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Young Scientist India

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Young Scientist India

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From the Editor's Desk

Welcome, Young Scientists!

It is a pleasure to welcome you to the October edition of Young Scientist India. This month's issue invites you to roll up your sleeves and step into the world of innovation, not as spectators, but as active thinkers and doers. Every section of this edition has been carefully designed to help you look closer, think sharper and build with purpose.

Our **Innovation Training Modules** form the foundation of this journey. In *Art of Observation*, we explore how noticing what others overlook can lead to powerful ideas and discoveries. Alongside this, *How Smart Groups Think: The Delphi Way* introduces you to a fascinating method of collective thinking, showing how groups can arrive at better decisions through structured discussion. Together, these modules highlight an important truth: innovation grows through both individual insight and shared thinking.

Bringing these ideas together is our **Cover Story, Innovation Toolkit**. Think of it as a guidebook for your innovation journey—introducing tools, mindsets, and approaches that help turn curiosity into meaningful action. It reminds us that innovation is not a sudden moment of brilliance, but a process that anyone can learn and practice.

This month's articles show how science can be simple, practical, and impactful. *Simple Science, Big Impact* takes you through ideas that changed the world using basic principles. For hands-on learners, *Arduino for Beginners* offers easy projects to explore electronics and coding, while How to Build a DIY Science Innovation Lab proves that you don't need expensive equipment to start experimenting—just imagination and initiative.

We also celebrate the people and ideas that shape India's scientific spirit. Our **Indian Scientist profiles** introduce you to individuals whose work has strengthened research, technology, and national progress. Alongside this, our features on **Indian inventions and innovations**, from *Cashmere wool to cotton cultivation and weaving*, highlight how traditional knowledge and scientific thinking have long gone hand in hand in India.

What truly brings this issue alive are the **award-winning student innovations** featured in our pages. From clever solutions that make everyday work safer and easier, to ideas that tackle environmental challenges using simple mechanisms, these young innovators show how observation and empathy can turn into real-world solutions.

As you turn these pages, I hope this issue encourages you to observe more carefully, think more collaboratively, and experiment more confidently. Science is not just about finding answers, it is about asking better questions.

Vennela Valiveti, B. Des.
YSI Magazine Editor
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S&I Article

Simple Science, Big Impact

Where Everything is Connected

Have you ever wondered how some of the biggest changes in the world started with a simple idea? A falling apple. A kettle of steam. A scratchy cloth that clung to socks. These aren't just everyday moments, they are how science gave birth to ideas that changed the way we live.

Science is not always about giant laboratories or rocket launches. Many powerful innovations that transformed the world came from small, simple ideas and people who were curious enough to explore them.

Let's discover how simple science made a big impact and how you, too, can become an innovator for the country.

Gravity: The Apple That Made the World Think

More than 300 years ago, young **Isaac Newton** sat under an apple tree. An apple fell. Instead of just eating it, he asked why it fell straight down and not sideways or up. This question led him to discover gravity, a force that pulls everything toward Earth.

Big Impact: Newton's discovery became the foundation for physics. Without it, we couldn't have built airplanes, satellites or sent rockets to space.

The Steam Engine: How Boiling Water Moved the World

James Watt, a Scottish engineer, noticed how steam from boiling water could move a kettle lid. He used this simple idea to improve the steam engine, which powered factories, trains, and ships.

Big Impact: The steam engine began the Industrial Revolution, which changed the way people worked, travelled, and made goods.

Simple Science Big Impact

The Light Bulb: Bringing Daylight to Night

Thomas Edison didn't invent the first light bulb, but he made it practical. He used trial and error, testing hundreds of materials until he found a filament that would glow without burning out.

Big Impact: Thanks to his persistence, homes, schools, streets, and cities were lit up, allowing people to work and study even after sunset.

Paper: Writing That Changed Civilisation

Thousands of years ago, people wrote on stone, clay or animal skins. Then the Chinese discovered that mashing tree bark and plants into a thin sheet made a great writing surface, paper.

Big Impact: Paper made it easier to share knowledge, create books, and educate people.

The Internet: The World at Your Fingertips

The internet wasn't created all at once. It started as a way for scientists to share information between computers.

Over time, it grew into the web of knowledge, communication, and entertainment we use today.

Big Impact: With a phone or computer, we can now learn, talk, play and even build things online.

The Wheel: The Round Revolution

Imagine life without wheels, no bicycles, cars or even rolling schoolbags. The wheel is one of the oldest inventions, created over 5,000 years ago.

Big Impact: It helped people move heavy loads, travel longer distances, and build machines.

Mobile Phone: A Pocket Powerhouse

The first phones could only make calls. Today, mobile phones are cameras, calculators, clocks, books and more, all in your pocket.

Big Impact: Mobile phones have changed how we communicate, learn and connect across the world.

The Vaccine: Fighting Invisible Enemies

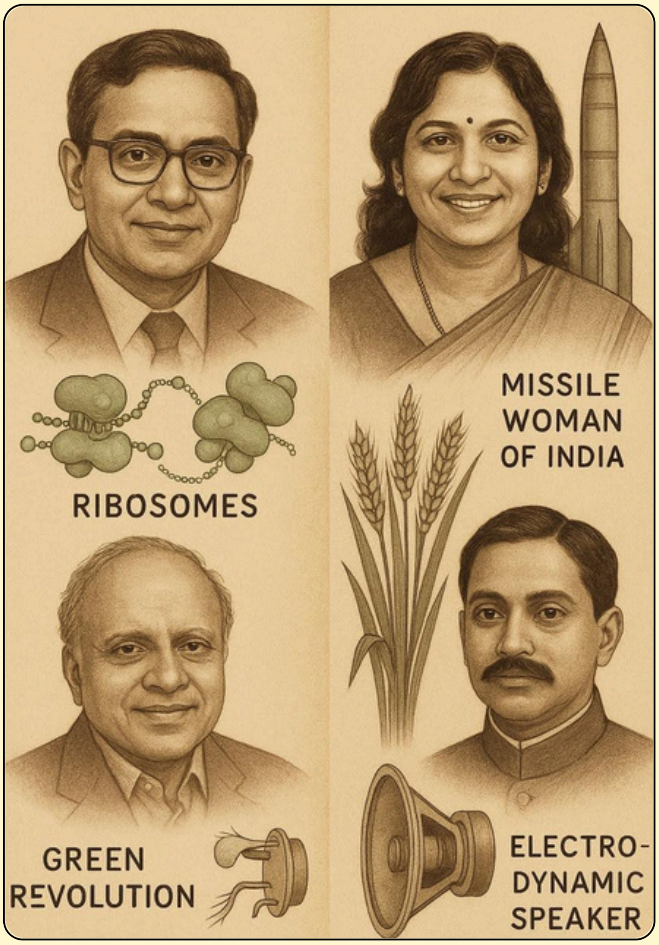
In the 1700s, English doctor **Edward Jenner** noticed that milkmaids who had cowpox didn't get smallpox. He used this simple idea to create the first vaccine, which saved millions of lives.

Big Impact: Vaccines have helped us fight deadly diseases and live longer, healthier lives.

Indian Scientists and their contributions.

Ribosomes: Understanding the Factory Inside You.

Dr. Venkatraman Ramakrishnan, born in Tamil Nadu, received the Nobel Prize in Chemistry for figuring out how ribosomes work. Ribosomes are like tiny factories inside every cell in your body that make proteins, which help your body grow and repair itself.



Tessy: The Missile Woman of India

Dr. Tessy Thomas was the first woman to lead a missile project in India. She worked on Agni missiles, which are long-range missiles that are important for our country's defense.

She used basic physics, like Newton's Laws of Motion, gravity and aerodynamics, to guide missiles through space with accuracy. Her success proves that science and technology aren't just for men, they are for anyone with curiosity and courage.

Green Revolution: Feeding a Nation

In the 1960s, India was facing food shortages. Dr. M. S. Swaminathan, a plant geneticist, worked with farmers to grow **high-yielding varieties of wheat and rice.** This led to the **Green Revolution,** which helped India become self-reliant in food.

He used simple techniques in biology, soil science and climate study to improve crops.

Electro-Dynamic Speaker: Making Music Portable

Before modern-day speakers and microphones, sound had to be produced manually and loudly. **Dr. S. Natesa Iyer** invented an early version of the electro-dynamic speaker in the 1920s.

He worked on electromagnetism and sound waves, simple physics concepts you study in school.

Secret Behind These Innovations

- **Curiosity:** Asking "Why?" and "How?". Curiosity is the starting point of all scientific discovery. It's what makes you ask questions.
- **Observation:** Noticing everyday problems and patterns.
- **Creativity:** Trying new ideas, even if they seem silly.
- **Persistence:** Not giving up, even after many failures.

What Can You Do as a Young Innovator?

- Look around your school or neighborhood. Is there a problem that science can fix?
- Build simple models, solar cookers, water filters or sensor alarms.
- Keep a science diary. Write down any strange or interesting ideas.

Nature and Invention

- Butterfly wings inspire solar cells. Lotus leaf water-repellent surfaces.
- Bird beaks and bullet trains.

India Needs Young Scientists Like You

From APJ Abdul Kalam to G.N. Ramachandran, many Indian scientists started with simple questions and later made global contributions.

You don't have to wait to grow up to innovate. You can start right now in your classroom, lab, kitchen or garden. Remember, great inventions start with small ideas and those ideas can come from you.

So keep observing, keep asking and keep experimenting. Your simple science project could be the next big thing to change the world.

Indian Scientist

Dr. Vasudev Kalkunte Aatre

Padma Vibhushan (2016)

(Born in 1934)

When we speak about India's scientific strength, we often imagine rockets, radars, and advanced defence systems. Behind many of these achievements stands **Dr. Vasudev Kalkunte Aatre**, a scientist who quietly helped shape India's technological confidence.

Born in 1934, Dr. Aatre began his journey as an engineer with a deep interest in electronics and systems design. He believed that science was not just about discovery, but about solving real problems faced by the nation. This belief guided his work throughout his life.

Dr. Aatre played a key role in strengthening India's defence research ecosystem. He served as the Scientific Adviser to the Raksha Mantri and later as the Director General of the Defence Research and Development Organisation (DRDO). During his leadership, India focused on developing **indigenous technologies** systems designed, built, and improved within the country.

This was a major step toward reducing dependence on foreign technology.

One of his important contributions was in **command, control, communications, and intelligence systems** - the "thinking brain" behind modern defence operations. These systems help decision-makers receive accurate information quickly and act effectively. While such technologies may not always be visible like missiles or aircraft, they are essential for national security.

Dr. Aatre also strongly believed in collaboration. He worked to bridge gaps between scientists, engineers, policymakers, and the armed forces. He understood that innovation succeeds best when ideas move smoothly from laboratories to real-world applications.

For students, Dr. Aatre's life offers an important lesson: impactful science does not always seek the spotlight. It requires patience, teamwork, and a strong sense of purpose. His journey reminds us that engineering and science are powerful tools - not just for personal success, but for building a stronger nation.

India's scientific story is richer because of minds like Vasudev Kalkunte Aatre - thinkers who helped the country stand taller through knowledge, discipline, and quiet determination.

Water Heating Without Electricity

MD Sajid Pasha
9th Class

Concept: This project is based on the principles of heat efficiency and thermal conductivity.

