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Macmillan Budding Scientist 2026-27

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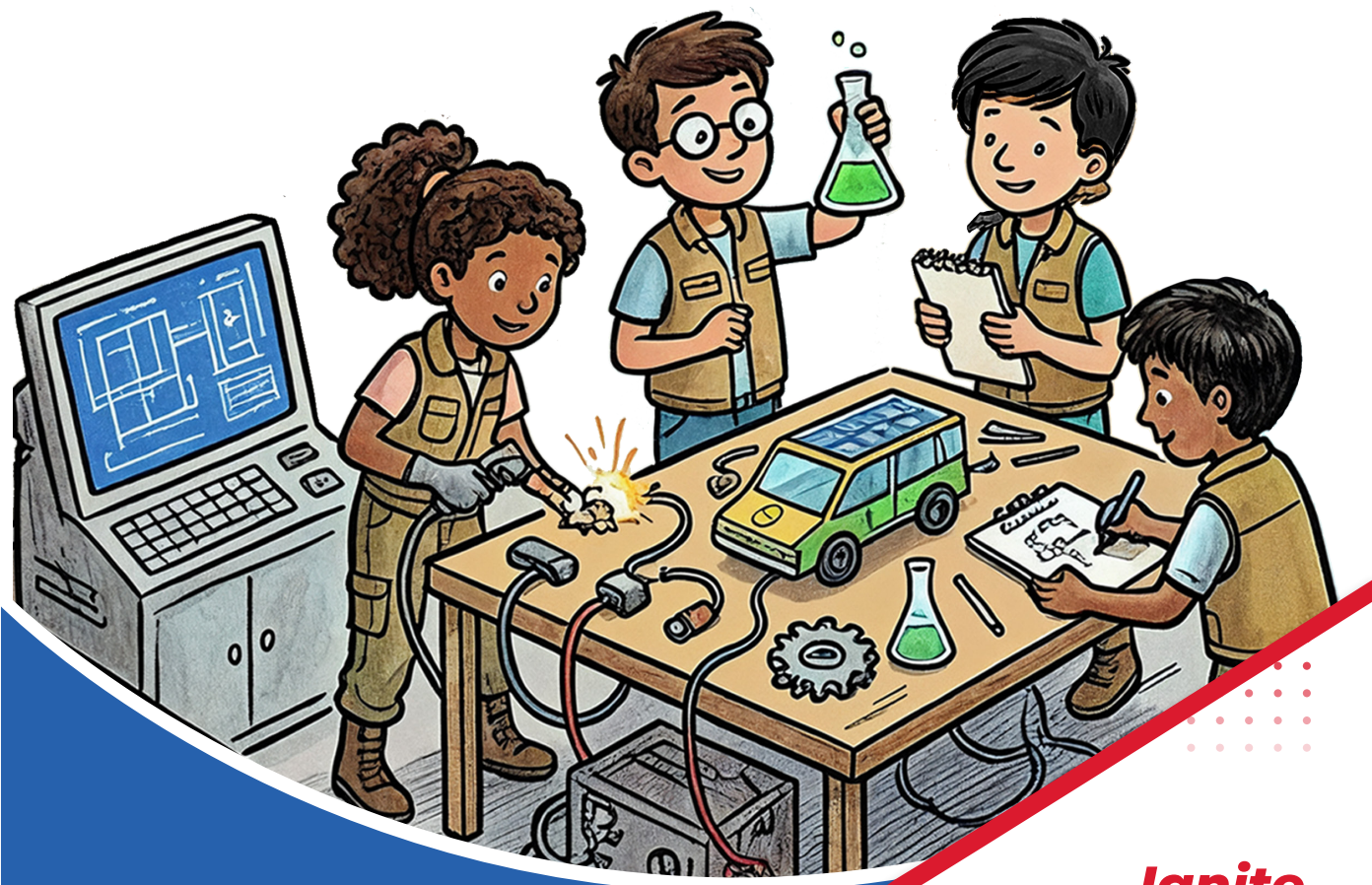
12000+
schools
participated

15,500+
original ideas explored
and developed

30,000+
students
engaged



Project Reference Book

Ignite Curiosity

Macmillan Budding Scientist

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Foreword

It was a pleasure for me to be approached by Macmillan Education India (MEI) in 2018 to explore the possibility of my involvement in their initiative "Macmillan Budding Scientist" (MBS). Right from the outset, it was clear to me that this was a somewhat unique beginning in the landscape of Indian school education system. At the time, I had already been professionally introduced to the school education system in India through (a) several invited and "popular" guest lectures for school students both at IIT Delhi and/or their respective schools, (b) an MHRD (now MoE) programme called IIT-Professor Assisted Learning (IIT-PAL) for class XI and XII school students that I was given the responsibility to initiate from IIT Delhi (along with a few of my colleagues), and (c) an honour of serving as an "Eminent in Education" member in the management committee of a Kendriya Vidyalaya (KV) in Delhi. Through the latter two, it was my sheer privilege to closely interact with KV teachers, who inspired me to appreciate the key foundational roles school teachers play in our lives and the unparalleled efforts they put in towards executing their responsibilities, beyond any prior experience of mine.

In 2018, MEI took the bold step of advancing the concepts of co- and extra- curricular initiatives of the Government of India that aim at enhancing the school education experiences of students by integrating beyond-the-classroom exploratory avenues for teachers and students. Inspired by Neil Armstrong, I would go to the extent of stating "*That first Macmillan Budding Scientist in 2019 was one step for Macmillan Education India, but a giant leap for corporate involvement in the Indian education sector*".

Having successfully completed three iterations since the first one in 2019, MBS initiative has fast established itself as a benchmark for recognizing co- and extra- curricular academic efforts of student-teacher teams from schools across the country. While encouraging beyond-the-classroom engagements of teachers with their students in schools, MBS initiative encourages students who wish to push their educational explorations beyond their books. Additionally, an abstract achievement of the MBS initiative is that it recognizes and celebrates those teachers who push their own limits in guiding students beyond classrooms. I feel privileged to have been asked to write this foreword for the first edition of this booklet showcasing projects of the MBS initiative. I hope that these projects will inspire students towards pushing the boundaries of their educational experiences beyond-their-classrooms but within-their-school-systems. More importantly, I hope this booklet will be seen as a first-of-its-kind effort in recognizing the often-unsung champions in our society – the teachers in schools who push their limits for every pupil entrusted to them.

Prof Aditya Mittal, B. Tech., Ph. D.

Kusuma School of Biological Sciences,

Indian Institute of Technology Delhi

Foreword

The word "Science" refers to the state of knowing through questioning, answering, and solving problems. It starts off with basic questions like 'Why is it happening?' Is it possible to modify it? 'The Macmillan Budding Scientist (MBS)' programme aims to cultivate these urges in learners, guiding them to seek beyond their books and think about how science relates to the real world. By fostering curiosity and critical thinking, MBS empowers young students to engage with scientific concepts in a meaningful way.

IIT Delhi's Academic Outreach & New Initiatives office has been supporting MBS for the past two years now, and we are proud as it complements our goal of bringing science to more schools and inspiring students to develop a scientific temperament. Science, in our opinion, is for everyone, especially for students who want to address real-life problems, pose thought-provoking queries, and come up with creative answers. This active and practical style of learning is what scientific research is based on.

A crucial aspect of this collaboration is the involvement of IIT Delhi's research scholars, who not only contribute to MBS by evaluating the entries but also gain valuable insights from their experiences. Interacting with young curious students helps our scholars to experience science in a new light - one that is unfiltered by conventional academic boundaries. This interaction feeds their own inquisitiveness, which strengthens the essence of scientific curiosity. While interacting with the bright young minds, our researchers are refreshed on the principles of inquiry-based learning that helps formulate their own investigations.

I take great pride in the association with the 'Macmillan Budding Scientist Programme' and hope to sustain this partnership. By joining hands, we can create a world where every child is able to reason, investigate, and create, like a real scientist.

At IIT Delhi, we remain dedicated to helping young learners while also inducing a spirit of scientific inquiry. We salute 'Macmillan Budding Scientist' for nurturing the coming generation of problem-solver, researchers and innovators. Over the years, the programme has grown in scale and stature and now receives participation from over 1200 schools spread across India and the Middle East. Let us make deeper attempts to motivate, educate and research because the future of science starts here!

Prof. Shilpi Sharma

Associate Dean,
Academics (Outreach & New Initiatives), and Professor,
Department of Biochemical Engineering and Biotechnology,
IIT Delhi

Foreword

It has been my privilege to be associated with an initiative like 'Macmillan Budding Scientist (MBS)'. Since its inception in 2019, the MBS initiative has completed six successful iterations and grown significantly, with many prestigious IITs joining hands to support this noble endeavour over the years.

Fostering a scientific temper among students and democratising science to make it more accessible are two objectives that are extremely close to my heart. MBS provides a unique platform for students, encouraging them to view science as an application-driven discipline while nurturing their boundless creativity. Through MBS, students not only apply their scientific knowledge to address real-world challenges—problems they encounter in their daily lives—but also gain the invaluable experience of life at an IIT. IIT Delhi, in particular, has been a beacon of inspiration, championing the cause of pursuing science and fueling curiosity.

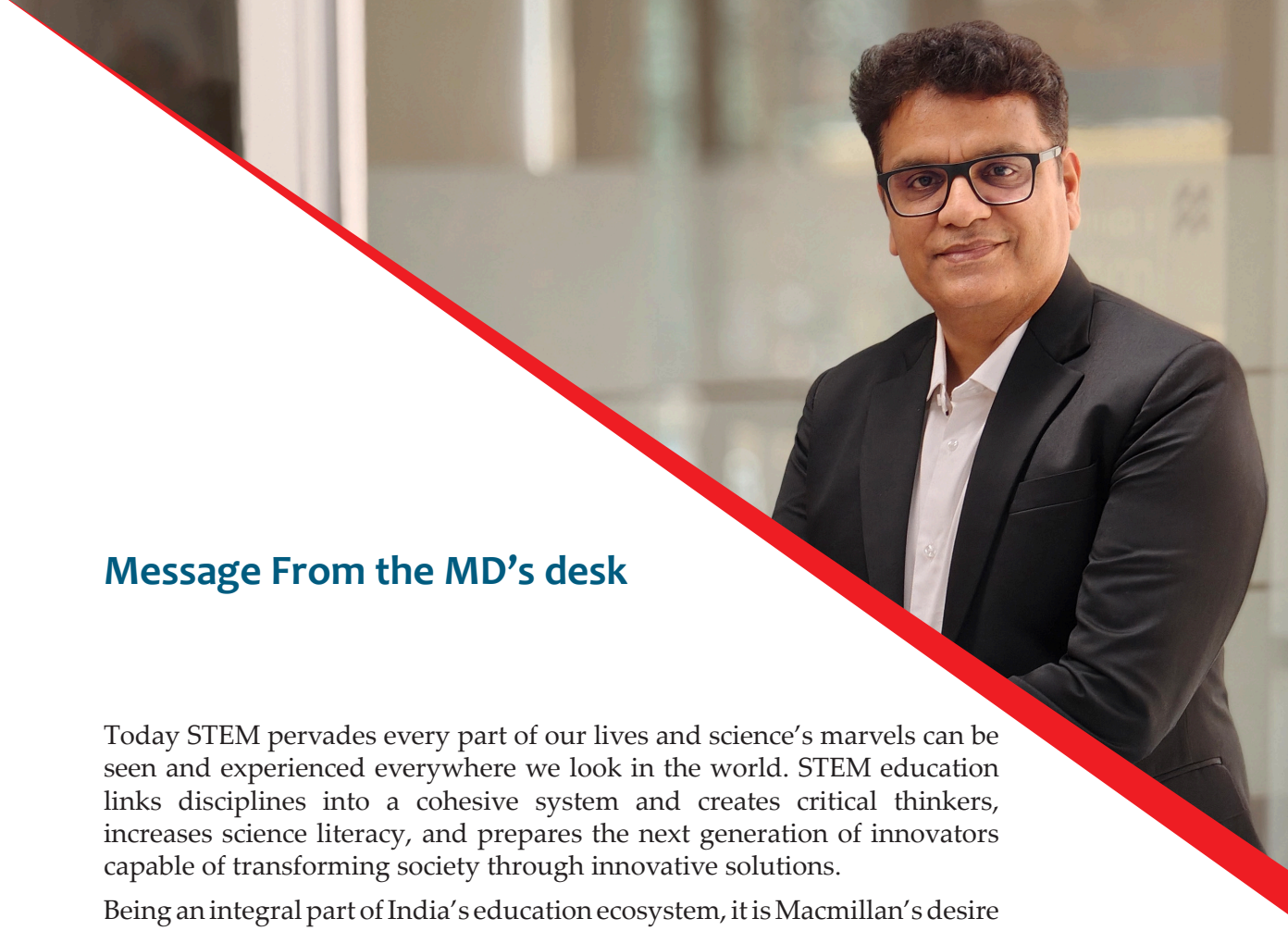
The contributions of mentor teachers deserve special recognition. These dedicated educators invest themselves wholeheartedly to ensure their students excel, shaping young, inquisitive minds and inspiring them to explore science beyond the confines of textbooks.

Equally commendable are the principals and school leaders of the participating institutions. Creating an environment that encourages students to ask questions and think critically is no small feat. Their leadership fosters a culture of inquiry that is vital for nurturing the innovators of tomorrow.

I hope these projects inspire students to push the boundaries of their educational experiences, exploring learning opportunities that extend beyond the classroom while remaining rooted within their school systems. More importantly, I envision this booklet as a pioneering effort to honor the often-unsung champions of our society—school teachers—who consistently go above and beyond to empower every student entrusted to their care.

Prof. Subodh Sharma

Associate Professor
and Pankaj Gupta Chair Professor in
Privacy and Decentralisation,
Department of Computer Science and Engineering, IIT Delhi



Message From the MD's desk

Today STEM pervades every part of our lives and science's marvels can be seen and experienced everywhere we look in the world. STEM education links disciplines into a cohesive system and creates critical thinkers, increases science literacy, and prepares the next generation of innovators capable of transforming society through innovative solutions.

Being an integral part of India's education ecosystem, it is Macmillan's desire and duty to foster their interest, and ambition and give them a platform to showcase their creativity, which will spearhead tomorrow's technology.

At the Google Science Fair 2019, Tuan Dolmen from Turkey received the Scientific American Innovator Award for a digital agriculture module design that can capture tree vibrations. Further Aman KA and AU Nachiketh Kumar from India took home the National Geographic Explorer Award for a natural coagulant for rubber latex.

All of these children have done India proud, and we can't wait to see what they come up with in the future. You children should look up to young scientists like them as role models and strive to solve India's pressing problems, such as pollution, hunger and infant mortality.

I also encourage teachers to embrace STEM education because children are born with a natural curiosity for exploration and discovery.

We look forward to taking Macmillan Budding Scientist to schools across the country giving young learners an opportunity to showcase their ideas at a national level.

Rajesh Pasari
Managing Director
Macmillan Education India

About Macmillan Budding Scientist

I remember the town hall hosted by the entire Springer Nature senior management team, on a cool November evening in 2016, in India. The Springer Nature group launched an innovative initiative to encourage and develop scientific talent in schools across India - Macmillan Budding Scientist, powered by Springer Nature. The thought behind it was to develop curiosity and scientific temper in young learners and promote research and innovation for sustainable development. The announcement came after an education conclave was organized by Springer Nature to discuss strategies and evolve solutions to challenges in science education in the years ahead. This initiative was to be integrated with the efforts of IIT Delhi towards school outreach and taken to thousands of schools in India, by Macmillan Education India. I would like to acknowledge the support of Ms. Subhra Priyadarshani, Chief Editor, Nature India who was instrumental in the conceptualization of the Budding Scientist initiative, enabled the partnership with IIT, and promised workshops on Science Communication to students.

At the launch event, a student of Amity International School Gurgaon Vaishali Tikko, was honoured by Springer Nature for the novel instrument she developed to help her fellow students facing learning difficulties. From 2016 to 2022 Macmillan Budding Scientist has grown in stature and today the engagement with IIT Delhi has extended to IIT Mumbai, Bhubaneshwar and Chennai. This will allow more students across the country to experience Science.

Macmillan Education is looking to expand this programme in the coming years and deepen its impact.

Vandana R Juneja
Director Marketing
Macmillan Education India

Vaishali Tikko, of Class XII was awarded as the budding scientist for her project titled- Novel instrument to detect learning disabilities in children by Macmillan Education. School Principal, Mrs Arti Chopra was also bestowed for fostering scientific talent.

From the Principal's Desk

In an era defined by rapid technological advancement and complex global challenges, the ability to think critically, inquire rigorously, and apply scientific principles is no longer a luxury but a necessity. Nurturing this mindset equips our youth with the tools to innovate, solve pressing problems, and contribute responsibly to society.

To this end, we have integrated inquiry-based learning across the curriculum, encouraging pupils to pose questions, design experiments, and analyse real-world data. This hands-on approach cultivates curiosity and critical thinking from an early age. Our dedicated faculty employ interdisciplinary projects that connect science with technology, engineering, and mathematics, exemplified by initiatives such as Inkergy, which converts plastic waste into electricity. Such projects provide authentic contexts for students to experience the practical impact of scientific principles.

We further foster a culture of continuous exploration through workshops, science fairs, and partnerships with research institutions, offering exposure to cutting-edge ideas and mentorship from seasoned professionals. Emphasising ethical responsibility and sustainability ensures that our learners become not only skilled scientists but also conscientious citizens committed to the betterment of society.

We are particularly focused on encouraging students to identify real-world problems within our own region and to devise feasible solutions, especially those addressing environmental degradation and pollution. By directing their ingenuity toward local challenges, we aim to create tangible improvements that benefit our community and inspire broader action.

I am proud of the enthusiasm and ingenuity our students consistently demonstrate. Together, with the support of teachers, parents, and the broader community, we will continue to build a robust foundation of scientific literacy that prepares our youth for the challenges and opportunities of tomorrow.

We extend our sincere gratitude to Macmillan and the Indian Institute of Technology, Delhi, for organising the prestigious Budding Scientist Competition. Their commitment to fostering innovation provides our students with a vital platform to apply their knowledge, think beyond conventional boundaries, and showcase groundbreaking ideas. Such opportunities not only validate the hard work of our young minds but also inspire a culture of curiosity and excellence within our school community.

Yours sincerely,
Ravinder Sra
Principal
Silver Oaks School, Dabwali Road, Bathinda

From the Principal's Desk

At Disha Delphi Public School, Kota, we are committed to cultivating a strong scientific temperament that aligns with the rapidly evolving technological landscape of the 21st century. Our academic philosophy emphasizes evidence-based learning, critical thinking, and the application of scientific principles to real-world challenges. We believe that nurturing scientific inquiry from an early age equips students with the cognitive tools necessary to innovate and excel in an increasingly technology-driven world.

Our school integrates advanced STEM modules, research-oriented projects, and hands-on experimentation across subjects to strengthen conceptual understanding. Students engage with modern scientific practices such as data analysis, design thinking, coding, robotics, and environmental monitoring. These initiatives foster analytical reasoning, precision, and computational literacy—skills essential for future scientific pursuits.

Our laboratories and innovation spaces provide students with opportunities to conduct investigations, formulate hypotheses, test models, and draw evidence-based conclusions. Collaborative learning platforms and interdisciplinary projects enable them to explore the intersection of science, technology, and societal needs. Participation in national competitions and research-oriented events helps students benchmark their skills at a higher level and understand the demands of scientific problem-solving.

The project selected for the final round of this prestigious event is a reflection of our students' ability to integrate scientific knowledge with technological innovation. It highlights their competence in critical analysis, research methodology, and solution-driven thinking under the guidance of their mentor teacher.

We remain committed to fostering a scientific ecosystem where curiosity is transformed into discovery, ideas evolve into innovation, and learners grow into responsible contributors to the scientific community.

Dr. Poonam Jain,
Principal
Disha Delphi Public School, Kota

From the Principal's Desk

At Delhi Public School, Rohini, we believe that scientific temperament and innovative thinking are cultivated not just in classrooms but through curiosity, questioning, hands-on exploration, and experiential learning.

From the early years, our well-equipped Science, Mathematics, and Computer laboratories encourage students to learn by doing. Project-based learning, interdisciplinary activities, regular experiments, nature walks, and vegetable gardening help them connect theory with real-life applications while revealing the beauty of environmental conservation. Initiatives like Science in Focus, science quizzes, debates, and model-making competitions provide joyful platforms for students to ideate, collaborate, and transform ideas into tangible creations.

Our students actively participate in zonal, national, and international science events, exhibitions, and Olympiads, securing top ranks and gaining valuable exposure. Student leadership in Science and Innovation is strengthened through dedicated Student Council positions such as President – Innovation and Incubation, President – Science Activities, and President – Health and Nutrition. Driven by compassion and responsibility, they reach out to the community through rescue drives, health awareness campaigns, and impactful initiatives such as conducting sessions and nukkad nataks on substance abuse awareness.

We place equal emphasis on critical thinking, logical reasoning, data interpretation, ethical scientific conduct, and responsible citizenship. Academic excellence is recognised and celebrated—recently, the Delhi Public School Society instituted a cash award for PGT Physics Teachers to appreciate of the outstanding CBSE Class XII Physics Board Results.

Through continuous teacher training, we ensure that our classrooms and campuses remain vibrant spaces where curiosity is celebrated, creativity is nurtured, and empathy is lived every day.

At DPS Rohini, we are deeply committed to shaping young minds who observe keenly, question boldly, think critically, innovate responsibly, and serve selflessly—preparing them to meet the challenges of tomorrow with confidence, compassion, and care for the world around them.

Kanika Sachdeva Govi
Principal
Delhi Public School, Rohini

From the Principal's Desk

"To think scientifically is to reason with purpose, to question with intention, and to learn through evidence."

Scientific thinking involves not only understanding scientific concepts but also using the core reasoning skills that guide scientific work—such as induction, deduction, designing experiments, causal reasoning, forming concepts, and testing hypotheses. Future studies in schools are expected to emphasize collaborative dimensions of scientific thinking, improved strategies for teaching science, and the brain mechanisms that support scientific reasoning. Therefore, for schools and 21st-century learners, scientific thinking can be viewed as the process of actively seeking knowledge. It includes any intentional effort students make to deepen their understanding. In modern classrooms, this kind of thinking is essential—it equips learners with the ability to inquire, analyze, collaborate, and solve problems in a rapidly changing, information-rich world. Students engaged in hands-on sessions in coding, robotics, automation, light-sound experiments, gardening robotics, and other STEM-related tinkering — giving them opportunities to build, test and iterate their own designs. IIT here acts as a catalyst for scientific thinking in schools, and hands-on innovation platforms that spark curiosity, Scientific thinking can be summed up as both as true pursuit of knowledge and a necessity.

