on experience in Arduino programming to read sensor data and control motors.

·Practice diagnosing hardware/software issues and optimizing performance for better detection accuracy and response time.

HOW IT WORKS

Detection: Ultrasonic/IR sensors continuously scan for obstacles.

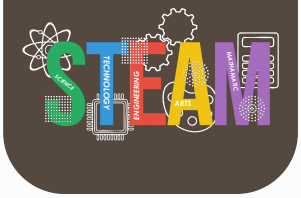
Processing: A microcontroller (like Arduino) interprets sensor signals.

Action: If an obstacle is detected, the robot stops and turns (left/right) to find a clear path.

Navigation: The process repeats, allowing smooth, autonomous movement without collisions

The Real World Application

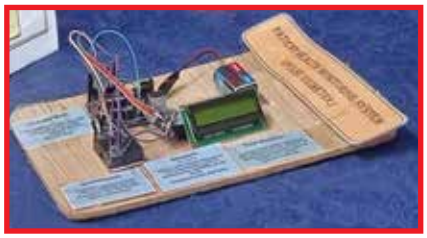
Autonomous Vehicles
Industrial Robots
Smart Home Devices
Search & Rescue



Participant's names (Class IX and IXO) :
Hambal | Afnan | Abdullah | Ismail | Yaseen | Ibrahim | Abu-Bakar
Zaid bin sajid | Abdullah Nadeem | Ahsan | Anas bin Asif | Abdul Hadi | Ehsan

Patient Health Monitoring System

This project highlights how technology can improve healthcare accessibility and save lives. With real-time monitoring, patients — especially those in remote or underserved areas — can receive timely care. It also reduces the burden on hospitals by enabling home-based health tracking



Remote Monitoring: Track patient vital signs and health metrics from a distance.

Real-Time Data: Collect and display data instantly for quick decision-making.

Early Detection: Identify potential health issues early, allowing timely intervention and treatment.

HOW IT WORKS

Components Used:

oArduino UNO (the "brain")

oMAX30100 Pulse Oximeter (measures pulse & oxygen levels)

oLCD Module (displays readings)

oJumper Wires & Breadboard (easy, solder-free connections)

oBattery (portable power source)

Circuit & Function:

oThe pulse oximeter sends data to the Arduino board via jumper wires.

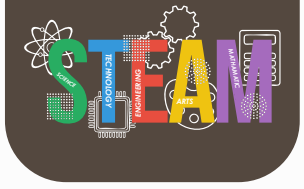
oThe Arduino processes the readings and sends them to the LCD display.

oThe display shows live pulse rate and oxygen saturation (SpO_2).

oEverything is powered by a small battery, making it portable and easy to use.

The Real World Application

Autonomous Vehicles
Industrial Robots
Smart Home Devices
Search & Rescue

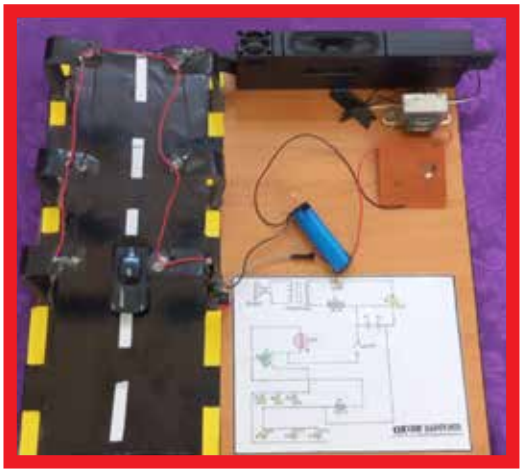


Participant's names(Class X) :
Samiya Ashar | Zara Khalid
Ayesha Rehan | Eshaal Shayan

Acoustic Energy Conversion: A Sustainable Solution for Street Lighting

Turning Noise into Light: A Smart Way to Reduce Pollution

We live in a world where noise pollution has become part of daily life — from honking traffic to bustling city streets. But what if all that unwanted sound could be turned into something useful? Imagine converting noise into electricity to power street lights. That's exactly the innovation behind a new sound-to-energy project!



The goal is simple yet powerful:

Reduce noise pollution.

Capture sound energy and convert it into electrical energy.

Use that energy to power LED lights and charge small batteries or capacitors.