Heat Efficiency = Qu (utilised heat by the bowl) / Heat evolved by the fuel

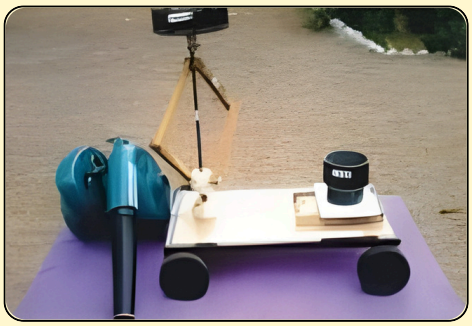
Since copper is an excellent conductor of heat, a copper pipe coil is placed beneath the stove burner. This setup utilises the waste heat emitted by the stove. When water is pumped through the copper coil, it absorbs the leftover heat, providing hot water as a by-product. This increases the overall efficiency of the stove by making use of heat that would otherwise be wasted.

Additionally, another copper pipe coil is placed in a cooling gel. Due to copper's high thermal conductivity, when water is pumped through this coil, it becomes cool.

Conclusion: By using copper coils to transfer heat effectively, this setup provides both hot and cool water without additional energy input, thereby improving energy efficiency and reducing waste.

(Source: INSPIRE MANAK NLEPC 2013 Booklet)

Wind Energy Based Model



Materials Used: Turbine, coupler, road link, Ball-bearing, nylon, wooden plank, screw, rubber, plywood, thread, and blower.

This model is based on the principle of air pressure. When the train moves slowly, the air pressure is low. At this low pressure, the wooden planks of the toilet remain closed through a mechanical system.

Hemtripti
10th Class

However, when the speed of the train increases, the air pressure also increases. This rising pressure activates a rotating mechanical system attached beneath the tank's gate, causing the wooden planks to open automatically. A blower helps create the necessary air pressure to operate the system.

Application: This system can be effectively used in train toilets to open and close toilet covers automatically based on the speed of the train, helping maintain hygiene and safety.

(Source: INSPIRE MANAK NLEPC 2014 Booklet)

The Art of Observation

Seeing What Others Miss

Pay Attention to the Small Details

Squeaky Door

Struggling to See

Pile of Homework

Look Closer... Discover Hidden Problems!

Observe

Notice

Find Ideas!

Training Module

Learn to See Like an Innovator!

Have you ever wondered why the water tap near your school washroom is always leaking? Or why does everyone crowd near the same staircase even when others are empty? Or why does your school bag feel heavier every year, even when books are "reduced"?

If yes - good news!

You are already thinking like an innovator.

Innovation does **not** start with big inventions or complex machines. It starts with something much simpler and much more powerful: **noticing**. This module will help you learn three super-skills used by innovators around the world:

1. The Art of Noticing
2. Pattern Spotting
3. Signal vs Noise Thinking

These skills will help you understand problems better, think clearly, and come up with smarter ideas—both in school and in life.

Part 1: The Art of Noticing - Seeing What Others Miss

What Does "Noticing" Really Mean?

Most people *look*, but very few people truly see.

For example:

- Everyone uses the classroom door, but few notice it squeaks.
- Everyone stands in the assembly, but few notice who struggles to see.
- Everyone complains about homework, but few notice why it feels overwhelming.

The Art of Noticing means slowing down and paying attention to small details that others ignore.

Innovators are not always the smartest people in the room. They are often the **most observant**.

A Real-Life Example You'll Relate To

Think about your school canteen.

You may notice that:

- Students always crowd around one counter
- Food runs out quickly for students at the back
- Waste bins overflow after lunch

These are not "random problems". They are clues. And clues are where innovation begins.

✏️ Activity 1: The 10-Minute Observer Challenge

What to do:

1. Pick one place: classroom, corridor, playground, bus stop, or home entrance
2. Observe quietly for **10 minutes**
3. Write down **5 things** you notice that most people ignore

Examples:

- Who always comes late?
- Where do people slow down?
- What gets damaged often?
- What confuses people?

Rule: Don't try to solve anything yet. Just observe.

Part 2: Pattern Spotting - Finding What Repeats

What Is Pattern Spotting?

A pattern is something that happens again and again.
If something repeats, it usually means there is a deeper reason behind it.

For example:

- The same students forget homework repeatedly
- The same road gets flooded every monsoon
- The same chapter feels difficult for most students

Innovators ask: "Why does this keep happening?"

A School-Based Example

Imagine this situation:

- Many students score low in the same subject
- The same chapters cause confusion every year
- Students lose interest halfway through the class

This is not about "weak students".
It's a **pattern** in learning—and patterns help us redesign systems.

Why Pattern Spotting Is Powerful

Patterns help you:

- Predict problems before they grow
- Understand systems, not just incidents
- Think like a planner, not a complainer

✏️ Activity 2: Pattern Detective

What to do:

Over one full day, identify **3 patterns** in your daily life.

They can be about:

- School routines
- Mobile phone usage
- Transport
- Water or electricity use
- Study habits

For each pattern, answer:

- Where does it repeat?
- Who is affected?
- What will happen if it continues?

Example:

"Everyone checks their phone before sleeping → Sleep reduces → Students feel tired next day"

Part 3: Signal vs Noise – Choosing What Actually Matters

What Is Signal? What Is Noise?

Today, students receive too much information:

- WhatsApp messages
- YouTube videos
- News headlines
- Opinions from everyone

This creates **noise**—too much information that distracts us.

A **signal** is the small but important information that actually helps us make a decision.

Innovators are good not because they know everything, but because they know **what to ignore.**

A Relatable Example

Imagine your exam result:

- Noise: "Everyone is saying the paper was tough", "Marks are unfair"
- Signal: "I lost marks in word problems", "I rushed Section B"

If you focus on noise, nothing improves.
If you focus on signal, learning begins.

✏️ Activity 3: Signal vs Noise Game

What to do:

Your teacher (or group leader) gives you **10 facts** about a problem.

Your task:

- Choose only **3 facts** that truly matter
- Explain why you chose them

Example problem: "Why students feel stressed before exams"

This activity teaches focus, clarity, and better decision-making.

How These Skills Work Together

Let's connect everything:

- **Noticing** helps you see small problems
- **Patterns** help you understand why they repeat
- **Signal vs Noise** helps you focus on what matters most

Together, they help you think before you act.
Instead of saying:

❌ "This system is bad"
You start saying:
✅ "I noticed this issue, it repeats because of this pattern, and this is the key thing we must fix."

That is the language of innovation.

Why This Matters for Your Future

Whether you want to become:

- A scientist
- An engineer
- A doctor
- A designer
- An entrepreneur
- Or even a sportsperson

These thinking skills will help you everywhere.

Innovation is not about being born a genius. It is about being **curious, observant, and thoughtful.**
The next big idea will not come from someone staring at a screen all day.

It will come from someone who looked around, noticed something small, and asked: **"Why is it like this, and can it be better?"**

And that someone could be **you**.

Ministry of New & Renewable Energy (MNRE)

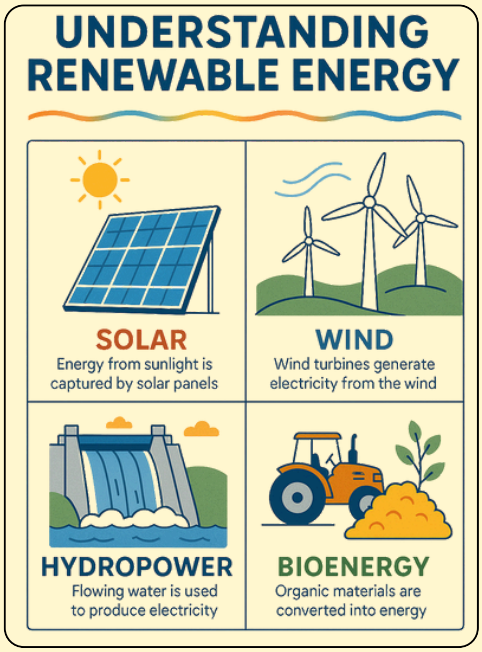
Have you ever wondered where the electricity powering your fan, phone charger, or streetlight comes from? More and more often, the answer is **nature**. Energy from sunlight, wind, and flowing water is all around us—and making sure India uses this clean energy wisely is the job of the **Ministry of New and Renewable Energy (MNRE).**

Renewable energy comes from sources that don't run out. The sun rises every day, the wind keeps blowing, and rivers keep flowing. MNRE, set up in 1981 and renamed in 2006, works to turn these natural forces into reliable power for homes, schools, farms, and industries across India. Headquartered in New Delhi, the ministry focuses on solar power, wind energy, small hydro projects, biogas, battery storage, and even futuristic fuels like green hydrogen.

Here's something you can easily relate to: **solar panels on rooftops**. Under schemes like PM Surya Ghar Muft Bijli Yojana, families can install rooftop solar and get free or very low-cost electricity. This means lower bills and fewer power cuts—helpful during online classes or summer vacations. MNRE also supports **solar streetlights,** which store sunlight during the day and light up roads at night without wires.

For those of you from farming families, MNRE-backed **solar water pumps** are a big deal. These pumps replace diesel ones, saving money and reducing air pollution. It's cleaner farming powered by sunlight!
MNRE also looks to the future.

Through the **National Green Hydrogen Mission**, India is investing billions to develop clean fuel that could one day run buses, trucks, and factories - without smoke or noise. magine travelling in a bus powered by clean fuel made using water and sunlight!



As of 2025, India has achieved around **172 gigawatts of renewable energy capacity and aims to reach 500 GW by 2030.** That's enough clean power to light up millions of homes. Institutions like the National Institute of Solar Energy and the Indian Renewable Energy Development Agency help turn research into real projects on the ground.

In simple terms, MNRE connects **science, technology, and everyday life.** It shows how ideas from classrooms and labs can become solar panels, windmills, and clean energy solutions all around us. For students, MNRE proves one exciting thing: learning science today can help power India tomorrow.

Chilli Bag Filling

T. Uday Kiran
8th Class

After plucking chillies, farmers have to pack them into gunny bags, a process that often causes skin burns, allergies, and rashes. To compress the chillies into the bags, they usually use their legs, which requires significant manpower and effort. To solve this problem, the student developed a simple, pain-free solution. The machine allows farmers to fill chillies into gunny bags without discomfort. It operates solely on mechanical power, requiring no electricity or fuel, making it an eco-friendly option.

The machine is built entirely from waste materials. It consists of two stands that hold two bags at a time, with pressing pads fitted with cushions to prevent damage to the chilies during compression. A hydraulic press, connected to a handle, is positioned between the pads, allowing easy operation. This device enables farmers to press chilies into bags efficiently and comfortably.

(Source: INSPIRE MANAK NLEPC 2021 Booklet)

Common Friendly Multiple Helmet

D. Harshitha
7th Class

A student developed a Common Friendly Multiple Helmet inspired by her uncle, who works as a factory welder. She observed that he only used goggles while welding, leaving his lungs exposed to harmful welding fumes because he didn't wear a mask. Similarly, other workers such as carpenters, meal agency workers, and teachers are often exposed to sawdust, chalk dust, cement particles, and other airborne contaminants without proper protection.

To address these issues, the student designed a special helmet. This innovation includes a lightweight helmet equipped with a sensor, a battery, two fans, and a switch. When the sensor detects smoke or dust near the worker's face, it activates the fans located at the top of the helmet, blowing the contaminants away from the breathing zone. This helps protect the health of ordinary workers by reducing their exposure to harmful particles. The helmet is lightweight, comfortable, and suitable for a wide range of professions.