Ms. Priti Wason

Principal

Delhi Public School Ghaziabad, Meerut Road

From the Principal's Desk

At Delhi Public School, Bijnor, we remain deeply committed to cultivating a scientific temperament that extends far beyond the boundaries of traditional learning. Our objective is to provide an academic environment where inquiry is encouraged, critical thinking is strengthened, and innovation becomes a natural pursuit for every student. We believe that true education in science emerges not only from concepts learned in the classroom, but from practical exposure, experimentation, and meaningful engagement with real-world problems.

It is a matter of great pride that our students continue to excel in nationally recognized scientific platforms such as the Macmillan Budding Scientist program. Their achievements reflect the dedication of our faculty, the support of our community, and the perseverance of our learners who consistently strive for excellence. Equally commendable are the contributions our students make to advanced, sustainability-focused research initiatives, demonstrating both their intellectual capability and their sense of responsibility toward the planet.

As we move forward, Delhi Public School, Bijnor reaffirms its commitment to providing students with opportunities that inspire scientific curiosity and empower them to become thoughtful, innovative, and future-ready citizens.

Mrs. Payal Kapoor
Principal,
Delhi Public School, Bijnor

From the Principal's Desk

I extend my heartfelt appreciation to the Macmillan Education team for creating such a meaningful platform that inspires young learners across the country to think beyond classrooms and explore the world of science with confidence and curiosity. Initiatives like the Macmillan Budding Scientist leave a lasting impact on students, encouraging them to pursue excellence in academics and holistic development.

At Allenhouse Public School, Khalasi Lines, Kanpur, we are committed to fostering scientific thinking, creativity, and problemsolving skills among our students. Our teachers and enriched learning environment provide students with exposure that motivates them to ask questions, explore new ideas, and work on solutions that address real-world challenges.

Through various school initiatives, club activities, field visits, workshops, and hands-on learning experiences, we ensure that our students receive multidimensional growth opportunities. Our students actively engages learners in experiments, research-based projects, and awareness campaigns that strengthen their understanding and confidence. We take immense pride in our students who represent the school at state and national platforms with their innovative ideas and strong commitment to learning. Their participation reflects the solid academic foundation and value-based education imparted at Allenhouse Public School.

Allenhouse Public School proudly celebrates the achievements of its young scientists and looks forward to their continued excellence in future endeavours.

Dr. Shabana Arora

Principal,

Allenhouse Public School, Khalasi Lines, Kanpur

From the Principal's Desk

I take this opportunity to appreciate and thank Macmillan Education India Private Limited for providing such a wonderful platform where students can showcase their scientific temper and attain confidence. Our students performed exceptionally well on this platform, which enabled them to become the ranker achievers in the North Zone competition held at IIT Delhi. They also received the golden opportunity to participate in the National Round, Which is to be held at IIT Delhi. It is indeed a matter of great joy and pride for us. I gratefully acknowledge Ms. Himanshi and Ms Monika Bidhan for being the mentors of our young scientists throughout this project.

The real meaning of education is to create an environment that not only helps children learn effectively but also inspires them to recognize and explore their own potential. We place equal emphasis on academics, sports, life skills, and values. To fulfil the global needs and trends of quality and holistic education, we provide technologically embedded learning where children receive ample exposure to Language, Science, Mathematics, Artificial Intelligence, Robotics, etc., along with digital smart classrooms that enhance the teaching and learning process.

Continuous learning not only helps students learn more but also enables them to develop a scientific temper. We guide the students to carry out activities, observe, derive, and conclude. This approach helps them innovate and explore.

Mr. Satvir Singh Gahlawat,

Principal,

Aadharshila Public School, Jind(Haryana)

From the Principal's Desk

7i World School stands as a testament to our steadfast dedication to providing students with meaningful and holistic learning experiences centered around the development of the '7 Intelligences': Imagination, Insight, Inquiry, Innovation, Integration, Interdependency, and Integrity. Our mission is rooted in empowering every student to discover and follow their unique path, enabling them to realize their full potential with confidence and determination. This vision drives us to create and maintain an exceptional learning environment that nurtures both intellectual curiosity and personal growth. We believe that education extends beyond traditional academics; it is about fostering a comprehensive intelligence that prepares students to face real- world challenges with creativity, critical thinking, empathy, and ethical integrity. By emphasizing the seven intelligences, we offer a broad spectrum of developmental opportunities that help children excel in various domains of life. At 7i World School, we place a strong emphasis on promoting science, encouraging students to explore and engage deeply with scientific concepts and practices. Our curriculum integrates hands-on experiments, inquiry-based learning, and the latest technological tools to inspire a passion for scientific discovery and innovation. This scientific focus supports our overall goal of intelligent learning aligned with international standards. Our educational approach blends innovative teaching methodologies, modern technology, and experiential learning, encouraging students to actively engage with knowledge, ask meaningful questions, and apply their learning in practical ways. We also emphasize collaboration and interdependency as essential skills, teaching students the value of teamwork and interpersonal abilities critical for future success. Integrity remains a core value throughout our teaching philosophy, shaping students into responsible, ethical individuals prepared to contribute positively to society. In summary, 7i World School is more than just a place of academic learning; it is a nurturing community where every student is guided and supported to thrive across multiple intelligences, including a strong foundation in science, equipping them with the tools to succeed both locally and globally, and to live fulfilling lives true to their unique strengths and aspirations.

Ms.Veenu Badmera

Principal,

7i World School SLR, Gwalior

From the Principal's Desk

"Education is not merely a means of earning a livelihood; it is a process of developing the mind, character, and spirit."

— Kulapati Dr. K. M. Munshi, Founder, Bharatiya Vidya Bhavan

At Bhavan's Visakhapatnam, scientific acumen is nurtured as a habit of mind rather than the accumulation of facts or procedures. Guided by the vision of our founder, we view science education as a means to develop thoughtful learners who observe carefully, question purposefully, and reason with clarity and evidence.

Classroom practices are consciously designed to be activity-based and experiential, enabling students to engage with scientific concepts through observation, hands-on exploration, and real-life applications. Emphasis is placed on understanding the why behind concepts, encouraging learners to connect ideas and think analytically.

A distinctive pedagogical practice at our school is the Student-Led Conference, where students present scientific ideas through models, demonstrations, and interactive explanations before peers, parents, and educators. This platform strengthens conceptual understanding, communication skills, and learner confidence, while placing students at the centre of the learning process.

Scientific engagement is further enriched through science exhibitions, observation-driven learning initiatives, science talk shows, and broadcasts via the in-house school radio station. These platforms provide meaningful opportunities for students to articulate scientific ideas, reflect on observations, and relate learning to everyday contexts.

Students are also encouraged to participate in government and private platforms at various levels, ensuring appropriate exposure, experience, and progressive learning opportunities.

Above all, the art of questioning is consciously fostered. Students are guided to think independently, validate ideas through evidence, and approach problems with a scientific mindset. At Bhavan's Visakhapatnam, scientific acumen is cultivated as a lifelong disposition—preparing learners to engage thoughtfully and responsibly with a rapidly evolving world.

Shimpy Kumari
Principal
Bharatiya Vidya Bhavan's Public School, Visakhapatnam

From the Principal's Desk

A school is a place where curiosity finds direction and young dreams are given shape. At Excellent English Medium School, Kallabettu, we strive to create a learning space that encourages exploration, originality, and confidence in every child.

Our students are consistently encouraged to engage with scientific ideas and creative thinking. Year after year, they take part in the INSPIRE Award initiative, reflecting their ability to observe, question, and innovate. Adding to this achievement, four of our students have been associated with the ISRO YUVIKA – Young Scientist Programme, where they experienced the excitement of scientific inquiry.

Learners from our school actively participate in competitions at the divisional, state, and national levels, gaining valuable exposure and recognition. Their regular presence at the Regional Science Fair stands as a testament to their enthusiasm for hands-on learning and practical understanding.

A distinctive feature of our institution is the Atal Tinkering Lab (ATL). Designed to nurture STEM skills, this vibrant space remains open to students at all times, offering uninterrupted opportunities to imagine, design, and experiment. The lab serves as a platform where ideas evolve into meaningful creations through collaboration and perseverance.

With the guidance of devoted educators and a supportive school environment, we are committed to nurturing thoughtful, skilled, and future-ready individuals. At Excellent English Medium School, Kallabettu, we continue to inspire young minds to learn with passion, create with purpose, and step forward with confidence.

Mr Shivaprasad Bhat Principal

Excellent English Medium School, Kallabettu

From the Principal's Desk

At our school, nurturing scientific acumen is a fundamental part of our educational vision. We believe that science education should go beyond textbooks and examinations, encouraging students to think critically, question logically, and explore the world with curiosity and confidence.

From the primary years onward, students are introduced to scientific concepts through hands-on activities, experiments, and interactive learning experiences. Well-equipped laboratories (Physics, Chemistry, Biology, Robotics, Computers, Homescience and Mathematics), activity-based teaching methods, and the use of technology in classrooms help students connect theory with real-life applications. Regular science experiments, model-making, and project-based learning instill a spirit of inquiry and innovation.

We actively encourage participation in science exhibitions, Olympiads, and inter-school competitions, which provide students with platforms to apply their knowledge and develop problem-solving skills. Guest lectures, workshops, and awareness programs further broaden their understanding of emerging scientific trends and career opportunities.

Our teachers play a pivotal role by mentoring students, promoting analytical thinking, and guiding them to ask meaningful questions rather than merely seek answers. Emphasis is also placed on environmental awareness, sustainable practices, and ethical use of science, shaping responsible future citizens.

By fostering curiosity, creativity, and critical thinking, our school strives to develop scientifically literate learners who are well-prepared to meet the challenges of a rapidly evolving world. We take pride in creating an environment where scientific thinking thrives and innovation is encouraged.

Ms. Qamar Sultana
Principal,
Ramadevi Public School, Hyderabad

From the Principal's Desk

At St. Raphael's Public School, fostering scientific acumen is a deliberate and continuous process that nurtures curiosity, critical thinking, and innovation rooted in our commitment to the holistic development of future generation. We believe that science is not confined to textbooks or examinations; it is a way of thinking that empowers learners to question, explore, and discover the world around them.

Scientific learning at St. Raphael's begins from the foundational years through observation-based activities, hands-on experiments, and experiential learning that ignite curiosity. As the students' progress, well-equipped laboratories, interactive panels, and digital resources provide opportunities to bridge theory with real – life application. Hands – on practical sessions, demonstrations, and project-based learning enable students to experiment, analyze results, and arrive at conclusions.

Our CBSE – aligned curriculum emphasizes inquiry-based learning, encouraging students to ask meaningful "why" and "how" questions. Platforms such as Science clubs, exhibitions, quizzes, and innovation – oriented events provide opportunities for creative expression and problem-solving. Active participation in interschool and national-level competitions further boosts confidence and exposure to real-world scientific applications.

Teachers at St. Raphael's act as facilitators and mentors, encouraging and guiding students beyond the prescribed textbooks. Regular workshops and activity-based assessments introduce learners to emerging fields such as AI, robotics and environmental science. Equal importance is given to cultivating scientific values through programmes on health awareness, sustainability and responsible use of technology.

By integrating knowledge, skills and values, our school nurtures scientifically aware, ethical and confident learners - preparing them not only for academic excellence but also to contribute meaningfully to society.

Tessy Jose C
Principal
St. Raphael's Public School,Kallur, Thrissur

From the Principal's Desk

At The Lords, we see science as more than just a subject, it is a way of thinking that begins with curiosity and grows through questioning, exploring and experimenting. We believe every child has the potential to be a scientist, and our aim is to create an environment where that curiosity can flourish and transform into true understanding.

This journey begins very early at The Lords. In kindergarten, our children engage in discovery-based activities that encourage them to observe, ask questions and explore the world around them. As they progress, inquiry-based learning takes center stage, helping students connect what they learn to everyday life. Practical science is introduced from Grade 3 onwards, ensuring that experimentation and hands-on learning become a natural and enjoyable part of their school experience.

Our well-equipped laboratories provide students with the space and tools to explore ideas safely, while digital literacy begins in the early primary years, making technology an integral part of learning from the start. Robotics adds yet another dimension, fostering creativity, problem-solving and logical thinking through exciting, interactive projects.

Our Science, Space, Eco Farm and Math clubs, along with project days and competitions, give students opportunities to collaborate, share ideas and apply their learning in meaningful ways. By encouraging curiosity, exploration and teamwork, we help students understand that science and technology are not just subjects, they are tools for discovery, innovation and shaping the world around them.

Ms.V Meena Thirpurasundari,

Principal,

The Lords' International School, Chennai, Tamil Nadu

From the Principal's Desk

At The NGP School, Science is not viewed merely as a subject confined to textbooks or classrooms. It is a way of life – an integral part of how students observe, question and engage with the world around them. This philosophy is deeply embedded in the school culture and is nurtured through a wide range of curricular and co-curricular initiatives.

The school has formally integrated STEM education into its regular curriculum. Dedicated periods are allocated, supported by specially trained teachers who deliver a structured and graded program and hands-on learning in areas such as electronics, Arduino programming, Python coding, Robotics and related technologies. The school's STEM lab, one of the most vibrant spaces on campus, stands testimony to students' enthusiasm and curiosity, and is consistently abuzz with experimentation and innovation.

Teachers handling STEM classes undergo specialised training to ensure effective delivery of the curriculum. In addition, the school regularly engages external resource persons to further enrich students' learning experiences through exposure and real-world applications of science and technology.

A distinctive feature of the school is its student leadership model in Science. The School Council includes a dedicated student position titled 'Science and Tech Lead', a role exclusively created to promote scientific initiatives and activities across the school.

The Science Expo is a flagship annual event in the school calendar and exemplifies student driven learning at its best. More than an exhibition, the expo is celebrated as a festival of ideas, with planning and preparation spanning over a month. What makes this event truly unique is that it is entirely conceptualized and executed by Higher Secondary Science stream students. From selecting themes and mentoring junior students to training participants and judging the projects, every aspect of the expo is managed by students themselves. The strong mentor-mentee culture inspires younger students and motivates them to take on similar leadership roles as they progress through the school.

Further strengthening scientific temper are the clubs such as Astronomy, Robotics and Aeromodelling which provide platforms for explorations beyond the curriculum. Engagement in science Olympiads, Vidyarthi Vigyan Manthan camps and the integration of hands-on methodologies in regular science classes are all part of the school's sustained efforts to cultivate curiosity, innovation and a strong scientific mindset among students.

Through these thoughtfully designed initiatives, The NGP School strives to nurture scientifically aware, confident and future ready learners who approach challenges with curiosity, logic and creativity.

Ms. A Preetha Prakash

Principal,

The Ngp School, Coimbatore

From the Principal's Desk

At Vijayagiri Public School, we view science not merely as a subject, but as a dynamic lens through which our students explore the infinite possibilities of life. In a world continually reshaped by rapid discoveries and innovations, our commitment is to ignite an enduring curiosity for knowledge—blending strong academic foundations with real-world experimentation to nurture resilient and responsible innovators.

We provide our students with enriching opportunities to visit other institutions and participate in a wide range of science-related activities and projects. These experiences encourage them to explore new ideas, collaborate with peers, and sharpen their skills through hands-on learning—from robotics challenges and experimental laboratories to innovative project work. Our environmental initiatives further enable students to study local ecosystems, deepening their curiosity and sense of responsibility towards nature.

With dedicated mentors guiding and nurturing young minds, we strive to shape not only future scientists, but thoughtful visionaries who dream boldly and act decisively for a sustainable tomorrow. Together with parents and educators, let us empower our students to move forward into a future where science inspires empathy, equity, and excellence.

Mr. N. M. George
Chief Education Officer & Principal
Vijayagiri Public School, Chalakudy

From the Principal's Desk

Birla High School is renowned for its academic prowess, particularly in science education. The institution nurtures students through excellent infrastructure and dedicated teachers who make science engaging and accessible. The school boasts of its state-of-the-art laboratories, including Biology, Physics, Chemistry, and AI/Computer science labs, providing students with cutting-edge facilities so that none of their questions remain unanswered.

Students participate in research projects and internships at prestigious institutions like IISc, Calcutta Medical College, and Tata Medical Research Centre, applying scientific knowledge in real-world contexts. This exposure enhances their understanding and prepares them to aim for an academic career in Research.

The students have excelled in scientific competitions, reaching finals in state and national-level events organised by CBSE and other bodies. The school conducts a Fun with Science show, visits to BITM and IISER Kolkata etc.

Birla High School focuses on cultivating scientific acumen, aiming to create an experiential learning environment so that science becomes an experience and not only a subject studied by the students.

Mrs. Loveleen Saigal

Principal,

Birla High School, Kolkata

From the Principal's Desk

We at Carmel School, Sadew Upper Shillong, fostering scientific acumen is not merely an academic goal—it is a commitment to nurturing curious, confident, and innovative young minds. We believe that science education must go beyond textbooks and examinations, inviting students to question, explore, experiment, and discover. Thus, our approach is rooted in hands-on learning, critical thinking, and real-world application.

From the early classes onwards, students are encouraged to observe their surroundings, ask questions, and engage in exploratory activities. Teachers guide students to think logically, analyse outcomes, and draw meaningful conclusions—skills that form the core of scientific temperament.

We also integrate project-based learning, where students investigate real-life problems and present creative solutions. Activities like science exhibitions, quizzes and eco-club initiatives further cultivate their scientific curiosity. Through these platforms, students develop research skills, teamwork, communication abilities, and confidence in expressing their ideas.

Technology plays a vital role as well. Digital tools, virtual labs, and interactive simulations complement classroom teaching, allowing students to visualise complex concepts and engage in self-paced learning.

We gratefully acknowledge Macmillan Education for its continued support in fostering a love for science among young learners through well-designed programmes such as "Budding Scientist." Such initiatives provide students with valuable opportunities to apply scientific concepts creatively, think independently, and grow in confidence as young researchers and innovators.

Ultimately, our mission is to shape learners who not only excel academically but also embrace science as a way of thinking—rational, open-minded, and solution-oriented. By fostering a culture of inquiry and innovation, we prepare our students to become responsible citizens and future leaders who can contribute meaningfully to society through the power of scientific understanding.

I wish all our young scientists every success as they continue to explore, question, and discover the wonders of science. May their curiosity always lead them to new horizons and inspiring achievements.

Rita Rithiang Rymbai (Sr. Hazel)
Principal,
Carmel School, Sadew, Shillong

From the Principal's Desk

When we founded Epic Public School, we established two core values: innovation and compassion. We believe that innovation without compassion can have disastrous consequences.

We set up innovation labs and appointed dedicated teachers to guide our students in critical thinking, problem-solving, and teamwork. However, we also recognized that our students needed to develop a compassionate heart to identify and address real-world problems.

To foster empathy, we established a free school in a nearby tribal village, where our students teach. We also have an organic farm where students learn farming and develop a connection with nature. These experiences help our students become empathetic individuals.

Our Windmill Project, which generates low-cost electricity for our tribal school, is a shining example of compassion and innovation coming together. Our students identified a pressing need and worked tirelessly to create a solution that will revolutionize rural households.

Another project developed by our students is an app that helps farmers identify crop diseases by scanning plant leaves.

As principal, I'm proud of our students, who are using science and technology to make a positive impact on society. They're proof that with compassion and innovation, we can create a brighter future for all.

Dr. Sanjukta Saha,
Principal,
Epic Public School, Coochbehar

From the Principal's Desk

It gives me immense pleasure to acknowledge and appreciate the enthusiastic participation of our students in the Science Exhibition and contest held at IIT Guwahati. Such prestigious platforms provide young minds with an opportunity to explore, experiment, and express their scientific thinking beyond the classroom.

At our school, we strongly believe that a nurturing and inquiry-driven environment is the foundation of scientific learning. The Science Club plays a pivotal role in fostering curiosity, creativity, and critical thinking among students. Through regular hands-on activities, collaborative projects, discussions, and mentorship, the club encourages learners to question, innovate, and apply scientific concepts to real-life situations.

The confident participation of our students at the IIT Science Exhibition is a reflection of this vibrant scientific culture within the school. It highlights how a supportive environment, guided by dedicated teachers and well-equipped facilities, empowers students to transform ideas into meaningful models and research.

I congratulate all the participating students and the Science Club mentors for their commendable efforts. I am confident that such experiences will continue to inspire our learners to pursue excellence in science and contribute positively to the scientific community in the future.

Principal

Monika Dutt Mishra

Foundation school, Patna

From the Principal's Desk

"Education is not the filling of a pail, but the lighting of a fire." — W. B. Yeats

At our school, this belief is not a slogan but a lived philosophy. In a world shaped by discovery and driven by innovation, the fire we seek to kindle is scientific acumen—a way of seeing, thinking, and engaging with the world that moves beyond rote learning to thoughtful exploration.

We believe that scientific acumen is cultivated when learners are encouraged to ask incisive questions, challenge assumptions, and make sense of the world through evidence and logic. Our classrooms are designed as thinking spaces where ideas are tested, perspectives are debated, and curiosity is given free rein. Learning here is not about following the beaten track, but about exploring new pathways with confidence and clarity.

STEM initiatives, robotics programmes, and research-driven projects provide fertile ground for experiential learning. Students learn to connect the dots between theory and practice, developing analytical precision and creative problem-solving skills. As Isaac Asimov aptly stated, "The most exciting phrase to hear in science is not 'Eureka!' but 'That's funny…'" We celebrate such moments of wonder, for they mark the birth of genuine understanding.

Our teachers act as catalysts, mentoring students to think critically and independently. Errors are treated not as dead ends but as learning curves. Echoing Albert Einstein, we remind our learners that "Anyone who has never made a mistake has never tried anything new."

Beyond knowledge and skill, we emphasise scientific ethics—objectivity, humility, and responsibility. Students are guided to balance innovation with integrity, ensuring that progress serves humanity. Our vision is to nurture scientifically literate individuals who are intellectually agile, morally grounded, and future-ready—learners who will not merely adapt to change, but shape it with wisdom and purpose.

(Mrs) Farhat Hasa

Principal

International School ICSE, Patna

From the Principal's Desk

"Science is not merely a subject to be learned; it is a way of thinking, a method of viewing the world through the lens of logic and wonder." Since our inception in 2018, JJ School Montessori, Imphal, has been dedicated to a singular vision: transforming the conventional classroom into a dynamic laboratory of ideas. We believe that the seeds of innovation must be sown early.