The Big Picture

This project is more than just clever engineering — it's a vision of a sustainable future where everyday problems are transformed into solutions. By harvesting the wasted energy of sound, we not only fight noise pollution but also light up our world in greener, smarter ways.

The Real World Application

Power Street Lighting: City noise powers the very lamps that light our roads at night.

Charge Batteries: Store the energy to charge small batteries and electronic devices.

Smart Cities: Integrating such systems could reduce electricity consumption and turn a major pollutant into a sustainable energy source.

Participant's names(Class X) :
Vareesha Mustafa | Bareerah Ahmed
Esha Tir Radiah | Aimal Fatima
Yumna Saif

Qausar Hive – The All-in-One Learning Hub for Students

With Qausar Hive, students can:

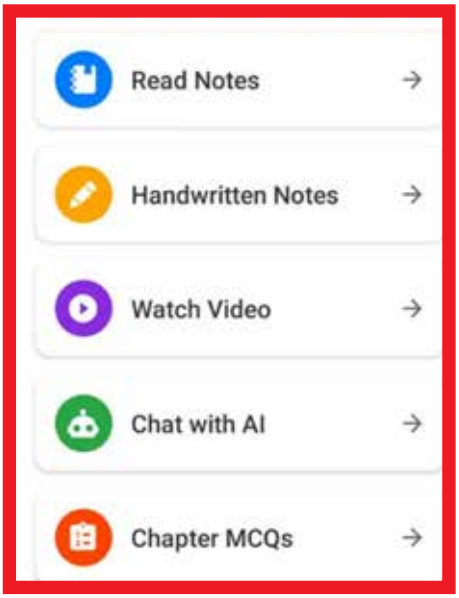
Access All Subjects: Browse every subject and chapter in a structured way.

Study Anytime: View digital notes and handwritten notes for quick revision.

Learn Visually: Watch concept-explainer videos for deeper understanding.

Test Knowledge: Take multiple-choice quizzes and track progress.

Ask AI: Get instant answers through an AI-powered chatbot — like having a personal tutor available 24/7.



Qausar Hive is designed to provide students with a complete, organized, and interactive learning experience — all in one app.

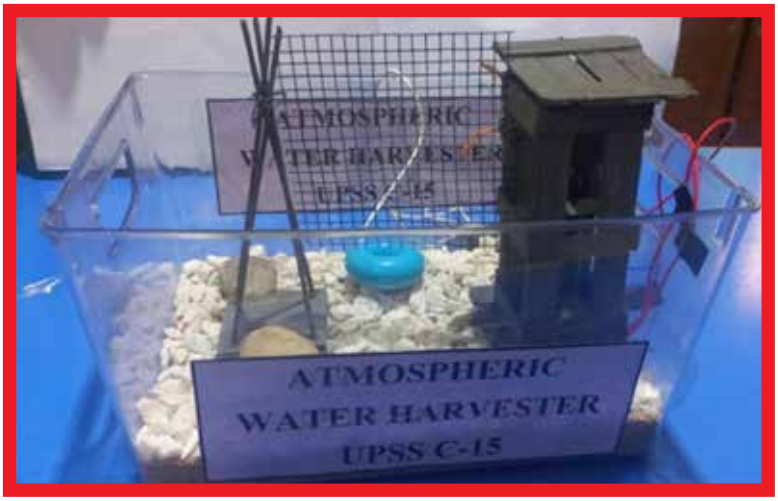
HOW IT WORKS

Qausar Hive was developed using React Native, allowing a single codebase to run on both Android and iOS devices. For development, Expo was chosen, which streamlined the build process and made testing faster and smoother.

Participant's names(Class- IXA) :
Alina Asif | Syeda Arwa Adnan
Hadia Asif

ATMOSPHERIC WATER HARVESTER

Catching Water from Fog: A Breakthrough for Pakistan In many parts of the world, water scarcity is one of the greatest challenges of our time. Punjab, Pakistan, faces a double problem — chronic water shortages and dense fog and smog that threaten health and safety. But what if the very fog that chokes the air could be turned into a source of clean, fresh water? That's the vision behind Pakistan's first sustainable fog harvesting system — a cost-effective solution that transforms fog into drinkable water while helping reduce pollution.



Develop and implement a sustainable, affordable system to harvest water from fog. Reduce the risks of fog and smog while providing a new source of freshwater.

HOW IT WORKS

Fog Simulation – A humidifier produces fog droplets (tiny particles just 3–10 microns in size).

