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Young Scientist India

A Science & Innovation Magazine for School Students

INNOVATIONS @ PUBLIC PLACES

PREDHIMAN KRISHAN KAW
SAMIR KUMAR BRAHMACHARI
TAPAN MISRA
WAMAN DATTATREYA PATWARDHAN

LEARNING TO UNLEARN
SYSTEMS THINKING
HACKING FOR GOOD
WHO IS AN INNOVATOR?

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Publisher
Murali Valiveti

Editor
Vennela Valiveti

Content Director
Krupa Kiran Nandamudi

Contributors
Bharath Valiveti
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From the Editor's Desk

Welcome, Young Scientists!

Innovation is often imagined as something that happens inside laboratories or research centres. But in reality, some of the most powerful innovations surround us every day—in the places we walk through, travel across, and depend on as a society. This month's edition of Young Scientist India invites you to look closely at the world around you and discover how science and creativity quietly shape our shared spaces.

Our Cover Story, **Innovations at Public Places**, explores how thoughtful design and scientific thinking improve everyday experiences in stations, roads, transport systems, markets, and other public spaces. These innovations may seem simple at first glance, but they solve complex problems of safety, accessibility, efficiency, and inclusion. They remind us that innovation matters most when it serves people.

Several articles in this issue focus on how innovators think and act. From understanding who an innovator is, to challenging assumptions and developing a strong innovation mindset, these pieces explore the habits behind great ideas—curiosity, creativity, and the courage to question the familiar. Together, they help you recognise the innovator within yourself and build skills that lead from ideas to impact.

Technology-driven innovation also takes centre stage. Articles on **ethical hacking** show how digital public systems are protected, while features on **transportation innovation** reveal how science is reshaping the movement of people and goods in safer, smarter, and more sustainable ways. These stories highlight the responsibility that comes with innovation in a connected world.

Our Innovation Training Modules—**Learning to Unlearn and Systems Thinking**—encourage you to rethink how you approach problems. By letting go of assumptions and learning to see connections within complex systems, you gain tools that are essential for solving real-world challenges, especially those found in public and social spaces.

We also celebrate India's scientific leadership and institutions. Profiles of eminent Indian scientists reflect lives dedicated to national progress, while our spotlight on scientific laboratories and organisations showcases places where electronics, food technology, materials, ceramics, and electrochemical research quietly support everyday life and public infrastructure across the country.

Young innovation shines brightly in our Avishkar and Award-Winners sections, where student-led ideas address road safety, public transport, accessibility, disaster resilience, healthcare, and energy. These projects remind us that meaningful innovation does not require age or advanced degrees—only awareness, empathy, and the confidence to act.

As you turn these pages, I hope you begin to see public spaces differently—not just as places you use, but as systems you can improve. Observe carefully. Question deeply. Innovate responsibly.

Stay curious. The future of our shared spaces is in your hands.

Vennela Valiveti, B. Des.
YSI Magazine Editor
Interior Designer
Ph. 9030600470

What is Ethical Hacking?

Why Ethical Hackers Matter?

S&I Article

Hacking for Good

The Role of Ethical Hackers

Hacking for Social Good

Securing Hospitals

Protecting Elections

Helping NGOs

When most people hear the word hacker, they imagine shadowy figures breaking into systems, stealing data, or causing digital chaos. But this picture tells only half the story. Around the world, a growing community of ethical hackers is using the same skills – not to harm – but to protect, improve, and strengthen the digital systems we all depend on.

Ethical hacking is about defending the internet from within. It is hacking with permission, purpose, and responsibility.

What Is Ethical Hacking?

Ethical hackers are cybersecurity experts who intentionally try to break into computer systems, networks, or applications – but with full authorization. Their goal is to find weaknesses before malicious hackers do.

Think of ethical hackers as digital testers. Just as engineers stress-test bridges to ensure safety, ethical hackers stress-test digital systems to prevent breaches. They look for:

- Security loopholes
- Weak passwords and access points
- Software bugs and misconfigurations
- Vulnerabilities that could expose user data

Once they find a flaw, they report it responsibly so it can be fixed.

Why Ethical Hackers Are Needed More Than Ever

Today, almost every part of our lives is connected to the internet – banking, healthcare, education, transport, government services, and even household devices. This connectivity brings convenience, but also risk.

Cyberattacks can:

- Steal personal and financial data
- Shut down hospitals or power systems
- Disrupt elections and public services
- Spread misinformation

Ethical hackers help prevent these disasters by staying one step ahead of cybercriminals. They help organizations build safer systems instead of reacting after damage is done.

Hacking as a Tool for Social Good

Ethical hacking is not just about protecting companies – it can directly benefit society.

Examples of hacking for good include:

- Securing hospital databases to protect patient records
- Testing government websites to prevent data leaks
- Helping schools and universities secure online learning platforms
- Protecting NGOs working with vulnerable communities
- Finding flaws in apps used for public services and welfare

In many cases, ethical hackers quietly work behind the scenes to ensure systems remain trustworthy and accessible.

The Mindset of an Ethical Hacker

Ethical hacking is not about shortcuts or showing off technical skill. It requires discipline, ethics, and responsibility.

Key values of ethical hackers include:

- **Permission:** They only test systems they are authorized to access
- **Responsibility:** Vulnerabilities are disclosed privately, not exploited

- **Curiosity:** A deep desire to understand how systems work
- **Integrity:** Protecting users matters more than personal gain

This mindset makes ethical hackers trusted partners in cybersecurity, not threats.

Skills Ethical Hackers Develop

Ethical hacking combines technical knowledge with problem-solving and creativity. Students interested in this field often enjoy puzzles, logic, and understanding how things break and can be fixed.

Common skills include:

- Understanding computer networks and operating systems
- Basics of programming and scripting
- Knowledge of how websites and apps are built
- Logical thinking and pattern recognition
- Strong documentation and communication skills

Importantly, ethical hacking teaches students how systems fail, which is often the first step toward building better ones.

Ethics Before Expertise

One of the most important lessons in ethical hacking is that just because you can do something doesn't mean you should. Power over systems comes with responsibility.

Teaching ethics alongside technical skills ensures that students:

- Respect privacy and consent
- Understand legal boundaries
- Use knowledge to protect, not exploit
- See technology as a public good

This balance is what separates ethical hackers from malicious ones.

Building a Safer Digital Future

As the world becomes more digital, ethical hackers will play a crucial role in shaping a safer future. They remind us that technology is not just about speed and scale—it is about trust.

For young learners, ethical hacking offers more than a career path. It offers a way to engage with technology thoughtfully, critically, and responsibly. It shows that even in the invisible world of code and networks, values matter.

Hacking for good proves one powerful idea: the same skills that can break systems can also protect them—and the choice of how to use them defines the future we build.

Hacking for good proves one powerful idea: the same skills that can break systems can also protect them—and the choice of how to use them defines the future we build.

Central Electronics Engineering Research Institute (CEERI)

Central Electronics Engineering Research Institute (CEERI) is one of India's leading research institutions in the field of electronics and engineering. Located in Pilani, Rajasthan, CEERI was established in 1953 and functions under the Council of Scientific and Industrial Research (CSIR). The institute plays an important role in strengthening India's capabilities in electronics, information technology, and advanced engineering.

CEERI focuses on research that connects basic science with real-world applications. Its work covers a wide range of areas such as electronic systems, sensors, communication technologies, semiconductor devices, robotics, and embedded systems. These technologies form the backbone of modern life, from mobile phones and computers to satellites, medical equipment, and smart infrastructure.

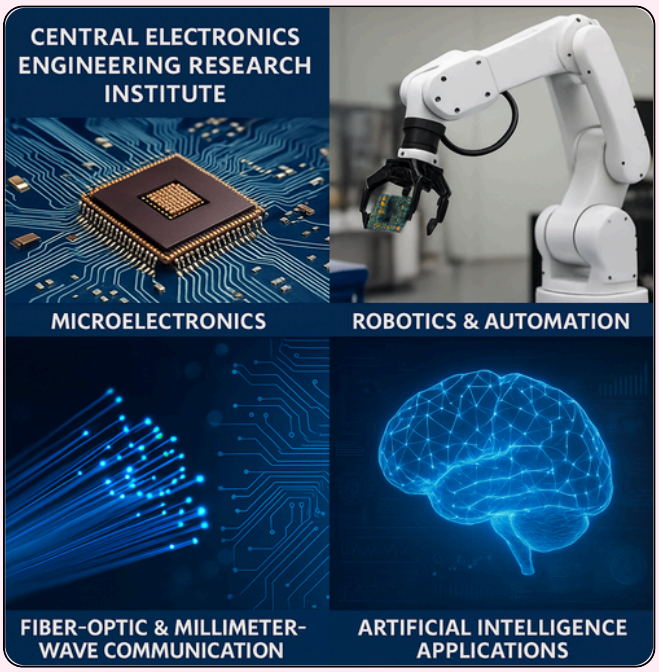
One of CEERI's major contributions is in the area of **electronics and sensor technologies.** The institute develops sensors that can measure temperature, pressure, gas levels, and other physical conditions. Such sensors are used in industries, healthcare, environmental monitoring, and defense. CEERI has also made significant progress in developing indigenous electronic systems, reducing dependence on imported technologies.

CEERI is actively involved in **digital and smart technologies.** Research at the institute supports areas such as the Internet of Things (IoT), artificial intelligence-enabled systems, and smart devices.