At JJ School Montessori, we are moving beyond rote memorization to a student-focused learning model rooted in the dialectic and reasoning method. We encourage our students to look at day-to-day observations—be it the morning dew or the changing seasons—and question the "Why" and "How" behind them right from a young age. Our goal is to train young minds to seek scientific explanations for the mundane, transforming curiosity into concrete understanding.

To foster this scientific temper, we have integrated a robust ecosystem of learning tools. Regular science exhibitions allow our students to translate theory into tangible models, while science quizzes and curated science documentaries expose them to the vastness of the universe beyond their textbooks. Furthermore, we have embraced the future by utilizing AI-based assessments. This technology allows us to understand the unique personalised learning curve of every child, ensuring no query is left unanswered.

However, technology is but a tool; the human connection remains our core strength. We maintain an environment of open student-teacher interactions, where questions are celebrated, not silenced. Under the mentorship of our Academic Advisor and team of well-qualified science teachers, students engage in a learning environment that makes science a lived experience.

Drawing inspiration from the collective wisdom of educators across India, we recognize that fostering scientific acumen is not just about individual development; it is an act of nation-building. As we nurture these young minds in Manipur, we are deeply committed towards fulfilling our duty as enshrined in the Fundamental Duties of the Indian Constitution: to develop the scientific temper, humanism, and the spirit of inquiry and reform.

We are preparing our students not just for exams, but to be the rational, innovative problem-solvers citizens our society needs.

Purnima Thangjam
Director and Principal
JJ School Montessori, Imphal

From the Principal's Desk

It is imperative for every school to create an environment that nurtures a scientific attitude in children through hands-on learning, technology integration, collaboration, and independent thinking. At Spring Dale International School, we believe that science education goes beyond merely addressing scientific claims. Our focus is on enabling students to think critically about all claims, understand that belief bias is not critical thinking, and learn to evaluate alternative perspectives through logical reasoning and evidence-based inquiry.

At Spring Dale, students are taught how to learn and how to observe—skills that form the foundation of lifelong learning.

Learning how to think is our second core pillar. Students are encouraged to relate concepts across disciplines and bring them onto a common platform through assertion–reasoning exercises and concept-based multiple-choice questions. To support this, we have developed Fundamental Science, an in-house, concept-driven textbook series—an intellectual initiative of Spring Dale International School, mentored by our science faculty and published by the school. This resource strengthens conceptual clarity and analytical thinking at every stage.

Third, we do not believe in teaching students in isolation from context—teaching the fish without explaining the water. Concepts are always linked to relatable, real-world experiences, enabling deeper understanding and relevance.

Fourth, collaboration and teamwork are strongly emphasized. During science exhibitions, students work in structured teams across all classes, fostering innovation, leadership, and collective problem-solving skills.

Fifth, students develop robust problem-solving abilities through carefully designed, concept-based projects that encourage inquiry, experimentation, and logical application.

Sixth, activity-based learning is introduced from Grade I onwards. This approach helps students grasp concepts accurately, stimulates curiosity, builds sustained interest, and provides a truly tangible, hands-on learning experience.

Seventh, our teaching methodology introduces unknown concepts through known and familiar experiences drawn from daily life. This ensures that science does not remain confined to textbooks or the syllabus but emerges as a factual, experiential subject. Observations of small yet significant changes in the environment—often overlooked—are highlighted through nature walks and educational outings. Learning is made enjoyable and meaningful, motivating students to explore further and participate confidently in scientific events beyond the school, with full institutional support.

In addition, our laboratories are accessible to students from Grade I onwards, allowing young minds to witness scientific principles in action. This application-based learning reinforces the belief that an idea without application holds limited value.

In essence, Spring Dale International School is committed to encouraging curiosity, exploration, critical thinking, and real-world connections—preparing students not just to learn science, but to live it.

Principal

Rupa Paull Hazarika

Spring Dale International School, Guwahati

From the Principal's Desk

As a conscious citizen of this nation, I think that we need to lift up the scientific threshold of our nation significantly if we need to claim the top ranking among the comity of nations. Currently, we have been facing challenges in implementing the scientific ethos in our society. This is an area of concern for me as the head of Tashi Namgyal Academy. The foundation of human progress and even our evolution has been science. Unfortunately, when it comes to comprehending the essence of that foundation, we get bogged down by voluminous books describing scientific theories. In the process we tend to ignore the skills needed to understand and implement scientific knowledge. Scientific knowledge without the ability to make a difference in our lives is of no use. Scientific knowledge needs to be moulded by skills in order to transform it into products that are needed in every day lives of common man.

So, we at Tashi Namgyal Academy have been encouraging our students to take the path of practicality when it comes to science. Even though it is a path less travelled, it is the path that STEM studies need to take. Hence, I as the head of the school consider this selection of our team to come to IIT Guwahati as a steppingstone in the right direction. I am proud of our team and proud of what they have produced. More than anything else, they have chosen the right paths.

I also feel that the curiosity in a student can best be nurtured when they are exposed to bigger scientific fields that exist across our country. Here, I think that their journey to IIT Guwahati is going to be a game changer as far as exposure is concerned. They will see new frontiers which will expose them to finer aspects of scientific achievements.

I think that the Macmillan Budding Scientist Competition was a brilliant step for the youth to shake up their souls and come up with great new ideas on how science can make a difference to our lives. I am fully confident that these students will come back with a glow they did not have at the beginning of their journey. Thanks, IIT Guwahati and Thanks Macmillan.

Brigadier M G Jacob (Retired)
Principal,
Tashi Namgyal Academy, Gangtok

From the Principal's Desk

At Bombay Scottish School, Mahim, education is viewed as a purposeful process that nurtures intellectual curiosity, critical thinking, and a scientific temperament among students. In an increasingly complex and technology-driven world, it is imperative that learners are equipped not only with knowledge but also with the ability to analyze, question, and apply scientific understanding to real-world contexts.

The school's science education framework places strong emphasis on experiential and inquiry-based learning. Through structured laboratory work, STEM-focused initiatives, and participation in reputed national platforms, students are encouraged to engage deeply with scientific concepts beyond the prescribed curriculum. Such experiences cultivate analytical thinking, collaborative skills, and innovation, all essential competencies for responsible and informed citizenship.

The school actively encourages participation in a wide range of inter-school and national-level competitions, where students have consistently demonstrated excellence. Achievements in platforms such as the National Robotics League and similar competitive forums reflect the school's sustained focus on applied learning, teamwork, and technological proficiency.

Participation in programs such as the Macmillan Budding Scientist initiative further reinforces this commitment. Projects like SeeRead, which seek to address practical societal challenges through scientific reasoning, exemplify the thoughtful integration of knowledge, creativity, and purpose. These outcomes are supported by the dedicated mentorship of teachers, who play a pivotal role in guiding inquiry-based learning.

Bombay Scottish School, Mahim remains committed to fostering an academic environment where inquiry is valued, achievement is earned, and innovation is encouraged, thereby developing scientifically literate, socially conscious, and future-ready learners.

Mrs. Sunita George,
Principal,
Bombay Scottish School, Mahim, Mumbai

From the Principal's Desk

In an age defined by discovery, innovation, and constant change, nurturing a scientific environment in schools is essential to shape informed, confident, and future-ready learners. Science is not merely a subject to be studied; it is a way of thinking that encourages curiosity, creativity, and the courage to question the unknown. As educators, our responsibility is to ignite this spirit and guide students toward meaningful exploration. At our school, we strive to create an atmosphere where inquiry is welcomed, ideas are respected, and learning extends beyond textbooks. From the early years, students are encouraged to observe their surroundings, ask questions, and experiment with concepts through hands-on activities and collaborative learning. Platforms such as science fairs, innovation projects, competitions, and experiential learning opportunities allow students to transform curiosity into understanding and imagination into discovery.

Exposure to real-world applications through educational visits, interactions with experts, and interdisciplinary learning inspires students to see science as a powerful tool for solving real-life problems. Equal emphasis is placed on developing communication and critical thinking skills, enabling learners to express ideas confidently and work together in the spirit of innovation.

By fostering a culture of exploration, resilience, and lifelong learning, we aim to instil a scientific temper that empowers our students to think independently, act responsibly, and contribute positively to society. Through this commitment, we hope to inspire the next generation of thinkers, innovators, and changemakers who will shape a better tomorrow.

Ms. Rachana Desai,

Principal

Broadway International School, Surat

From the Principal's Desk

At our school, we believe that education is a powerful tool to shape young minds and prepare them for a rapidly changing world. In today's age of innovation and technology, developing a scientific temperament among students is essential. With this vision, our school has created a rich scientific environment that nurtures curiosity, creativity, critical thinking, and a love for learning from the very early classes.

The foundation of scientific learning begins in the classroom, where students are encouraged to observe, question, and explore. Our teaching-learning process emphasizes conceptual clarity rather than rote memorization. Teachers adopt interactive and activity-based methodologies that allow students to understand scientific principles through real-life applications. This approach helps learners connect theory with practice and develop logical reasoning skills.

To strengthen experiential learning, the school is equipped with well-maintained science. Recently, keeping pace with technological advancements, an AI and Robotics Laboratory was introduced two years ago, further enriching the scientific ecosystem of the school. This state-of-the-art lab exposes students to emerging technologies and prepares them for future-oriented learning.

Students actively engage in the AI and Robotics lab using Quarky kits, which enable them to learn the fundamentals of Artificial Intelligence, coding, robotics, and automation in an interactive and practical manner. Through guided activities and projects, students apply their learning to real-world challenges and participate enthusiastically in various inter-school, district, and national-level competitions, showcasing innovation, teamwork, and technical proficiency.

Beyond laboratories, the scientific environment extends to various co-curricular and extracurricular activities. Science exhibitions, model-making competitions, project-based learning, quizzes, and STEM-related activities are regularly organized to stimulate innovation and teamwork. Educational excursions, including visits to the Regional Science Centre, further enrich students' understanding by allowing them to interact with scientific concepts through real-time demonstrations and exhibits. These platforms allow students to express their ideas creatively, apply scientific concepts practically, and learn collaborative problem-solving.

The school also integrates modern technology into learning through digital tools, smart classrooms, educational videos, and simulations. These resources make learning engaging and help students visualize complex concepts with ease.

Environmental awareness and sustainability form an integral part of our scientific approach. Activities such as plantation drives, waste management programs, water conservation projects, and energy-saving initiatives encourage students to understand their role as responsible global citizens.

Teachers play a pivotal role in fostering this scientific culture. As facilitators and mentors, they inspire curiosity, guide inquiry, and encourage independent thinking.

The school also gratefully acknowledges the support of the Macmillan Budding Scientist Programme, which plays a significant role in nurturing scientific curiosity and providing young learners with a meaningful platform to explore, experiment, and showcase their innovative ideas.

Sister Saluja OSM

Principal

Servite Convent Senior Secondary School, Narmadapuram

From the Principal's Desk

I extend my *heartfelt appreciation to Macmillan Education and the Indian Institutes of Technology (IITs)* for organizing the Macmillan Budding Scientist 2025–26. Such visionary initiatives play a vital role in nurturing scientific curiosity, innovation, and research-oriented thinking among young learners.

At Shree Swaminarayan Gurukul English Medium School, Surat, we strongly believe that education must inspire students to explore, experiment, and evolve. This project presentation is the outcome of sincere collaboration between our students and teachers, where ideas were transformed into meaningful scientific models through dedication, discipline, and teamwork.

The journey of preparing for this platform has helped our students develop critical thinking, creativity, problem-solving skills, and confidence—qualities essential for future scientists and responsible global citizens. Guided by committed educators, our learners have explored real-life challenges and attempted innovative solutions with clarity and purpose.

Gurukul education emphasizes a harmonious blend of modern scientific learning and timeless values. Through such national-level platforms, students gain exposure, confidence, and a vision to apply knowledge for the betterment of society.

I take immense pride in our students and teachers for their hard work and perseverance. I am confident that this experience will ignite a lifelong passion for science, research, and innovation in our learners.

I wish all participating teams a successful, enriching, and memorable presentation.

Mr. Dharmesh Saliya
Principal
Shree Swaminarayan Gurukul English Medium School, Surat, Gujarat

From the Principal's Desk

At our school, we believe that curiosity is the foundation of all meaningful learning. The **Macmillan Budding Scientist** programme is a wonderful step in nurturing this curiosity and transforming young learners into confident thinkers and problem solvers.

In a world driven by science and technology, it is essential that students do not merely learn facts, but develop the ability to question, explore, and innovate. This programme encourages hands-on learning, observation, experimentation, and critical thinking—skills. Through engaging activities and well-structured content, students learn to connect classroom concepts with real-life applications.

The enthusiasm and creativity displayed by our students while participating in the Budding Scientist activities have been truly inspiring. Such initiatives help ignite a scientific temper at an early age.

I congratulate the students for their active involvement and commend Macmillan Education for designing a programme that makes science meaningful, enjoyable, and relevant. I am confident that experiences like these will empower our students to grow into responsible, innovative, and future-ready individuals.

Mr. Bipin Deshmukh

Principal,

Sri Sankara Vidyalaya, Sector-x, Bhilai

From the Principal's Desk

At The Ardee School, I am proud to share how we intentionally cultivate scientific acumen through a rich blend of curriculum, enrichment, and community engagement. At Ardee, we believe science comes alive when curiosity meets purposeful action, guided by our philosophy of "Be the Change." We encourage our learners not only to question the world around them, but also to respond thoughtfully and responsibly.

Beyond the classroom, our enrichment programmes play a vital role in deepening scientific thinking. Through structured pathways, maker spaces, and science labs, students apply concepts to real-world challenges. Learners have designed and developed projects such as hydroponic growing systems, sea-cleaning devices, energy-conservation models, and sustainable prototypes—each encouraging problem-solving, design thinking, and collaboration. These experiences empower students to move from ideas to impact, fostering confidence and creativity.

Our Science education is interdisciplinary by design, integrating science, technology, engineering, and mathematics with environmental studies and global perspectives. Students are guided to research, test, iterate, and reflect—embracing failure as part of the scientific process. Regular exhibitions, showcases, and maker markets further strengthen communication skills and scientific reasoning.

Equally central to our ethos is social responsibility. As part of our environmental initiatives and CSR programmes, students actively engage in climate action, sustainability drives, community outreach, and conservation efforts. Whether adopting green practices on campus, participating in clean-up initiatives, or designing solutions for local environmental concerns, learners understand that science carries responsibility toward people and the planet.

At Ardee, we strive to nurture not only capable scientists, but ethical, environmentally conscious global citizens, young minds equipped to question, innovate, and lead with purpose.

Mr.Aviral Rishi
Academic Convenor
The Ardee School, Goa

From the Principal's Desk

In our school, our aim is to provide a learning environment where curiosity, exploration, and pure enthusiasm for learning drive the learning process. Our strong conviction is that education in the sciences is vital for shaping young minds and preparing them for the challenges of the future.

The Macmillan Budding Scientist Programme has been an enriching addition to our academic journey. It encourages students to think beyond textbooks and actively engage with scientific ideas through inquiry-based learning. By asking questions, conducting experiments, and analysing outcomes, students develop essential skills such as logical reasoning, problem-solving, and critical thinking.

Our school boasts an exquisite science laboratory where students can experience science in a practical manner. The facilities in this lab are equipped with the latest technology, enabling students to explore science innovatively. This not only enhances conceptual understanding of science but also inculcates discipline, accuracy, and scientific temperament in students.

The zeal, creativity, and dedication shown by our students in the 'Budding Scientist' events are truly commendable. Such activities, supported by adequate infrastructure and a dedicated teaching faculty, encourage students to explore, innovate, and apply their knowledge in practical situations.

I would like to thank our students for their active participation and Macmillan Education for their thoughtful and impactful programme. They have always supported us on our journey and will continue to play an important role in shaping our learners into responsible and inquiring citizens.

Ms Anamika Singh,
Principal,
The Emerald Heights International School, Indore

From the Principal's Desk

At The Jain International School, Nagpur, we strongly believe that science is best learned through curiosity, exploration, and hands-on experience. To nurture scientific acumen among our students, we have created a learning environment that encourages observation, experimentation, and problem-solving.

Well-equipped Science Kits are provided to the students so that they can perform activities related to their textbook chapters. These kits help learners understand concepts through practical application rather than rote memorization. When students conduct experiments themselves, they develop critical thinking skills and gain confidence in their scientific abilities.

Our Science Club plays a vital role in promoting innovation and research. Through various activities such as experiments, discussions, project work, and awareness drives, students are motivated to explore scientific ideas beyond the classroom. They are encouraged to identify real-life problems around them and think of scientific solutions, fostering a research-oriented mindset.

Classroom teaching is enriched with hands-on activities, demonstrations, and models. This approach ensures that learning remains interactive, engaging, and meaningful. Students actively participate in experiments, making science both enjoyable and effective.

To further enhance creativity, the school organizes house activities such as model-making competitions. These platforms allow students to apply their knowledge, work collaboratively, and showcase their innovative ideas. Our students also proudly represent the school in Science talk competitions, exhibitions, and inter-school model-making contests, bringing laurels to the institution.

Through these continuous efforts, we aim to develop scientifically aware, inquisitive, and responsible citizens who are prepared to face future challenges with confidence and innovation.

Mrs Anmol Mukherjee
Principal,
The Jain International School, Nagpur

From the Principal's Desk

As the Principal of Aspire Indian International School, I extend my sincere gratitude to Macmillan Education for providing our learners with meaningful platforms that nurture scientific aptitude, curiosity and inquiry-based learning. When children are encouraged to think, imagine solutions, explore, experiment and confidently share their ideas, learning becomes a joyful, engaging and transformative experience that goes far beyond textbooks. Such opportunities help them connect classroom knowledge with real-life challenges and develop critical thinking, collaboration and problem-solving skills. This year, our AIIS students beautifully demonstrated this spirit through their innovative project on a carbon purification model for factories using an eco-friendly filtration technique. Their work reflected not only scientific understanding and creativity but also a deep sense of environmental responsibility. Initiatives like this, sow the seeds of empathy, awareness and action, nurturing in young hearts the care and commitment to discover the cure our Mother Earth truly needs. We deeply value Macmillan's continued support in shaping confident, compassionate and environmentally conscious global citizens.

Dr. Geetika Ahuja
Principal
Aspire Indian International School, Jaleeb, Kuwait

From the Principal's Desk

"Science begins with wonder, scientific temperament and rational thinking"

DPS Dubai encourages intellectual curiosity, sustained hard work, rational and critical thinking, independent learning, and innovative problem-solving among students. Students feel comfortable and secure in their surroundings and are therefore more willing to take academic risks and maintain positive relationships with their teachers. DPS Dubai has a team of highly qualified and experienced faculty.

Students at DPS Dubai are encouraged to apply scientific process skills and creative thinking to develop a strong foundational understanding of science. Learning at our school emphasizes a "learn by doing" approach, supported by reflection on experience. Our well-designed, closely monitored, and regularly evaluated experiential learning programs foster interdisciplinary learning, civic engagement, career development, cultural awareness, leadership, and other intellectual and professional competencies.

These activities promote academic research, enhance student engagement through collaboration and scaffolding, improve learning effectiveness, support memory retention, connect theory with practice, and facilitate skill development. Students are creative thinkers who meaningfully connect their learning with real-life applications.

The school is equipped with STEAM laboratories in the primary and middle school sections, as well as well-equipped Chemistry, Physics, and Biology laboratories, to further strengthen students' scientific skills. Through project-based learning, students investigate and respond to complex, thought-provoking, real-world challenges while acquiring knowledge and essential skills. These projects empower students to take ownership of their learning and cultivate 21st-century skills such as communication, collaboration, critical thinking, and creativity.

An AI and Career curriculum has been designed from KG to Grade 12 so that students' experience is relevant for future needs.

Lessons are integrated with technology, and students are provided with choices in their learning tasks. Students actively participate in inter- and intra-school science exhibitions, create prototypes, and present innovative solutions to real-life problems.

They have won numerous awards at state and national levels.

Rashmi Nandkeolyar
Principal and Director,
Delhi Private School, Dubai

From the Principal's Desk

At Habitat School, scientific learning extends beyond textbooks and laboratories; it is part of everyday life. Our Net Zero initiative provides real-world contexts for students to understand energy conservation, carbon cycles, and environmental responsibility. Learners see theory in action by exploring how reduced energy use and responsible resource management support a sustainable future.

Experiencing nature firsthand goes far beyond studying it in theory. Our classrooms are integrated into the surrounding ecosystem, nurturing both academic learning and a deep respect for the environment, reflecting our strong commitment to sustainability.

The school has earned the Sharjah Sustainability Award and holds Guinness World Records for large-scale sapling distribution, demonstrating dedication to a zero-carbon future.

Habitat School was the first in the UAE to integrate farming into its curriculum. Students from Grades 3–8 attend bi-weekly farming classes on a 500,000-square-meter organic farm and in high-tech greenhouses, growing crops such as tomatoes, sweet corn, and medicinal plants.

Our Farming in Education programme strengthens scientific thinking through hands-on experiences with soil, plants, and ecosystems. Students ask questions, make observations, record data, and understand the interdependence of living organisms and their environment, building curiosity, responsibility, and problem-solving skills.

Greenhouses enable year-round learning, supporting controlled experiments on plant growth and climate conditions, while solar panels serve as live models of renewable energy and sustainable technology.

Coding, robotics, and Artificial Intelligence are integrated across subjects. Students use programming, digital tools, sensors, and data logging to analyse information, automate tasks, and design innovative solutions, connecting scientific concepts with modern technology.

Together, these initiatives develop environmentally conscious, tech-savvy learners who think critically, apply scientific knowledge meaningfully, and contribute to a sustainable world.

Bala Reddy Ambati
Principal,
Habitat school-Al Jurf, Ajman, UAE

From the Principal's Desk

At Loyola International School, we believe that true education extends far beyond the acquisition of textbook knowledge. In an ever-evolving world driven by science, technology, and innovation, it is imperative that schools nurture curiosity, critical thinking, and a spirit of inquiry among students from an early age.

We greatly value initiatives such as Macmillan Budding Scientist, which provide a meaningful platform for young learners to explore scientific concepts through research, experimentation, and real-world problem solving. Macmillan Education's long-standing commitment to quality education and its pioneering efforts in fostering scientific temper resonate strongly with Loyola's educational philosophy. By encouraging students to question, investigate, and innovate, Macmillan empowers them to become confident thinkers and responsible contributors to society.