Charging the Droplets – An arc generator creates a corona discharge, ionizing the air. Neutral fog droplets collide with these ions and become charged.

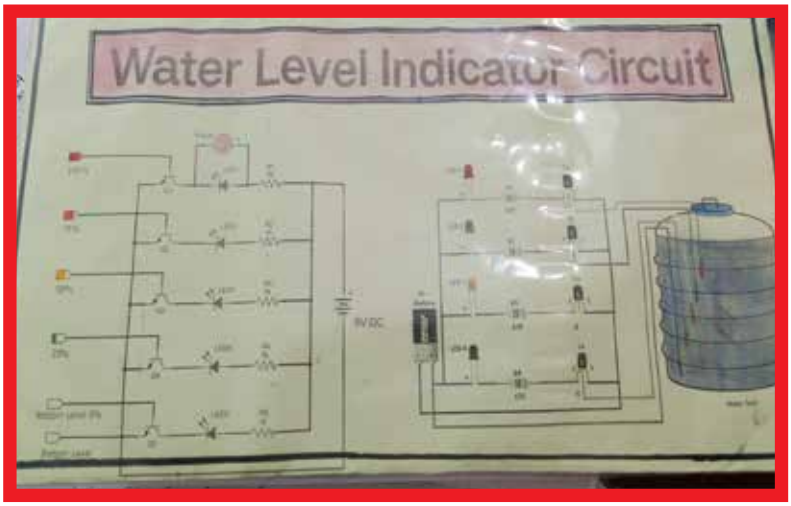
Attracting the Water – The charged droplets are pulled towards a fine mesh under an electric field.

Collecting the Water – Droplets stick, merge, and drip down into a collector plate, producing usable water.

Participant's names(Class X) :
Alishbah Syed | Ayesha Noor
S. Ghuzaila Adnan | Sumaima Aijaz

Water Level Indicator – Smart Solution for Efficient Water Management

With water becoming a precious resource, such devices make homes smarter, industries safer, and agriculture more efficient — all while helping protect the environment



The Water Level Indicator is designed to monitor and display the water level in a tank, helping to prevent overflow and ensure efficient use of water resources.

HOW IT WORKS

Probes/Sensors: Installed at different levels in the tank to detect water presence.

LED Indicators: Each probe lights up a corresponding LED when water reaches that level.

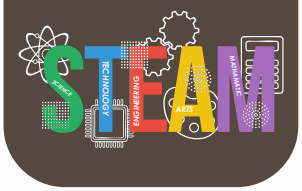
Overflow Prevention: When the top probe is reached, it can trigger a buzzer or switch off the motor automatically.

The Real World Application

Homes: Monitors overhead

Factories: Keep track of water levels in boilers

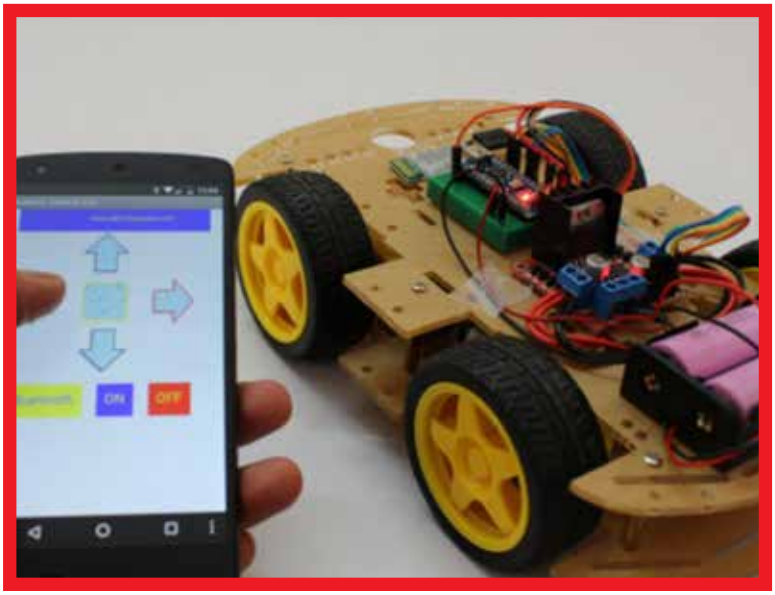
Agriculture: Ensures proper water levels in irrigation reservoirs