These innovations help improve efficiency in sectors like agriculture, manufacturing, transportation, and urban planning. By working on such technologies, CEERI contributes to building a smarter and more connected India.

Another important area of CEERI's work is **national and strategic projects.** The institute collaborates with government departments, public sector units, and industries to design and develop technologies needed for national development. This includes work in defense electronics, space-related systems, and secure communication technologies.

Education and skill development are central to CEERI's mission. The institute provides training to students, engineers, and scientists through internships, workshops, and research programs. School and college students often visit CEERI to explore laboratories and interact with researchers, which helps spark interest in science and engineering careers.



First Aid ATM

This project was inspired by a real-life road accident witnessed by the student, where timely first aid was unavailable to an injured person. The incident highlighted the urgent need for easily accessible emergency medical support in public spaces, motivating the idea of a First Aid ATM to provide immediate assistance during critical situations.

Adam Wangsu
10th Class

The proposed First Aid ATM is designed for installation in accident-prone and high-risk areas such as schools, colleges, crossroads, and construction sites.

The model includes essential emergency supplies like Dettol or Savlon bottles, cotton and gauze rolls, antiseptic ointment, T.T. injections, and basic medicines. Such ATMs can play a crucial role in saving lives by ensuring prompt first aid before medical help arrives.

(Source: INSPIRE MANAK NLEPC 2021 Booklet)

Provided Light and Fan in Goods Train Break Van in Indian Railways

Goods train brake vans in Indian Railways lack basic amenities such as lighting and fans, forcing guards to work in darkness and discomfort, especially during night operations and long halts away from stations. This project addresses the issue by proposing a self-sufficient, sustainable power system that generates electricity using the motion of the train itself. Guards often struggle to record data and monitor train movement safely due to poor visibility and ventilation. The solution aims to improve working conditions by providing reliable lighting, airflow, and charging facilities.

Jayee Lalith Siva Sai
9th Class

With a low material cost of ₹800–₹1,000 and simple construction, the system is highly affordable, scalable, and suitable for widespread adoption across goods trains in India.

Solution

The solution uses a dynamo-based energy generation system connected to the train's wheel through a gear mechanism. As the train moves, the rotating wheel drives the dynamo, converting mechanical energy into electrical energy via electromagnetic induction.

The generated power is stored in a battery and later used to operate LED lights, a fan, and USB charging ports when the train halts. A diode ensures safe current flow, while a charging module regulates voltage. The eco-friendly system is simple, reliable, and low-maintenance.

(Source: GYS Avishkar Awards 2025 Booklet)

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

Indian Scientist

Dr. Predhiman Krishan Kaw

(15 January 1948 - 18 June 2017)

Have you ever seen lightning crack across the sky, noticed the glow inside a tube light, or wondered how scientists hope to create artificial suns on Earth? All these are connected by **plasma**, the fourth state of matter and one of the scientists who helped India understand and master it was **Predhiman Krishan Kaw.**

Unlike solids, liquids, and gases, plasma is made of charged particles that behave in surprising and sometimes wild ways. It fills the stars, powers the Sun, and makes auroras dance in the sky. On Earth, plasma is everywhere, too, inside **neon signs, fluorescent lamps, plasma TVs, and even in the tiny sparks inside electronic devices.** Understanding how plasma behaves is not easy, and that is where Kaw's work becomes important.

Predhiman Krishan Kaw was a **theoretical plasma physicist**, which means he studied plasma using ideas, equations, and models to explain what cannot always be seen directly. One of the biggest problems with plasma is that it can suddenly become unstable just like how a calm crowd can turn chaotic.

Kaw's research helped scientists understand **plasma instabilities and turbulence**, knowledge that is essential for controlling plasma in real-life applications.

One exciting application of this research is **nuclear fusion energy**. Fusion is the process that powers the Sun and stars. Scientists are trying to recreate it on Earth to produce clean energy with no air pollution and very little waste. Devices called **tokamaks** use powerful magnetic fields to control extremely hot plasma. Kaw's work helped scientists understand how to keep this plasma stable, bringing us closer to a future where electricity could come from fusion instead of fossil fuels.

Kaw didn't just work in labs—he helped **build India's scientific future**. As the founding director of the **Institute for Plasma Research (IPR)** in Gandhinagar, he created a place where Indian students and scientists could work on world-class research without leaving the country. Because of institutions like IPR, India today contributes to global projects such as ITER, one of the world's largest fusion experiments.

For students, Kaw's story carries an inspiring message: **the science you study in classrooms connects directly to real life**. The physics For students, Kaw's story carries an inspiring message: the science you study in classrooms connects directly to real life. The physics behind sparks, lights, mobile devices, and future clean energy all traces back to ideas explored by scientists like him. Predhiman Krishan Kaw showed that curiosity about how nature works can one day light homes, power cities, and even help save the planet.

Cover Story

Innovations at Public Places

How Science is Making Everyday Spaces Smarter

Smart Lighting

Autonomous Transport

High-Tech Parks

Eco-Friendly Cities

Think of a world where bus stops tell you how long you'll have to wait, dustbins call for help when they're full and parks help you stay fit for free. All of this is real.

Public Place Innovations

Public Place Innovations use science and technology to make shared spaces, like parks, streets, railway stations and even schools, cleaner, safer, faster and smarter. Imagine walking into a bus stop that tells you when the next bus will arrive, a park that waters its plants automatically or a railway station that runs on solar power. Sounds futuristic? Well, it's already happening around us.

The creative use of science and technology to solve everyday problems in common areas like parks, streets, railway stations, airports, schools and government buildings. These changes make life easier, more efficient, safer and often more eco-friendly.

For students like you, understanding how these ideas work can inspire you to create your own smart solutions for your school, neighborhood.

Why Are Innovations at Public Places Important?

India is a country of 1.4 billion people and most of us share the same roads, markets, parks and stations. Any improvement in these areas affects millions.

Reasons why public place innovations are so important:

- **Better Quality of Life:** Clean toilets, smart dustbins, drinking water kiosks, these improve basic living conditions.
- **Time Saving**: Real-time train schedules or online ticketing kiosks reduce long queues.
- **Safety and Security**: CCTV-enabled public transport and smart streetlights increase public safety.
- **Environmental Benefits:** Solar-powered bus shelters or waste segregation bins help the environment.

Public Place Innovations in India

Let's look at some exciting innovations from different corners of India that are transforming public places into smarter, cleaner and safer spaces.

1. Smart Bus Stops

Have you ever waited for a bus without knowing when it will arrive? In some Indian cities, smart bus stops solve this problem. That's changing with the rise of Smart Bus Stops. Waiting Becomes Informative

Example: Indore, Madhya Pradesh has introduced solar-powered bus stops that show digital displays with real-time arrival updates. They also provide Wi-Fi, charging ports and CCTV cameras.

Science Behind It

- GPS Technology tracks the buses.
- IoT Sensors relay real-time information to display boards.
- Solar Panels provide energy to run these systems sustainably.

Student Spark

Can you design a smart waiting area for your school bus? Think of using low-cost solar panels and recycled materials.

Fun Fact

India's first solar-powered smart bus stop was launched in Punjab in 2015.

2. Automated Public Toilets

Hygiene Gets a Tech Upgrade. Public toilets are often seen as unhygienic. But with automation, that is changing.

Example: e-Toilets developed by Eram Scientific Solutions are now common in Kerala, Bengaluru and even small towns. These are self-cleaning, coin-operated and use minimal water.

Science Behind It

Motion Sensors trigger cleaning cycles. Water-saving Mechanisms recycle water for flushing.

Solar Panels keep them running in areas with no grid power.

Student Spark

Can you think of a design to use rainwater harvesting in these e-toilets?

3. Smart Dustbins

Clean Streets, Smart Cities. Garbage disposal is a huge challenge in India. Smart dustbins alert authorities when they are full, preventing overflow and foul smell.

Example: Pune has introduced sensor-enabled dustbins that send signals when they are 80% full. This helps the city corporation schedule pick-ups efficiently.

Science Behind It

Ultrasonic Sensors detect fill levels. GSM (Global Systems for Mobile) Technology sends messages to the municipal server.

Mobile Apps are used to track and monitor bins in real-time.

Student Spark

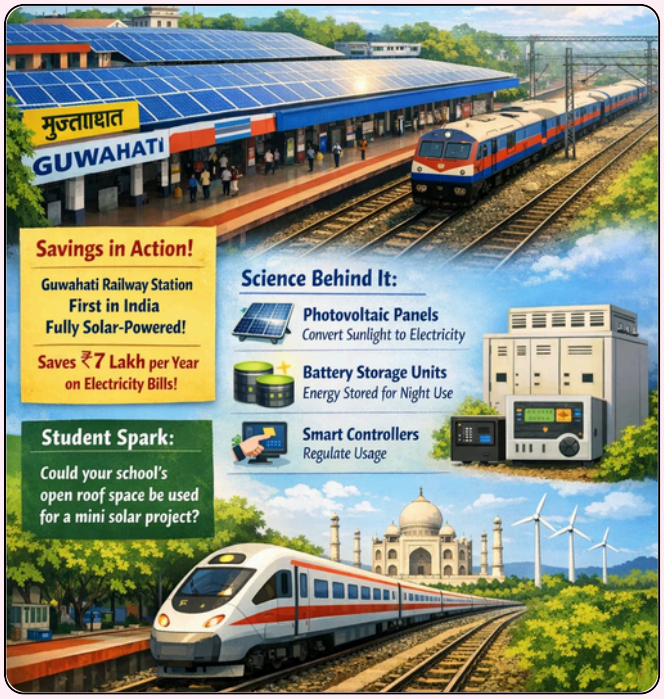
What if you could design a dustbin that rewards people for throwing garbage?