Participation in such programmes reinforces our vision of experiential learning, where students learn not merely what science is, but how science works. Through guided mentorship, collaborative projects, and exposure to national-level academic platforms, students develop analytical skills, creativity, resilience, and a deeper understanding of STEM disciplines. Equally commendable is Macmillan's focus on recognising and celebrating the role of teachers, who act as mentors and facilitators in this journey of discovery.

At Loyola International School, we continuously strive to create a learning environment that promotes hands-on exploration, interdisciplinary learning, and innovation aligned with the National Education Policy. Collaborations with esteemed academic initiatives such as Macmillan Budding Scientist strengthen our resolve to prepare students for the challenges of the future while instilling values of scientific integrity, sustainability, and social responsibility.

We extend our appreciation to the Macmillan Education team for providing an inspiring and well-structured platform that nurtures young scientific minds. We look forward to continued collaboration in our shared mission of shaping inquisitive, innovative, and future-ready learners.

Ms. Bhavna Vijaykumar S
Principal,
Loyola International School, Doha, Qatar

Macmillan Budding Scientist, powered by Springer Nature 2025-26

Finalists:

Scan the code to watch the video of the project

1. **School Name:** The Emerald Heights International School, Indore

   Winner - Grand Finale and **Winner** - West Zone

   Students: Aarav Gaggar, Ashka Gupta and Nav Jain

   Project Supervisor: Ms. Vaishali. S. Joshi

   Project Name: Bro: Borewell Rescue Operation

The Borewell Rescue Operation (BRO) is a robotics-based rescue system developed to address a significant safety problem in India: children and animals falling into dangerous borewells. India has 27 million borewells, many of which are left uncovered or unsealed. Survival rates remain below 25 percent, mainly due to delayed access and oxygen deprivation. So, BRO has been developed as a miniature model to demonstrate how robotics and IoT-assisted rescue systems can reduce rescue time and increase survival chances. The model is capable of descending directly into a borewell, with features capable of saving lives.

The Problem:

Traditional borewell rescue methods rely on digging parallel shafts alongside the borewell to reach the trapped victim. The entire process typically takes 24 to 48 hours, and in difficult soil conditions it can take even longer. During this time, oxygen levels inside deep borewells fall rapidly, leading to hypoxia and loss of consciousness.

Most borewells have diameters of 20 and 40 centimeters, which makes rescuer's entry nearly impossible and severely restricts visibility. Rescue teams often operate without visual access to the victim, increasing risk. In several cases, victims died before physical access could be established. These operations also endanger rescue personnel due to risks such as tunnel collapse, poor air quality, and unstable ground conditions. But a standardized rapid-deployment rescue system is still lacking.

The Solution and How is It Better:

BRO replaces traditional parallel-digging rescues with a direct vertical approach, saving crucial time. Designed for the confined space of borewells, it features a live camera with

adjustable lighting, giving rescue teams real-time visuals to assess the victim's condition and the borewell's structure. An oxygen supply system tackles hypoxia, the leading cause of death in borewell accidents, while the mechanical design reduces risk of injury and allows rescue operations entirely from the surface. Unlike manual methods, BRO cuts rescue time by hours, provides better visibility, reduces chances of hypoxia, and keeps rescuers safe. Though a prototype, it is scalable for real-world deployment, making it far more efficient and reliable than traditional methods.

Key Features:

- Real-time camera feed
- Adjustable lighting system
- An oxygen delivery system
- Dual robotic arms
- Robotic pulley-based lifting and extraction mechanism
- Stabilizing plank to support the victim during rescue
- Compact and lightweight design

Future Enhancements:

Future enhancements include backup systems to ensure safe uninterrupted operation, increased oxygen storage capacity for the chance of longer rescues, better communication systems, addition of more sensors for more automation, and stronger structural materials for full-scale deployment. These improvements would increase system reliability and effectiveness under real emergency conditions.

Conclusion:

The BRO project demonstrates an IoT-driven solution to a long-standing public safety issue in India. By providing safer and more effective methods for rescue, BRO presents a scalable and effective alternative to conventional borewell rescue methods.

2. **School Name:** The Jain International School, Nagpur

   Runner Up Grand Finale and **Runner Up** - West Zone

   Students: Miss Tvisha Kakani, Miss Vidhi Thote and Miss Advita Poddar

   Project Supervisor: Mrs Ritu Sharma

   Project Name: Signals for a Cleaner

   Tomorrow: Stop, Wait, Breathe

Scan the code to watch the video of the project

Rationale

Air pollution from vehicular exhaust is a major contributor to poor air quality in urban areas. Harmful gases such as carbon monoxide (CO) and other toxic pollutants pose serious risks to human health and the environment. This model provides a dual-purpose solution—reducing air pollution levels in high-traffic zones and collecting gases for industrial reuse—powered by renewable solar energy and wind energy. This is a working model designed to be installed on road dividers or footpaths to detect, filter, and collect harmful vehicular emissions using sensors, fans, and ion exchangers. The model not only cleans the air but also collects certain gases for reuse, making it an environmentally and economically beneficial system. The circuit will be powered by renewable solar or wind energy.

Need of the Work

With increasing vehicle density, roadside air pollution levels have surged. Prolonged exposure to vehicular exhaust leads to respiratory diseases, cardiovascular issues, and environmental degradation. This model addresses the urgent need for real-time roadside air cleaning and pollutant collection systems to improve air quality, promote sustainability, and reduce dependency on fossil fuel-based energy.

Scientific Principle /concept:

The project "Signals for a Cleaner Tomorrow: Stop, Wait, Breathe" is based on the scientific principles of air pollution control, sensor-based monitoring, and ion exchange technology for gas filtration.

Materials Used:

- ESP32 microcontroller
- Ultrasonic sensor (for vehicle detection) – 1 unit
- Carbon monoxide (CO) sensors – 2 units
- Multi-gas sensors (for other harmful gases) – 2 units
- Fans – 3 units
- Ion exchangers – 3 units
- Diaphragm pump – 1 unit
- LCD display

- Two-wheeler tyre tube (for gas collection) – 1 unit
- MOSFET (4 units)
- Mode switch
- Electrical circuit components (wires, capacitors, resistors, regulator IC's)
- GSM module
- Acrylic frame on which the circuit is mounted to show the working of the circuit.

Procedure / Description:

We are providing an input of 12 volts, to the circuit through an adapter. A regulator IC converts it into 5 volts and this 5volts is given to ESP32 (microcontroller).

We have used regulator IC's for converting 12volts to 5volts as all the sensors operate on 5volts. For measuring the level of CO in the intake air and the level of CO at outlet we have used (MQ9) CI and C2 sensors. We have used (MQ2) G1 and G2 sensors for measuring the level of other gases like LPG, methane smoke etc.

When the microcontroller turns ON it checks the signals from ultrasonic sensors that is there is any vehicle or not. If there is no vehicle detected by the ultrasonic sensor then it will be detected as LOW TRAFFIC, and the fans, ion exchangers and the pump will remain OFF. If a vehicle is detected in front of ultrasonic sensor than HEAVY TRAFFIC is displayed on the LCD display and ESP32 turns the fans ON, initially but the ion exchangers and the Pump remain OFF. The fan operates on 12 volts whereas ESP32 operates on 5volts. The microcontroller can give the output of 5volts only. At 5volts fans cannot be operated so we have used a MOSFET as a 'N' type enhancement switch. It is triggered by 5volts through a resistance (100 ohms). MOSFET acts as a switch.

1st MOSFET for operating fan.

2nd MOSFET for operating pump

3rd and 4th MOSFET for operating ionisers.

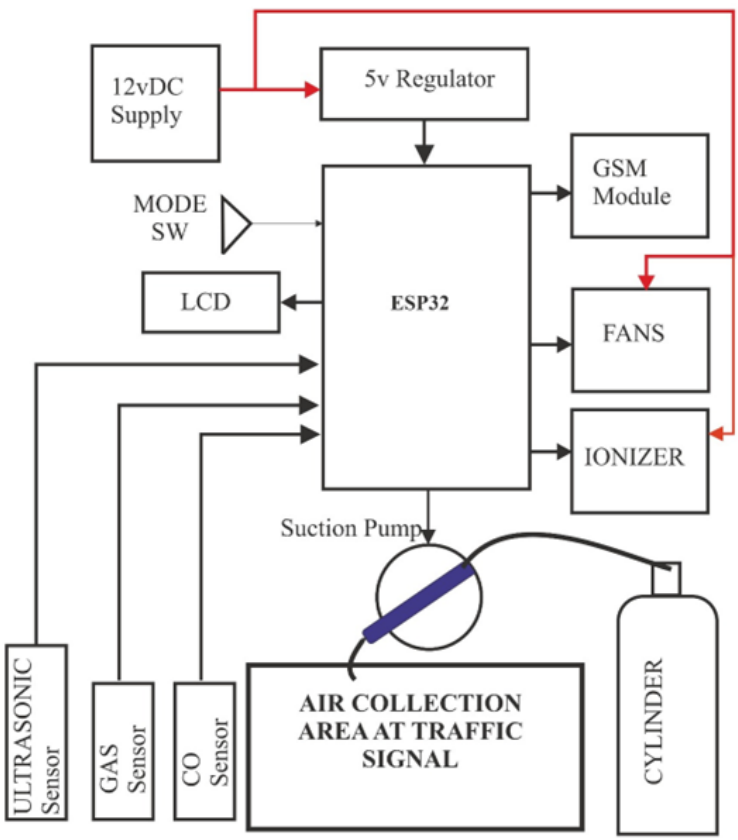
When the level of CO at inlet is below 1600 ppm and the level of other gases is below 350 ppm the ion exchangers and pump remain OFF.

If we bring a lighted incense stick near the fans which represent the exhaust coming out of vehicles the CO level crosses the normal threshold and the ion exchangers and the pump start operating and the polluted air is sucked by the pump and will be stored in a cylinder which is shown by the tube in our model.

During testing it was observed that the value of CO at inlet is 1700 ppm and at outlet is 1200 ppm. This shows that the air is being filtered by the ion exchangers. If we bring a gas lighter which has butane near the fan the gas level goes above the threshold of 350 ppm the ion exchangers and pump turn ON and this polluted air gets filled in the tube and can be distilled to get several products which we can use for various purposes. During testing it was observed the gas level at input was 470 ppm and at output was 280 ppm, it proves that the air is getting filtered.

We can even use a sanitiser bottle and spray the sanitizer, ethyl gas is liberated, which is a dangerous gas. So if we spray a little sanitizer in front of fans, the value of G1 goes up rapidly and the ion exchangers and pump turn ON to collect the polluted air.

There are two counters as seen on the LCD display. UPPER counter is count up counter. Upper counter updates the data on the server after every 90 counts. MODE SWITCH decides that data should be transmitted through GSM or through internal WIFI of ESP32. This data goes to the server thingspeak and can also be seen on our mobile through an app thingshow. We can see the level of CO and other gases at outlet and inlet. We can also see when the ion exchangers and exhaust fans, suction pump turn ON and OFF according to date and time. We can also know the traffic level at different times of the day. DOWN counter is used for keeping the system active for a certain period of time. If the vehicle is detected then this counter starts from 19 and ends at 1. After this the fans and other parts are turned OFF. If the vehicle is detected, it again starts working for 19 counts. After 19 counts it again turns off when no vehicle is detected, in this way energy is saved.



Hypothesis

If harmful vehicular gases can be detected and filtered in real time at roadside locations using renewable energy, then urban air quality will improve and collected gases can be reused for industrial applications, making the process both environmentally and economically sustainable.

Data Analysis

- Measurement of CO and other gas concentrations before and after purification.
- Recording number of high-pollution incidents detected per day.
- Volume of gases collected over a given period.
- We can see different parameters such as the levels of carbon monoxide and other gases at inlet and outlet, traffic density, status of pump and ion exchangers on our mobiles through an app thingshow.

Results

- Significant reduction in CO and other harmful gas concentrations in the monitored zone.
- Successful collection of gaseous pollutants for reuse.
- Zero external electricity cost due to solar operation.
- Potential to scale for urban roadside networks.

Sustainable Development Goals (SDGs) Addressed

1. Goal 3 – Good Health and Well-**being:** Reduces air pollution-related health issues.
2. Goal 7 – Affordable and Clean **Energy:** Uses renewable solar power for operation.
3. Goal 9 – Industry, Innovation and **Infrastructure:** Promotes innovative pollution control infrastructure.
4. Goal 11 – Sustainable Cities and **Communities:** Improves air quality in urban areas.
5. Goal 13 – Climate **Action:** Helps mitigate harmful emissions.
6. Goal 12 – Responsible Consumption and **Production:** Reuses collected gases for industrial purposes.

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3. **School Name:** The Lords' International School, Chennai

   Winner - South Zone

   Students: Sanjana Matcha, Geetha Janani and Pranavi Sannidhi

   Project Supervisor: Ms. Abilasha Rajendra Prasad

   Project Name: Artificial Coral Reefs – Restoring Ocean Habitats Sustainably

Scan the code to watch the video of the project

Coral reefs are among the most biodiverse ecosystems on Earth, covering less than 0.2% of the ocean floor but supporting more than 25% of all marine species and protecting coastlines by dissipating up to 97% of wave energy. Yet today they are in dramatic decline worldwide.

In recent years, catastrophic global bleaching events have affected an unprecedented proportion of reefs due to rising ocean temperatures and increasing acidity. According to global monitoring data, more than 80–84% of the world's coral reefs have experienced bleaching-level heat stress, a dramatic increase compared with earlier events (e.g., 68% in 2014–2017). Additionally, surveys of the Great Barrier Reef show that hard coral cover has fallen sharply, with some regions losing up to a third of living coral cover in just one year. These statistics highlight how natural reef ecosystems are struggling to survive under current climate pressures.

Traditional coral restoration projects, such as coral gardening and transplantation, have shown some local successes but face limitations. Scientific reviews estimate that more than one-third of restoration efforts fail, and most operate on small scales that cannot offset global reef losses. These challenges underline the need for innovative, scalable, and sustainable solutions — not only to preserve existing coral but to rebuild marine habitats where they have already been lost.

To meet this need, the concept of Artificial Coral Reefs has been developed. These structures are designed to provide immediate habitat and environmental support for marine life while promoting natural ecological processes that accelerate recovery. Each artificial coral is composed of natural clay, edible calcium carbonate, sand, and water — a biodegradable mixture that mimics the natural composition of reef substrate and gradually breaks down over 2–5 years depending on its placement. Over time, calcium carbonate dissolves, helping to stabilize local pH levels in slightly acidic environments, while clay and sand provide structural strength and surface complexity for organisms to colonize.

The design creates a foundation for algae, microorganisms, and biofilms, which in turn attract small fish and invertebrates — effectively jump-starting a micro-ecosystem. Unlike expensive or limited restoration methods, artificial coral can be produced at low cost (about ₹100–₹200 or USD 1–4 per unit) and installed at scale using water drones and cranes. This cost-effective approach increases the potential for wider deployment in degraded reef zones or areas where natural recovery is slow.

Studies of restoration success show that, when habitats are given structural support, coral cover and ecosystem function can improve significantly — in some cases rebounding to growth rates similar to healthy reefs within a few years of intervention. Although challenges remain, combining artificial reef structures with broader conservation efforts offers a measurable step toward reversing reef decline and restoring marine biodiversity globally.

4. **School Name:** The Ngp School, Coimbatore
   Runner Up- South Zone
   Students: Bavesh.J, Anirudh Krishnan. K and Dharanish. N
   Project Supervisor: Ms. Nandhini Nallasivan
   Project Name: Dynamic Emergency Lane Creation

Scan the code to watch the video of the project

Abstract

In urban environments, ambulances frequently face severe delays due to traffic congestion, especially during emergencies when every minute is critical. The absence of a dedicated emergency lane often leads to loss of valuable time, directly affecting patient survival. This project presents a Dynamic Emergency Lane Creation System uses Computer Vision (CV) to detect ambulances in real time and guide surrounding traffic through a dedicated signaling mechanism. By dynamically creating an emergency lane only when required, the system aims to significantly reduce response time and improve emergency medical outcomes.

Problem Statement

The Golden Hour is a crucial period following a medical emergency, during which timely medical intervention can save lives. However, ambulances in Indian cities often struggle to reach hospitals within this time due to traffic congestion and the lack of a systematic emergency lane. Traditional sirens are frequently ignored or unnoticed amid traffic noise, and constructing permanent additional lanes is costly, time-consuming, and impractical in densely populated urban areas. The absence of an intelligent and automated traffic management solution results in dangerous delays, reducing the chances of patient survival.

Statistics

Studies indicate that a significant percentage of emergency patients in India fail to reach hospitals in time due to traffic delays. Nearly 30% of emergency cases result in fatalities before hospital admission, highlighting the urgent need for uninterrupted ambulance movement during the Golden Hour.

Proposed Solution

The proposed Dynamic Emergency Lane Creation Device detects ambulances using computer vision algorithms and automatically activates special signaling lights installed at intervals of 150–200 meters along major roads. These lights provide real-time visual instructions to motorists, guiding them to clear a temporary emergency lane for the approaching ambulance. This approach offers a cost-effective and scalable alternative to road expansion and can be implemented using existing urban infrastructure.

Working Mechanism

Traffic cameras continuously monitor road conditions and identify ambulances based on visual mapping. Once an ambulance is detected, signals are transmitted to nearby

emergency indicator lights. An arch way system is used to indicate the ambulance's proximity: red signals immediate clearance, yellow signals preparation, and green signals awareness. Drivers respond accordingly by moving to the sides, enabling the creation of a clear and organized emergency lane.

Benefits & Impact

The system reduces ambulance delays during critical emergencies and improves patient survival rates. It promotes disciplined traffic behavior, requires minimal infrastructure changes, and aligns well with smart city initiatives, making it suitable for large-scale urban deployment.

Future Scope

Future enhancements include integration with centralized traffic signals, GPS-equipped ambulances, and AI-based predictive traffic management systems. Mobile application alerts can further support drivers and hospitals through advance notifications and estimated arrival times.

APP – SOS Services

SOS Services is a smart emergency response application designed to complement the hardware system. It enables real-time ambulance tracking, hospital coordination, and traffic prioritization through secure and reliable communication. Together, the app and hardware system form a comprehensive solution for intelligent emergency traffic management.

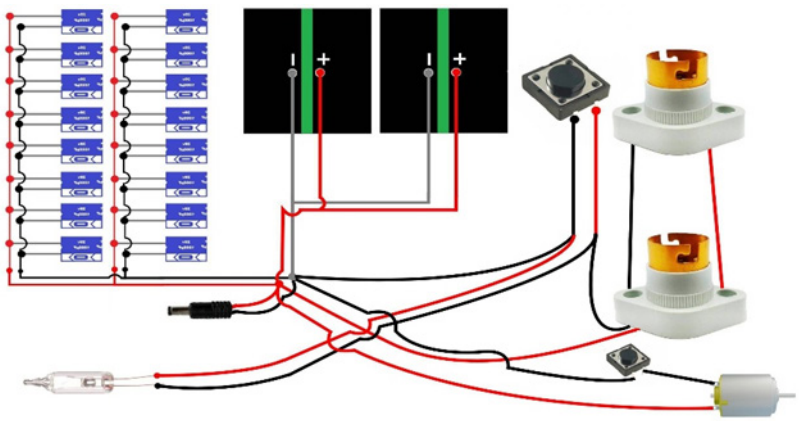
5. **School Name:** Silver Oaks School, Bathinda
   Winner - North Zone
   Students: Bhavika Singla, Harshil Kumar and Sargun Jaura
   Project Supervisor: Ms. Navjot Kaur
   Project Name: Inkergy

Scan the code to watch the video of the project

Introduction

Plastic waste has become a global threat due to its non-biodegradable nature and careless disposal. This project focuses on a new technique to convert plastic waste into usable energy and other practical materials, ensuring minimal pollution and complete resource recovery.

Circuit Diagram:



Working:

The project begins by placing waste plastic inside a sealed iron chamber, where it is burnt under controlled conditions. The heat generated from burning plastic is collected through installed heating panels. Unlike traditional solar panels that convert sunlight, these heating panels convert thermal energy directly into electricity using thermoelectric principles. The generated electricity is stored in a rechargeable battery and is successfully used to light a DC LED bulb. Through this process, the model demonstrates an alternative energy source generated from plastic waste.

A major innovation in the system is filtration of harmful smoke. When plastic burns, toxic gases are released. To prevent atmospheric pollution, smoke is passed through PVC piping into a carbon filtration system. This filter traps harmful elements and converts collected residue into usable carbon powder, which is later transformed into carbon-based ink. The remaining burnt residue of plastic, called ash, is further processed and mixed with binding materials to form sturdier concrete-like blocks. Thus, the project not only converts waste into energy but also produces valuable by-products.

Ultimately, this project reflects an integrated solution for waste management, energy development, pollution reduction, and material recycling

Key Features:

Toxic fumes are not released into air

Filter collects harmful particles

Filtered carbon turns into usable ink

Ash is reused in construction material

Advantages

- ✓ Converts heat to electricity
- ✓ Produces useful carbon-based ink
- ✓ Ash is recycled into construction material
- ✓ Reduces environmental pollution
- ✓ Promotes complete waste utilization
- ✓ Encourages practical sustainable practices

Limitations

- × Initial cost is high
- × Requires handling with safety
- × Filter needs periodic maintenance
- × Electricity output depends on waste quantity

Conclusion

This project demonstrates how harmful plastic waste can be converted into beneficial resources. By using heating panels, thermoelectric conversion, smoke filtration systems, and ash recycling, the project successfully produces electricity, ink, and construction material. It highlights a sustainable model where waste is not discarded but transformed into valuable outputs—ensuring environmental protection, energy generation, and resource conservation.

6. **School Name:** Disha Delphi Public School, Kota
   Runner Up - North Zone
   Students: Monark Gautam, Angel Choudhary and Anshi Gupta
   Project Supervisor: Ms. Anjana Singh
   Project Name: KinderWeb

Scan the code to watch the video of the project

Kinderweb: A Proactive Digital Protection and Mental Health Monitoring App for Minors

In today's hyper-connected world, minors engage extensively with social media and digital platforms for learning, communication, and entertainment. However, this digital exposure has also made them increasingly vulnerable to online predators, cyberbullying, harassment, and emotional distress. At the same time, a rising number of minors experience mental health challenges, including anxiety, depression, and suicidal ideation—often reflected subtly in their online behaviour. Recognizing the urgent need for a comprehensive solution that safeguards both the digital and emotional well-being of young users, we developed Kinderweb, an AI-driven protection and mental health monitoring application.