(Source: INSPIRE MANAK NLEPC 2017 Booklet)

Cover Story

Innovation Toolkit

In the 21st century, every child has the power to shape the future. You don't need to be an adult or a professional scientist to innovate. You just need the right toolkit, a curious mind and a desire to solve problems.

Why Innovation Matters

In today's rapidly changing world, innovation is not a luxury, it is a necessity.

From solving everyday problems to tackling global challenges like climate change, healthcare, education and clean energy, innovation is the key that unlocks progress. For India, a country with one of the youngest populations in the world, the real power lies in its students.

But how does one become an innovator? Do you need a lab, expensive tools or a degree? Not really. What you need is a mindset, a method and a toolkit, **an Innovation Toolkit,** that helps you think creatively, solve problems scientifically and build practical solutions.

Innovation Toolkit

Just like a carpenter uses a hammer and nails or an artist uses brushes and paints, an innovator uses tools, mental, digital and physical. These tools help:

- Identify a problem
- Come up with ideas (ideate)
- Design and build solutions
- Test and improve them
- Share and scale them

This step-by-step approach is often called the Innovation Cycle or Design Thinking process. An Innovation Toolkit includes this process, along with important scientific habits, access to materials and even platforms where you can showcase your ideas.

The Elements of the Innovation Toolkit

1. Curiosity & Observation

Innovation begins with noticing. Train your eyes and ears to observe problems in daily life.

Tools:

Problem Journal: Keep a notebook where you write every time you see a problem.
Example: "My grandmother finds it hard to use a smartphone."

Why-Why Analysis: Keep asking "why" to dig deeper into a problem.

Example: Pune's Ananya Khaire, a Class 8 student, noticed that small children often forget to drink water while playing. She designed a **"Reminder Cap"** with a timer and a buzzer that reminds kids to hydrate.

Fun Fact:

Thomas Edison tested over 6,000 plant materials before finding the right filament for the electric bulb

2. Scientific Thinking

Every innovation is based on science. You don't need a lab coat, just a questioning mind.

Tools:

Hypothesis Template: "If I do ___, then ___ will happen."

Experiment Checklist: What will you test? What do you expect?

Example:

Lavanya J, from Tamil Nadu, used basic physics principles to design a pedal-powered washing machine for villages without electricity.

DIY Activity:

Make a Balloon-Powered Car

Materials:

balloon, straw, 4 bottle caps, 2 skewers, tape, cardboard.

Principle: Newton's Third Law, every action has an equal and opposite reaction.

Test different sizes of balloons and record the distances your car travels. Make predictions before testing

3. Ideation & Brainstorming

After spotting a problem, you need to come up with multiple ways to solve it.

Tools:
SCAMPER Technique: Substitute, Combine, Adapt, Modify, Put to other use, Eliminate, Rearrange.
Example:
Nashik's Sarthak Deshmukh designed a **"Silent Firecracker"** using compressed air and confetti, fun for kids but safe for ears and pets. He used the SCAMPER method to improve on traditional firecrackers.

Mind Maps: Draw ideas around the central problem.

Fun Fact:
The Post-It Note was invented by accident when a scientist was trying to make a super-strong glue.

4. Building

Now it's time to build a simple model, this is called a prototype. It doesn't need to be perfect, just functional.

Tools:
Low-Cost Materials: Cardboard, motors, syringes, sensors from old toys, Arduino boards.

Tinkering Labs: If your school has an Atal Tinkering Lab, use it. Or create your own DIY space.

Example:
Arunabh, a student from Jharkhand, built a low-cost "Automated Irrigation System" using recycled materials and Arduino sensors. His prototype reduced water usage by 40%.

Fun Fact:
The Wright brothers built their first flying machine using wood, cloth and a bicycle chain.

5. Testing & Feedback

Does your solution actually work? Could it be made better? Testing helps you improve.

Tools:
User Feedback Form: Ask 5 people to try your solution and suggest improvements.
Failure Journal: Record what didn't work, failure is a step toward success!

Example:
Vaidehi Sharma from Gujarat designed a "**Smart Cane**" for the visually impaired. After her first test, she realised it was too heavy. She modified it using lighter materials.

Fun Fact:
Dyson vacuum cleaners went through 5,127 prototypes before the final version.

6. Presentation & Sharing

Innovation is only useful when shared. Present your idea clearly so others can understand it and maybe even support it.

Tools:
Innovation Canvas: A one-page summary of your problem, solution, features, and impact.
Posters and Videos: Use creativity to show your innovation.

Example:
At the National Innovation Foundation's IGNITE Awards, many students like Kandarp Gawande have turned their simple projects into national-level innovations by presenting them clearly.

DIY Activity:
Make a Innovation Canvas Template including:
Title of your project
Problem you observed
Your solution (idea)

How it works
Who it helps
Sketch or photo of your model
Make a 1-minute video explaining your idea using this template.

Platforms and Support for Young Innovators in India

Many students don't innovate because they don't know where to go with their ideas. Luckily, India has several platforms to support student innovation.

Atal Innovation Mission (AIM)

Operates Atal Tinkering Labs (ATL) in schools across India. Offers resources like 3D printers, sensors and coding kits.

INSPIRE Awards – MANAK

Run by the Department of Science and Technology (DST). Offers funding ₹10,000 per idea to build models and participate in exhibitions.

National Innovation Foundation (NIF)

Recognises grassroots student inventors through competitions like IGNITE. Helps students file patents and scale up their ideas.

GYS Young Scientist Program (GETA Service Trust)

Organises national innovation challenges and exhibitions. Provides mentorship and publishing opportunities for student innovators.

Building Your Personal Innovation Toolkit

You don't need to wait for a competition or a lab to start innovating. You can build your own innovation toolkit at home. Here's what you can include:

Item	Use
Old toys/motors	For making moving models
Wires, batteries, switches	For circuit projects
Cardboard, glue, plastic bottles	For building prototypes

Also include soft skills like, Presentation skills, Problem-solving mindset.

Student Innovators of India

Here are a few more inspiring stories of students like you:

Rifath Sharook (Tamil Nadu), Created the world's lightest satellite, **"KalamSat"**, launched by NASA. He started building models in his backyard using waste materials.

Harshwardhan Zala (Gujarat), Built a drone to detect and defuse landmines. He started at age 14 and now runs a startup.

These students didn't wait for the perfect moment. They observed, asked questions and used simple tools to change the world.

Quiz Time: Are You Ready to Innovate?

1. What does SCAMPER stand for?
2. Which Indian student built the KalamSat satellite?
3. Name one tool used in prototyping.
4. True or False: Failure is a step in the innovation process.
5. What do you call a simple working model of an idea?

Check your answers at the end of the article.

Conclusion:

Innovation Starts With You

The future of India depends not just on its leaders or scientists but on the young innovators in classrooms, villages, towns and cities across the country. Whether it is a small improvement in your school timetable app, a solution to plastic waste or a device to help your grandparents, every idea counts. With this Innovation Toolkit, you now have the method, the mindset and the motivation to start your own journey.

So pick up that notebook, observe your surroundings, ask questions and build something awesome.

Start observing. Start imagining. Start building. Remember every great invention in the world once began as a simple idea inside a young mind.

"India doesn't need just students who study science. India needs students who do science." Be the innovator India is waiting for.

Quiz Answers:

1. SCAMPER - Substitute, Combine, Adapt, Modify, Put to other use, Eliminate, Rearrange
2. Rifath Sharook
3. Cardboard / Motors / Syringes (any)
4. True
5. Prototype

Word Search 2510

(The Brain)

W	E	C	R	T	M	N	E	I	V	O	B	M	D
T	G	O	N	C	R	E	E	M	E	E	E	U	U
R	D	N	N	A	T	G	C	M	N	E	I	I	E
C	E	H	E	C	H	E	E	T	T	B	N	N	R
E	L	L	C	R	I	N	R	L	R	M	T	A	F
R	W	B	O	K	N	I	E	N	I	E	E	R	I
E	O	D	R	R	K	U	B	E	C	D	L	C	G
B	N	A	T	A	L	S	R	R	L	U	L	E	I
E	K	L	E	P	I	O	U	V	E	L	E	H	E
L	K	P	X	S	E	N	M	E	K	L	C	C	B
L	E	E	L	U	E	C	R	M	E	A	T	Y	B
U	R	B	N	M	O	B	O	E	E	M	E	S	Y
M	R	E	B	N	L	R	O	G	S	T	P	P	E
C	E	E	C	D	A	R	R	L	E	U	S	E	D

NERVE
PSYCHE
LEARN
STEM
MEDULLA
BRAIN

CEREBRUM
KNOWLEDGE
CEREBELLUM
VENTRICLE
FREUD
GENIUS

INTELLECT
CORTEX
EGO
LOBES
THINK
CRANIUM

Sudoku Challenge 2510

	2	6		3				8
9			6			1		
				1	9		4	
		7	3		2			
		4		7		8		
			8		6	7		
	5		7	2				
		9			5			4
4				6		2	1	

(Answers on Back Cover Inside)

Ministry of Education (MoE)

Education is the foundation of every great nation. It shapes how we think, solve problems, and dream about the future. In India, the Ministry of Education (MoE) plays a central role in ensuring that every child, from a small village to a bustling city, has access to learning, knowledge, and growth opportunities.

The Mission of Learning

The Ministry of Education, formerly known as the Ministry of Human Resource Development, is responsible for everything related to learning and teaching in India, from schools and universities to research and innovation. It works to make education more inclusive, creative, and connected to real life.

The MoE operates through two major departments

- **Department of School Education and Literacy,** which focuses on elementary and secondary education
- **Department of Higher Education,** which looks after universities, technical institutes, and research organisations.

Together, they form the backbone of India's knowledge ecosystem.

From Classrooms to Creativity

One of the biggest achievements of the Ministry of Education has been the introduction of the National Education Policy (NEP) 2020. This policy aims to transform education by making it more flexible, skill-based, and rooted in India's culture and values. It encourages students to ask questions, explore their interests, and develop creativity, rather than just memorise facts.

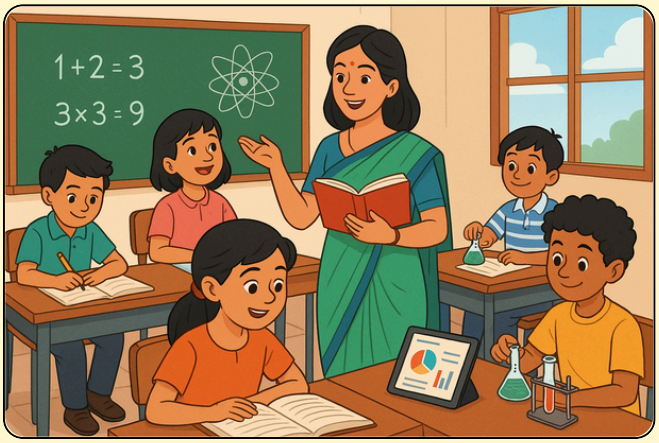
The ministry also runs important programs like the Samagra Shiksha Abhiyan, which focuses on improving school infrastructure, teacher training, and digital learning. The Mid-Day Meal Scheme ensures that millions of children receive nutritious food in schools, helping them stay healthy and focused on learning.

In higher education, initiatives like IMPRINT, GIAN, and Institutions of Eminence promote cutting-edge research and innovation in science, technology, and social sciences. The MoE also supports online platforms such as SWAYAM, DIKSHA, and the National Digital Library, making learning accessible to everyone, anywhere.