Fun Fact

Some bins in smart cities like Bhopal even say, they say "Thank You" when you throw trash.

4. Solar-Powered Railway Stations

Clean Energy for the Masses. India has one of the largest railway networks in the world. Powering these stations with solar energy saves crores of rupees and reduces pollution.



Example: Guwahati Railway Station became the first in India to be fully solar-powered. This initiative saves about 7 lakh rupees per year in electricity bills!

Science Behind It

Photovoltaic Panels convert sunlight into electricity.

Battery Storage Units store energy for use at night.

Smart controllers regulate usage

Student Spark

Could your school's open roof space be used for a mini solar project?

Fun Fact

India's goal is to make over 7000 stations eco-friendly with solar power.

5. Digital Parking Systems

No More Parking Chaos. Finding a parking spot in a busy city can be frustrating. Smart parking systems help by showing where spaces are available.

Example: Hyderabad has introduced Smart Parking Zones in areas like Hitec City, where sensors detect if a spot is empty and display it on a mobile app.

Science Behind It

Magnetic Sensors under the road detect parked cars.

Cloud Servers update the parking status in real-time.

App Interfaces guide users to the nearest available space.

Student Spark

What if your school had a digital bicycle parking space that locked and unlocked using a student ID card?

6. Water ATMs

Safe Water for All. Clean drinking water is a big problem in crowded public placesClean drinking water is a basic need. In rural and urban slums, Water ATMs provide purified water at low cost or even free. Quenching Thirst Smartly.

Example: Delhi and Ahmedabad have water ATMs where people swipe a card or insert a coin to fill water bottles.

Science Behind It

RO + UV Filtration cleans the water.
Sensors and Flow Meters manage the quantity and prevent wastage.
Prepaid Cards allow for regulated distribution.

Student Spark

How about a portable water ATM for use during school sports events?

DIY Activity: Model a Coin-Operated Water Machine

Tools: Use a bottle, cardboard and a coin dropper made from bottle caps.

Show how the tap works only after the "coin" is inserted.

Fun Fact: Delhi's water ATMs serve over 2.5 crore litres of water every year.

7. Smart Street Lights:

Light When You Need It. Electricity is often wasted when streetlights stay on all night even if no one's around. Smart lights help reduce this wastage.

Example: New Town, Kolkata uses smart lights that brighten when movement is detected and dim when there is none.

Science Behind It

Motion Sensors detect people or vehicles.
LED Technology uses less power.

Timers and Controllers adjust lighting automatically.

Student Spark

Can your school playground use smart lighting for night events?

DIY Activity: Motion Sensor Night Light

Tools: Use a mini sensor kit (available online) with LED light.

Show how it lights up only when someone moves.

Fun Fact: Smart lights can cut electricity costs by 50% in cities

How can you be a Young Innovator for Public Places?

You don't have to wait to become an engineer or scientist to start innovating. You can start right now by:

Observing problems in your surroundings. Asking questions like "Why is this a problem?" or "How can this be solved better?"

Drawing models or using LEGO, cardboard or recycled materials to build prototypes. Joining science clubs or participating in innovation contests like INSPIRE Awards or National Innovation Foundation (NIF) programs. Documenting your ideas in a notebook or on a blog.

Programs and Competitions

Here are a few platforms where your ideas can shine:

- Dr. APJ Abdul Kalam IGNITE Awards by NIF.
- Atal Tinkering Labs (ATL) run by NITI Aayog in many schools.
- IIT Tech Fests often have school innovation challenges.
- Young Scientist India Awards hosted annually for 6th to 12th students.

Conclusion

Innovation Starts With You. Innovation doesn't always need huge money or complex machines. Sometimes, a simple idea like adding a timer to a school bell or a water-saving tap design can create real change.

Innovations at public places are not just about big cities. They are about observing a common problem and thinking of a smart solution that can help many people.

Whether it's a solar-powered water cooler at a railway station, a smart app to track waste pickup or a simple handwashing station near a public toilet, all these ideas started with someone asking "How can we do this better?"

Eco-Friendly Pot Cooler

This project proposes a simple, eco-friendly alternative to conventional air coolers and air conditioners. Modern cooling appliances are expensive, consume large amounts of electricity, and contribute to environmental problems through high energy use and harmful emissions. This pot cooler is designed to address these issues by using natural air circulation and evaporative cooling principles. The model is affordable, portable, and energy-efficient, making it suitable for homes, classrooms, and small shops.

With a low manufacturing cost of about ₹1000 and materials that are easily available in local markets, it has strong market potential, especially in rural and low-income areas where access to affordable cooling solutions is limited.

Solution

The solution uses two similar earthen pots placed vertically. A small submersible motor pumps water through a PVC pipe into the upper pot, where it is sprinkled over a sponge or dry grass. A 12V DC fan fixed at the top blows air downward through the wet surface. As the air passes through, evaporation cools it naturally. The system consumes very little water and electricity, occupies minimal space, and provides effective cooling without generating pollution.

U Yoshini
7th Class

(Source: GYS Avishkar Awards 2023 Booklet)

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

Blind Stick

This project focuses on assisting visually impaired individuals by improving safe and independent mobility. The student designed an affordable and lightweight walking stick that helps users detect obstacles and navigate their surroundings with greater confidence. The innovation emphasizes simplicity, cost-effectiveness, and practical usefulness for everyday life.

The stick uses a Light Dependent Resistor (LDR) to sense changes in light. When light falls on the LDR, it triggers different sound frequencies through a speaker, alerting the user to nearby obstacles.

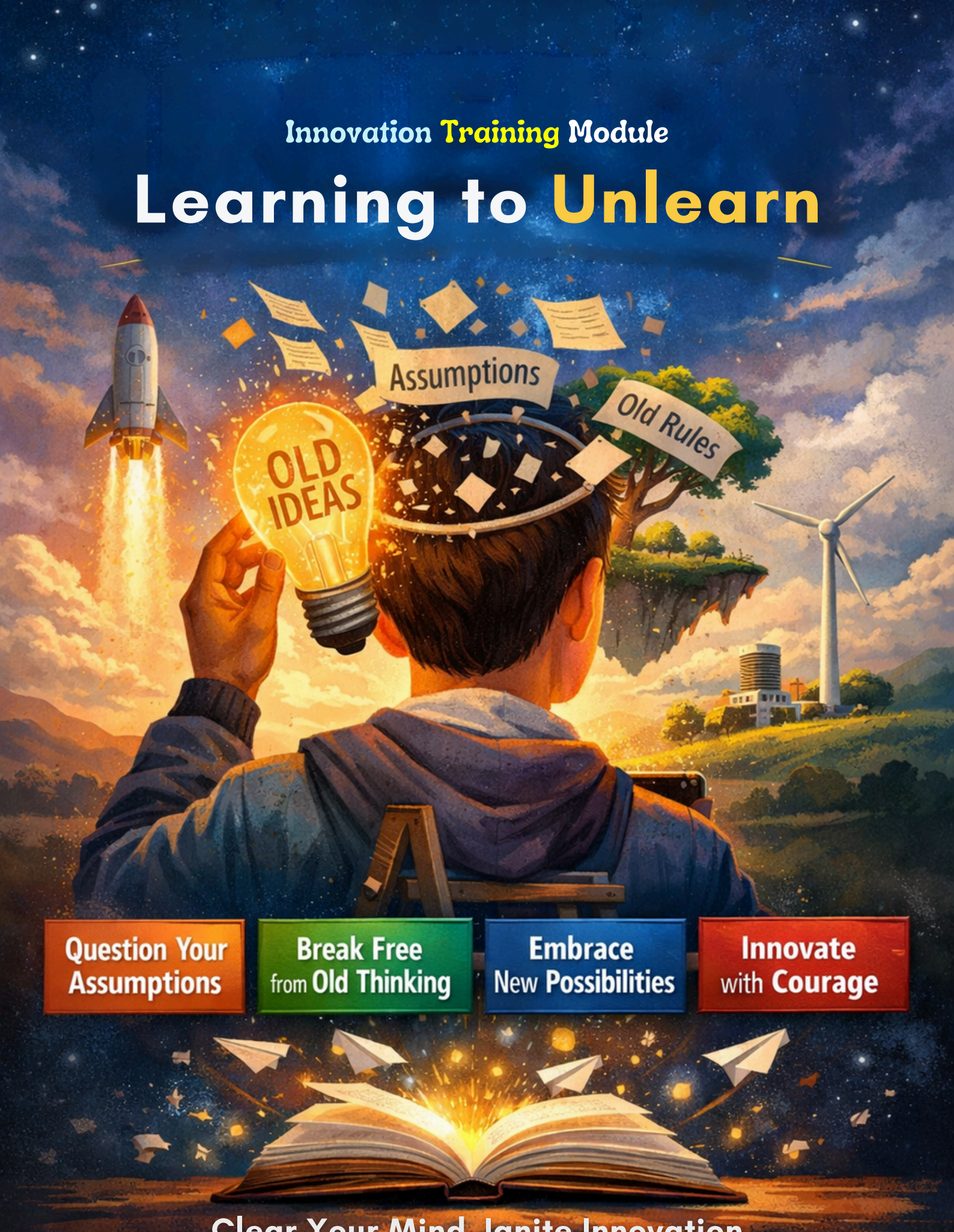
The student also aims to further enhance the stick by integrating advanced sensors while keeping it lightweight. Inspired by Sir Isaac Newton, he aspires to develop a smart fire extinguisher in the future.