Kinderweb provides a dual-layered approach that integrates online safety mechanisms with mental health detection. The app uses advanced AI algorithms, including Natural Language Processing (NLP) and sentiment analysis, to scan a minor's social media activity for signs of harmful interactions, suspicious contacts, inappropriate content, or emotional distress. What sets KinderWeb apart is its emphasis on consent, transparency, and ethical monitoring. Both the minor and parent must approve access before any scanning occurs, ensuring that the platform fosters trust rather than surveillance.

When the system detects any red flags—such as grooming attempts, abusive messages, depressive language patterns, or indications of self-harm—it sends real-time notifications to parents or guardians. These alerts are accompanied by clear, actionable reports, empowering families to intervene before situations escalate. By bridging the communication gap between a child's digital world and their caregivers, Kinderweb helps prevent potential harm while encouraging open dialogue about safety and emotional well-being.

The app's design Is intentionally user-friendly, featuring customizable settings, intuitive dashboards, and privacy controls that allow minors to understand and manage their own digital footprint. Rather than restricting or policing children, KinderWeb aims to educate, empower, and protect. It introduces a balanced framework where independence is respected, yet safety is prioritized.

On the technological front, Kinderweb continuously evolves through machine learning, improving its accuracy in detecting subtle behavioral patterns. It adapts to new challenges posed by rapidly changing online trends, diverse social media platforms, and variations in communication styles among minors. Its cloud-based, encrypted data system ensures that user information remains secure and confidential.

The broader vision of Kinderweb is to create a safer digital environment where minors can explore, learn, and connect without fear. By integrating child protection and mental health monitoring into one seamless platform, the app fills a critical gap in existing digital safety tools. It not only supports parents in navigating the complexities of online risks but also contributes to long-term mental health awareness and early intervention.

Kinderweb aspires to become an essential safeguard for families in the digital age—one that champions safety, empathy, and responsible technology use for the next generation.

7. **School Name:** Carmel School, Sadew, Shillong

   Winner - East Zone

   Students: Mandiwat B. Lynser, Sannakisha Rapsang and Maygrace Fidela Nongkhlaw

   Project Supervisor: Ms. Navita Kharkongor

   Project Name: Smart Livestock Feeder

Scan the code to watch the video of the project

Introduction:

This project is designed to make the feeding process for farm animals easier and smarter, by using simple electronic components. The main idea of this project is to feed farm animals accurately and efficiently with the help of a smartphone and the Blynk application. A person can monitor and control the feeding system anytime and from anywhere using the app.

Objective:

The main objective of this project is to reduce manual work in feeding animals and to ensure that they are fed on time, every day. This helps the animals stay healthy and grow properly.

The smart livestock feeder also helps to save time, effort and manpower on the farm.

Component used.

Here are the key components used in this project.

1. Arduino Uno R3 - Acts as the main controller that manages all operations.
2. RTC Module (Real Time Clock) - Keeps the correct time for feeding schedules.
3. LCD Display (16x2): Shows real-time information such as current time.
4. Servo Motor - Controls the movement of the of the feeder gate to release food.
5. Breadboard and Jumper wires - used for making all the circuit connections easily

Here how Smart Live Stock Feeder works:

1. The RTC module provides the real-time clock to the Arduino uno.
2. Arduino is programmed with Specific feeding times.
3. The servo motor rotates to open the gate or lid of the container, allowing food to fall into the feeding bay. After a few seconds, it closes again.
4. The LCD display shows messages like “Feeding in Progress” on current time.
5. The mobile phone with Blynk app to control the opening of the gate automatically with the schedule time or open it whenever the user needs.
6. The Blynk app will display the message like “ Feeding in Progress” and “ Feeding done” at a particular time.
7. The user can set the time from the Blynk app if any inaccurate time displayed in the LCD.

Advantages:

1. Ensure livestock are fed on time.
2. Helps reduce human effort and save time.
3. Maintain a regular feeding schedule for healthy animals.
4. Can be controlled and monitored through the Blynk app.

Conclusion:

In conclusion, the Smart Livestock Feeder is simple but very useful project for farmers. It effectively combines modern technology with traditional farming practices to create a smart and reliable feeding solution. This system helps save time, energy, and resources while ensuring better care and management of livestock.

8. **School Name:** Spring Dale International School, Guwahati

   Runner Up - East Zone

   Students: Daniel Hassan, Yaihoiba Tongbram and Aasim Tanveer

   Project Supervisor: Ms. Nabanita Chakraborty

   Project Name: Eco Drop Cloud

Scan the code to watch the video of the project

Eco Drop Cloud is a fully autonomous smart irrigation and solar-tracking system designed for sustainable agriculture and environmental resource optimization. It operates on an ESP32 microcontroller, integrating sensors, servos, and pumps for field-level automation while maintaining real-time communication with a Nest JS backend and an Ionic Angular dashboard via Web Sockets. It integrates several modern technologies to automate and optimize water usage in agriculture.

These are mentioned below-

a. Solar panels to power the entire setup including sensors, microcontroller, wi-fi, modules and the water pump, making it energy efficient and independent of main power grid.

b. IOT, sensors collect real time data from the field. This data is transmitted via a wi-fi module to a cloud-based platform.

c. Cloud platform- The cloud server stores and processes the data, allowing for remote monitoring and control via a mobile application or web interface

d. Hydro irrigation- The system uses a water pump and a drip irrigation network to deliver water directly to the plant roots based on actual needs, significantly reducing water wastage compared to manual methods.

Key feature and benefit-

a. Water conservation- It minimizes water wastage by applying the right amount of water only when needed, based on real time condition.

b. Energy efficiency- Utilizing solar power reduces reliance on non-renewable energy sources and lower operational costs.

c. Increased efficiency and convenience- Automation save time and effort, while remote monitoring provides convenient flexibility to users.

d. Sustainable Agriculture - By promoting efficient resource use, the system contributes to environment conservation and potentially enhance Agricultural productivity and crop yield.

Although this project also comes with certain limitations, which are as follows-

a. Weather dependency - The performance is reduced on cloudy days and at night as it is solar based. So, it requires a large and costly battery bank to store energy for continuous operation.

b. Technical Complexity - A certain level of technical knowledge and skill is required for proper installation

c. Connectivity issues - As there can be some connectivity issues as the system relies on stable internet or cellular connection for remote monitoring.

d. Hardware vulnerability- The hardware including sensors and tubing for drip irrigation is exposed to harsh email condition like sun, rain, dust etc. Which can shorten its usable lifetime and increases maintenance need.

The above limitations are although not very huge and are solution oriented.

Finally, it can be stated that Eco drop cloud demonstrate the potential of combining IOT and renewable energy for a smart, sustainable and efficient approach to irrigation.

Eco Drop Cloud stands as a production-grade embedded automation system integrating environmental sensing, autonomous decision-making, and cloud synchronization.

It is field-deployable, scientifically accurate, and engineered for 24×7reliability.

Even without connectivity, it maintains local intelligence.

So, it can be of great help to our farmers who are facing water scarcity due to less rainfall and other irrigation related problems which affects their crop yield and their livelihood.

9. **School Name:** Delhi Private School, Dubai

   Winner - Middle East Zone

   Students: Vyom Jha, Kishore Gurunathan and Ram Kishore Thirumalai Murugan

   Project Supervisor: Ms. Nidhuna PM

   Project Name: INSECT PROTEIN FARM (Mealworm)

Scan the code to watch the video of the project

Main Components of the Model

We can divide the setup into 4 interactive sections:

A. **Enclosed Insect Farm (Live or Simulated)**

Goal: Show how insects (like mealworms or crickets) can be farmed in a controlled habitat.

What to Include:

- Transparent box or acrylic container (like a small terrarium).
- Live mealworms (easy to find in pet stores) or model insects (if real ones aren't allowed).
- Layers with:
  - Food waste or bran (as bedding and food).
  - Humidifier pad or sponge for moisture.
  - Heat lamp or heating pad to simulate warm climate.
- Temperature and humidity sensors (optional, for data display).

Use a small fan or ventilation system to show airflow.

B. **Waste-to-Feed Bioconversion Unit**

Goal: Demonstrate how insects convert waste into biomass (protein).

What to Include:

- A diagram or 3D section showing:
  1. Food scraps (e.g., veggie peels) → added to insect bin.
  2. Insects consume waste → grow in size.
  3. Frass (insect droppings) → collected as organic fertilizer.
- Include real dried vegetable scraps to simulate input.
- Add an animated or interactive flowchart.

Create Pet Feeder so that food enters the chamber of the meal worm

C. **Protein Extraction / Processing Station (Mock)**

Goal: Show how insect protein is harvested and processed.

What to **Include:**

- Section **showing:**
  - Collected mature insects → dried or powdered.
  - Blender jar mockup (labelled "Processing Unit").
  - Output: Protein powder (use soy flour or chickpea flour as a placeholder).
- Use a sieve, grinder, or pretend "extruder" to simulate edible protein forms (e.g., bars or biscuits).
- Add packaging samples like "Insect Protein Biscuits", "Cricket Flour" mock labels.

D. **Nutritional & Environmental Comparison Board**

Protein Source	Protein/100g	Water Use	Land Use	Greenhouse Gas
Beef	26g	Very High	High	Very High
Soybeans	36g	Medium	Medium	Medium
Mealworms	50g	Low	Low	Low

Goal: Show why insect protein is a smart choice.

Use Infographics or Working Screens

- Include models of livestock vs. insects to show space savings.
- Add posters: "Feed 100 People with Just 1m² of Insect Farm!"

Science & Tech Concepts to Highlight

- Entomology: Life cycle of insects.
- Food Tech: Drying, powdering, protein extraction.
- Waste Bioconversion: Converting food waste to protein + organic fertilizer.
- Nutrition Science: Macronutrient and micronutrient value.

Optional Tech Add-Ons

- Add IoT sensors to monitor the environment (humidity, temp).
- Display live data on a small screen using Arduino + DHT11 sensor.
- Use a solar-powered fan for ventilation to tie in renewable energy.

10. School Name: Woodlem Park School, Al Hamidiya, Ajman

Runner Up - Middle East Zone

Students: Ninan Negi, Muhammad Fawaz Waqar Majeed and Aashin Shiju

Project Supervisor: Ms. Saswati Biswas

Project Name: 360 degree arm fire fighting robot

Scan the code to watch the video of the project

This Smart Fire-Fighting Robot is designed to extinguish fires at home shopping-mall,resturants. It features an advanced intelligent water-nozzle system that detects fire intensity using flame sensors connected to analog inputs. The system automatically adjusts water output based on fire size, thereby conserving water and ensuring efficient firefighting.

The robot uses eight flame sensors along with humidity, temperature, and gas sensors for complete environmental monitoring. All collected data, including power and signal inputs from the Quarky board, is transmitted and stored through an IFTTT web hook system, enabling the creation of a detailed mission log (captain's log) for analysis, monitoring, and future improvements.

Objectives

- To design a robot capable of detecting and extinguishing fires autonomously.
- To optimize water usage using intelligent analog flame-intensity detection.
- To provide real-time environmental monitoring using multiple sensors.

Components and Materials Used

1. Quarky Board: Main microcontroller for controlling all sensors and actuators.
2. Quarky Expansion Board: Provides additional power and connectivity ports.
3. 8 Flame Sensors: Detect fire direction and intensity using analog signals.

Components and Materials Used

1. Quarky Board: Main microcontroller for controlling all sensors and actuators.
2. Quarky Expansion Board: Provides additional power and connectivity ports.
3. 8 Flame Sensors: Detect fire direction and intensity using analog signals.
4. Servo Motors: Rotate flame sensors for scanning the environment.
5. N20 Motors: Provide precise and smooth robotic movement.
6. 360° Robotic Arm: Supports all-direction nozzle rotation for targeted firefighting.
7. Mechanism Wheels: Enable omnidirectional 360° movement.
8. Smart Water Nozzle: Controls water output to save water effectively.
9. Water Pump (PWM Controlled): Ensures variable water flow based on fire intensity.

10. Humidity, Temperature, and Gas Sensors: Monitor environmental conditions.
    - Small Breadboard & Power Board: Used for circuit integration and stable power supply.

Working Mechanism

1. Initialization: Robot powers on and begins scanning using flame and environment sensors.
2. Fire Detection: Flame sensors detect intensity and direction of fire.
3. Positioning: Servo motors rotate sensors and the robotic arm aligns the nozzle.
4. Water Optimization: Low flame → low water output High flame → increased water output
5. Fire Extinguishing: Water pump releases water through the smart nozzle.
6. Data Logging: All sensor readings and operations are logged using IFTTT web hook.

Features and Advantages

1. 360° Robotic Arm: Provides full-range directional firefighting ability.
2. Water-Saving Technology: Smart nozzle regulates flow according to fire intensity.
3. Environment Monitoring: Humidity, temperature, and gas data help assess fire risk.
4. Advanced Mobility: Mechanism wheels enable smooth 360° movement in any direction.
5. Precise Control: N20 motors and servo motors provide accurate positioning.
6. Data Logging: Full mission log stored automatically for review.

Challenges and Solutions

Challenge 1: Sensor calibration during an outdoor fire.

Solution: To increase accuracy, apply analog averaging and filtering techniques.

Challenge 2: Water usage during intense fires.

Solution: A smart nozzle adjusts the water flow to reduce waste.

Challenge 3: Electronics are impacted by heat.

Solution: Use heat-resistant casing and keep critical devices away from the fire zone.

Results and Impact

1. Successful detection of fire direction and magnitude using multi-flame sensors.
2. Significant water saving due to intelligent flow-control mechanism.
3. Improved safety for house, social life.
4. Detailed data logging enables performance monitoring and research.

Future Scope

1. Integration of AI for advanced prediction of fire spread.
2. Development of autonomous navigation using LiDAR and computer vision.

3. Solar-powered version for remote outdoor deployment.
4. Multi-robot coordination for covering larger areas during emergencies.

Conclusion

This Intelligent Fire-Fighting Robot serves as an example of how automation and robotics may effectively avert major fire catastrophes. The system offers a dependable and efficient way to combat fires in high-risk areas by integrating flame detection, intelligent water management, and environmental monitoring. Its capacity to log data via IFTTT facilitates future scalability and ongoing enhancement.

11. School Name: Delhi Public School Rohini, Delhi

Students: Rushil Gupta, Md. Aariz Alam and Abhiraj Singal

Project Supervisor: Ms. Aparna Chatterji

Project Name: AcoustiFire

Scan the code to watch the video of the project

Fire remains one of the most insidious threats to human safety and infrastructure, with incidents in homes, industries, and sensitive facilities like data centres causing widespread devastation annually. Traditional fire extinguishers, reliant on foam, carbon dioxide (CO_2), or chemical agents, provide reliable suppression but at a cost: they can damage delicate electronics, release hazardous residues, and pose environmental risks due to non-biodegradable components. Moreover, their deployment in confined indoor spaces often exacerbates ventilation challenges, limiting safe use. Addressing these shortcomings, a team of grade 8 students from Delhi Public School Rohini—Rushil Gupta, Md. Ariz Alam, and Abhiraj Singal—has developed the IoT-based Sonic Wave Fire Extinguisher. This proof-of-concept prototype reimagines fire safety through the elegant application of acoustic physics, offering a chemical-free, eco-friendly alternative that disrupts flames with sound waves alone.

The project's foundation lies in the fire triangle principle: for combustion to sustain, a fire requires fuel, oxygen, and heat. The Sonic Wave Fire Extinguisher targets the oxygen component by generating low-frequency sound waves in the 30-60 Hz range—deep, infrasonic vibrations akin to those from subwoofers. These waves induce rapid air turbulence, creating pressure gradients that physically displace oxygen molecules from the flame's vicinity. Deprived of its oxidizer, the flame collapses within seconds, extinguishing without residue or secondary hazards. As Abhiraj Singal articulates in their presentation, "Fire needs three things: fuel, oxygen, and heat. When we hit it with sound waves, the vibration pushes away the oxygen, cutting off the fire triangle and extinguishing the flame without chemicals." This method not only preserves sensitive environments but also aligns with sustainability goals, as it produces no waste and requires minimal energy for operation.

At the technical core is an integrated IoT framework for detection and response. The prototype centres on a NodeMCU Wi-Fi-enabled microcontroller, serving as the system's intelligent hub. Power is supplied by four external batteries, which drive two subwoofers amplified through metal-oxide-semiconductor field-effect transistors (MOSFETs) to precisely modulate the sonic output. Detection relies on dual infrared flame sensors, capable of identifying heat signatures from nascent fires. Upon triggering, the system activates visual alerts via an LED array and transmits real-time notifications through the IoT network—potentially to a user's smartphone app—enabling proactive intervention. Rushil Gupta details the assembly: "This is the NodeMCU, which is the Wi-Fi-enabled

microcontroller. We have used four external batteries which power the two subwoofers, which—with the help of the MOSFET—produce sonic waves to extinguish the fire. We have used two flame sensors to detect the fire. And this is the LED system, which lights up when there is a fire inside the house."

A key validation came through a controlled proof-of-concept demonstration. In a simulated indoor "house" enclosure, the team ignited a small, open flame. The flame sensors registered the threat, illuminating the LEDs and initiating the sonic barrage. Within moments, the subwoofers emitted the targeted frequencies, and the flame visibly wavered before extinguishing entirely. Concurrently, an IoT message confirmed: "Fire detected and extinguished." This seamless sequence underscores the prototype's efficacy for small-scale fires, with scalability potential for larger applications via amplified arrays.

The innovation draws from established scientific precedents, enhancing its credibility. The U.S. Defense Advanced Research Projects Agency (DARPA) pioneered acoustic fire suppression in 2008, demonstrating how sound waves could shear fuel vapors and thin flame fronts for rapid quenching. Similarly, a 2015 prototype by George Mason University students Viet Tran and Seth Robertson employed 30-60 Hz waves to suppress laboratory flames, validating the frequency range's disruptive power. The team adapted these concepts for accessibility, emphasizing IoT for modern integration. "Researchers at DARPA and universities have already worked on this idea," notes Abhiraj. "By making it and installing it in a house, we show how this can lead to a better future."

In essence, the Sonic Wave Fire Extinguisher exemplifies how interdisciplinary ingenuity—merging physics, electronics, and data connectivity—can yield transformative solutions. As the students reflect, "Innovation doesn't always mean invention, but it means reimagining what already exists in a new and meaningful way." This project paves the way for intelligent, sustainable fire safety systems, potentially integrable into smart buildings or portable devices. For Rushil, Md. Ariz, and Abhiraj, it marks not just a technical milestone, but a resonant call to harness sound as a silent guardian of life: "The Sonic Wave Fire Extinguisher, powered by sensors and guided by sound, represents a new direction in fire safety—intelligent, chemical-free, and eco-friendly... where even sound can save lives."

12. School Name: Delhi Public School Ghaziabad, Meerut Road

Students: Rhea Agarwal, Shreya Agarwal and Vanika Gupta

Project Supervisor: Ms. Richa Rawat

Project Name: Thermovolt Roads

Scan the code to watch the video of the project

1. Problem: Urban Heat Island Effect

   Indian cities experience a major challenge known as the urban heat island effect. Roads and buildings absorb large amounts of heat during the day and release it slowly at night, causing unusually warm evenings. This increases the use of air-conditioners, raises electricity consumption, and leads to discomfort and heat-related health problems. Roads become extremely hot surfaces that store vast amounts of unused heat, contributing significantly to rising city temperatures.

2. Solution: The ThermoVolt Road Concept

   ThermoVolt Road is an innovative idea designed to convert this wasted heat into clean, usable electricity. Instead of allowing roads to trap and radiate heat back into the environment, the concept focuses on collecting, storing, and converting that heat into electrical energy. This can help cool urban spaces while generating renewable power for streetlights and other public utilities. The idea presents a smart and practical approach to tackling both urban heating and high electricity demand.

3. Components Used in the Model

   To demonstrate this concept, a simplified model was built using:

   Black-painted tiles to represent heat-absorbing road surfaces

   A metal plate to quickly collect and transfer heat

   A thermoelectric Peltier module that converts temperature differences into electricity

   A hairdryer to act as the heat source, simulating sunlight

   An LED streetlight to display the electrical output

   A small rechargeable battery to store extra energy

   Each component plays a role in showing how real roads could be redesigned to generate clean energy using everyday heat.

4. Working of the ThermoVolt Road Model

   In the model, the hairdryer heats the metal plate placed above the Peltier module. The top of the plate becomes hot while the underside stays cooler, creating a temperature difference. This difference activates the Seebeck effect, which allows the Peltier module to generate electricity. The LED streetlight glows, demonstrating that road heat can power lighting systems.

A rechargeable battery stores some of the produced energy, allowing the LED to stay lit even after the heat source is removed. This represents how roads can collect heat during the day and use it to power streetlights at night.

Thermoelectric modules were chosen because they are safe, compact, and operate without moving parts. Unlike piezoelectric sensors that require constant pressure from heavy vehicles, thermoelectric modules produce electricity as long as heat is available, making them more reliable for Indian climatic conditions.

ThermoVolt Road offers a visionary solution for modern cities. It reduces urban temperatures, promotes sustainable energy use, and teaches important scientific concepts like thermodynamics, heat transfer, and innovation. By transforming wasted heat into useful electricity, this project presents a forward-looking approach to creating cooler, greener, and more energy-efficient cities.

13. School Name: Allen House Public School Khalasi Lines Kanpur, Kanpur

Students: Tanmay Mishra, Shivansh Kanodia and KB. Atharv

Project Supervisor: Ms. Nida Tasneem

Project Name: Oxygen Generating Roads" / "Oxy Way 2033

Scan the code to watch the video of the project

1. Introduction

   One of the most urgent issues facing the world today is air pollution, which has an impact on the environment, human health, and general quality of life. The air we breathe now contains dangerously high levels of particulate matter and harmful gases due to growing urbanization, rapid industrial expansion, and rising vehicle usage. Millions of premature deaths annually, weakened immunity, and chronic respiratory illnesses have all been connected to poor air quality. In this situation, clean air is now a basic need rather than a luxury. Our team created Project OxyWay, a smart, small, and environmentally friendly air purification and monitoring system intended for daily use, with the goal of developing an economical, efficient, and sustainable solution to this problem.