Participant's names(Class IX) :
Sana Sheikh | Ayesha Fayyaz
Aneeqa Meeraj | Fareeha Shoukat

Wireless Car – Learning the Future of Mobility

This project gives students a taste of robotics, automation, and wireless communication, sparking interest in fields like autonomous vehicles, drones, and IoT technology



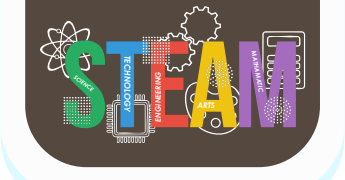
This project introduces students to the basics of wireless technology and shows how communication between devices powers modern innovations like drones and autonomous vehicles.

HOW IT WORKS

The wireless car is paired with a smartphone or controller via Bluetooth. Commands sent through the app are received by the Arduino, which drives the motors to move the car forward, backward, left, or right — a mini demonstration of modern driverless systems

The Real World Application

Wireless Communication:
Understand how data is transmitted via Bluetooth.
Global Applications:
Explore how wireless tech is used in drones, smart cars, and IoT devices worldwide



Participant's names(Class IX) :
Taha Farooq | Omer Qazi
Musab bin Touseef | Arfeen Ahmed

Firefighting Robot – Smart Technology for Safer Environments

This project combines robotics, automation, and safety engineering to create a system that can save lives, protect property, and assist first responders — a true example of technology serving humanity.

This project aims to design and develop a firefighting robot prototype that can detect and extinguish fires in different environments, reducing the risk of fire-related injuries and fatalities.

HOW IT WORKS

Heat Detection: Sensors detect the presence of heat or flames.

Autonomous Navigation: The robot moves toward the fire automatically.

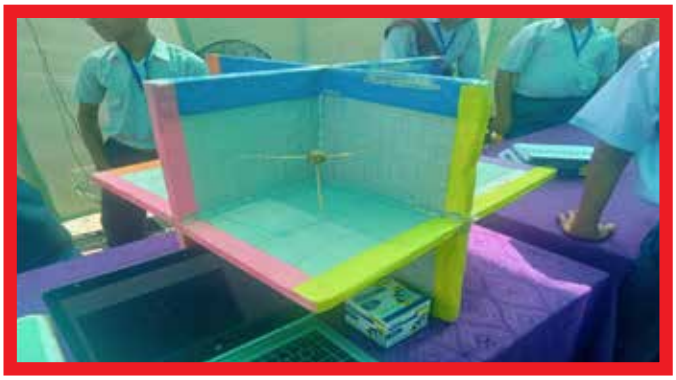
Extinguishing System: A small water pump sprays water to control or put out the fire.

Remote Control: Users can also operate the robot manually via Bluetooth and a smartphone app, allowing precise control when needed.

Participant's names(Class IX- X) :
Fatima Ibrahim | Leena Imran
Lamees Junaid

COORDINATE GAME

Graphs and coordinates are not just math topics – they help us navigate, design, play games, analyze sports, study space, manage businesses, and even save lives in medicine.



To make learning 2D & 3D coordinates fun by using a game-based approach where students roll dice, find points, and form shapes on a graph board

HOW IT WORKS

Roll two octahedron dice – one for X and one for Y.

Plot the point (X, Y) on the graph board.

Players compete to find points correctly and form shapes (triangle, square, etc.).

Points are awarded for every correct point pinned and shape completed

Participant's names(Class IX) :
Muhammad Arman Siddiqui | Mudabbir Mansoor
Muhammad Afris Gul

Scholar AI – Your AI-Powered Learning Assistant

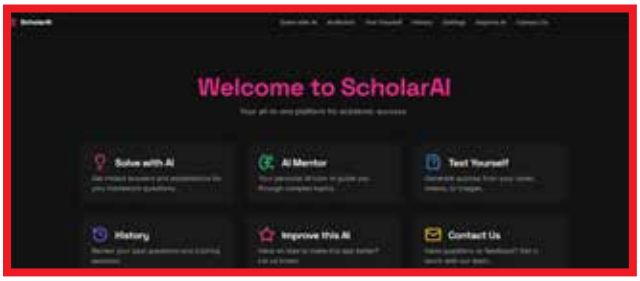
Unlike typical AI chatbots, ScholarAI combines:

Problem-Solving – Clear, subject-specific solutions.