Inspiring a Nation of Learners

The MoE isn't just about policies and programs; it's about building the future. Every time a teacher inspires curiosity, every time a student discovers something new, and every time a school opens its doors to a child, the Ministry's mission comes to life.

Education is the light that guides our nation forward, and the Ministry of Education ensures that this light shines bright for every learner across India.



Indian Scientist

Dr. Motilal Madan

(Born on 1 January 1939)

Light surrounds us every day—in mobile screens, medical scanners, internet cables, and scientific instruments. Understanding how light interacts with matter is essential to modern science, and one Indian scientist who made this possible was **Dr. Motilal Madan**, a physicist whose work quietly strengthened India's foundations in advanced physics.

Dr. Madan worked in the field of **molecular spectroscopy and laser physics** - areas that help scientists study the structure and behavior of molecules using light. While this may sound abstract, its impact is very real. These techniques are used today in medical diagnostics, environmental monitoring, chemical analysis, and even space research.

Because of scientists like Dr. Madan, we can detect pollutants in the air, analyze materials at the atomic level, and improve technologies that rely on precision measurements.

One of Dr. Madan's most lasting contributions was building **scientific capacity in India**. At a time when advanced experimental physics was still developing in the country,

He helped establish strong research and teaching systems, especially at the Indian Institute of Technology (IIT) Kanpur. His work ensured that students in India could learn and experiment with world-class scientific tools without having to go abroad.

Dr. Madan was deeply committed to education. He believed that curiosity - driven research and strong fundamentals were essential for innovation.

For students, Dr. Motilal Madan's life offers an inspiring message: science does not always change the world overnight. Sometimes, it builds the **knowledge base** that future discoveries stand on. By patiently studying light and matter, and by nurturing young minds, he helped India prepare for a future driven by science and technology—one equation, one experiment, and one student at a time.

Riddles 2510

1. What gets wetter as it dries?
2. I have no life, but I can die. What am I?
3. What is full of holes but still holds water?
4. What kind of table has no legs?
5. This electronic device has buttons on it that aren't meant to open doors.?

(Answers on Back Cover Inside)

Department of Atomic Energy (DAE)

When you hear the word atomic, you might think of tiny particles or glowing laboratories, but did you know that these tiny atoms power some of India's greatest scientific achievements? The Department of Atomic Energy (DAE) is one of India's most fascinating and important scientific institutions. It combines physics, chemistry, biology and engineering to use atomic science for peace, progress and people.

The Birth of Atomic Science in India

The Department of Atomic Energy was established in 1954 under the visionary leadership of **Dr. Homi Jehangir Bhabha**, often called the **Father of India's Nuclear Programme.** His dream was to use atomic science not for weapons, but for development, to produce clean energy, improve healthcare and advance research.

The DAE's headquarters are in Mumbai, but its research centres stretch across the country, from Bhabha Atomic Research Centre (BARC) in Mumbai to Indira Gandhi Centre for Atomic Research (IGCAR) in Kalpakkam and Variable Energy Cyclotron Centre (VECC) in Kolkata. Together, these centres explore everything from nuclear power generation to particle physics and radiation medicine.

The Science Behind the Atom

At its core, the DAE studies how energy is stored inside atoms and how it can be released safely for useful purposes. In nuclear power plants, the energy released by splitting uranium atoms produces heat, which turns later into steam to drive turbines, creating electricity without releasing harmful greenhouse gases.

But the DAE's work goes far beyond power generation. Radiation from atomic energy is used in hospitals to treat cancer, in agriculture to develop better crops and in industry to test materials for strength and safety. This shows how science, when guided responsibly, can improve everyday life.

Science for Peaceful Progress

The DAE also ensures that all nuclear work in India is safe, peaceful and environment-friendly. It has set up educational programs and scholarships to encourage students to study nuclear physics, chemistry, and engineering. The department's outreach programs, exhibitions and school visits make complex science approachable and exciting for young learners.

Inspiring Young Scientists

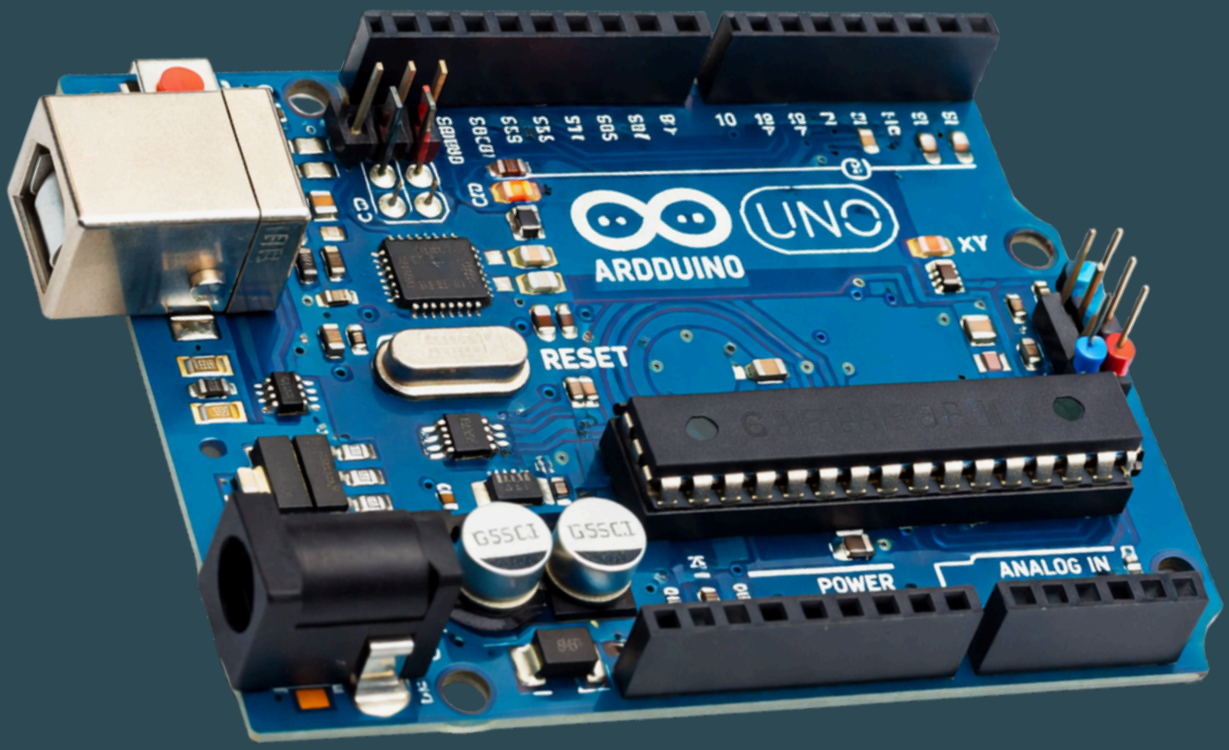
The story of the Department of Atomic Energy reminds us that science isn't just about experiments in labs, it's about imagination, precision, and service to society. Every light bulb powered by nuclear energy, every patient healed by radiation therapy and every student inspired by atomic research reflects the spirit of scientific curiosity that drives India forward.

So, the next time you think of atoms, remember, they might be small, but in the hands of great scientists, they can light up an entire nation!

S&I Article

Arduino for Beginners

5 Simple Projects to Get You Started



Arduino is a fun and easy way for high school students to start learning how to build and program their own electronic gadgets.

What is Arduino?

Arduino is like a small, simple computer that you can use to make things in the real world move, light up, or make sounds. Imagine a tiny brain that can follow instructions you give it; those instructions are called code or a program.

Arduino lets you bring your creative ideas to life with a bit of code and some simple electronics.

History of Arduino

Arduino started in 2005 at the Interaction Design Institute Ivrea in Italy.

It was created by a group of designers and engineers, including **Massimo Banzi and David Cuartielles,** who wanted to make electronics easy and affordable for students and artists. They were inspired by an earlier project called Wiring, which was designed by **Hernando Barragán** to help people create interactive electronic projects without needing to be experts.

The first Arduino boards were released in 2006, and they quickly became popular because they were simple to use, inexpensive and open-source, meaning anyone could use or improve them.

Why Arduino?

There are many ways in which Arduino can help a student boost their curiosity through building cool stuff.

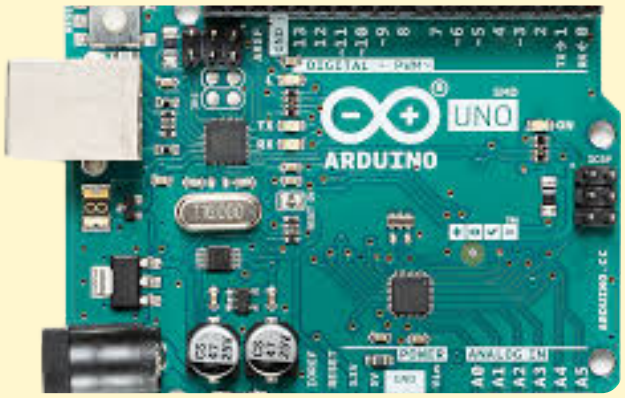
It's affordable: Arduino kits don't cost much and usually come with everything you need to get started, like LEDs, sensors and wires.

Hands-On Learning: Arduino lets you actually build things, not just read about them. You can make a robot, a blinking light, or even a musical instrument

They can learn by doing: You get to actually build and see things work, not just imagine them.

Creativity: You can invent your own gadgets and bring your ideas to life

Problem-Solving: If something doesn't work, you get to figure out why and fix it, which is a great way to learn.



How does it work?

The Board: This is the main part. It looks like a small blue rectangle with lots of holes and metal pins. You plug in wires and other parts here.

Sensors and Outputs: You can connect things to the board, like sensors which can sense light, temperature, or distance and outputs like lights, buzzers, or motors.

Programming: You write simple code on your computer using a special software called Arduino IDE, telling it what to do. For example, you can tell it to blink a light every second.

Upload and Go: You send the code from your computer to the Arduino board using a USB cable. Then the board follows your instructions all by itself

Successful Arduino projects

The following are a few examples of Indians who have successfully understood how to use Arduino and have implemented into their own ideas.

Fingerprint Door Lock: Developed by Anvesh Pathak, this project utilises

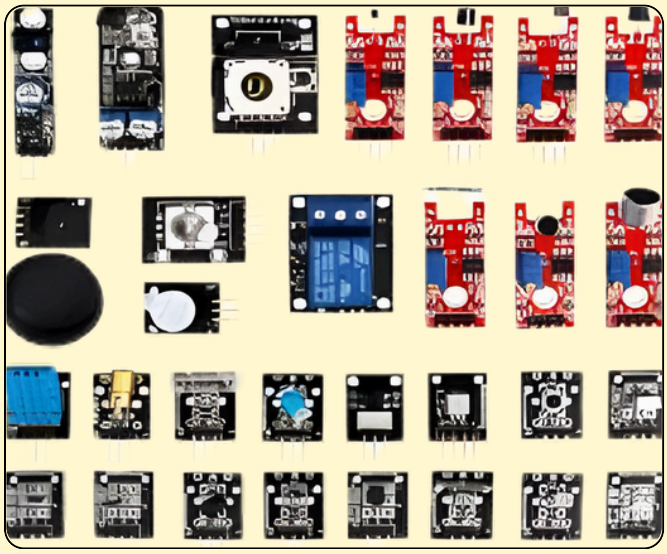
Arduino and a fingerprint sensor to create a secure, keyless entry system. It demonstrates practical applications for smart home security

and was highlighted among the top creative projects globally

Smart Dustbin: Designed by an Indian YouTuber named Indian LifeHacker, this trashcan is smart indeed! This sensor-based bin allows you to "open" your trash can without actually touching the lid, which is perfect if you have your hands full or simply don't want to make contact with a dirty lid.