2. The Purpose behind the development

   The foundation of OxyWay is the idea that everyone should have access to clean air, regardless of their financial situation or standard of living. OxyWay combines smart purification and real-time air monitoring into a single, effective system, in contrast to conventional air purifiers that only work as standalone filters. The core of our project is its capacity to detect ambient air quality and react automatically to pollution levels, guaranteeing steady and ideal performance without human intervention.

3. Scientific Principle Involved

   A collection of environmental sensors that can identify temperature, humidity, dangerous gases, and particulate matter (PM2.5 and PM10) form the foundation of OxyWay. A microcontroller interprets the data that these sensors continuously gather. The device modifies the fan speed or airflow direction to change the purification intensity based on this analysis. By prolonging filter life and lowering power consumption, this feedback-driven automation enables energy-efficient operation. Through an optional mobile interface or an onboard display, the user can access real-time air quality readings, raising awareness and promoting eco-friendly behavior.

   Depending on the model chosen, the purification system's multi-stage filtration may use HEPA filters, activated carbon, or specially designed eco-friendly filter materials. Together, these layers collect dust, smoke, chemical pollutants, and allergens. The device produces much cleaner, safer-to-breathe air. OxyWay can be installed in a variety of settings, including homes, offices, hospitals, classrooms, and even small

public spaces, thanks to its small size and modular design. Because of its portability, the system is particularly well-suited for developing areas where there are few dependable purification options and frequent fluctuations in air quality.

SCAN THE QR FOR MORE INFORMATION

OxyWay's dedication to sustainability is one of its most notable characteristics. Our design prioritizes the use of recyclable materials whenever feasible, and the device's low energy consumption lessens its environmental impact. Furthermore, by giving users clear information about pollution levels, OxyWay enables them to comprehend and respond to their environment, ultimately raising community awareness of environmental issues.

4. Applications

OxyWay's effects go beyond its advantages for personal health. It could be incorporated into public health campaigns, educational programs, and urban planning initiatives. Hospitals can implement it for patient safety, schools can use it to keep classrooms healthier, and community centers can use it to enhance indoor air quality during periods of high pollution. Devices like OxyWay provide workable and scalable solutions as cities continue to fight smog and environmental degradation.

In summary, Project OxyWay exemplifies a well-balanced combination of social responsibility, sustainability, and innovation.

14. **School Name:** Delhi Public School Bijnor, Bijnor

Students: Navika Jeveriya, Aradhya, and Aradhya Taneja

Project Supervisor: Ms. Ritu Rani

Project Name: Sound Waves Green Saves

Scan the code to watch the video of the project

Problem Statement

In both rural and urban areas, large amounts of sound energy are produced every day—from generators, mills, diesel pumps, traffic, loudspeakers, and construction sites. This energy goes completely unused, while many regions still struggle with limited or expensive electricity, especially for basic lighting. The challenge was to find a low-cost and renewable method to convert readily available sound into a useful form of energy.

Solution

The students designed a model that captures ambient sound and converts it into electrical energy using piezoelectric discs and a sound sensor circuit.

Piezoelectric discs vibrate when exposed to sound waves and generate a small electric charge.

A sound sensor with a condenser microphone detects sound vibrations, which are amplified using a transistor to increase output.

The combined energy is stored in a rechargeable battery and used to power LED lights.

This system works near any noisy location—villages with generators or sugar mills, and cities with traffic or public events—providing a simple, affordable, and sustainable lighting solution.

Future Scope

Improving piezoelectric efficiency and increasing the number of discs to generate more power.

Scaling the model for street lights, markets, railway stations, and highways.

Integrating sound-based energy harvesting with other renewable sources like solar panels for hybrid lighting systems.

Developing a compact, robust design that can be installed in households, street poles, and parks.

15. School Name: 7i World School SLR, Gwalior

Students: Ananya Sharma, Kriti Bhatnagar and Navshree Chaturvedi

Project Supervisor: Ms. Ruchi Neekhra

Project Name: Smart Exit Control Device

Scan the code to watch the video of the project

Problem Statement:

At one of the pre-primary school, a UKG student accidentally walked out of the school gate alone during dispersal time without a parent. This incident highlighted the need for a technical solution to ensure 100% student safety during school hours.

Proposed Solution:

We developed a Smart Exit Control Device—a safety system designed to detect if a child is leaving the school gate alone and alert the authorities immediately.

Technical Details:

- Weight Sensor: Detects the weight of the person stepping out. If the weight is between 15 kg and 35 kg, it assumes a child is exiting alone and triggers a beep alert. If the weight is above 35 kg, it assumes the child is with a parent, and no alert is activated.
- Camera: Captures a photo of the person exiting. The camera sends the photo to a computer for image processing.
- Weight Module: Reads the weight detected by the sensor and sends it to the system.
- LED Display Unit: Shows the weight of the person stepping out, so authorities can see it from outside.
- Node MCU Wi-Fi Module: Sends the photo from the camera to a computer for analysis.
- Arduino Uno: Controls the entire system, processes data from the weight module, manages the camera, and updates the LED display.
- *Buzzer: Sounds an alarm if the system confirms that a child is exiting alone.

Working Mechanism:

The device checks the weight of the person stepping out using the weight sensor. The weight module reads the weight and sends it to the system. The LED display shows the weight outside, so authorities can see it. If the weight is between 15 kg and 35 kg, it assumes a child is alone. The camera captures a photo and sends it to a computer for confirmation. If the child is alone, the buzzer sounds an alarm to alert the authorities. Key Features:

- Ensures child safety at school gates
- Smart alert for unauthorized exits
- Power-efficient and easy to install
- Expandable system (can include SMS alerts or camera integration)
- Low-cost and school-friendly innovation

Social Impact:

- Prevents unintentional or unsafe student exits
- Strengthens trust among parents and school authorities
- Promotes smart safety practices in educational institutions

Prototype Status:

A working prototype has been developed using weight sensor, weight module, LED display unit, camera, buzzer, Node MCU Wi-Fi module, and Arduino Uno. The GSM module will be integrated in the next version for remote alerts.

Theme:

AI & IoT – Smart Safety Solutions for Schools

16. School Name: Aadharshila Public School, Jind

Students: Vansh, Naitik and Moksh

Project Supervisor: Ms. Himanshi

Project Name: Smart safety Badge for school children

Scan the code to watch the video of the project

Student safety inside school premises has become a major priority for administrators and parents. Schools often struggle to monitor the movement of students across sensitive areas such as washrooms, classrooms, corridors, libraries, and boarding points. Traditional manual supervision is not always sufficient, especially in large campuses. To address this challenge, this project proposes a low-cost, privacy-preserving IoT-based system that tracks student movement in real time using IR break-beam sensors and a secure local Wi-Fi network. The system ensures that all data remain within the school premises without relying on external internet connectivity.

The core Idea of this project is simple yet effective. IR break-beam sensors are installed at entry and exit points. When a student passes through a door, the sensor beam is interrupted, generating a digital signal. This signal is immediately detected by a NodeMCU/ESP8266 or ESP32 microcontroller placed near the zone. The microcontroller processes the event, attaches a timestamp, and sends it as a JSON packet to a local server through a dedicated Wi-Fi hotspot created in Access Point (AP) mode. The hotspot may be generated through the ESP itself or through a Raspberry Pi acting as a local central server.

Because the system works in local AP mode, only authorized teachers or guardians connected to the hotspot can access the dashboard. This ensures privacy and prevents external interference. The local server (built using Flask or Node.js) receives each event and stores it in a log database. A lightweight dashboard displays real-time zone occupancy, last movement timestamps, and alerts. The dashboard updates instantly using WebSocket communication, allowing teachers to see the student's latest location. An alert can also be triggered if a student remains in a sensitive area for an unusually long time.

One of the strengths of this system is its affordability. IR break-beam sensors are inexpensive, accurate, and reliable for indoor environments. The NodeMCU/ESP8266 provides both sensor processing and Wi-Fi connectivity at a low cost. A Raspberry Pi can optionally be added to improve data handling, but the system can also function with just ESP modules. The total cost of implementation ranges between ₹3000 to ₹8000 depending on the number of zones covered.

The project was implemented in phases: assembling the IR sensor and NodeMCU circuit, configuring the microcontroller in AP mode, creating the event-logging server, building the dashboard, and testing in real-world conditions. Tests included single-person crossing, group movement, prolonged obstruction, and variations in lighting. Results showed that

the system performed reliably after proper sensor alignment and software filtering for noise.

This IoT solution offers significant future potential. Features like RFID-based student identification, camera-assisted verification (with strict privacy measures), mesh networking for larger campuses, and AI-based anomaly detection can be added. Overall, the project demonstrates an effective, scalable, and privacy-focused approach to improving student safety through real-time movement monitoring within school premises.

17. School Name: Birla High School, Kolkata

Students: Sulin Chakraborti, Ishaan Dey and Ayitijhya Chakraborty

Project Supervisor: Ms. Deblina Das

Project Name: Renewable Resource Model

Scan the code to watch the video of the project

Plastic waste, particularly materials such as polystyrene (PS) and high-density polyethylene (HDPE), presents a major environmental challenge due to its non-biodegradable nature and limited scope for mechanical recycling. At the same time, these plastics are composed almost entirely of hydrocarbons, making them valuable candidates for chemical recycling. This project explores a conceptual industrial system that converts plastic waste into fuels and useful chemicals through an integrated pyrolysis-based process.

At the core of the system is the pyrolysis of PS and HDPE in an oxygen-free stainless-steel chamber. When heated, the long polymer chains break down into smaller hydrocarbon molecules, producing a mixture of vapours and gases. These hot vapours are directed through a series of condensers designed to separate different fuel fractions based on boiling point. In our demonstration model, copper tubing immersed in a water bath represents the primary condenser, where heavy hydrocarbons condense and are collected. These primary condensables have potential industrial applications as asphalt modifiers or heavy fuel components.

The remaining vapours pass through a second copper coil immersed in an ice bath, simulating a secondary condenser. Here, lighter hydrocarbons in the gasoline boiling range condense and are collected separately. After appropriate refining, such fractions can be blended into petrol-like fuels. This staged condensation highlights how a single pyrolysis process can yield multiple useful liquid products.

The gases that do not condense, known as non-condensable gases (NCGs), are not treated as waste in this concept. Instead, they are introduced into a sodium hydroxide solution, where carbon monoxide present in the gas stream reacts to form sodium formate. This demonstrates a simple chemical route for capturing and utilising carbon-containing gases. Sodium formate can be further converted into sodium oxalate, releasing hydrogen gas in the process. Both the oxalate and the hydrogen represent additional energy-carrying products.

Finally, the model conceptually integrates the remaining gas streams, hydrogen, and carbon dioxide into downstream fuel synthesis pathways, such as methanol production, which is widely used as a green fuel additive. All components of the physical model are designed for visual clarity and safety, serving as a scaled representation of an industrial system rather than a working reactor.

Overall, this project demonstrates how plastic waste can be re-imagined as a resource, showcasing a circular approach in which fuels, chemicals, and energy are recovered from materials that would otherwise be discarded.

18. School Name: Epic Public School, Coochbehar

Students: Korak Maitra, Bedaporna Deb and Parnika Dutta

Project Supervisor: Mr. Arnab Thokder

Project Name: Electricity Generator for Village Homes

Scan the code to watch the video of the project

While volunteering and teaching in an economically backward village named Mendabari, our students observed that many children there do not have access to electricity and struggle to study after it is dark. Our students decided to solve this problem by creating an electricity generator that is portable and very easy to install and also costs very less to make, which is perfect for a rural setup.

The students learnt about Archimedes spiral other necessary technical details and first built a prototype made of plastic and cardboard. Using the design of the prototype, they then built a real model of a portable working windmil, using polycarbonate sheets, plywood, bearings, dynamo motor, bridge rectifier and capacitor. It is waterproof and can withstand high wind force. The windmill is generating electricity with relatively less wind because the students used a high velocity conversion ratio to convert slower windmill rotating motion to much higher rpm in the generator. The windmill is now generating upto 40 volts in moderate wind and can generate and store more with little modifications in the capacitor. The students wants to modify it with a rotating base which can follow the wind direction and adjust itself and also charge batteries to make a mini inverter using the same. The students will now install the same in the Mendabari village to help children study under the lights. With a bit of support, this can be produced in mass and can help other economically backward villages too.

19. School Name: International School ICSE, Patna

Students: Aadvik Sinha, Aadya Chouhan and Zainab Ashraf Shaikh

Project Supervisor: Mr. Abhishek Kumar

Project Name: Offline Chatbot

Scan the code to watch the video of the project

An offline chatbot is an intelligent system designed to interact with users without relying on internet connectivity. Unlike online chatbots that depend on cloud servers and continuous network access, an offline chatbot processes all data locally within the device. This makes it a reliable and practical solution for environments where internet access is limited, unstable, or unavailable.

The primary purpose of an offline chatbot is to provide consistent assistance under all conditions. In many real-world scenarios such as rural areas, schools with limited infrastructure, hospitals, libraries, and emergency situations, internet-based systems often fail. An offline chatbot ensures that users can still receive information, guidance, and support even when connectivity is disrupted. This reliability makes it especially valuable for critical applications where uninterrupted access is essential.

Offline chatbots operate using embedded systems or local processors, where all commands, responses, and decision-making logic are stored in the system's firmware. User input can be provided through buttons, voice commands, or predefined triggers. The system processes the input locally and generates appropriate responses through displays, speakers, or physical movements. Since no external servers are involved, response time is fast and predictable.

Another major advantage of offline chatbots is data privacy and security. Online chatbots often transmit user data to cloud servers, which can raise concerns about data misuse or breaches. Offline chatbots eliminate this risk by keeping all data within the device. This makes them safer for use by children, elderly users, and institutions that handle sensitive information.

Cost-effectiveness is also a key benefit of offline chatbot systems. By using affordable hardware components such as microcontrollers, displays, and audio modules, these systems can be developed at a low cost. This makes them accessible to schools, public institutions, and communities with limited resources. Their simple design also allows easy maintenance and long-term usage.

Offline chatbots can be used in a wide range of applications. In education, they can assist students with basic queries and learning support. In healthcare, they can provide general guidance and information. In public spaces, they can act as help desks or information kiosks. During emergencies or disasters, offline chatbots can continue functioning when online systems fail.

In conclusion, offline chatbots represent a practical and inclusive approach to intelligent system design. By focusing on reliability, privacy, affordability, and real-world usability, they bridge the gap between advanced technology and everyday needs. Offline chatbots demonstrate that intelligent assistance does not always require internet connectivity and can still deliver meaningful impact across diverse environments.

20. **School Name:** Foundation School, Patna

Students: Adity Kumari, Anjali Kumari and Sanskriti Kumari

Project Supervisor: Ms. Farha Naz

Project Name: AuraSphere: (The Complete Smart Home Ecosystem for Safety & Efficiency)

Scan the code to watch the video of the project

21. School Name: Tashi Namgyal Academy, Gangtok

Students: Tashi Palden Sherpa, Sahana Pradhan and Kysong Pema Bhutia

Project Supervisor: Mr. Pravash Mothey

Project Name: Verdant Shield

Scan the code to watch the video of the project

Overview

Verdant Shield is a student-led innovation from Tashi Namgyal Academy, developed for the Macmillan Budding Scientist Competition 2025. It is a modular, solar-powered green wall that integrates environmental science, acoustic engineering, and IoT automation. Designed to tackle pressing urban challenges, Verdant Shield demonstrates how nature and technology can work together to create cleaner, quieter, and more sustainable spaces.

The Problem

Cities and hill towns like Gangtok face increasing noise and air pollution due to traffic, tourism, and construction. Traditional solutions such as concrete barriers or synthetic filters are costly, environmentally unfriendly, and often impractical. Students in noisy classrooms struggle to concentrate, hospital patients require peaceful surroundings to heal, and workers in offices deserve clean air. The lack of affordable, eco-friendly solutions to these problems inspired the creation of Verdant Shield.

The Solution

Verdant Shield is a living wall that absorbs sound, purifies air, and operates sustainably. By combining natural fibers, hardy plants, and smart automation, it reduces noise levels by up to 10 decibels and improves air quality significantly. Powered entirely by solar energy, the system runs at zero electricity cost. Its modular design makes it portable and adaptable for schools, hospitals, offices, and highways.

Key Features

- Noise Absorption: Coir, jute, and rubber crumb layers trap sound waves, while an air cavity reduces low-frequency noise.
- Air Purification: Plants such as pothos, ferns, spider plants, and coleus absorb pollutants and release oxygen.
- Smart Automation: Arduino sensors monitor soil moisture and air quality, triggering irrigation pumps when needed.
- Solar Power: A 12V/5W solar panel with rechargeable batteries ensures self-sustaining operation.
- Educational Transparency: An OLED display shows real-time AQI and soil moisture, making the system interactive and informative.

Who Will Benefit

- Schools: Quieter classrooms that improve concentration.
- Hospitals: Peaceful healing environments for patients.
- Offices: Cleaner air and reduced street noise for workers.
- Highways/Residential Areas: Eco-friendly barriers that protect communities from traffic pollution.

Materials and Architecture

The structure uses bamboo or wooden frames with plywood backing. Acoustic layers include coir sheets, jute felt, coconut husks, and recycled rubber mats. Planters made from recycled bottles hold soil enriched with compost and biochar. Electronics include Arduino microcontrollers, sensors, relay modules, pumps, and displays, all powered by solar panels and lithium-ion batteries. The design emphasizes sustainability, portability, and modularity, with one section left open during exhibitions to showcase the internal layers and wiring.

Future Enhancements

Verdant Shield can be scaled for larger installations along highways or urban centers. Future versions may integrate advanced sensors for particulate matter, humidity, and temperature, as well as mobile app connectivity for remote monitoring. Improvements in solar efficiency and battery storage could make the system even more reliable during monsoon seasons. With funding and support, Verdant Shield could evolve into a practical solution for sustainable urban infrastructure.

22. School Name: JJ School Montessori, Imphal West

Students: Lanchenbi Angomcha, Harshika Moirangthem and Sagolsem Sunaina

Project Supervisor: Ms. Hanglem Shreena Chanu

Project Name: Leaf Power: The Banana Leaf Battery

Scan the code to watch the video of the project

Introduction

Conventional batteries depend largely on manufactured chemicals and heavy metals, which raise serious environmental concerns during production, usage, and disposal. With the growing need for sustainable and eco friendly energy alternatives, bio based energy sources have gained significant attention.

The banana leaf battery is an innovative application of electrochemical principles that utilizes the natural moisture and organic acids present in the banana plant as an electrolyte. By inserting two dissimilar metal electrodes into the banana plant's midrib or pseudo stem, a small amount of electrical energy can be generated. This project explores the feasibility of producing electricity from a natural, biodegradable, and renewable source using easily available materials.

Objectives

The objectives of this project are:

- To construct a simple bio battery using a banana plant.
- To study the generation of electrical energy from organic matter.
- To understand the working of a galvanic cell using natural electrolytes.
- To demonstrate an environmentally friendly and low cost alternative energy source.

Scientific Principle

The banana leaf battery works on the principle of a galvanic (voltaic) cell, similar to a Daniell cell. In a galvanic cell, chemical energy is converted into electrical energy through spontaneous oxidation reduction (redox) reactions.

The banana plant's pseudo stem and leaf midrib contain water and organic acids, which act as a natural electrolyte. When two dissimilar metals—zinc (Zn) and copper (Cu)—are inserted into the banana plant, an electrochemical reaction takes place.

- Anode (Negative Electrode – Zinc): Zinc is more reactive and undergoes oxidation, releasing electrons into the external circuit and forming Zn^{2+} ions.
- Cathode (Positive Electrode – Copper): Copper is less reactive and accepts electrons flowing through the external circuit, where reduction occurs.

The movement of electrons from zinc to copper through the connecting wire produces an electric current, which can be used to power small electrical devices such as a low voltage LED bulb.

Materials Required

- Fresh banana leaf midrib or banana stump (pseudo stem)
- Zinc strips
- Copper strips
- Connecting wires
- Soldering iron or alligator clips
- Voltmeter or multimeter
- Low voltage LED bulb
- Switch

Procedure

1. Preparation of the Banana Plant:

   A fresh banana leaf midrib or a section of banana stump is cut and cleaned to ensure sufficient moisture content.

2. Preparation of Electrodes:

   Small zinc and copper strips (approximately 2 cm × 1 cm) are taken. Connecting wires are attached to the metal strips using a soldering iron or alligator clips.

3. Insertion of Electrodes:

   The zinc and copper electrodes are inserted into the banana midrib or stump, keeping a small distance between them to avoid direct contact.

4. Measurement of Voltage:

   The free ends of the wires are connected to a voltmeter or multimeter to measure the voltage produced by a single banana cell.

5. Series Connection:

   Multiple banana cells are connected in series to increase the total voltage output.

6. Load Connection:

   The combined setup is connected to a low voltage LED bulb to observe whether the generated electricity is sufficient to produce light.

Observations

- Number of Midrib / Banana Stump Connected Voltage Obtained LED Bulb Observation
- 5 (midrib) 0.8 V Bulb does not glow
- 10 (midrib) 1.6 V Bulb does not glow

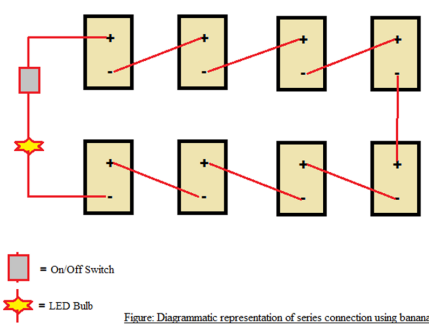


Figure: Diagrammatic representation of series connection using banana pseudo stem.

- 8 (banana stump ~8 cm length) 3 V Bulb glows
- 10 (banana stump ~8 cm length) 4 V Bulb glows

Results and Discussion

The experiment confirmed that a banana plant can function as an electrochemical cell and generate a measurable amount of electrical energy. It was observed that banana stumps produced higher voltage compared to leaf midribs due to higher moisture content and better electrolyte availability. Connecting multiple cells in series significantly increased the voltage, making it sufficient to glow a low voltage LED bulb.

Although the power output is small, the experiment clearly demonstrates the conversion of chemical energy into electrical energy using natural materials.

Conclusion

The banana leaf battery project successfully demonstrates the concept of bio electricity using organic materials. While it is not suitable for large-scale power generation, it highlights the potential of renewable and biodegradable resources in producing clean energy. This project enhances understanding of electrochemistry and encourages innovative thinking towards sustainable energy solutions.

Applications and Future Scope

- Educational demonstrations of electrochemical cells.
- Low power energy sources for sensors or experimental devices.
- Exploration of other plant based or bio waste energy sources.
- Further research to improve efficiency and output voltage.