Mentorship – Personalized learning with interactive Q&A.

Self-Testing – Automatic quiz generation for effective revision.

Its ability to process text and images, create quizzes from user-provided material, and offer an interactive learning environment makes it a practical, student-focused solution for modern education.



ScholarAI is built to guide and support students throughout their learning journey — helping them with assignments, classwork, homework, and concept clarity while encouraging independent learning.

HOW IT WORKS

ScholarAI combines modern web technologies with powerful AI models to create a smooth, interactive learning experience.

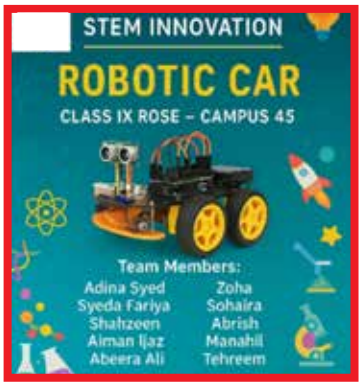
Frontend: Built with React + Next.js and styled with Tailwind CSS, the interface is fast, responsive, and student-friendly, with smooth transitions and a theme toggle for customization. Backend: Uses Next.js API routes integrated with Google Vertex AI and Transformers.js for natural language understanding, question generation, and quiz creation. AI Power: Google's Vertex AI models handle text and image inputs, providing accurate answers, explanations, and custom quizzes for any subject.

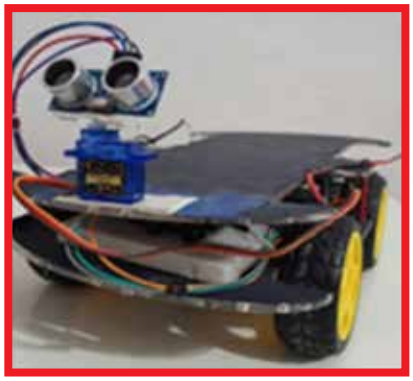
Together, this setup ensures speed, reliability, and intelligent results — whether students are solving problems, exploring concepts, or testing themselves.

Participant's names(Class IX) :
Arman Siddiqui

Robotic Car – Smart Obstacle Avoidance in Action

This project introduces students to robotics, programming, and automation — giving them a taste of how modern autonomous systems work. It inspires future engineers to explore AI-powered mobility solutions.





Design & Build: Create a robotic car that can automatically detect and avoid obstacles.

Hands-On Learning: Apply robotics, electronics, and programming concepts to a real-world problem

HOW IT WORKS

Detection: Ultrasonic sensors continuously scan for obstacles in the car's path.

Decision-Making: A microcontroller (e.g., Arduino) processes sensor data.

Action:

Car moves forward if no obstacle is detected.

Car turns left or right when an obstacle is detected to avoid collision.

Continuous Navigation: The process repeats, allowing smooth, autonomous movement

Participant's names(Class IX) :

Shahzeen | Adina Syed | Arman Ijaz | Syeda Fariya | Huda Arif
Abeera Ali Zoha Shahab | Sohaira Shafqat | Abrish Fawad | Manahil Khan | Tehreem Fatima

AI-Powered Disease Prediction & Healthcare Recommendation System

Preliminary Health Check at Home – Helps users assess symptoms before visiting a doctor.

Support for Rural Areas – Provides medical guidance where healthcare facilities are limited.

Online Consultations – Integrates easily with telemedicine platforms.

Pandemic Situations – Quickly screens large populations for symptoms.

Health Awareness – Educates users about preventive care and healthy living

This project aims to create a web-based health assistant that predicts possible diseases based on symptoms entered by users and provides personalized recommendations — including medications, precautions, workouts, and diet plans.

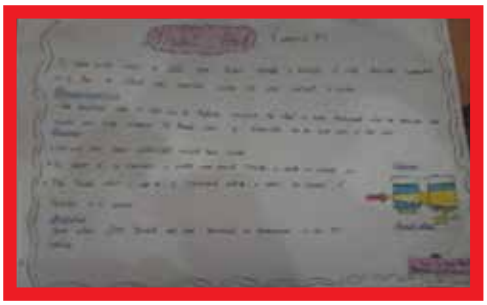
HOW IT WORKS

This project aims to create a web-based health assistant that predicts possible diseases based on symptoms entered by users and provides personalized recommendations — including medications, precautions, workouts, and diet plans.