Portable Humidifier: This project is designed and created by Debasis Parida. The portability factor of the humidifier makes it simple to move from room to room.

As the humidifier is also automatic, it helps that you don't have to constantly check the moisture levels, which can often be an annoying aspect of standard humidifiers.



Projects to get started on Arduino

These are few simple project ideas through which you can learn and use Arduino:

1. Make an Arduino sound control system

The potentiometer is like a volume knob you can turn. When you twist it, it sends different signals to the Arduino, telling it how much you've turned. The Arduino can "read" these signals using a special pin called an analogue input. The more you turn the knob, the higher the number the Arduino reads.

When the Arduino sees that the knob is turned enough, it will turn on the buzzer and the LED at the same time. If the knob is turned back down, both the buzzer and the LED turn off. So, by turning the knob, you control both the light and the sound!

What you'll need:

1 × Breadboard

1 × Arduino Uno R3

1 × LED

1 × Piezo(buzzer)

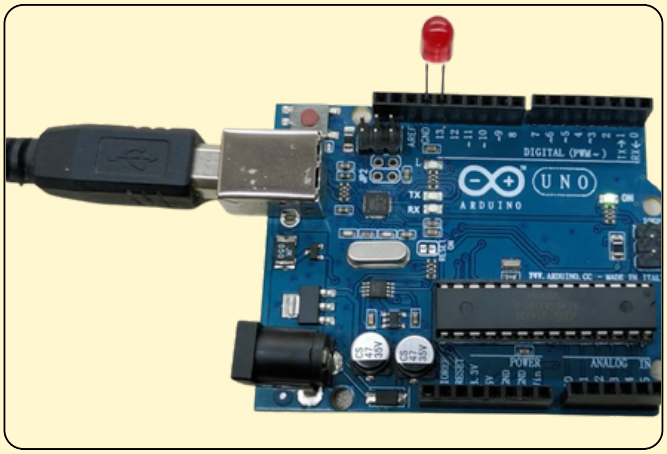
1 × Potentiometer

1 × 220Ω Resistor

5 × Jumper wire

2. Arduino Blinking LED

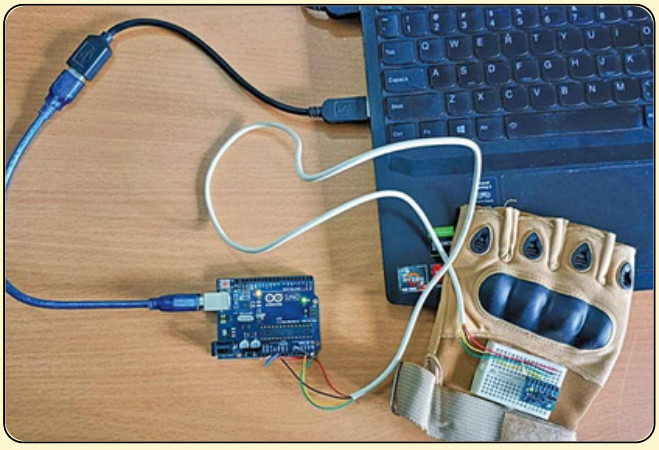
This is a simple yet effective technique for learning how Arduino can control external components.



What You'll Need:

Arduino Uno, LED Light, Resistor (220 ohms), Jumper wires, Breadboard

3. Arduino-based Gaming Glove



This Arduino-based gaming glove works like a mouse and keyboard in the air and allows you to control a graphic user interface (GUI).

Enhance your gaming experience with this amazing gesture glove powered by Arduino.

What you'll need:

1x Arduino uno, 1x MPU6050 sensor, 1x hand glove, 10x jumper wires

4. Pavlov's Cat

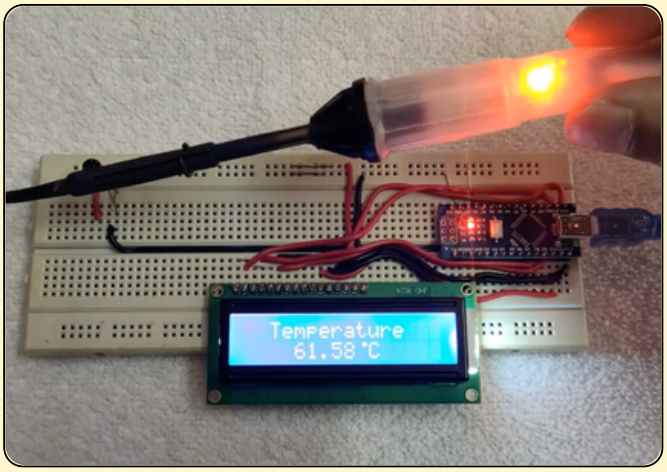
It's a training device that rewards your cat for coming to the food dispenser when a certain sound is played. It effectively conditions your cat to respond to specific stimuli and establish them as keywords, often making it easier to have those keywords correspond to different actions, such as "sit" or "come", since food is associated with them.

What you'll need.

Arduino IoT Bundle, 9V battery (generic), 9V Battery Clip

5. Simple Digital Thermometer

LM35 temperature sensor to measure temperature and show the results on an LCD screen. It's an educational project that teaches you about sensors and displays.



What You'll Need:

Arduino Uno, LM35 temperature sensor, Jumper wires, Breadboard, LCD display

How to code your projects?

The software used to code Arduino is called the Arduino IDE (Integrated Development Environment). It's a simple program you install on your computer, where you type the instructions (code) that tell your Arduino what to do. In the Arduino IDE, you write your code in a special area called the editor. The IDE is designed to help beginners learn and have fun creating their own gadgets.

Conclusion

By working with Arduino, you get a peek inside how these devices operate, making the technology less mysterious and more understandable.

Arduino is like a mini-lab where you can build, program, and test simple versions of real gadgets. It shows you how inputs, brains (microcontrollers) and outputs work together to make devices do cool things.

This hands-on experience is the best way to understand how the gadgets you use every day actually function.

Indian Scientist

Prof. Biman Bagchi

Shanti Swarup Bhatnagar Prize (1991)

(Born on 1 January 1954)

Professor Biman Bagchi, born in Kolkata, is one of India's most distinguished theoretical chemists. His groundbreaking work uses statistical physics to explain complex phenomena like chemical reactions, how proteins fold, and how glass forms. Currently a National Science Chair and Honorary Professor at the Indian Institute of Science (IISc), Bengaluru, his contributions continue to shape modern chemistry and biophysics worldwide.

Scientific Contributions and Innovations

Dr. Bagchi is an acclaimed theorist known for pioneering work across several fields:

1. Statistical Mechanics and Liquids: He developed foundational theories in **statistical mechanics** to describe the rules governing large numbers of atoms and molecules. This includes theories on **phase transitions** (like liquid turning into solid), **nucleation**, and the **glass transition** (how a liquid slowly turns into glass).

2. Reaction Dynamics: Prof. Bagchi pioneered the first successful theory explaining barrierless chemical reactions. These are reactions where molecules combine or change without needing an initial activation energy barrier.

This reveals hidden dynamics in reaction speed. He also introduced translational modes into theories of dielectric relaxation, showing how solvent molecules move in response to an electric field.

3. Biophysics and Biological Water: His research has been crucial in biophysics, studying processes like protein folding how proteins correctly arrange themselves into 3D shapes. He coined the influential term **"biological water"** to describe the special dynamic layer of water molecules that surround biomolecules like proteins and DNA. His work also advanced theories in Fluorescence Resonance Energy Transfer (FRET), a powerful technique used to measure distances inside single molecules.

Honors and Academic Legacy

For his outstanding contributions in Chemical Sciences, Dr. Bagchi has received top honors:

- **Shanti Swarup Bhatnagar Prize (1991):** India's most prestigious science award.
- **TWAS Prize in Chemistry (1998):** Awarded by The World Academy of Sciences.

His theoretical frameworks and concepts, such as "biological water," continue to be vital references for experimental and simulation studies globally.

Always Usable Umbrella

Debayan has developed a multifunctional umbrella. In his design, the umbrella features a built-in lighting system, making it useful at night as well as during the rainy season. The challenges people face while trying to carry multiple items in the rain inspired Debayan to create this innovative project. He draws inspiration from Albert Einstein, whose remarkable ideas changed the world.

(Source: INSPIRE MANAK NLEPC 2017 Booklet)

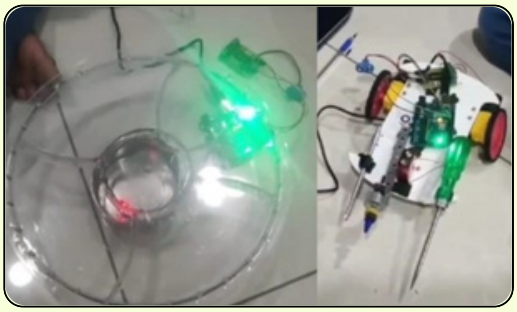
Debayan Das
10th Class

Maintenance Hole Monitoring & Cleaning

The project aims at solving one of the common problems or challenges faced in our lives related to 'Manholes' or 'Maintenance holes' that we see in our streets. Many a time, manholes are not maintained properly; for example, lids are left open, risking people falling inside (especially during the rainy season). There is no proactive notification when manholes are getting filled. And humans still enter inside to clean them in unhygienic conditions. The project proposes 3 solutions to address these problems as described in the 'Solution' section.

Pradyun Koduru
6th Class

The solution involves three parts. The first part of the solution involves adding an IR sensor to the lid of the manhole. It is programmed to alert with a sound if the lid is open and on the ground for more than a certain amount of time. The second part of the solution involves adding a moisture sensor to the manhole's vertical tunnel to detect a rise in the level of water beyond a certain threshold. The third part of the solution involves adding simple accessories to a small moving robot that will enable it to clean the tunnel for simple blockages without a human entering it.



(Source: GYS Avishkar Awards 2023 Booklet)

Link for the project's video presentation
YouTube.com/@GETAYoungScientist

Indian Inventions

Cashmere Wool

Imagine touching something so soft and warm that it feels like it is almost alive. For centuries, people across the world have admired a fabric like this—cashmere wool, known in India as pashmina.

Though today cashmere is sold in luxury stores from Paris to New York, its story begins much closer home, in the cold mountains of the Indian subcontinent.

This is not just a story about clothing. It is a story about geography, animals, skilled hands, and how Indian knowledge quietly shaped global fashion.

Born in the Cold Mountains

Cashmere wool comes from a special type of mountain goat that survives in extremely cold climates.

These goats grow a soft inner coat beneath their rough outer hair to protect themselves from freezing winters. This inner coat is what we call cashmere.

In India, these goats have traditionally been reared in high-altitude regions such as Ladakh and the Himalayan belt, closely connected with the cultural history of Kashmir. The harsh environment was not a disadvantage—it was the very reason such fine wool existed. Indian pastoral communities learned to live alongside these animals and understood their seasonal cycles better than anyone else.