23. School Name: St. Raphael's Public School, kallur, Thrissur

Students: Aryandev Ratheesh, Henrietta Mariya Tony and Theertha Krishna

Project Supervisor: Ms. Monica Wincent

Project Name: Ai for Primary Students

Scan the code to watch the video of the project

Statement Problem

In today's fast world, many children struggle to develop and maintain healthy habits. Poor eating habits, lack of physical activity, insufficient sleep, increased screen time, etc. have become common issues. It has become the need of the hour for a fun- filled, motivating and interactive solution that encourages the children to track their habits to maintain a healthy routine.

Project Details

The Healthy Habit Tracker is a mobile application designed specifically for children. Its Primary objective is to help children to develop good habits such as drink enough water, eat nutritious food, exercise, desirable sleep, good hygiene, etc. The app makes habit tracking fun by awarding points for each activity. It creates a game like experience and also encourages children to stick to their goals.

Elements Incorporated

The app is designed by using MIT App Inventor, that makes it easy for the children to interact.

Core Features

- Daily Habit Tracker - water intake, nutritious food, sufficient sleep, etc.
- Point based rewards.
- Visual achievements
- Fun and colorful interface with simple instructions
- Motivation for timely habit completion.
  - ❖ Science - Concepts of Health and well-being.
  - ❖ Technology - MIT App Inventor
  - ❖ Engineering - Design and structure including functions for tracking and calculating points.
  - ❖ Arts - Child - friendly, vibrant colours
  - ❖ Mathematics - simple calculations for points

Expected Outcomes

- Improved Health habits.
- Behavioural change.
- Expertise in simple calculations.
- Self-awareness.
- Increased motivation.

Conclusion

The Healthy Habit Tracker designed to promote healthy habits promotes self-awareness and thereby self-esteem. The technology used enhances motivation not only in health but also in overall development. As we conclude, there is one thing you must remember: the Healthy Tracker is not just an app. It is a partner designed just for your children. This app maintains your children to actively perform healthy habits every day without any distractions. Often, we might feel lonely on this health journey—but not anymore.

We celebrate every small victory and every extra step you take when your children learn healthy habits. We share in that joy.

Our mission is to make every child the best version of themselves through healthy habits learned one step at a time.

The Healthy Tracker app is very useful for your child, so don't hesitate any longer. Use this tool right at your fingertips. The "Vitality Grow" app is here to support your children's goals. We will do everything we can for their future.

Thank you for helping shape a healthier future.

24. School Name: Vijayagiri Public School, Chalakudy

Students: Aman Mukthar KS, Ron Jaison and Charles Jaison

Project Supervisor: Ms. Beena Vincent

Project Name: Borewell Rescue Robot

Scan the code to watch the video of the project

Open borewells have become a serious danger in many places. In several cases, children have accidentally fallen into borewells. Rescuing them is very difficult because borewells are deep and narrow. A human rescuer cannot safely go inside such a small space. Traditional rescue methods take a lot of time and sometimes fail to save the victim. Because of these problems, there is a need to use technology for rescue operations. The Borewell Human Rescue Robot is designed to help rescue trapped people in a safer and faster way.

OBJECTIVE OF THE PROJECT

The main aim of this project is to design a robot that can be lowered into a borewell to find and rescue a trapped person. The project focuses on reducing rescue time and avoiding danger to human rescuers.

DESIGN AND WORKING

The rescue system mainly uses a lightweight 3D printed gripper. The gripper works using a hydraulic mechanism which allows smooth movement and controlled gripping force. This is very important while handling a trapped human because too much force can cause injury.

The hydraulic system provides force feedback which helps the operator control the grip properly. This ensures the person is held safely and supported well during lifting. The design helps in balancing the body weight while pulling the victim out.

An oxygen supply system is placed near the gripper. A flexible tube supplies fresh oxygen from the surface directly to the trapped person.

The vertical movement of the robot is controlled using a 12 V DC motor with PWM control. PWM allows smooth speed control and accurate positioning during both downward and upward movement. The robot is operated from the surface using a remote-control unit.

The robot is fitted with a 5 V 1.3 MP camera and LED lights to provide a clear view inside the borewell. This helps rescuers monitor the situation in real time. A simple adjustable support system helps hold the victim safely. A communication system allows rescuers to talk to the trapped person and reduce fear.

ADVANTAGES

- The robot is small in size and suitable for narrow borewells
- The hydraulic gripper provides safe and controlled handling

- Continuous oxygen supply reduces the risk of suffocation
- Live video helps in better monitoring
- PWM control allows smooth and precise movement

DISADVANTAGES

- Initial cost is high
- Skilled operators are required
- Not effective in fully collapsed borewells
- Depends on power supply

OUTCOME AND IMPACT

This project shows that robots can be very useful in rescue operations. It helps save time and increases the chance of saving lives. It also helps students understand how technology can be used to solve serious problems in society.

FUTURE SCOPE

In the future, the robot can be improved by adding better sensors, stronger support systems, and automatic movement features. With further development, it can become a reliable tool for rescue and disaster situations.

25. **School Name:** Excellent English Medium School, Moodubidre
Students: Abhineeth A, Pramath Pai and Arvin Rishon Dcosta
Project Supervisor: Mr. Venkatesh B.C.
Project Name: Ai Voting Machine

Scan the code to watch the video of the project

A SMART STEP TOWARDS STRONGER DEMOCRACY

In India, voting is the backbone of democracy because it empowers citizens to directly shape the nation's future. Every effort is made to ensure that citizens can cast their votes easily and securely. However, reaching voters in remote and rural areas, managing power availability and security challenges can be difficult. To solve these problems, we have created a new type of voting system called the AI powered voting machine, designed to be portable, secure, and reliable for all regions.

The AI powered voting machine uses "yolonew V8" as its face-recognition software, which we refer to as Artificial Intelligence (AI). The core processing unit of the system is a Raspberry Pi 5, which acts as the main brain of the voting machine. The Raspberry Pi 5 is compact, efficient, and consumes very little power. Because of this low power requirement, the machine can easily operate using a small portable power bank, making it suitable for areas with limited or unreliable electricity supply.

The entire system will be enclosed in a rugged and weather-proof casing, allowing it to be placed on a table or mounted on a pole in remote villages and indoor locations. When a voter approaches the machine, the camera automatically captures a quick image and the face-recognition AI runs locally on the Raspberry Pi, ensuring that no personal data leaves the device. This design provides a strong level of privacy and data protection. Within seconds, the display shows a clear "Verified" message, if the captured image matches to photo of registered voter.

Once verification is complete, it allows the user to vote. The user interface will be designed to be simple and user-friendly so that voters of all ages and literacy levels can use it comfortably. Voters can cast their vote by tapping on the image of their chosen candidate or by using swipe gestures.

26. School Name: Bharatiya Vidya Bhavans Public School, Visakhapatnam

Students: L. Dhruvika Aaryana, G. Guru Vaishnav and B. Vardhan Kumar

Project Supervisor: Ms. V.Vasudha

Project Name: Automated Child Safety & Truancy Prevention System

Scan the code to watch the video of the project

Rationale (Need of the Work)

Ensuring student safety during school hours is one of the most important responsibilities of educational institutions. Schools commonly rely on manual supervision and CCTV surveillance to maintain discipline and security. While these systems are essential, they mainly assist in monitoring and reviewing incidents after they occur.

During observation and discussion, we realised that one of the most sensitive areas related to student safety is the school exit gate. Once a student crosses the gate without authorisation, the opportunity for immediate intervention is significantly reduced. This highlighted the need for a preventive system that can support existing measures by reacting at the moment of risk rather than after the incident.

As school students, we felt it was meaningful to design a project that strengthens the school safety ecosystem through responsible use of technology.

Problem Identified

The key problem identified is the absence of an automated preventive mechanism to detect unauthorised student exits during school hours. Existing systems such as CCTV cameras and manual supervision are largely reactive and depend heavily on continuous human attention. A system capable of detecting exit attempts in real time and alerting authorities immediately is required to reduce safety risks.

Proposed Solution

To address this problem, we developed the Automated Child Safety and Truancy Prevention System, an IoT-based preventive safety solution focused on school exit points. The system is designed to detect unauthorised exit attempts and generate instant alerts, enabling timely human intervention before a student leaves the campus.

The solution is intended to support and strengthen existing safety infrastructure, not replace it.

Concepts and Technologies Used

- Preventive child safety systems
- Embedded systems and microcontrollers
- Sensor-based detection and validation

- Wireless communication and alert mechanisms
- Automation for real-time monitoring
- Working Overview

In the proposed system, each student carries an identification card embedded with a low-power RF transmitter. An RF receiver installed near the school gate detects the presence of the transmitter. An IR motion sensor placed at the gate detects physical movement when someone approaches or attempts to cross the exit.

The Arduino Uno functions as the control unit, processing inputs from both sensors. When movement is detected at the gate along with the presence of a valid RF signal, the system identifies this as an unauthorised exit attempt. Immediate alerts are generated through audible alarms and SMS notifications to school authorities, allowing prompt action to be taken.

Benefits of the System

- Prevents unauthorised exits during school hours
- Provides real-time alerts instead of post-incident review
- Reduces dependence on constant manual supervision
- Scalable for schools with multiple exit gates
- Enhances overall school safety and discipline

Conclusion

The Automated Child Safety and Truancy Prevention System demonstrates how preventive design and automation can enhance student safety in schools. By focusing on critical exit points and enabling immediate alerts, the system strengthens existing safety measures and supports timely human intervention. The project highlights the importance of thoughtful, preventive solutions in addressing real-world safety challenges within educational environments.

27. School Name: Ramadevi Public School, Hyderabad

Students: Palakurthi Surya Vibhav, Shreyank Kulkarni and Sai Varshith Tudimilla

Project Supervisor: Ms. Himabindu

Project Name: Intelligent Bridge System (IBS)

Scan the code to watch the video of the project

Flooding is a major issue in many regions, damaging infrastructure and blocking transport routes. Traditional bridges are fixed and often get submerged in high water levels, disrupting connectivity. This project proposes an intelligent bridge system that automatically adjusts its height during floods using a water level detection mechanism.

The intelligent bridge system illustrates how physics is applied in real-world engineering:

1. Pressure and force from rising water are detected using sensors.
2. Torque from motors helps lift the bridge.
3. Energy transformation shows how power is converted into motion.
4. Balance and stability are key to ensuring safe operation.
5. Feedback control systems help maintain automated responses.

Objective:

To build a model of a bridge that automatically lifts when water levels rise, simulating how real bridges can be designed to prevent damage or allow boats to pass during floods

Principle:

The model works using a water level sensor and a microcontroller. When water rises beyond a certain point, the sensor sends a signal to the Arduino, which then powers the motor to lift the bridge structure.

Working:

1. The water level sensor constantly monitors the height of the water.
2. When the water reaches a set threshold, the sensor signals the Arduino.
3. The Arduino sends a signal to the motor driver, which powers the motor.
4. The motor pulls the thread or wire, lifting the bridge platform.
5. Once the water level goes back to normal, the motor lowers the bridge back to its original position.

Applications:

- Bridges that can lift during floods.
- Disaster management systems.

- Smart infrastructure solutions.
- Educational robotics projects.

Future Enhancements:

- Use wireless communication to alert authorities.
- Add solar power for energy efficiency.
- Implement multiple sensors for better flood detection.

Materials Required:

Mechanical Parts

1. Cardboard or Foam Board – for making the bridge structure.
2. Ruler / Scale – for measurements and construction.
3. Thread or Wire – to connect the moving parts.
4. Small motor or servo motor – to lift the bridge platform.
5. Support structures – like wooden sticks or plastic strips for stability.
6. Glue / Fevicol / Double-sided tape – for assembly.

Electronic Components

1. Arduino Uno (or similar microcontroller) – to control the motor.
2. Water level sensor (or float sensor) – to detect flooding.
3. Jumper wires – for electrical connections.
4. Power supply / Battery pack – to power the system.
5. Resistors (as needed) – depending on circuit requirements.
6. Transistor or motor driver (like L298N or ULN2003) – to control motor current.
7. LED indicators (optional) – to show when the bridge is active.

28. School Name: Servite Convent Senior Secondary School, Narmadapuram

Students: Pahal Dubey, Bhavya Mishra and Batul Ali

Project Supervisor: Ms. Seema Ameen

Project Name: Smart Anti-snake Bite Shoe

Scan the code to watch the video of the project

Snakebites remain a critical but often ignored issue in many parts of rural India. Thousands of people, especially farmers and villagers, suffer snakebites each year while working in fields or walking outdoors during the night or monsoon season. In many cases, the lack of medical facilities and delayed first aid make the situation worse. Our project, Smart Anti-Snake Bite Slipper, presents an innovative idea aimed at reducing such risks by combining basic technology with a practical safety concept that can be implemented in real life.

The idea behind the Smart Anti-Snake Bite Slipper is to create a conceptual design for a type of footwear that can help detect, alert, and respond quickly in case of a snakebite situation. The concept is based on integrating pressure and vibration sensors into the sole of a slipper. These sensors would be designed to detect sudden, abnormal force or motion—similar to what happens during a snake strike. When this movement is detected, a buzzer and LED alert would immediately activate to warn the wearer and people nearby.

The innovative part of this idea is its dual alert system. Along with the sound and light indicators, a small Bluetooth or GPS module could be connected to a mobile application that records the location of the incident. This data could then be shared automatically with emergency contacts, medical centers, or rescue teams to ensure rapid assistance. This early-warning and communication concept could potentially save lives in remote villages where medical help is not immediately available.

Our project also focuses on feasibility and affordability. The materials proposed for this concept are lightweight, low-cost, and eco-friendly, ensuring that even rural communities can benefit from it. The slipper would be designed for comfort and regular use, appearing just like an ordinary pair of footwear but with built-in safety intelligence. Unlike traditional repellents or chemical-based solutions, this idea is non-toxic, safe for both humans and the environment, and easy to implement in daily life.

In conclusion, the Smart Anti-Snake Bite Slipper is not a ready-made product but an innovative idea-based solution that highlights how simple technology can address real-world safety challenges. By blending awareness, design thinking, and technology, our project aims to inspire future innovators to develop life-saving tools for rural populations. This concept emphasizes that innovation doesn't always mean building something new — it begins with imagining smarter, safer possibilities for everyday .

29. School Name: The Ardee School, Goa

Students: Om Rangayyan, Benjamin Clay Summers and Kelden Lama Patel

Project Supervisor: Mr. Mohit Singh

Project Name: Real-time Fuel Filling Monitoring System

Scan the code to watch the video of the project

Introduction

We are excited to introduce the "Real Time Fuel Filling Monitoring System," a project created by students from The Ardee School, Goa. As technology keeps making our lives easier, one major problem that we found was the lack of trust between customers and petrol station staff during automobile refueling. We want to provide car owners with information. Thus, our project will ensure complete transparency and correctness in the dealings of a purchase.

The Problem Statement

In India, where automobiles have become essential for daily travel, the refueling process is still a source of anxiety for many. A very common worry, especially for middle-class citizens who work hard but are still not very well off, is the fear of being "short, filled" at the petrol pump. Thus, people, rather than just merchants, are at fault here who, despite paying for the specific volume of fuel, get less from the meter due to the pump not being properly calibrated or the petrol station staff being dishonest. From these small purchases and losses, which are not noticed now, consumers are facing overall losses in the long run. We also thought that besides a financial matter, it is basically a question of honesty and consumer rights that a technological solution was required.

Innovation and Methodology

What we came up with is a clever, electronic monitoring unit that can prove the exact fuel quantity on the business transaction in real time. Our instrument doesn't get reading from the petrol pump but rather from common fuel delivery means that it is independent of the pump's machinery, so we can give unbiased reading.

Firstly, the system is a combination of a very accurate water flow sensor, an Arduino microcontroller, and an LCD unit.

Working:

At the point when fuel is moving through the intake pipe, the sensor detects the liquid movement and produces data pulses. These pulses are sent straight away to the Arduino microcontroller, which counts the exact volume passing through the system.

The LCD screen is refreshed every second, showing the flow rate in real time and the total quantity filled so that the user can make a comparison of our reading with the petrol pumps meter instantly.

Flexibility and Implementation

To achieve greater user-friendliness, we have come up with a system that offers two different ways to be used. It can be fixed once and for all at the fuel tank entrance of any vehicle (cars, bikes, or buses) for smooth integration. However, if the users are looking for more flexibility, the system can be turned into a portable module that can be carried and attached externally while refueling.

Conclusion

The Real, Time Fuel Filling Monitoring System is basically aimed at restoring the trust of customers in fuel stations by a third party, very independent, extremely accurate means.

30. **School Name:** Shree Swaminarayan Gurukul English Medium School, Surat

Students: Limbani Shubh Bharatbhai, Somaliya Mitanshu Sanjaybhai and Desai Avi Amitkumar

Project Supervisor: Mr. Davara Virenkumar N.

Project Name: Smart Health Station

Scan the code to watch the video of the project

OVERVIEW:

The Smart Health Monitoring Station is an IoT-based system designed to measure essential human health parameters using a single integrated platform. The project uses an ESP32 microcontroller along with multiple biomedical and physical sensors to measure weight, height, body temperature, heart rate, and blood oxygen saturation (SpO_2). Based on these values, the system calculates Body Mass Index (BMI) and displays the results on an OLED screen. The collected data is uploaded wirelessly to Google Sheets for cloud storage. Using Google Apps Script, an automatic PDF health report is generated, and a QR code is provided to allow users to view and download the report directly on their mobile phones.

THE PROBLEM:

Traditional health checkups require multiple separate instruments such as weighing machines, thermometers, and pulse oximeters. These methods are time-consuming and involve manual data entry, which increases the chances of human error. Maintaining physical health records is inefficient and makes long-term monitoring difficult, especially in rural areas and health camps.

THE SOLUTION:

The proposed Smart Health Monitoring Station provides a unified automated solution by integrating multiple sensors into one system. The ESP32 processes sensor data and uploads it to Google Sheets in real time. Google Apps Script automatically generates a structured PDF report, and a QR code enables instant access to the report on smartphones.

KEY FEATURES:

- Weight measurement using Load Cell and HX711
- Height measurement using Ultrasonic Sensor
- Contactless body temperature using MLX90614
- Heart Rate and SpO_2 measurement using MAX30102
- BMI calculation
- OLED display for real-time output
- Cloud data storage using Google Sheets
- Automatic PDF generation
- QR code scanning for mobile access

WHO WILL BENEFIT:

This system is useful for schools, colleges, gyms, clinics, offices, and rural healthcare centers. It is suitable for mass health screening and provides easy access to digital health records.

SYSTEM ARCHITECTURE:

The ESP32 acts as the central controller, interfacing with HX711, Ultrasonic Sensor, MLX90614, and MAX30102. The processed data is displayed on an SSD1306 OLED and uploaded to Google Sheets. Google Apps Script generates the PDF report and QR code.

FUTURE ENHANCEMENTS:

Future improvements include real blood pressure sensor integration, mobile application development, patient ID management, doctor login access, and AI-based health analysis.

CONCLUSION:

This project demonstrates a low-cost, efficient, and smart health monitoring solution using IoT technology. The integration of cloud storage, PDF reporting, and QR-based access makes the system suitable for real-world healthcare applications.

31. School Name: Bombay Scottish School, Mahim, Mumbai

Students: Mr Sarthak Sekhsaria, Mr Vidit Shukla and Mr Jatin Dixit

Project Supervisor: Mr. Jason Samuel

Project Name: SeeRead

Scan the code to watch the video of the project

Access to printed text remains a major challenge for visually challenged individuals, especially when books, newspapers, and academic materials are not available in Braille or audio formats. Despite the growth of digital content, a large portion of essential information still exists only in printed form. This creates barriers to education, independence, and everyday access to information for individuals with partial or complete vision loss.

SeeRead is an assistive technology project aimed at addressing this challenge by converting printed text into clear, audible speech. The objective of the project is to design a cost-effective, portable, and reliable system that enables visually challenged users to independently access printed content without relying on external assistance.

The hardware component of SeeRead is built using the Seed Studio XIAO ESP32-S3 Sense board integrated with a camera module. This compact microcontroller-based system captures images of printed pages and transmits them wirelessly for further processing. The device is powered by a small Li-Po battery, making it lightweight and suitable for assistive use. The ESP32-S3 platform was chosen for its integrated camera support, processing capability, and efficient wireless communication.

At the current stage of development, SeeRead uses an application running on a laptop as the primary processing interface. Once an image is captured by the ESP32 camera, it is sent to the laptop application, which handles image processing, text extraction, and audio output. Although a mobile application is planned for future versions, the laptop-based setup effectively demonstrates the complete working model and validates the feasibility of the system.

The SeeRead system follows a structured text-processing pipeline to ensure accuracy and clarity. First, the captured image undergoes preprocessing to correct issues such as tilt, skew, and uneven lighting. This step enhances image clarity and prepares it for reliable text recognition. Next, Optical Character Recognition (OCR) is performed to extract text from the image. The extracted text is then refined to correct common recognition errors, improving readability while preserving the original meaning. A quality-checking stage evaluates the output to ensure that the extracted text is meaningful before proceeding further. Finally, the verified text is converted into natural-sounding speech using text-to-speech technology and read aloud to the user.

Several commercial assistive devices, such as smart reading glasses and portable OCR scanners, offer similar functionality. However, these solutions often come with significant

limitations, including extremely high costs, limited battery life, and dependence on proprietary hardware. SeeRead currently operates using an active internet connection to leverage advanced cloud-based AI services for high-accuracy text recognition and speech synthesis. This approach ensures reliable performance during the current phase of development. In future iterations, the system can be optimized to support offline or hybrid operation, improving flexibility and accessibility.

SeeRead is designed to support individuals with both partial vision loss and complete blindness. By combining affordable hardware with intelligent software processing, the project aims to promote inclusivity, independence, and equal access to information. The project demonstrates how modern technology can be applied thoughtfully to create meaningful assistive solutions and highlights the potential for further enhancement and real-world impact.

32. School Name: Sri Sankara Vidyalaya, Sector-x, Bhilai

Students: Madhu Varsha M, Paridhi Verma and Anushka Singh

Project Supervisor: Ms. Premlata Laharey

Project Name: Food Spoilage Detector

Scan the code to watch the video of the project

Problem Identified

The use of chemical injection and artificial treatment in fruits has become a growing concern in local markets. Such treatments are commonly applied to enhance colour, appearance, and shelf life during transportation and storage. Although these fruits may appear fresh externally, their internal quality and safety may be adversely affected. Consumers generally rely on visual inspection, touch, or smell, which are unreliable methods for identifying treated fruits. Farmers often face financial losses due to rejection of suspected produce, while laboratory-based testing methods, although accurate, are expensive, time-consuming, and inaccessible at the consumer level. These challenges create a clear need for a simple, affordable, and awareness-oriented screening approach.