Pukhrambam Dayananda Singh
7th Class

(Source: INSPIRE MANAK NLEPC 2021 Booklet)

Innovation Training Module

Learning to Unlearn



Clear Your Mind, Ignite Innovation

Why Unlearning Matters More Than Learning

From the time we enter school, we are taught how to learn. We learn alphabets, formulas, definitions, rules, and methods. We learn what is "right" and what is "wrong." Over the years, this learning helps us understand the world and succeed in exams.

But innovation—the kind that leads to new discoveries, inventions, and ideas—requires something more powerful and far less discussed: **the ability to unlearn.**

Unlearning does not mean forgetting everything you know. It does not mean rejecting science, knowledge, or teachers. Instead, unlearning means questioning ideas that may no longer be true, useful, or complete. It means letting go of habits of thinking that limit curiosity. It means creating space in your mind for new possibilities.

Many of the greatest scientific breakthroughs did not happen because someone learned something new—but because someone unlearned what everyone else believed was obvious.

This module will help you understand:

- What unlearning really means
- Why it is essential for innovation
- How assumptions shape (and sometimes trap) our thinking
- How you, as a student, can practice unlearning in daily life

Innovation begins not when you add more information to your mind—but when you clear outdated thinking from it.

1. What Does "Unlearning" Actually Mean?

Unlearning is often misunderstood. Let's clear that first.

Unlearning is NOT

- Erasing your memory
- Disrespecting teachers or textbooks
- Ignoring facts or scientific evidence

Unlearning IS:

- Questioning assumptions
- Updating beliefs when new evidence appears
- Recognizing that knowledge evolves
- Being comfortable with saying, "What if this isn't the full picture?"

Think of your mind like a cupboard. Over time, it gets filled with ideas, rules, shortcuts, and habits. Some of them are useful. Some are outdated.

Some were never correct in the first place. If the cupboard is too full, nothing new can fit.

Unlearning is the act of **opening that cupboard, checking what's inside, and deciding what still serves you.**

In science, this process happens all the time. Scientific knowledge grows because scientists constantly test, revise, and sometimes discard earlier explanations. What makes a good scientist—or an innovator—is not how much they know, but how willing they are to revise what they know.

2. The Hidden Power of Assumptions

At the heart of unlearning lies one powerful concept: **assumptions**.

An assumption is something we believe to be true without questioning it.

Examples

- "This is how it has always been done."
- "This problem has only one correct solution."
- "I'm not good at science."
- "If something failed before, it will fail again."

Assumptions are not always wrong. In fact, they help us function quickly in everyday life. But in innovation, **unquestioned assumptions are dangerous.** They quietly decide what we consider possible - and what we never even try.

For a long time, people assumed:

- Heavier objects fall faster than lighter ones
- Diseases were caused by bad air
- The Earth was the centre of the universe

These ideas felt logical. They were widely accepted. And they were wrong.

Innovation begins when someone asks: "What if this assumption is incorrect - or incomplete?"

Learning to unlearn is learning to **spot assumptions hiding inside our thinking**.

3. Why the Brain Loves Old Ideas (and Fears New Ones)

Our brains are efficient machines. They love patterns, shortcuts, and familiarity. Once an idea works a few times, the brain says, "Great—let's stick with this."

This is helpful for survival—but not always for innovation.

Psychologists call this **mental fixation:** the tendency to stick to familiar solutions even when better ones exist. In exams, this may help you solve standard problems quickly. But in real-world challenges—climate change, water shortages, health issues—this kind of thinking fails.

Unlearning feels uncomfortable because

- It creates uncertainty
- It challenges our confidence
- It forces us to admit we might be wrong

But innovation lives exactly in this uncomfortable space.

Every time you feel confused or unsure while thinking about a problem, that is not a weakness—it is a signal **that learning and unlearning are happening together.**

4. Why Good Students Sometimes Struggle with Innovation

This may sound surprising, but students who always score well can sometimes struggle with innovation.

Why?

Because traditional education often rewards:

- Correct answers
- Speed
- Following known methods

innovation, on the other hand, requires:

- Asking unusual questions
- Exploring wrong paths
- Challenging instructions

A student trained only to look for "the right answer" may hesitate to explore unknown possibilities. They may fear being wrong. They may avoid questions that don't have clear solutions.

Unlearning helps students move from:

- "What answer does the teacher want?"

to

- "What is really happening here?"

This shift is essential for scientific thinking.

5. Historical Lessons: Unlearning Changed Science

Science progresses not by collecting facts alone, but by replacing old explanations with better ones.

Here are a few simplified examples:

The Shape of the Earth

For centuries, it was assumed the Earth was flat. Observations slowly challenged this idea. People had to unlearn a belief that felt obvious.

Motion and Force

It was once believed that objects stop moving because they "run out of force." This idea had to be unlearned before new laws of motion could be understood.

Health and Medicine

The assumption that diseases were caused by bad smells delayed medical progress for years. Unlearning this idea led to modern hygiene and medicine.

In each case, progress required courage - not just intelligence.

6. Unlearning in Everyday Student Life

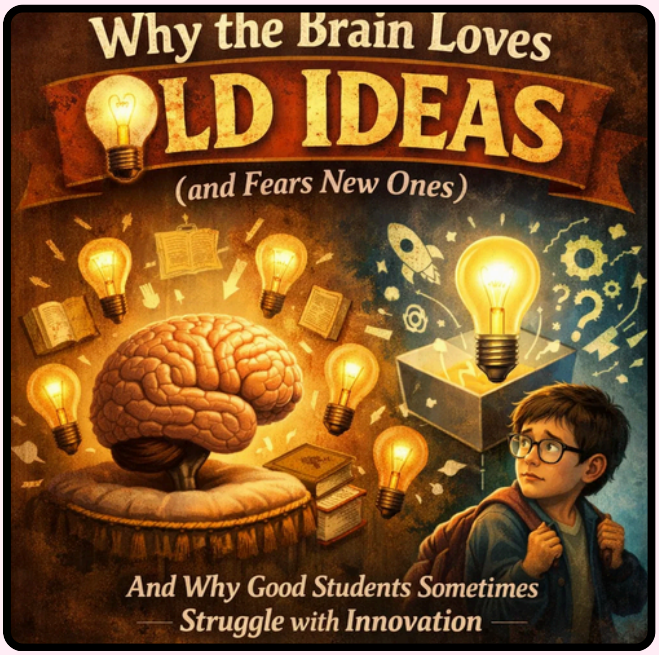
Unlearning is not only for scientists in laboratories. Students can practice it every day.

In the Classroom

- Question why a method works, not just how
- Ask if there could be another approach
- Explore "what if" questions

In Studying

- Replace memorization with understanding
- Challenge yourself to explain concepts in your own words
- Identify topics you believe you are "bad at"- and ask why



In Group Work

- Listen to ideas different from your own
- Notice when you reject ideas too quickly
- Ask: "Am I dismissing this because it's wrong—or because it's unfamiliar?"

Unlearning starts with awareness of **your own reactions.**

7. Exercises to Practice Unlearning

Exercise 1: Assumption Hunt

Pick a common object (a pen, a school bag, a classroom chair).

Ask:

- What assumptions do I have about this object?
- Why is it designed this way?
- What if one assumption changed?

Exercise 2: Reverse Thinking

Take a rule you are familiar with.

Example: "Homework must be written."

Ask:

- What if homework was explained verbally?
- What if learning was demonstrated, not written?

The goal is not to reject rules—but to see alternatives.

Exercise 3: "I Might Be Wrong"

Once a day, consciously say:

"I might be wrong about this."

This simple sentence opens the mind to new information.

8. Unlearning Before Innovation

Many people think innovation begins with ideas. In reality, innovation begins with clearing mental space.

Before you design a solution, ask:

- What am I assuming about this problem?
- Who decided this rule?
- When was this idea last questioned?

Unlearning helps you avoid fixing symptoms instead of causes. It prevents you from repeating old mistakes with new tools.

A powerful innovation mindset follows this order:

1. Observe, 2. Question, 3. Unlearn, 4. Relearn, 5. Experiment

Skipping the unlearning step often leads to shallow solutions.

Conclusion: Innovation Begins by Letting Go

Learning fills the mind. Unlearning frees it.

Innovation is not about being smarter than others. It is about being **braver with your thinking**—brave enough to question, to doubt, and to update your understanding of the world.

As a young scientific mind, your task is not just to absorb knowledge, but to **keep your thinking flexible, curious, and alive.**

As a young scientific mind, your task is not just to absorb knowledge, but to keep your thinking flexible, curious, and alive.

Before you try to change the world, learn to unlearn the ideas that quietly limit how you see it.

That is where innovation truly begins.

Technology Development Board (TDB)

Have you ever thought, "This is a great idea—why isn't anyone using it yet?" In India, there is a government body that helps turn such ideas into real-world solutions. It's called the **Technology Development Board (TDB).**

The Technology Development Board works under the Department of Science and Technology (DST), Government of India. Its main job is simple but powerful: **support Indian-made technologies and help them reach the market.** In other words, TDB helps bridge the gap between a good idea in a lab and a useful product in real life.