From Goat to Thread: A Test of Patience

Cashmere does not come easily. Unlike regular wool, it cannot be roughly sheared. The fine fibres are carefully combed from the goat during spring, when it naturally sheds its winter coat. From one goat, only a small amount of usable cashmere is collected each year.

Once collected, the wool goes through a long and delicate process - cleaning, sorting, spinning, and weaving. For centuries, Indian artisans perfected these steps without machines. Each thread was spun by hand, often inside homes during the winter months. This slow process ensured unmatched softness and strength.

This deep understanding of material science - long before the term existed - is one of India's greatest traditional innovations.

The Rise of Pashmina Shawls

By the medieval period, Indian cashmere shawls had become highly prized. Kashmiri weavers transformed raw wool into beautifully patterned shawls using intricate designs inspired by nature—flowers, leaves, rivers, and paisleys.

These shawls were not everyday items. They were worn by royalty, gifted during ceremonies, and passed down generations. Their warmth was extraordinary, but so was their lightness. A large shawl could be folded into a small bundle, yet protect the wearer from severe cold. When traders carried these shawls along land and sea routes, the world took notice.

When the World Took Notice

By the 18th and 19th centuries, cashmere shawls reached Europe. They became symbols of elegance among the elite. Empress Joséphine of France famously adored Kashmiri shawls, helping spark a global craze.

European factories tried to copy them, but they struggled to match the softness and warmth. The reason was simple: they lacked access to the same fibre and the centuries-old Indian techniques behind it.

Even the word cashmere comes from "Kashmir," showing how deeply the invention is tied to India's identity.

Science Behind the Softness

What makes cashmere so special? The fibres are extremely thin—much finer than human hair. This allows them to trap air efficiently, providing insulation without weight. At the same time, the fibres are flexible, giving cashmere its famous softness.

Modern science now explains what Indian artisans knew through experience: thinner fibres mean better warmth and comfort. This blend of natural conditions and human skill is what turned cashmere into a global marvel.

Cashmere Today: Tradition Meets Challenge

Today, cashmere is produced in several countries, but Indian pashmina remains among the finest. However, the tradition faces challenges—climate change, machine-made imitations, and declining artisan livelihoods.

Efforts are being made to protect authentic pashmina through geographical tagging and sustainable practices. Each genuine shawl still represents weeks or even months of careful work.

Why Cashmere Matters

Cashmere wool shows us that innovation does not always come from laboratories or factories. Sometimes, it comes from observing nature closely and respecting its limits. Indian communities turned survival in extreme cold into a craft that warmed the world.

The next time you see a cashmere scarf, remember—it carries within it mountain winds, patient hands, and an Indian invention that quietly changed global fashion.

Think About It

- Why do you think handmade products often feel more valuable than machine-made ones?
- Can traditional knowledge be as important as modern science? Where else do you see this today?

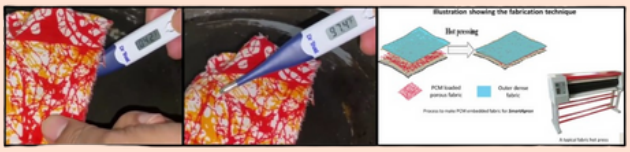
Smart Apron for Delivery Boy/Girl

Aadhya Paul
6th Class

The delivery personnel employed by various platforms face odd weather conditions, including scorching heat waves and air-conditioned environments of the delivery locations. Such frequent thermal fluctuations could make them vulnerable to getting sick with issues like thermal fatigue.

SmartApron is an innovative idea/concept that makes use of phase change materials (PCM), a smart material, as an ingredient in the apron. PCM will keep the body temperature constant during the temperature fluctuations. A similar concept was used by NASA scientists way back in 1980, where they used microencapsulated PCMs for space scientists.

A small piece of fabric is developed by sandwiching PCM-loaded fabric between two layers of normal clothes. The middle cloth is loaded with paraffin wax in this case and tested using a tawa to generate heat. When PCM melts, it absorbs the heat (absorbs energy in the form of latent heat) and reduces the temperature. Thus, the inner side of the apron facing our body faces a lower temperature when wearing this SmartApron. Similarly, when fabric is taken to a cold condition from a hot condition, it solidifies, and so the body will not experience a sudden chill. Thus, the thermal fluctuation is arrested. The transformation can happen any number of times, making the apron very useful to arrest large thermal variations. PCM material may be chosen as per the demand of the conditions.



Link for the project's video presentation
YouTube.com/@GETAYoungScientist

(Source: GYS Avishkar Awards 2023 Booklet)

Bio Pots

K Lavanya
8th Class

Bio pots are eco friendly plant pots and best alternative for black colour polythene bags used in plant nurseries. They are directly planted along with plant and are made up of natural substances.

Bio pots are made from compost manure, saw dust, paper pulp of waste egg trays and coconut husk. They are rich with macro and micro nutrients which enable rapid growth of plants. A plant can be planted directly along with these biopots. It's low in cost and easy to prepare. Lavanya says he supplied her Bio pots to a few nursery owner and has seen good results.

(Source: GYS Avishkar Awards 2023 Booklet)

Link for the project's video presentation
YouTube.com/@GETAYoungScientist

Ministry of Environment, Forest and Climate Change (MoEF & CC)

Every time you breathe clean air, walk through a forest, or hear birds chirping, you experience the quiet work of nature. Protecting that balance between people and planet is the mission of the **Ministry of Environment, Forest and Climate Change (MoEF&CC)**, India's guardian of the environment and biodiversity.

Its mission is simple yet powerful: to conserve natural resources, protect wildlife, fight climate change and create environmental awareness among citizens.

Conserving Forests and Wildlife

India is one of the world's most biodiverse countries, home to tigers, elephants, leopards and thousands of unique plant and animal species. The MoEF&CC manages over 100 national parks, 500 wildlife sanctuaries, and tiger reserves under programs like Project Tiger and Project Elephant. Through these efforts, India has successfully increased its forest cover and protected many endangered species.

Tackling Climate Change

Climate change is one of the biggest challenges of our time. The MoEF&CC leads India's efforts to reduce pollution, save energy and adapt to changing weather patterns. Under initiatives such as the National Action Plan on Climate Change (NAPCC), the ministry promotes renewable energy, afforestation and water conservation. Programs like Green India Mission aim to increase forest cover and absorb carbon dioxide from the atmosphere, helping to keep the planet cool.

Cleaner Air, Water and Cities

The ministry runs several programs to keep India's environment clean and healthy. The National Clean Air Programme (NCAP) focuses on reducing air pollution in major cities. The National River Conservation Plan helps rejuvenate rivers like the Ganga and Yamuna. It also promotes solid waste management and plastic reduction campaigns, encouraging citizens to make small lifestyle changes for a greener planet.

Inspiring Young Eco-Warriors

The MoEF&CC believes that protecting the environment starts with awareness. Through the National Green Corps (NGC), school students across India become Eco-Club members, learning about tree planting, waste segregation and energy conservation. These young ambassadors of nature help spread environmental values in their communities.

Our Shared Responsibility

The Ministry of Environment, Forest and Climate Change reminds us that every small act counts, planting a sapling, saving water, avoiding plastic or protecting animals. Together, these actions create a chain of positive impact that safeguards our planet.

For students and young readers, the ministry's message is clear: **be curious about nature, respect it and protect it.** The future of our forests, rivers and skies depends on how responsibly we act today.

After all, the Earth is not something we inherit from our ancestors, it's something we borrow from our children.

S&I Article

Build a DIY

Science Innovation Lab

Turn Your Home Space into an Awesome Science Workshop!

A science innovation lab does not need expensive machines, fancy furniture, or imported equipment. At its heart, an innovation lab is simply a space where curiosity is encouraged, questions are welcomed, and students are free to experiment without fear of failure. A well-designed DIY (Do it Yourself) Science Innovation Lab can transform how students see science - from a textbook subject to a living, breathing way of understanding the world.

Why a DIY Innovation Lab Matters

Traditional science education often focuses on memorising formulas and reproducing experiments with fixed outcomes. While this builds foundational knowledge, it rarely sparks imagination. A DIY innovation lab flips this approach. Instead of asking students to follow instructions, it invites them to ask why, how, and what if.

Such labs help students:

- Learn by doing rather than only listening
- Develop problem-solving and critical thinking skills
- Build confidence to test ideas and accept failure as part of learning
- Connect science concepts to real-life problems

Most importantly, a DIY lab shows students that innovation is not about perfection—it is about persistence.

Step 1: Define the Purpose of the Lab

Before setting up the space, clearly define what the lab is meant to achieve. Is it for school-level experiments? Student-led innovation projects? Environmental problem-solving? Or early exposure to research thinking?

A good DIY innovation lab should aim to:

- Encourage curiosity and exploration
- Support interdisciplinary thinking (science, design, math, environment)
- Promote teamwork and discussion
- Allow open-ended experimentation

Once the purpose is clear, decisions about materials, layout, and activities become easier.

Step 2: Choose the Right Space (Not the Perfect One)

You do not need a new building or a high-tech room. A spare classroom, library corner, unused storeroom, or even a well-ventilated veranda can work.

Key requirements:

- Good lighting and ventilation
- Basic electrical points (optional but useful)
- Tables that can get messy
- Wall space to display ideas, sketches, and failed experiments

Flexibility is more important than size. Students should be able to rearrange tables, sit on the floor, or work in small groups without restrictions.

Step 3: Start with Low-Cost, High-Impact Materials

A DIY lab thrives on everyday materials. Many powerful experiments can be done using items found at home or in local markets.

Basic materials to include:

- Beakers, measuring jars, test tubes (plastic is fine)
- Magnifying glasses and simple microscopes
- Wires, batteries, bulbs, switches
- Cardboard, paper, tape, glue, rubber bands
- Clay, sand, soil, leaves, seeds
- Old electronics for dismantling and exploration

The goal is not to impress students with equipment, but to empower them to build, break, and rebuild things themselves.

Step 4: Organise the Lab Around Questions, Not Subjects

Instead of dividing the lab into "Physics," "Chemistry," or "Biology," organise it around questions and themes such as:

- How does water move and get polluted?
- How can we store energy?
- How do plants respond to stress?
- How do simple machines reduce effort?

This approach helps students see science as interconnected and relevant to real-world challenges. It also encourages cross-disciplinary thinking, which is essential for innovation.

Step 5: Create a Culture Where Failure Is Safe

One of the biggest barriers to innovation is fear of failure. A DIY science lab must actively celebrate attempts, not just results.

Ways to do this:

- Display failed prototypes with notes on what was learned
- Encourage students to maintain experiment journals
- Ask "What did not work?" before "What worked?"
- Reward curiosity and effort, not only correct answers

When students realise that mistakes are valuable, they become bolder thinkers.

Step 6: Role of Teachers and Mentors

In an innovation lab, teachers are facilitators, not instructors. Their role is to guide students with questions rather than give direct answers.

Effective mentors:

- Encourage students to explain their thinking
- Help refine questions instead of solving problems
- Connect experiments to real-life applications
- Promote teamwork and respectful debate

Inviting local scientists, engineers, doctors, or environmental professionals for informal interactions can further enrich the lab experience.

Step 7: Document, Share, and Reflect

Innovation gains meaning when ideas are shared. Encourage students to document their work through sketches, photos, short reports, or videos.

Simple practices include:

- A lab wall showcasing ongoing projects
- Monthly "demo days" where students present ideas
- Peer feedback sessions
- Reflection discussions on what could be improved

This builds communication skills and shows students that science is a shared journey.