Participant's names(Class IX) :
ZUNERA AYESHA | TABEER ZEHRA
UMAMA KHAN | QANEETA AZEEM

Tyndall Effect – When Light Shows the Way

Understanding the Tyndall Effect is crucial for pollution control, clean water initiatives, and scientific research — helping us see what's hidden and take action for a cleaner, healthier environment.



To observe the Tyndall Effect and use it to distinguish between a true solution and a colloidal solution, while understanding its role in detecting impurities in air and water.

HOW IT WORKS

When a beam of light is passed through a medium (air, water, or colloid):

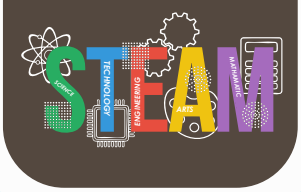
True Solution: The light passes straight through and is not visible.

Colloidal Solution: The light beam becomes visible due to scattering by tiny particles.

This scattering of light is called the Tyndall Effect.

The Real World Application

Air Pollution Detection: Helps detect dust and smoke particles in the air.
Water Treatment: Used to check impurities in water during filtration.
Science Labs: Distinguishes true solutions from colloids in chemistry experiments.
Nature: The blue color of the sky is partly due to scattering of light — a natural Tyndall Effect!



Participant's names(Class X) :
Muhammad Taha | Musabbeh Hamdani
Rana Huzaifa Ahmed

AI Against Cyberbullying – Protecting Students in the Digital Age

In today's connected world, students spend hours on social media and online platforms — but along with opportunities come risks. Harmful, abusive, and bullying messages can deeply affect young minds. This project introduces an AI-based system that detects abusive online text using Natural Language Processing (NLP) and Machine Learning (ML) in Python. The system aims to protect students, promote safe digital practices, and raise awareness about cyberbullying.

To develop an AI-based system that detects harmful and abusive online text using Natural Language Processing (NLP) and Machine Learning (ML) in Python. The aim is to protect students, promote safe digital practices,and create awareness about cyberbullying.

HOW IT WORKS

Data Collection – Large datasets of social media comments (in both English and Roman Urdu) are gathered for training. Text Processing – The text is cleaned, broken down into tokens, and unnecessary words are removed. Feature Extraction – Text is converted into numbers using TF-IDF, a smart technique that highlights important words. Model Training – A Naive Bayes classifier is trained to differentiate between bullying and non-bullying content. Prediction – When a message is entered, the system predicts whether it is harmful or safe and even shows a confidence score. User Interface – A simple Tkinter-based GUI allows anyone to type in text, check messages, and receive cyber safety tips instantly.

The Real World Application

Social Media Platforms
Schools & Colleges
Parents
Digital Platforms

Participant's names(Class IX) :
Iqra Khan | Ayesha Siddiqa
Amna Irfan | Iqra Shafaat

Environmental Protection Project – Keeping Our Planet Safe

This project focuses on proactive environmental care, helping protect forests, soil health, and air quality while encouraging industries to adopt sustainable waste management practices. It is a step toward a cleaner, greener future for all.

To prevent damage to forests, soil, and the environment by controlling harmful waste before it is released into nature

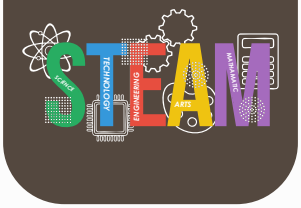
HOW IT WORKS

Waste Storage: Factories are required to store waste materials, especially harmful gases, instead of releasing them directly into the atmosphere.

Reuse & Conversion: Collected waste is treated or converted into useful by-products that can be used by other industries — reducing pollution and promoting a circular economy.

The Real World Application

Environmental Institutes: Provides actionable data and recommendations for government policy-making.
Industrial Zones: Ensures factories manage waste responsibly.
Sustainability Efforts: Supports global initiatives to combat pollution and climate change.



Participant's names(Class IX) :
Bilal Abid | Nabeel Farooq
Mirza Hamdan

Vertical Axis Wind Turbine – Turning Traffic into Power

This project uses existing traffic flow as a free energy source, producing low-cost electricity and improving road safety — especially in areas where power outages cause accidents. It's a creative step toward clean energy and smart infrastructure.

Safety First: Reduce highway accidents by ensuring uninterrupted power for streetlights and traffic signals.