Think of TDB as a **support system for innovators and startups.** Many scientists, engineers, and young entrepreneurs have great ideas—like affordable medical devices, clean energy solutions, or smart farming tools—but they often lack money, guidance, or industry support. TDB steps in by providing **financial assistance, loans, and grants** to help these ideas grow into successful products.

Here's something students can relate to: imagine a college team invents a low-cost water purifier or a device that reduces electricity waste at home. Without support, that idea might stay in a project file forever. With TDB's help, it can be manufactured, sold, and used by thousands of people. That's how innovation becomes impact.

TDB focuses strongly on **Indian technologies.** It supports projects in areas like renewable energy, healthcare, agriculture, electronics, and manufacturing—sectors that affect daily life.

For example, technologies that improve medical testing, reduce pollution, save energy, or help farmers grow better crops often receive TDB backing.

Another exciting aspect is that TDB encourages **self-reliance,** often linked to the idea of Atmanirbhar Bharat. By supporting Indian innovators, the country reduces dependence on imported technologies and creates jobs at home. That means more opportunities for today's students to become tomorrow's inventors and entrepreneurs.

Most importantly, TDB shows that **science is not just for exams.** What you learn in physics, chemistry, biology, or computer science can solve real problems—if given the right push. The Technology Development Board provides that push.

In short, TDB proves that innovation doesn't have to stay in notebooks or labs. With the right support, student ideas can change industries, improve lives, and shape India's future.

S&I Article

Transportation Innovation

Every morning, millions of people step out of their homes with one shared goal to reach somewhere else. Whether it's a student catching a bus to school, a farmer transporting produce to a market, or a worker commuting to an office, transportation quietly shapes our daily lives. Yet today, this familiar system is undergoing one of the biggest transformations in human history. Transportation innovation is no longer just about speed; it is about sustainability, safety, inclusion, and intelligence.

From Roads to Revolutions

For centuries, transportation evolved slowly from animal-drawn carts to steam engines, and later to automobiles and airplanes. But the 21st century has brought an urgent need to rethink how we move. Rapid urbanization, climate change, fuel scarcity, and rising congestion have forced innovators to ask new questions: Can transport be cleaner? Can it be smarter? Can it serve everyone, not just a few?

The answers are reshaping roads, railways, skies, and even oceans.

Electric Mobility: A Cleaner Way Forward

One of the most visible changes on our streets is the rise of electric vehicles (EVs). Unlike traditional petrol or diesel vehicles, EVs produce no tailpipe emissions, reducing air pollution in crowded cities. Advances in battery technology have made electric scooters, cars, and buses more affordable and practical than ever before.

Beyond private vehicles, electric buses and delivery fleets are transforming public transport and logistics.

Charging infrastructure, once a major challenge, is expanding rapidly, supported by innovation in fast-charging and battery swapping systems. Transportation is no longer just about burning fuel—it is about managing energy intelligently.

Smart Public Transport Systems

Innovation is not limited to vehicles alone. Entire transport systems are becoming smarter. Digital ticketing, real-time tracking, and data-driven route planning have improved efficiency and convenience for commuters. Sensors and artificial intelligence help cities predict traffic patterns, reduce delays, and improve safety.

In many places, public transport is being reimagined as an integrated experience. A single app can now connect buses, metros, bicycles, and shared cabs, encouraging people to choose sustainable options over private cars. When technology meets good planning, transport becomes not only faster but fairer.

The Promise of Autonomous and Connected Vehicles

Self-driving vehicles, once the stuff of science fiction, are now being tested on real roads.

These vehicles use cameras, radar, and machine learning to navigate without human intervention. While full autonomy is still developing, partial automation—such as lane assistance and automatic braking—is already saving lives by reducing human error.

Connected vehicles take this further by communicating with each other and with infrastructure. Imagine traffic signals that adjust automatically to reduce congestion, or vehicles that warn each other about accidents ahead. Innovation here is about cooperation, not just control.

High-Speed and Alternative Transport Concepts

Transportation innovation also challenges our imagination. High-speed rail, magnetic levitation trains, and vacuum-based travel concepts aim to drastically reduce travel time between cities. While some of these ideas are still experimental, they push engineers to rethink limits of speed, efficiency, and design.

At the same time, non-motorized transport is gaining renewed attention. Walking paths, cycling lanes, and pedestrian-friendly urban design are being recognized as powerful innovations in themselves. Sometimes, the smartest solution is not faster machines, but better cities.

Sustainability at the Core

Perhaps the most important shift in transportation innovation is its focus on sustainability. Transport is one of the largest contributors to global carbon emissions. Innovations today are judged not only by performance, but by their environmental impact.

From biofuels and hydrogen-powered vehicles to lightweight materials and circular manufacturing, engineers are redesigning transport with the planet in mind.

The goal is clear: mobility that meets today's needs without harming tomorrow's world.

Inspiring the Next Generation

Transportation innovation is not just an engineering challenge; it is a social mission. It affects access to education, healthcare, jobs, and opportunity.

For young readers, this field offers a chance to combine creativity with responsibility.

Whether you are interested in design, coding, environmental science, or policy, transportation innovation needs diverse minds.

The next breakthrough might not come from a laboratory alone, but from someone who understands people, places, and purpose.

As the world moves faster than ever, one thing is certain: the future of transportation will be built not just on wheels and wires, but on ideas that put people and the planet first.

Word Search 2511

Outer Space

Word Search Puzzle

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

ASTEROID
ASTRONAUT
BLACK HOLE
COMET
CONSTELLATION
COUNTDOWN
GALAXY
JUPITER
LAUNCH
MERCURY
METEOR
MILKY WAY
MOON
NEPTUNE
PLANETS
ROCKET
SATELLITE
SATURN
SHUTTLE
STARS
TELESCOPE
UNIVERSE
URANUS
VENUS

Solution
Sudoku Challenge 2511

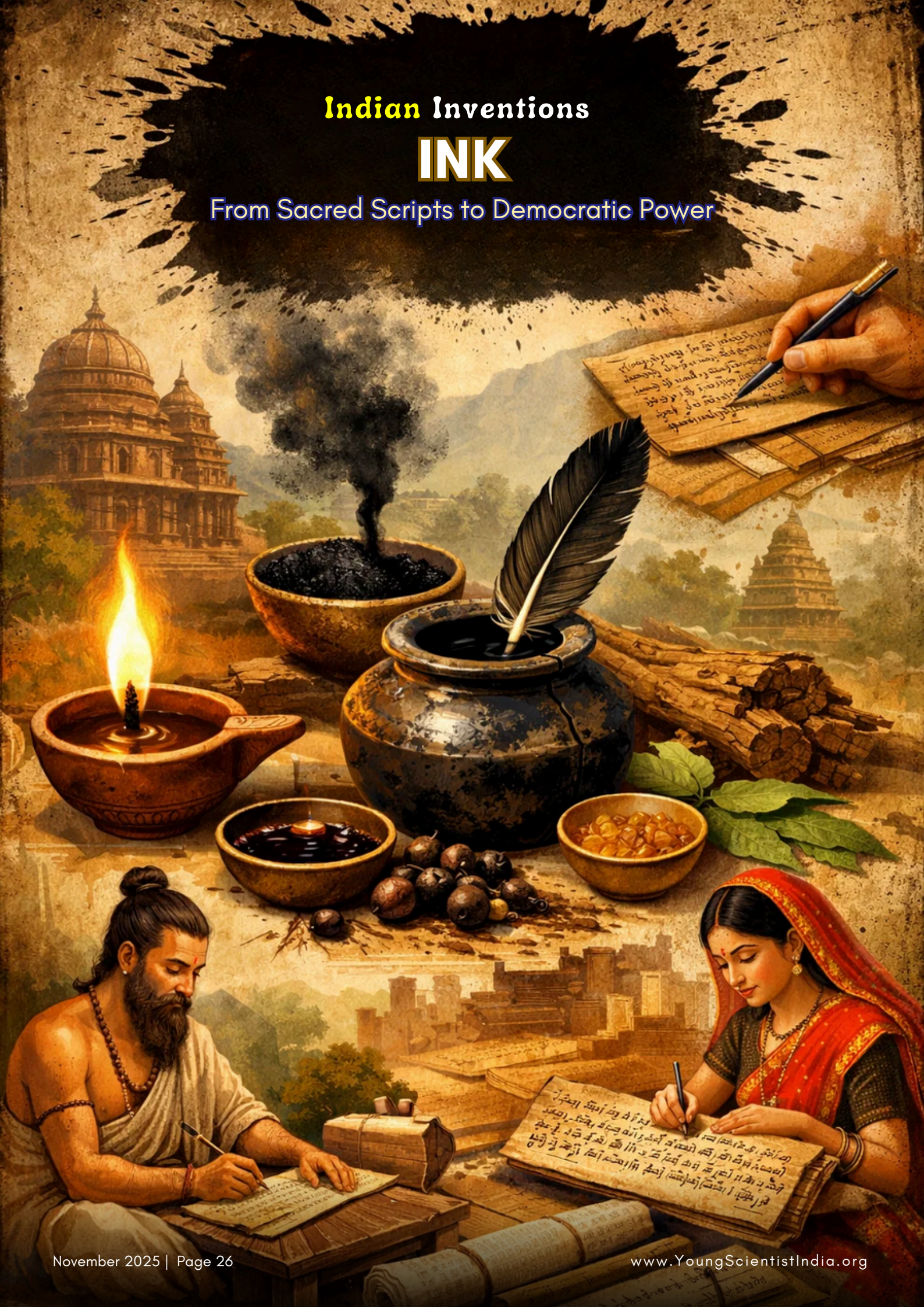
		6	5					8
	9	5					2	
7			9			3		
				4		2	7	
			8	7	3			
	7	9		5				
		2			8			9
	5					8	1	
3					5	4		

(Answers on Back Cover Inside)

Indian Inventions

INK

From Sacred Scripts to Democratic Power



Ink may look like a simple liquid, but its story in India is one of science, culture, and innovation stretching across thousands of years. Long before modern pens, printers, and ballots existed, Indians had already mastered the art of making ink, an invention that helped preserve knowledge, shape civilization, and even protect democracy.