Building the Future, One Question at a Time

A DIY Science Innovation Lab is not about creating the next big invention overnight. It is about nurturing habits of curiosity, experimentation, and resilience. When students are given the freedom to explore and the confidence to fail, they begin to see themselves not just as learners of science—but as creators of knowledge.

In a world facing complex challenges, these are the minds that will shape the future.

Indian Scientist

Dr. Nitya Anand

Padma Shri (2016)

(1 January 1925 – 27 January 2024)

Every time you take a tablet for a fever, cough, or infection, you trust that it will help you not harm you. That trust exists because of scientists like **Dr. Nitya Anand**, whose work quietly protects millions of people every single day.

Dr. Anand was not a scientist who made headlines with flashy discoveries. Instead, he worked on something far more important: **making sure medicines are safe before they reach patients.** At a time when many drugs were still being tested with limited understanding of side effects, he helped introduce scientific methods to study how medicines behave inside the human body. His work reduced unexpected reactions, overdosing risks, and long – term harm problems that directly affect everyday life.

Working at the Central Drug Research Institute (CDRI), Lucknow, Dr. Anand strengthened India's ability to test medicines properly. Because of such systems, drugs today go through multiple safety checks before being sold in pharmacies.

This means the painkiller your family uses, the antibiotics prescribed by doctors, and even life saving medicines in hospitals are far more reliable than in the past.

Dr. Anand also played a major role in **setting rules for medicines** in India. He helped design standards that decide how pure, effective, and safe a drug must be. These standards ensure that medicines made by different companies work in the same way and do not contain harmful substances. Without such rules, healthcare would be unpredictable and dangerous.

Another lasting contribution of Dr. Anand lies in the people he trained. Many scientists, regulators, and researchers working today were once his students. Through them, his ideas continue to shape medical research and public health.

For students, Dr. Nitya Anand's story shows that science is not only about inventing new things it is about protecting lives. His work reminds us that behind every safe medicine is a scientist asking careful questions, testing patiently, and putting people first.

Innovation Training Module

How Smart Groups Think

The Delphi Way

Introduction: Why Groups Don't Always Think Smart

Group work is everywhere – in classrooms, sports teams, school clubs, and even families. Yet, students often notice something strange: **groups don't always make better decisions than individuals**. Sometimes the loudest voice wins. Sometimes everyone agrees too quickly. Sometimes good ideas disappear because no one wants to speak up.

So how do scientists, planners, and decision-makers make **good group decisions**—especially when problems are complex and answers are unclear?

One powerful approach is called the **Delphi Method**. While it sounds complicated, its core idea is very simple:

Groups think better when thinking is structured, fair, and reflective.

This module introduces students to **Delphi-style thinking**—a way of improving ideas step by step, together.

What Is the Delphi Way of Thinking?

The Delphi Method was originally developed to help experts make predictions and decisions about the future. But at its heart, it is not about experts – it is about how thinking improves through rounds of reflection and feedback.

In simple words, the Delphi way means:

- People think individually first
- Ideas are shared without names
- Everyone sees the group's thinking
- People revise and improve their ideas
- The group slowly moves toward better answers

It values thinking over talking and listening over arguing.

Why Ordinary Group Discussions Often Fail

Before understanding Delphi-style thinking, students must see what usually goes wrong.

Common problems in group discussions:

- One or two students dominate
- Others stay silent
- Friends agree with friends
- Ideas are judged too early
- The group rushes to a decision

This leads to:

- Groupthink (everyone thinks the same)
- Missed ideas
- Poor-quality decisions

The Delphi approach fixes this by **changing the process**, not the people.

The Core Principles of the Delphi Method (Student-Friendly)

1. Independent Thinking First

Everyone gets time to think **on their own** before hearing others.

Why this matters:

- Prevents copying
- Encourages original ideas
- Builds confidence in quiet students

2. Anonymity of Ideas

Ideas are shared **without names**.

Why this matters:

- No fear of judgment
- No pressure from popularity
- Ideas are judged on quality, not who said them

3. Feedback, Not Debate

Instead of arguing, the group looks at:

- Similar ideas
- Differences
- New perspectives

This creates a **learning environment**, not a competition.

4. Thinking in Rounds

The group thinks again—**with new information**. Each round improves ideas, like polishing a rough stone.

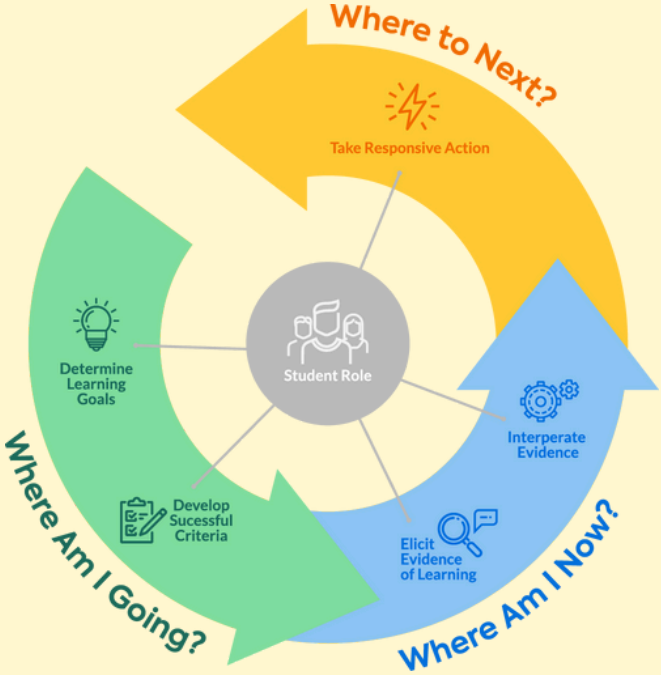
How the Delphi Method Actually Works (Simplified)

Step 1: The Question

A clear, open-ended question is asked.
Example: *"How can our school reduce plastic waste?"*

Step 2: Round One – Individual Responses

Each student writes their ideas privately.
No discussion. No influence.



Step 3: Sharing Ideas (Without Names)

The teacher or facilitator collects and lists ideas:

- On the board
- On a chart
- On a screen

Step 4: Reflection Round

Students read all ideas and think:

- What makes sense?
- What can be improved?
- What ideas connect?

They revise or add new ideas.

Step 5: Finding Common Ground

The group notices:

- Repeated ideas
- Strong suggestions
- Practical solutions

The goal is **better thinking**, not total agreement.

✏️ Activity 1: Mini Delphi in the Classroom

🕒 Time: 25–30 minutes

Problem: "What should our school priorities to become more eco-friendly?"

Round 1 - Students write 2-3 ideas silently.

Round 2 – Teacher reads out ideas anonymously.

Round 3 – Students refine or rank ideas.

Outcome

A shortlist of thoughtful, well-considered solutions.

💡 **Reflection**: *Did your idea change after seeing others' ideas? Why?*

What Skills Does the Delphi Way Build?

Using this method helps students develop:

- Critical thinking
- Patience and reflection
- Listening skills
- Respect for diverse opinions
- Better decision-making

Most importantly, students learn that changing your mind is not weakness – it is growth.

Real-Life Situations Where This Helps Students

Delphi-style thinking can be used for:

- Choosing class projects
- Planning school events
- Solving local problems
- Predicting future needs
- Group assignments without conflict

It also prepares students for:

- Leadership roles
- Teamwork in careers
- Democratic participation

✏️ Activity 2: Predicting the Future (Delphi Style)

🕒 Time: 20 minutes

Question: "What skills will students need most in 2040?"

Round 1 - Students list skills individually.

Round 2 – Ideas are shared anonymously.

Round 3 – Students revise their answers after seeing trends.

🎯 *Learning Outcome: Students see how collective thinking improves predictions.*

Delphi Thinking vs Ordinary Discussion

Ordinary Discussion	Delphi Way
Loud voices dominate	Everyone participates
Quick decisions	Thoughtful rounds
Emotional reactions	Reflective thinking
Pressure to agree	Freedom to rethink

Reflection Questions

1. How did anonymity change the way ideas were shared?
2. Did seeing others' ideas improve your thinking?
3. Where else can this method be used in daily life?
4. Why is it important to think before speaking?

Conclusion: Smarter Groups Are Made, Not Found

Good group thinking does not happen by chance – it happens by design. The Delphi Method shows students that when thinking is structured, fair, and reflective, **groups can be wiser than individuals.**

River Cleaning Boat

N Yaswanth Reddy
8th Class

The River Cleaning Boat is used for the collection of water debris, plastic trash, and other impurities floating on water bodies or by boat trash skimmer

The river cleaning boat, when placed in water and connected to a battery, moves forwards floating on water. When it gets in contact with floating waste, a rotating cloth belt collects the waste into a compartment. This invention relates to skimmer boats, i.e., work boats for collecting and disposing of floating solid waste materials in harbors and waterways.

(Source: GYS Avishkar Awards 2023 Booklet)

Link for the project's video presentation
YouTube.com/@GETAYoungScientist

Powerplay

Saisha Gupta
10th Class

Addressing the issue of the continuous rise of energy demands and the shortage of conventional sources of energy generation, Varsha came up with POWERPLAY - an energy generation system using humans as the power source to operate the equipment in the gym. This is basically a piece of equipment which can be attached or connected to the gym machines or can be inbuilt into the gym exercise machines. The muscular energy generated by the gym machines through the people using them gets converted into electrical energy with the help of a dynamo generator.

Based on the principle that energy can only be converted from one form to another, the to-and-fro motion of the equipment is transformed into rotary motion by the use of a rack-and-pinion arrangement. The speed of the rotary motion is controlled with the help of a gear reduction method using a chain drive. After this, electric energy is generated by the conversion of rotary motion with the help of a dynamo generator. This energy generated can be stored or used in various appliances or gadgets like fans and lights, or even to charge mobile phones.

(Source: GYS Avishkar Awards 2023 Booklet)

Link for the project's video presentation
YouTube.com/@GETAYoungScientist

Indian Scientist

Dr. Manchanahalli Rangaswamy Satyanarayana Rao

(21 January 1948 – 13 August 2023)

When a rocket lifts off the ground, the moment feels magical but behind that power lies years of careful science. One of the minds that made India's rocket launches reliable and strong was **Dr. Manchanahalli Rangaswamy Satyanarayana Rao,** a scientist who helped give India its confidence in space.

Dr. Rao's most important contribution was in the field of **solid rocket propulsion** - the technology that provides the massive thrust needed to launch rockets into space. Solid propellants are like the heart of a rocket: once ignited, they must burn steadily, safely, and exactly as planned. If anything goes wrong, the mission can fail. Dr. Rao's work helped ensure that India's rockets were not just powerful, but dependable.