Aim

The aim of this project is to develop a low-cost Fruit Spoilage Detector that provides a comparative indication of possible chemical injection or abnormal spoilage behaviour in fruits using sensor-based measurements.

Approach

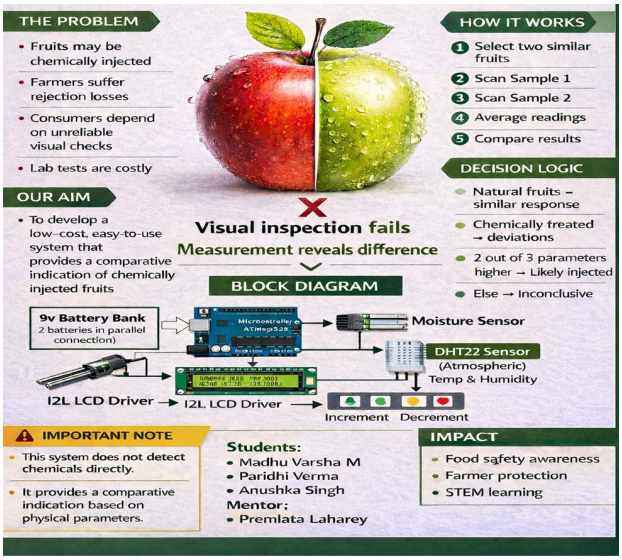
The project follows a comparative analysis approach. Two fruits of the same type and similar size are tested under identical environmental conditions. A moisture sensor is used to measure relative moisture behaviour on the fruit surface or pulp, while a temperature–humidity sensor monitors the surrounding micro-environment. Sensor readings are collected over a fixed time interval and averaged to reduce fluctuations and ensure stable and reliable comparison.

Working Principle

Naturally ripened fruits are expected to exhibit similar sensor responses when tested under the same conditions. Fruits affected by chemical injection or abnormal treatment may show irregular moisture distribution and altered interaction with the surrounding micro-environment. If one sample consistently shows higher values in at least two of the measured parameters, it is identified as more likely to be chemically treated. In the absence of a clear difference, the result is reported as inconclusive, ensuring ethical and safe interpretation.

Future Scope

The system can be enhanced by integrating gas sensors to detect gases released during artificial ripening or spoilage. Data logging features may be added to record long-term observations and trends. Basic machine learning techniques can be applied to improve comparative accuracy. In the future, the device may be integrated with a mobile application for real-time monitoring and user-friendly result display. With further refinement, the system could be adapted for use in markets, storage facilities, and food safety awareness programs.



Limitations

This device provides indicative, comparative results and does not replace laboratory-based chemical analysis.

Outcome and Significance

The Food Spoilage Detector provides a comparative and indicative result rather than laboratory confirmation. This low-cost prototype promotes food safety awareness, supports informed decision-making by consumers, and demonstrates how simple sensors and embedded systems can be effectively applied by students to address real-world societal challenges.

33. School Name: Broadway International School, Surat

Students: Charmy Patel, Burhanuddin Mistry and Nityansh Bansal

Project Supervisor: Ms. Shreya Bhagat

Project Name: Smart Weight Management Bridge With Energy Generation System

Scan the code to watch the video of the project

PROBLEM STATEMENT:

In today's modern world, transportation plays a crucial role in connecting cities, industries, and communities. Bridges are an essential part of this system, allowing the smooth movement of vehicles. However, one major problem faced today is bridge damage caused by overloaded vehicles. Heavy trucks carrying loads beyond the permitted limit pass over bridges daily, putting excessive pressure on their structure which causes damage or sudden collapse. Along with safety concerns, another important issue is energy wastage. Thousands of vehicles cross bridges every day, producing pressure and vibrations, but this mechanical energy is completely wasted. To overcome these challenges, there is a strong need for a smart system that can ensure bridge safety while also utilizing the wasted energy.

PROPOSED SOLUTION:

To tackle these problems, we have designed a system that continuously monitors the weight of vehicles approaching the bridge and automatically prevents overloaded vehicles from entering. At the same time, the system captures the mechanical pressure created by moving vehicles and converts it into electrical energy. This makes the bridge not only safer but also energy-efficient and partially self-powered, contributing to sustainable infrastructure development.

WORKING EXPLANATION:

The Smart Weight Management Bridge functions as an intelligent gatekeeper that not only monitors traffic but actively protects the bridge by controlling vehicle entry. The system ensures that only vehicles within the safe load limit are allowed to cross the bridge, thereby preventing structural damage.

At the entry point of the bridge, a specially designed smart bumper system is installed. This bumper contains a high-precision load sensor that detects the weight applied by vehicles as they pass over it. When a vehicle moves onto the bumper, the load sensor accurately measures the pressure exerted by the vehicle's weight.

The ESP32 compares the real-time bridge load with a predefined maximum safe load limit: If the load is within the safe limit, the servo-controlled shaft remains open, allowing vehicles to pass smoothly. If the load exceeds the safe limit, the microcontroller instantly activates a safety response.

In an overload condition, the ESP32 sends a signal to the servo motor, which immediately closes the shaft to block further vehicle entry. At the same time, an LCD display shows

warning messages such as "STOP" or "OVERLOADED", clearly informing drivers about the unsafe condition.

The system is designed to respond not only to a single overloaded vehicle but also to situations where the bridge becomes overloaded due to multiple vehicles, each individually within limits. In such cases, the system automatically prevents additional vehicles from entering until the load returns to a safe level.

ENERGY GENERATION SYSTEM:

In addition to weight management, the system also includes an energy generation mechanism. The mechanical pressure applied by vehicles while crossing the smart bumper is not wasted. Instead, this pressure is used to rotate a small motor mechanism installed beneath the bumper.

As the vehicle passes over the bumper, the downward force causes the motor shaft to rotate. This rotational motion converts mechanical energy into electrical energy using electromagnetic principles. The generated electricity is regulated and stored safely in a rechargeable battery.

The stored electrical energy is used to power LCD display boards, Signal and warning lights, Streetlights installed on the bridge. As a result, the bridge can operate independently even in the absence of external power sources. This makes the system energy-efficient, eco-friendly, and self-powered, effectively combining safety and sustainability in a single smart infrastructure solution.

APPLICATION:

Highway bridges, City flyovers, Industrial transport routes, Toll plazas, Smart city infrastructure projects

FUTURE ADVANCEMENT:

The system can be upgraded using Internet of Things (IoT) technology to enable real-time remote monitoring of bridge load, traffic flow, and system status. Authorities can receive instant alerts in case of overload or abnormal conditions. Solar panels can be installed along the bridge structure to work alongside vehicle-generated energy. This hybrid system will ensure a continuous, reliable, and sustainable power supply. AI algorithms can be used to analyse collected data and predict traffic patterns, peak load timings, and potential stress points on the bridge. This will help in early warnings and preventive maintenance. The long-term data collected from the system can assist engineers and planners in designing safer bridges, optimizing transportation routes, and improving overall road infrastructure.

CONCLUSION:

The Smart Weight Management Bridge is more than just a structure made of concrete and steel; it is an intelligent and responsive system designed to protect human lives, preserve infrastructure, and promote sustainability. This dual functionality addresses multiple real-world challenges through a single smart solution. It enhances public safety, lowers maintenance costs, and supports the use of renewable energy, making the bridge both reliable and eco-friendly.

34. **School Name:** Loyola International School, Oasis, Qatar

Students: Tejas Puri, Praneet Nilesh Harke and Saurabh Sajeesh

Project Supervisor: Ms. Suma Sreejith

Project Name: A Laser Security System

Scan the code to watch the video of the project

INTRODUCTION

A laser alert system is a security and detection mechanism that uses laser technology to sense intrusion or the presence of a directed laser beam in a protected area. The system operates by transmitting or detecting laser light and triggering an alert when the beam is interrupted, reflected, or detected by sensors. Due to its high accuracy, fast response time, and ability to cover long distances, laser alert systems are widely used in security applications, military surveillance, industrial safety, and perimeter protection. These systems provide a reliable and efficient method for early warning and threat detection in both.

OBJECTIVE

- Design a simple and cost-efficient Digital Laser Security System.
- Use Laser technology and Digital forehand as a combined tool in the variants of systems.
- Complement Arduino boards and SIM modules in security systems.

APPLICATION

- Intrusion Detection: Alerts homeowners of unauthorized entry via doors, windows, or sensors.
- Surveillance: Monitors activity.
- Emergency Response: Automatically contacts the owners.
- Asset Protection: Prevents theft or damage to valuable equipment and inventory.

PROJECT CONCEPT

- This project enhances a conventional 9 V intruder alarm by integrating SMS notification.
- When the alarm's buzzer is activated, the Arduino senses a 5 V signal—regulated from the 9 V buzzer line using a 7805 voltage regulator—and sends an alert message via the SIM900 GSM module.
- Once the alarm stops, the Arduino resets and waits for the next trigger before sending another SMS.
- An onboard LED provides GSM status indication: blinking while the GSM module is initializing, and steady ON when the module is fully registered and ready.

WORKING PRINCIPLE

Our alarm system works on the principle of the Voltage Divider Circuit:

- A Voltage divider circuit is used to find the value of current flowing out of a passage (Vout) by the equation: V-out=Vin× R1÷R1+R2

CASE 1 : Laser Light on LDR

In this case, the value of R1 is fixed:10kΩ, the value of R2(LDR) is 1kΩ in this condition so the V-out to the Transistor is 0.81 v .So the system does not activate.

Case 2: Intrusion/No Laser Light on LDR

In this case value of R1 is fixed:10Ω but the value of R2 is 100Ω which is very high and the V-out to the Transistor is 8.18v which activates the system.

OPERATION PROCEEDURE

- Power ON
  - → GSM LED blinks (initializing)
  - → Arduino LED blinks while checking GSM, then stays ON when registered.
- Alarm triggered (buzzer ON)
  - → Arduino reads HIGH input
  - → Sends "Intruder detected!" SMS
- Alarm stops (buzzer OFF)
  - → Arduino waits for next activation
  - → Next time it beeps, sends again.

WHY THE PROJECT MATTERS

- Cost efficient & reliable – affordable protection for families and communities.
- Simple circuit design – easy to build, repair, and replicate.
- Locals can be trained easily – sustainable, community owned security.
- Immediate social impact – It can be a back bone security solution for developing countries and is highly reliable and affordable for middle calss families to tackle theft including villages, and small cities.
- Eco responsible – Arduino reuse, solar power option, reduces waste.
- High demo reliability – proven circuit, low malfunction risk.

FUTURE IMPROVEMENTS

- To improve reliability, the system includes a laser to minimize ambient light interference.
- The system is modular and scalable. This allows coverage of larger areas like warehouses or school campuses.

- Mobile app integration will be a key tool.
- Power backups will make the system reliable
- False alarms rectifications.
- Solar powered systems can improve Security with sustainability.

PROJECT SUMMARY

- A simple laser security system is used as an activation mechanism to trigger SMS alerts.
- The project is compatible with multiple environments, including offices and home security.
- Provides remote alerts, ensuring users are notified even when far away.
- Ensures security in an easy and efficient form.
- Demonstrates how basic electronics and microcontroller programming can be combined to create a smart security solution.
- The system is scalable and adaptable, making it suitable for various applications.
- Our project is simple, reliable, and built for the masses with a proven concept.
- It represents our future vision under the motto: “Security is for All.”

35. **School Name:** Aspire Indian International School, Jaleeb, Kuwait

Students: Menal Fatima Panalan, Ammar Adam Anwar Sait and Shreshta Varsha Arun

Project Supervisor: Ms. Varsha Arunkumar

Project Name: CocoShell ,Care and Cure

Scan the code to watch the video of the project

Carbon Purification Model for Factories

Arid countries like Kuwait require innovative environmental projects due to their fragile ecosystems and harsh climatic conditions. Rapid industrialization increases air pollution, leading to serious health issues and climate impacts. The Carbon Purification Model for Factories aims to reduce harmful emissions and support Kuwait's transition toward green technology and sustainable development.

This project presents a hands-on model designed to capture and purify carbon emissions from factory chimneys, pollution outlets, and vehicle exhaust systems. The methodology uses an eco-friendly filtration technique combining coconut shell charcoal, pure cotton, sponge, and fiberglass layers. These materials are arranged in a multilayer stacked configuration with perforations that allow exhaust gases to pass through while trapping dust, smoke particles, and poisonous gases through adsorption and filtration.

Two experiments validate the system's effectiveness. In Test 1, an acetic acid adsorption test confirms the strong adsorption capacity of activated charcoal, proving its suitability for removing acidic pollutants. In Test 2, the cotton filter is weighed before and after repeated smoke exposures. A graph plotted between mass gained (adsorbed carbon) and number of exposures shows an increasing trend, indicating continuous carbon capture.

Applications include factory chimneys such as brick kilns, rubber factories, oil industries, and vehicle tailpipes. Future plans focus on reusing filter materials, improving heat resistance, and using low-cost natural alternatives. Overall, this project offers a low-cost, efficient solution for cleaner air and environmental protection.

36. School Name: Habitat school-Al Jurf, Ajman, UAE

Students: Ahsan Abdussamad, Easwar Vinu Nair and Gershom Gilu John

Project Supervisor: Ms. Nithya sandeep

Project Name: Harmful to useful

Scan the code to watch the video of the project

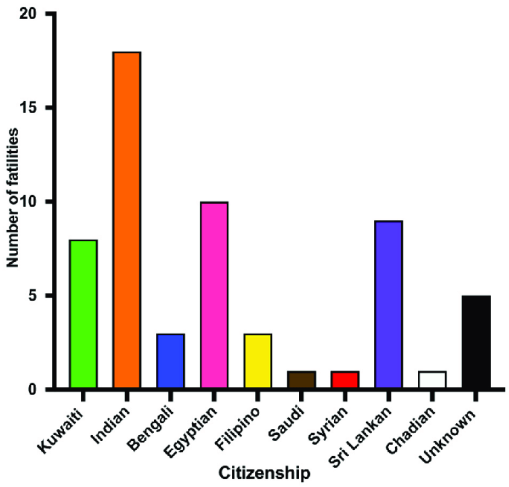
Introduction

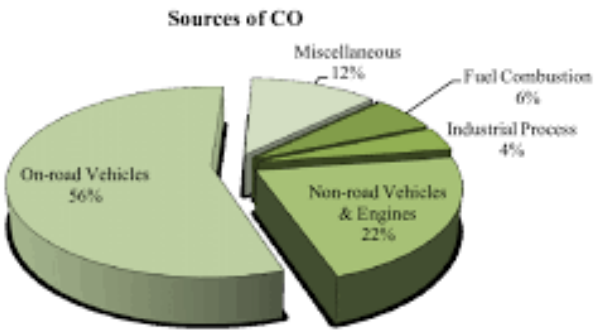
Rapid industrial growth has increased environmental pollution, with industries releasing harmful greenhouse gases like carbon monoxide, methane, and nitrous oxide. These gases contribute to air pollution, global warming, and climate change, posing serious risks to human health and ecosystems. Controlling and managing industrial CO emissions has therefore become an urgent challenge.

Problem Identification

Carbon monoxide (CO) poisoning poses a serious health risk, as evidenced by six people being hospitalized at a community centre on Charlotte Street in London. Similar incidents are alarmingly frequent in India, where Delhi's severe air pollution from vehicles and factories leads to high CO levels. This widespread exposure to toxic air highlights an urgent need for solutions to monitor, reduce, and prevent CO-related health hazards.

Collected data





Proposed Solution

Instead of allowing harmful gases to escape into the atmosphere, this project proposes an innovative solution—capturing and converting industrial greenhouse gases into useful and valuable products (CNG, acetic acid etc). By treating these emissions as resources rather than waste, the project aims to reduce pollution while supporting sustainable and eco-friendly industrial practices.

Aim of the Project

The aim of this project is to address the problem of industrial air pollution by converting harmful greenhouse gases into useful products such as fuels, chemicals, and construction materials.

Objectives

- To identify and capture harmful greenhouse gases released from industrial sources
- To separate and process the captured gases using scientific techniques
- To convert waste gases into useful and valuable products
- To promote environmental sustainability and encourage a circular economy

Uniqueness of the Project

Most pollution control methods only reduce or store emissions. This project goes further by converting industrial waste gases into useful products, promoting "waste to wealth" and eco-friendly industrial practices.

Working Principle (Solution Method)

Industrial Exhaust Gases

1. **Capture System** (Greenhouse gases are trapped before release)
2. **Transport Unit** (Gases are carried through pipelines)
3. **Separation Unit** (Condensation, evaporation, and distillation separate gases)
4. **Processing Unit** (Gases are converted into liquid form)
5. **Utilization Unit** (Production of fuels (CNG,methanol etc) chemicals (Acetic acid, Formic acid etc), and construction materials (cement and concrete additive)

Key Impacts

- Reduces air pollution and greenhouse gas emissions
- Improves air quality and protects human health
- Safeguards ecosystems, plants, animals, and wildlife
- Converts industrial pollution into valuable products
- Creates jobs in science and engineering
- Lowers healthcare and environmental cleanup costs
- Supports sustainable industrial and economic growth

Conclusion

The "Harmful to Useful" project tackles industrial greenhouse gas pollution by converting harmful emissions into useful resources. This approach reduces pollution, creates economic value, and promotes sustainable development, showing how science and technology can turn environmental challenges into opportunities for a cleaner, greener future.

Vision

This project promotes the idea that pollution control can also create useful resources for the future.

Write down Your Idea

Write down Your Idea

Write down Your Idea

HOW TO PARTICIPATE

Scan the QR Code for the nomination form

OR

Enter this URL in your browser: https://macmillaneducation.in/macmillan-budding-scientists/

Eligibility

- **Classes:** 6 to 8
- **Team Size:** 3 students and 1 mentor teacher

Last date to submit video: October 31, 2026

Last date to register: September 30, 2026

ARE YOUR STUDENTS...

Looking in the right place?

- ✗ Searching online for ready-made project ideas
- ✓ Observing their surroundings and identifying problems worth solving

Asking the right questions?

- ✗ Using theoretical answers
- ✓ Probing to understand the source of the problem

Being original?

- ✗ Relying on available ideas online
- ✓ Developing possible options grounded in practicality

Being thorough?

- ✗ Stopping at the first workable idea
- ✓ Following a problem-solving framework to build and refine a complete solution

Thinking practically?

- ✗ Ignoring cost, feasibility, and impact
- ✓ Building solutions that are cost-conscious, practical, and mindful of the environment

HOW TO NOMINATE

1. Each school must nominate a Coordinating Teacher who will be responsible for completing the registration and uploading all student videos. Coordinating Teacher automatically becomes the first mentor teacher.
2. For registration, an OTP (One Time Password) will be sent to the Coordinating Teacher's registered email ID. Once registration is confirmed, the teacher can add student details and upload the final video submission against each team's name. They can also add more mentor teachers.
3. Login access is available only to the registered Coordinating Teacher who can log in later using the registered mobile number, email ID, or Google login.

For queries write to **mbs@macmillaneducation.com**

Macmillan Budding Scientist

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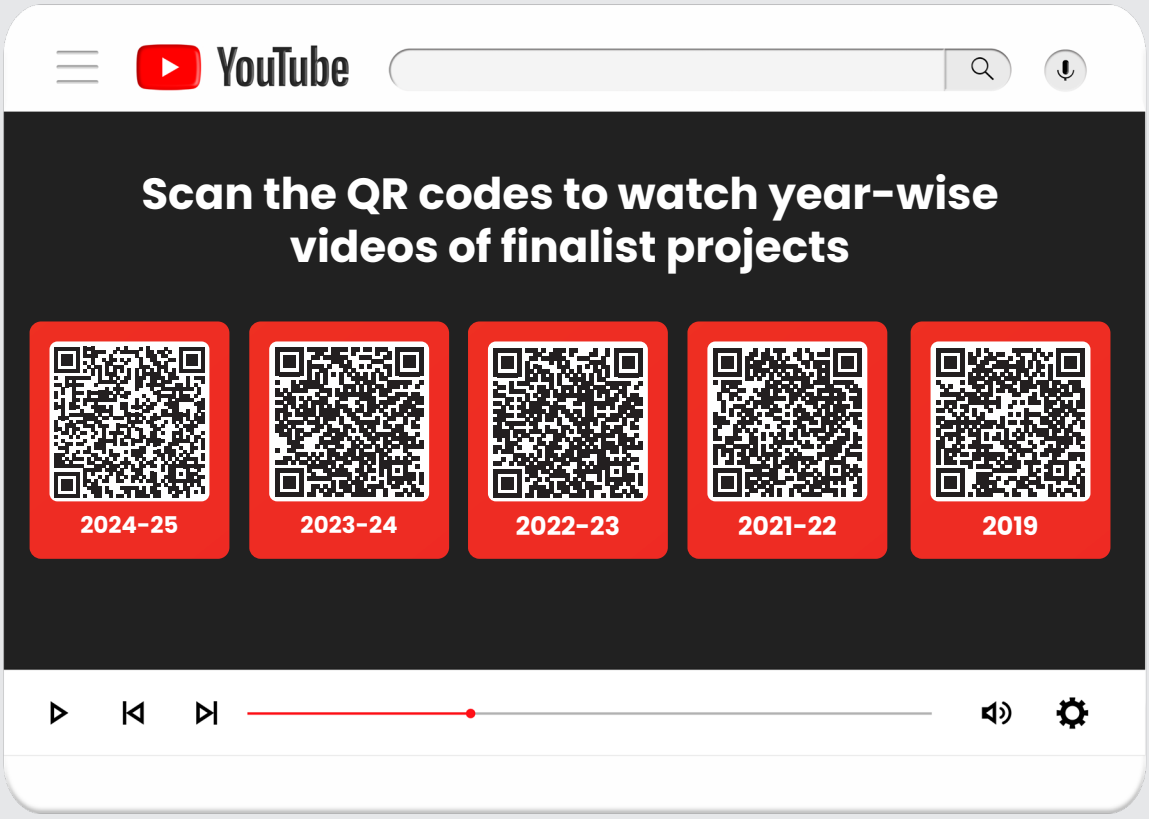

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