Ink: A Simple Idea with Powerful Impact

Ink is a colored liquid or paste used for writing, printing, and drawing. While it may seem ordinary today, in ancient times, ink was a technological breakthrough. It allowed human thoughts to travel across generations, turning spoken ideas into permanent records. India was one of the early civilizations to develop its own sophisticated methods of ink - making.

India's Early Contribution: Masi

In ancient India, ink was known as Masi in Sanskrit. This early ink was made using locally available, natural materials:

- Lamp soot (carbon black) collected from burning oil lamps
- Plant extracts from bark, fruits, and leaves
- Gum and water are used as binders

This mixture created a durable, deep-black ink that could last for centuries. Masi was commonly used to write on palm leaves, birch bark, cloth, and handmade paper, long before modern paper became common.

Scholars at renowned ancient universities such as Nalanda and Takshashila relied on such inks to record knowledge in medicine, astronomy, mathematics, literature, and philosophy. Thanks to ink, ideas could travel beyond classrooms and lifetimes.

Why This Was a Major Innovation

The development of ink in India was not just a technical achievement; it was a cultural and intellectual milestone.

- **Preservation of knowledge:** Ink allowed sacred texts, scientific observations, and historical records to survive for generations.
- **Eco-friendly design:** Ancient inks were made from natural, biodegradable materials that were safe and long-lasting.
- **Cultural significance:** Writing with ink was often seen as a sacred act, especially while copying scriptures or creating intricate calligraphy.

Ink became deeply tied to India's educational traditions and cultural identity.

Modern Ink Innovations in India

India's contribution to ink did not end in ancient times. Even today, Indian scientists and industries continue to innovate.

1. Eco-Friendly Inks

Modern Indian researchers and companies are developing inks made from natural dyes and plant-based oils. These inks are used in sustainable printing practices that reduce pollution and environmental harm bringing innovation full circle back to nature.

2. Industrial and High-Tech Inks

Ink today goes far beyond writing. Indian innovations now include inks used in:

- Packaging and textile printing
- Electronics and circuit printing
- 3D printing and printed electronics

These advanced inks help power modern industries, showing how a traditional idea can evolve with technology.

The Pride of Indian Innovation: Voting Ink

Perhaps the most powerful example of ink as a tool for social innovation is voting ink.

Indelible voting ink, invented in India, ensures fair elections.

What Is Voting Ink?

Voting ink is an indelible ink that is applied to a voter's finger during elections. The mark cannot be easily erased and ensures that a person cannot vote more than once.

Who Developed It?

India's indelible ink was developed in 1962 by the National Physical Laboratory of India. The ink contains silver nitrate, a chemical that reacts with the skin and leaves a dark mark that lasts for several days.

Why Is This Ink Special?

- **Highly reliable:** It does not fade easily, even with washing or rubbing.
- **Safe:** It is non-toxic and harmless to the skin.
- **Affordable:** It is low - cost and easy to produce, even for elections with millions of voters.

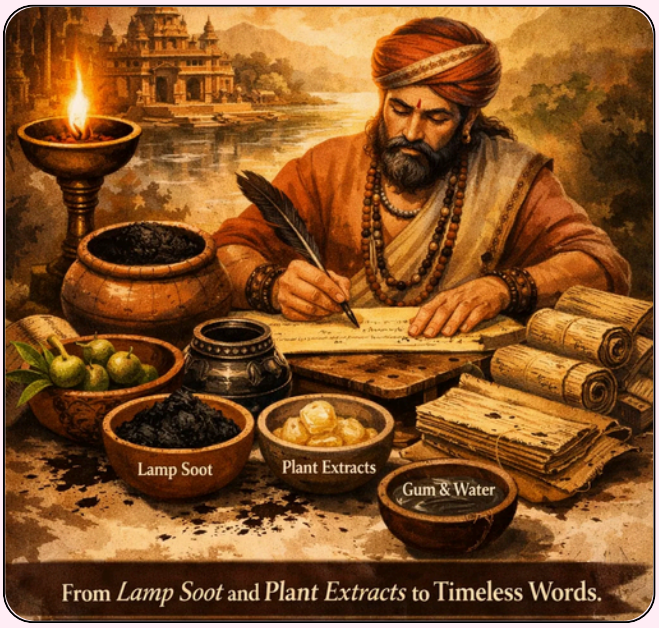
India uses this ink in the world's largest democratic exercises, and it is now trusted and appreciated globally. Many countries have adopted Indian made voting ink, making it a symbol of India's contribution to fair and transparent elections.

Why Ink Matters for Students Today

The story of ink shows students that innovation does not always start with complex machines. Sometimes, it begins with careful observation and simple materials.

- It shows how natural resources can lead to advanced technologies
- It inspires young minds to think creatively and responsibly

From ancient manuscripts to modern democracy, ink proves that even the simplest inventions can leave a permanent mark on the world.



A Lasting Legacy

Ink is more than a writing tool it is a quiet but powerful Indian innovation. Its journey from lamp soot to high-tech applications reminds us that true innovation lies in blending knowledge, purpose, and imagination.

Indian Scientist

Dr. Samir Kumar Brahmachari

(Born on 1 January 1952)

Have you ever wondered how new medicines are discovered, how doctors understand diseases at the genetic level, or how science helps fight pandemics? Behind many of these advances lies the work of scientists who study **life at its smallest scale** genes, proteins, and cells. One such scientist who played a major role in shaping modern biomedical research in India is **Samir Kumar Brahmachari.**

At the heart of Brahmachari's work is **molecular biology and genomics** the study of DNA and how it controls everything from eye colour to disease. DNA can be thought of as a giant instruction manual inside every cell. Understanding it helps scientists predict diseases, design better medicines, and even personalise treatments for individuals.

Brahmachari made important contributions to **drug discovery and systems biology**, a field that looks at the human body as a connected system rather than isolated parts. This approach is especially useful in tackling complex diseases like **diabetes, tuberculosis, cancer, and malaria,** where many genes and environmental factors work together.

The ideas he helped develop are now used in designing safer and more effective medicines.

for students, the real-life connections are everywhere. The science behind:

- Antibiotics and vaccines
- COVID-19 testing and genome sequencing
- Personalised medicine, where treatments are tailored to a person's genes
- all depend on the kind of research Brahmachari championed. When you hear about doctors using genetic data to choose the best treatment, you are seeing their field of work in action.

Beyond his own research, Brahmachari had a huge impact as a **science leader**. As Director General of the **Council of Scientific and Industrial Research (CSIR),** he helped transform India's laboratories into centres that focused on real-world problems. Under his leadership, CSIR labs worked on affordable medicines, diagnostics, and technologies that could directly benefit ordinary people—not just scientists.

He strongly believed that science should serve society. This meant encouraging collaboration between biologists, chemists, doctors, engineers, and even computer scientists. Today, fields like **bioinformatics**, which combine biology with computing and data analysis, are growing rapidly, creating exciting career paths for students interested in both science and technology.

Samir Kumar Brahmachari's journey shows students that biology is no longer just about memorising diagrams. It is about solving real problems that affect human lives. From medicines in pharmacies to health apps powered by genetic data, his work helps connect classroom biology to the world outside.

S&I Article

Who is an Innovator?

Awakening the creative scientist within you

When we hear the word innovator, we often imagine famous scientists, inventors, or tech founders. But innovation is not limited to laboratories, patents, or big discoveries.

At its core, an innovator is anyone who notices a problem, asks questions, and tries to find a better way. Innovators can be students, teachers, artists, engineers, or everyday people who refuse to accept "this is how it has always been done."

Innovation begins not with answers, but with curiosity.

Who Is an Innovator?

An innovator is someone who:

- Observes the world closely
- Feels curious about how things work
- Notices what is inefficient, unfair, or confusing
- Tries to improve existing ideas or create new ones

Innovators are not always the smartest people in the room. Often, they are the most curious and persistent. They are willing to try, fail, learn, and try again.

Qualities of a Good Innovator

While innovators come from different backgrounds, they often share a few key qualities:

- **Curiosity:** Asking "why?" and "what if?"
- **Problem sensitivity:** Noticing small problems others ignore
- **Courage:** Being unafraid of failure or mistakes
- **Patience:** Understanding that good ideas take time
- **Adaptability:** Changing approach when something doesn't work
- **Empathy:** Designing solutions that help real people

These qualities are not inborn talents – they are skills that can be developed.

Are You Creative? (Yes, You Are!)

Many students believe creativity belongs only to artists or writers. In reality, creativity is simply the ability to connect ideas in new ways. If you have ever:

- Found a shortcut to solve a problem
- Asked a question that others didn't
- Combined ideas from different subjects

You were being creative.