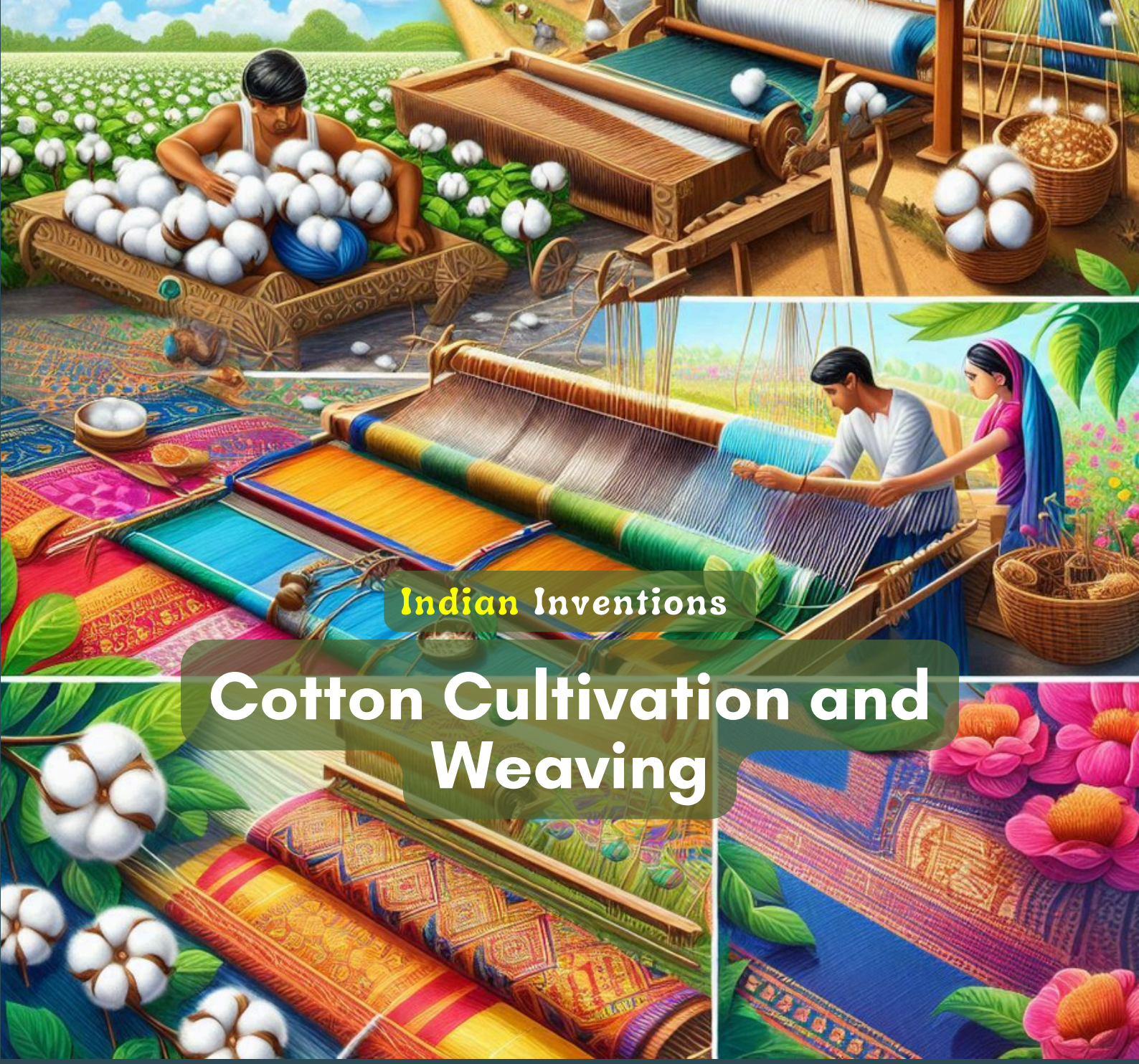
As Director of the Vikram Sarabhai Space Centre (VSSC), he strengthened India's launch vehicle programme at a critical stage. Under his leadership, Indian rockets became more robust, allowing satellites for communication, weather forecasting, and remote sensing to be placed in orbit.

These satellites help us today by improving mobile communication, television broadcasting, disaster warnings, and even GPS-based services.

Dr. Rao later served as the Chairman of ISRO, guiding India's space programme during a time when resources were limited but ambitions were high. He believed strongly in **self-reliance**, pushing Indian scientists and engineers to design and build technologies within the country. This mindset laid the foundation for India's low-cost, efficient space missions that are admired globally today.

Beyond rockets and satellites, Dr. Rao was a mentor and institution builder. He trained teams, trusted young engineers, and encouraged careful experimentation. His leadership showed that great science is built not just on ideas, but on discipline and teamwork.

For students, Dr. M. R. S. Rao's life sparks curiosity about what happens behind a rocket launch. His story reminds us that science can turn imagination into motion - and quiet determination into national achievement.



Indian Inventions

Cotton Cultivation and Weaving

The Birth of Cotton and Early Indian Innovation

Imagine a world before cotton, where people wore heavy animal skins, wool, or rough linen. These materials were useful but uncomfortable, especially in warm regions. It was in India that a remarkable discovery changed this forever—the use of cotton, a soft fibre grown from plants. This innovation made clothing lighter, more breathable, and far more comfortable, perfectly suited to tropical climates.

Archaeological evidence shows that cotton was cultivated in the Indian subcontinent as early as 3000 BCE during the Indus Valley Civilisation. Excavations at ancient sites have revealed cotton fibres, woven cloth, and tools used for spinning. Indians were the first to understand how to grow cotton plants, harvest the fibres, spin them into thread, and weave them into fabric. While many other civilisations had never seen cotton cloth, India was already perfecting this complete system, giving it a huge technological and economic advantage.

Mastering the Art: From Field to Fabric

India's greatness in cotton came from mastering the entire journey of the fibre—from farm to fabric. Farmers selected seeds carefully and developed methods suited to different soils and rainfall patterns. Artisans then cleaned and combed the fibres before spinning them using spindles and later the charkha (spinning wheel), which greatly improved speed and efficiency.

Skilled weavers used handlooms to create a wide range of fabrics, from strong cloth for everyday use to incredibly fine muslin so delicate it was once said to pass through a ring. Natural dyes made from plants, minerals, and insects added vibrant colours and patterns. Cotton weaving was not just an occupation—it was a way of life. Entire villages depended on cotton-related work, creating a self-sustaining system that supported millions long before modern factories existed.

India as the World's Cotton Superpower

By ancient and medieval times, India had become the world's cotton superpower. Indian cotton textiles were traded across land and sea routes to Mesopotamia, Egypt, Southeast Asia, China, and later Europe.

Merchants travelled thousands of kilometres to obtain Indian cloth because no other region could match its quality, comfort, and variety.

India's dominance was so strong that it reshaped global economies. European demand for Indian cotton helped fuel international trade and eventually colonial expansion. British factories later copied Indian techniques, while colonial policies weakened local handloom industries to promote machine-made cloth. Yet cotton also became a symbol of resistance—hand-spun cloth represented self-reliance, dignity, and national pride during India's freedom struggle.

Cotton Today: India and the World

Today, cotton remains one of the most important natural fibres in the world. It is used not only for clothing but also for bedsheets, towels, medical supplies, cooking oil, animal feed, and even paper. Globally, countries like India, China, the United States, and Brazil dominate cotton production. At the same time, modern cotton farming faces serious challenges such as climate change, water scarcity, pest attacks, and environmental damage caused by chemical use.

India continues to be one of the world's largest producers of cotton, supporting millions of farmers and textile workers across states like Gujarat, Maharashtra, Telangana, Andhra Pradesh, and Punjab. Alongside large textile factories, India's handloom traditions are gaining renewed importance for being sustainable, eco-friendly, and culturally rich. For students today, cotton is not just something they wear—it is proof that Indian innovation once shaped the world and still holds lessons for a more sustainable future.

Ministry of Electronics and Information Technology (MeitY)

Imagine a world where government services are just a click away, classrooms are connected online and villages have access to digital tools that change lives. In India, much of this transformation is driven by the **Ministry of Electronics and Information Technology (MeitY)**, the backbone of the country's digital revolution.

The Digital Engine of India

The Ministry of Electronics and Information Technology (MeitY) was established in 2016 as a separate ministry to focus on one powerful mission to make India a digitally empowered society and knowledge economy. It leads India's journey into the future through programs in information technology, electronics, cybersecurity, artificial intelligence and digital governance.

Building a Digital India

One of MeitY's most impactful initiatives is **Digital India**, launched in 2015. The goal of this program is to ensure that every citizen has access to digital services, information, and opportunities. Through Digital India, the government has created online platforms for education, healthcare, and governance, making daily life more efficient and transparent.

From DigiLocker (which allows people to store important documents digitally) to UMANG (a single app for hundreds of government services), MeitY has made governance smarter and simpler. The Aadhaar system, one of the largest digital identity programs in the world, also operates under its umbrella, helping millions access welfare benefits easily.

Innovation and Electronics for a Smart Nation

MeitY is not only about software, it's also about hardware. The ministry supports electronics manufacturing, aiming to make India a global hub for producing mobile phones, semiconductors and smart devices. Programs like Make in India and Production Linked Incentives (PLI) are creating jobs and encouraging innovation in the electronics sector.

Empowering Young Innovators

The ministry believes that India's youth are its greatest digital strength. Through initiatives like TIDE 2.0, MeitY Startup Hub, and FutureSkills PRIME, it supports students, entrepreneurs, and professionals to build skills for tomorrow's tech world. Coding, robotics, data analytics, and AI are no longer subjects of the future; they're part of the present, thanks to MeitY's efforts.

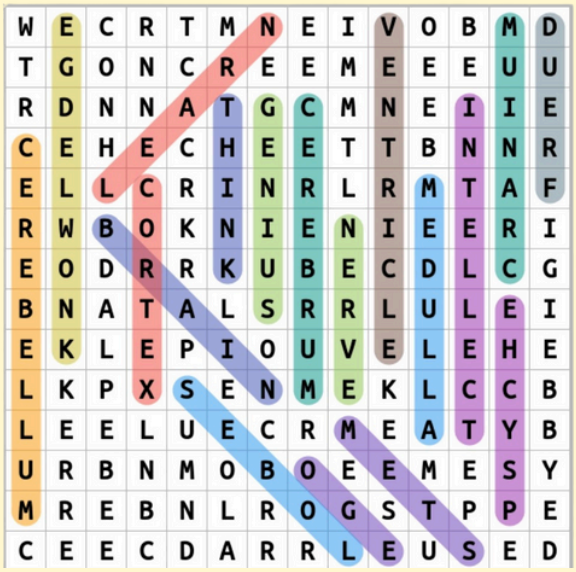
Conclusion

The Ministry of Electronics and Information Technology (MeitY) plays a crucial role in shaping India's digital future. By developing secure digital systems, supporting innovation in electronics, promoting startup ecosystems and ensuring technology reaches every citizen, MeitY is building a smarter and more connected nation.

Solution
Sudoku Challenge 2510

1	2	6	4	3	7	5	9	8
9	4	3	6	5	8	1	2	7
7	8	5	2	1	9	3	4	6
8	6	7	3	9	2	4	5	1
3	9	4	5	7	1	8	6	2
5	1	2	8	4	6	7	3	9
6	5	1	7	2	4	9	8	3
2	3	9	1	8	5	6	7	4
4	7	8	9	6	3	2	1	5

Solution
Word Search 2510



Riddle 2510 Answer

1. **A Towel 2. A Battery 3. A Sponge 4. Periodic 5. Calculator**

GYS CHARAKA SCIENCE MEDAL

A National Online Mega Science Quiz for High School Students

Syllabus: Round 1 Syllabus: GYS Quizzes 150 to 200

Round 2 Syllabus: GYS Quizzes 1 to 200

Mode: Online Quiz (30 Minutes)

Eligibility: 6th to 10th Classes

Junior: 6th, 7th Classes

Senior: 8th, 9th & 10th Classes

Winners: Certificates, Medals, Cash Prizes

Cash Prizes: ₹ 3,000, ₹2000, ₹ 1,000

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