Affordable Power: Generate cheap, eco-friendly electricity using wind created by moving vehicles.

HOW IT WORKS

Wind Generation: As heavy trucks and cars pass, they create strong wind currents.

Rotation: This wind spins the vertical axis wind turbine installed on the road median.

Power Production: The spinning turbine generates electricity, which is stored or directly used for:

Streetlight illumination

Traffic signal operation

The Real World Application

Highways & Expressways
Traffic Signals & Streetlights
Green Energy

Participant's names(Class IX):
Shahan Shahab
Musab Bin Mansoor | Yaseen Bilal

Optical Illusion – The Power of Triangles

Optical illusions combine art, psychology, and science, helping learners appreciate how the human brain processes images. This understanding enhances creativity, critical thinking, and observation skills, showing that science is not just about facts—it's about how we see the world

To explore how optical illusions work and how they can deceive the human brain by creating images that differ from reality. The activity helps students understand visual perception, reflection, and pattern recognition, connecting art with science

HOW IT WORKS

Optical illusions occur when our eyes and brain interpret visual information incorrectly. Certain patterns, colors, or angles cause the brain to perceive motion, depth, or shapes that don't actually exist.

Through simple classroom demonstrations—like mirror illusions, shape patterns, or light reflections—students learn how light, symmetry, and geometry affect what we see.

Participant's names(Class IX) :
Hassan Sami | Ammar Imran

Popsicle Bridge – Big Strength from Small Sticks

The Popsicle Bridge project proves that good design can turn weak materials into strong structures. It encourages creativity, teamwork, and problem-solving while giving students a hands-on introduction to engineering and physics

To demonstrate how shape and design affect strength in structures, showing that even light materials like popsicle sticks can support heavy loads when arranged correctly.

HOW IT WORKS

Design Principle: The bridge is built using pyramidal and triangular shapes that distribute weight evenly across a larger area.

Strength Demonstration: When weight is applied, the structure channels force efficiently, allowing even lightweight popsicle sticks to hold impressive loads — even the weight of a person

The Real World Application

Civil Engineering: Teaches the principles of bridge design, weight distribution, and structural stability.
STEM Education: Inspires students to explore physics, math, and engineering concepts through hands-on learning.
Practical Insight: Shows how engineers use shapes like triangles and pyramids to build strong, stable bridges in the real world.

Participant's names(Class IX) :
Yalish | Abdullah Amanullah
Ahmed Raza Faisal | Abdul Hannan

Test Your Skills with Triangles

Triangles play a vital role in real-world designs —

Construction and Architecture: Used in bridges, towers, and roof trusses to ensure strong and stable structures.

Engineering and Design: Applied in robotics, vehicles, and machinery for support and precision.

Safety and Navigation: Seen in road signs and design elements where visibility and strength are key.

To help students explore and understand the properties, angles, and symmetry of triangles through observation and problem-solving activities. This hands-on experience strengthens conceptual understanding of geometry while enhancing analytical and creative thinking skills.

HOW IT WORKS

Students engage in interactive exercises where they identify, draw, and construct triangles of different types. Through guided observation, they explore how changing the sides and angles affects the triangle's shape and stability.By experimenting with patterns, models, and puzzles, learners visualize the mathematical relationships that make triangles one of the most reliable structural forms.

Participant's names(Class X) :
Hassan Sami | Ammar Imran

Application of Fleming's Right-Hand Rule

Understanding Fleming's Right-Hand Rule builds the foundation for learning electromagnetism and electromechanical systems. It bridges the gap between theory and real-world technology—showing how a simple hand gesture represents the science behind the movement of machines that power our daily lives.

To understand the effect of a magnetic field on a current-carrying conductor and how the direction of motion (force) can be determined using Fleming's Right-Hand Rule.

HOW IT WORKS

When an electric current passes through a conductor placed in a magnetic field, it experiences a force.According to Fleming's Right-Hand Rule, if you stretch the thumb, forefinger, and middle finger of your right hand so that they are mutually perpendicular, then: The forefinger represents the direction of the magnetic field, The middle finger shows the direction of current, and The thumb points in the direction of motion (force) experienced by the conductor. This simple rule helps predict how electric energy converts into mechanical motion—forming the basic working principle of many electrical devices.

Participant's names(Class X) :
KAMRAN ASHRAF | ALIYAN MUHAMMAD EBADULLAH