In science and innovation, creativity means imagining possibilities beyond what already exists. It is not about being "right" immediately; it is about exploring options fearlessly.

Developing Your Innovation Mindset: Skills for Success

An innovation mindset is a way of thinking that welcomes questions, experiments, and learning from failure. You can build this mindset by practising a few habits:

- **Observe deeply:** Look at everyday objects and systems how could they be improved?
- **Ask better questions:** Instead of "What is the answer?", ask "Why does this happen?"
- **Experiment often:** Small experiments teach more than perfect plans
- **Reflect:** After failure, ask "What did I learn?"

Innovation is a process, not a moment of sudden genius.

Wake Up the Innovator in You

The innovator in you is already there it just needs permission to think freely. Schools often focus on correct answers, but innovation begins when you are allowed to explore incorrect ones too.

Start small:

- Improve something in your classroom
- Solve a daily inconvenience at home
- Redesign a process that feels slow or confusing

Every innovation starts as a small idea taken seriously.

Thinking Like an Inventor: Unlocking Your Creative Science Mind

Inventors think differently. They don't see science as facts to memorise, but as tools to solve problems. When faced with a challenge, an inventor asks:

- What do I already know that can help here?
- Can ideas from another subject be applied?
- What happens if I reverse the problem?

Science becomes exciting when it is used as a lens to understand and redesign the world.

Thinking Outside the Box: Challenging Assumptions in Science

Many breakthroughs happen when innovators challenge assumptions. Questions like:

- Does it have to be done this way?
- What if the opposite were true?
- Who decided this rule, and why?

Thinking outside the box does not mean ignoring science it means questioning limits respectfully and intelligently. Some of the greatest discoveries happened because someone challenged what everyone else accepted.

The Science of Problem-Solving: How Innovators Think

Innovators follow a simple but powerful cycle:

1. Identify a problem
2. Understand it deeply
3. Imagine multiple solutions
4. Test and improve
5. Learn from failure and repeat

This method is used in laboratories, startups, and even everyday life. Innovation is science in action.

Final Thought: Innovation Is a Way of Seeing

Innovation is not about being extraordinary, it is about being attentive, curious, and brave.

So the next time you notice something that feels confusing, inefficient, or unfair, don't ignore it. That moment might be the beginning of your journey as an innovator.

Because innovation doesn't start in a lab. It starts in your mind.

Riddles 2511

1. I'm tall when I'm young and short when I'm old. What am I?
2. What has roots as nobody sees, is taller than trees, up, up it goes, and yet never grows?
3. What is invisible yet makes a big impact?
4. I'm a bond that can't be seen, tighter than the strongest seam. I hold the world together so tight, yet I'm invisible to the sight. What am I?
5. What element is found in our blood, giving life and flow?

(Answers on Back Cover Inside)

Floating House for Flood Affected Area

Tenzing grew concerned after hearing repeated reports of floods occurring across various parts of India year after year. Determined to find a solution, she observed a boat carrying many people and was inspired to design a floating house. In her design, the house is built on top of concrete pillars anchored into the land.

When water levels rise, water can flow freely between the pillars, reducing the force exerted on the structure and keeping it stable. This design not only ensures safety during floods but also offers protection during landslides, as the house is elevated and not directly attached to the land.

Tenzing Kunsang Lachenpa
6th Class

(Source: INSPIRE MANAK NLEPC 2021 Booklet)

To Prevent Accidents in Sharp Turns

Sharp turns and hairpin bends on hilly and narrow roads often restrict visibility, leading to frequent head-on collisions. This risk is especially high for students, two-wheeler riders, and daily commuters who use such routes regularly. Existing safety systems are often costly, power-dependent, or difficult to maintain in remote areas. This project proposes a simple, low-cost, and low-maintenance safety mechanism to alert drivers about approaching vehicles at blind curves. Designed to work without complex electronics, the system is well suited for rural and hilly regions. With an estimated cost of ₹10,000 per unit and about ₹40,000 for a four-unit setup, it is affordable, scalable, and suitable for implementation by local administrations to improve road safety.

Solution

The system works on a pressure-based magnetic signaling principle. A flexible pipe filled with water and containing a small magnet is placed on the road before a blind curve. When a vehicle passes over it, pressure pushes the magnet upward, activating a magnetic switch connected to an indicator light. The light warns vehicles approaching from the opposite direction. A similar setup enables two-way signaling. The system is easy to install, reliable, and ideal for accident-prone areas.

Jiwaiso Bellai
11th Class

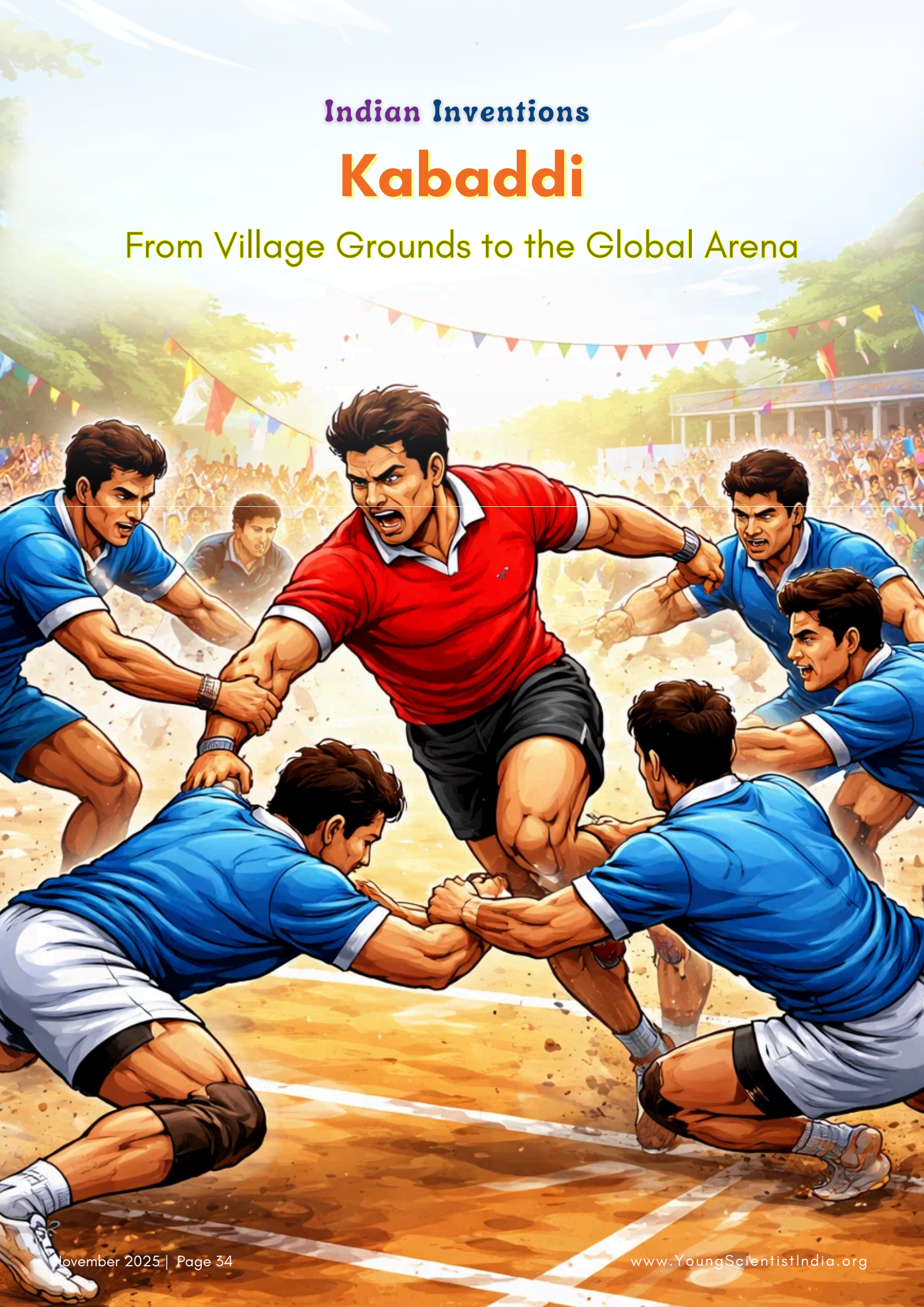
(Source: GYS Avishkar Awards 2025 Booklet)

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

Indian Inventions

Kabaddi

From Village Grounds to the Global Arena



Kabaddi is more than a sport it is a living example of Indian innovation rooted in simplicity, strategy, and strength. What began as a rural game played on mud fields has today transformed into a fast-paced, internationally celebrated sport. Kabaddi's journey shows how a simple idea, shaped by culture and necessity, can evolve into a global phenomenon.

Origins: A Game Born in Ancient India

Kabaddi originated in ancient India, especially in rural regions of present-day Tamil Nadu, Maharashtra, Punjab, and Haryana. Long before formal stadiums and leagues existed, Kabaddi was played in villages as part of daily life. It is widely believed that the game was developed as a training method for warriors, helping them build physical strength, sharp reflexes, mental alertness, and teamwork.

Unlike many sports that rely heavily on equipment, Kabaddi relied entirely on the human body and mind. This made it accessible to everyone, regardless of wealth or social status. In many ways, Kabaddi reflected the Indian philosophy of doing more with less.

How Kabaddi Is Played

The rules of Kabaddi are simple, yet the game is intensely challenging:

- Two teams compete on a rectangular court
- A "raider" from one team enters the opponent's half
- The raider must tag defenders while continuously chanting "Kabaddi, Kabaddi" in one breath
- The raider must return safely to their side without being tackled or losing breath
- If caught, the raider is out; if successful, points are scored

This unique combination of breath control, agility, and strategy makes Kabaddi unlike any other sport in the world.

Why Kabaddi Is an Innovation

Kabaddi stands out as an innovative sport for several reasons:

- **Breath control & stamina:** The continuous chant forces players to manage oxygen, endurance, and calm under pressure
- **No equipment needed:** Traditionally played on mud, Kabaddi requires no expensive gear
- **Simple rules, deep strategy:** Easy to understand, but extremely difficult to master
- **Cultural pride:** Kabaddi reflects Indian values of discipline, courage, and collective effort

It proves that innovation does not always mean complexity sometimes, it means refining simplicity.

From Rural Roots to Professional Sport

What truly sets Kabaddi apart is how it successfully transitioned from a local tradition to a professional, televised sport.

A major turning point came with the launch of the Pro Kabaddi League in 2014. With bright stadiums, prime time broadcasts, and city-based teams, Kabaddi suddenly reached millions of viewers across India and beyond.

Modern Kabaddi now uses:

- Video replays for decision-making
- Fitness tracking and performance analytics
- Professional coaching and sports science

Today, Kabaddi is played in over 30 countries and features in major events such as the Asian Games and Kabaddi World Cups.

Awards and Global Recognition

Kabaddi athletes and coaches have received some of India's highest sporting honours:

- Arjuna Award – For outstanding athletes
- Dronacharya Award – For exceptional coaches
- Major Dhyan Chand Khel Ratna Award – India's highest sports honor

On the international stage, India has won multiple gold medals at the Asian Games and several Kabaddi World Cups, cementing its dominance in the sport.

The Pro Kabaddi League has also introduced awards like Best Raider, Best Defender, Most Valuable Player, and Best Young Player encouraging excellence and inspiring young talent.

People Who Shaped Kabaddi's Growth

The professional organization of Kabaddi began with the Amateur Kabaddi Federation of India, which has governed the sport since 1950.

Several players have become household names and role models:

- Anup Kumar – Known for calm leadership and tactical brilliance
- Rahul Chaudhari – One of the top raiders in PKL history
- Pardeep Narwal – Famous for the iconic "dubki" move
- Ajay Thakur, Manjeet Chhillar, and Deepak Niwas Hooda – Other stars who elevated the sport

Their success stories show how traditional games can create modern sporting heroes.

Why Kabaddi Inspires Students

Kabaddi carries powerful lessons for young learners:

- Simple ideas can grow into global innovations
- Traditional knowledge can be modernized without losing identity
- Teamwork, discipline, courage, and quick thinking matter as much as physical strength

For students, Kabaddi is a reminder that innovation can come from playgrounds, villages, and cultural practices, not just laboratories.

A Living Symbol of Indian Innovation

Kabaddi is not just a sport it is a symbol of India's ability to transform tradition into global success. From mud courts to international stadiums, Kabaddi's journey reflects creativity, resilience, and pride. It stands as proof that when culture meets innovation, even the simplest games can conquer the world.

Indian Scientist

Tapan Misra

(Born On 20 January 1961)

What if doctors could treat brain tumours **without opening the skull**, without long hospital stays, and with extreme precision? This idea may sound futuristic, but it is already a reality—thanks to advances in **medical physics and radiation science.** One of the Indian scientists who helped bring this life-saving technology to patients is **Tapan Mishra.**

Tapan Mishra worked in the field of **radiation physics,** which combines physics, medicine, and engineering to treat diseases—especially cancer. While most students associate physics with equations on a blackboard, Mishra showed how physics can directly **save lives.**

He is best known for introducing and advancing **Gamma Knife radiosurgery** in India. Despite the name, the Gamma Knife is not a knife at all. It is a highly advanced medical machine that uses **focused gamma radiation** to treat brain tumors and certain neurological disorders. Instead, He is best known for introducing and advancing Gamma Knife radiosurgery in India. Despite the name, the Gamma Knife is not a knife at all. It is a highly advanced medical machine that uses focused gamma radiation to treat brain tumors and certain neurological disorders.

Instead of cutting through the body, doctors use hundreds of tiny radiation beams aimed precisely at a tumor. The tumor is destroyed, while the surrounding healthy brain tissue remains safe.

This technology has a real-life impact that students can easily relate to. Gamma Knife treatment means:

- **No open surger**y and no stitches
- **Less pain and faster recovery**
- Patients often return home the same or next day
- Safer treatment for tumors deep inside the brain

Before such technologies were available in India, many patients had to travel abroad for treatment, which was expensive and stressful. Tapan Mishra played a key role in making this advanced care **accessible within the country**, helping thousands of patients and families.

Mishra's work also highlights how **physics enters hospitals,** not just laboratories. Concepts students learn in school - like radiation, energy, waves, and precision measurement - are used in MRI scans, CT scans, cancer therapy, and nuclear medicine. His career showed that physics can be a powerful tool for healing, not just discovery.

Apart from his technical contributions, Tapan Mishra was deeply committed to **medical education and teamwork.** He worked closely with doctors, engineers, and researchers, showing that solving real-world problems often requires people from different fields working together. His efforts helped strengthen India's capacity in radiation oncology and medical technology.

Super Dikkel

Dhruthi Mundodi
7th Class

Super Dikkel is an innovative, eco-friendly device designed for processing and storing agricultural products. "Dikkel," a Tulu word meaning oven, reflects the core idea of the model. The device also supports cooking and water heating while offering improved protection from fire hazards and significantly reducing indoor air pollution. It is specially designed to use agricultural waste as fuel, making it both cost-effective and environmentally sustainable.

Super Dikkel can easily burn wet agricultural waste, withstand high temperatures, and use minimal fuel with maximum efficiency. It is safe for women and children, produces very little smoke, and helps prevent respiratory problems. The device has multiple uses, including cooking, heating water, drying crops like rubber sheets, coffee, pepper, coconuts, and areca nut, and providing storage space. It produces no ash or dust and includes a fire alarm system for added safety.

(Source: INSPIRE MANAK NLEPC 2012 Booklet)

Carry Comfort Belt

"Carry Comfort" is an ergonomic belt designed to reduce the physical strain caused by carrying heavy school and travel bags. Many students routinely carry bags heavier than recommended, leading to shoulder pain, back stress, poor posture, and reduced concentration. Traditional backpacks place excessive pressure on the shoulders, affecting long-term spinal health. Affordable and practical ergonomic solutions are rarely available, creating a need for a simple product that can improve comfort and well-being for daily users such as students, travellers, and delivery workers.

Mansi Chaurasiya
7th Class

Solution

The solution is a wearable belt system that shifts the load from the shoulders to the hips and back. It uses a 10 mm sunboard panel reinforced with a perpendicular wooden brace to distribute weight evenly, while adjustable nylon straps connect the bag to the waist for balance and stability. Testing with Arduino-based pressure sensors showed a 75% reduction in shoulder load. Designed using CAD tools, the belt is lightweight, compatible with most backpacks, low-cost, and easy to manufacture. Priced at ₹250-₹300, it offers strong market potential.

(Source: GYS Avishkar Awards 2025 Booklet)

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

Central Glass and Ceramic Research Institute (CGCRI)

The Central Glass and Ceramic Research Institute (CGCRI) is a leading research institute in India, located in Kolkata, West Bengal. Established in 1950 under the Council of Scientific and Industrial Research (CSIR), it focuses on research and development in glass and ceramic materials, supporting industries such as construction, electronics, healthcare and energy.

Key Research Areas

Glass Science and Technology: Development of high-strength, optical and thermal-resistant glass for electronics, telecommunications and industrial applications.

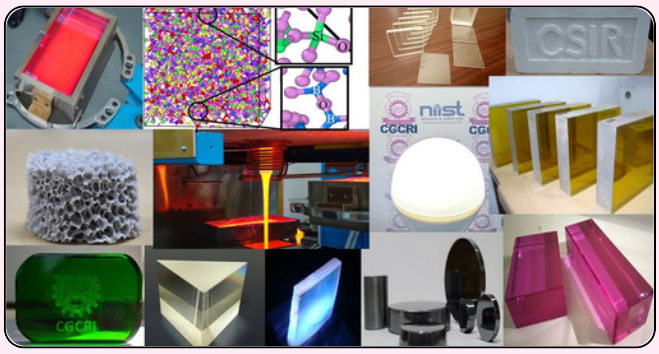
Ceramics and Advanced Materials: Study of traditional and advanced ceramics for use in aerospace, medicine and electronics.

Glass-Ceramics: Combination of glass and ceramic properties for applications in cookware, medical devices and electronics.

Ceramic Membranes by CGCRI

Glass and Ceramic Coatings: Protective coatings to improve resistance to wear, corrosion and environmental factors.

Biomedical Applications: Creation of bioceramics and biocompatible glass for implants and prosthetics.



Applications and Achievements

Industrial Applications: Advanced materials for construction, automotive and electronics industries.

Healthcare Innovations: Use of bioceramics in medical implants and tissue engineering.

Sustainability: Eco-friendly and energy-efficient manufacturing practices.

Collaborations and Mission

CGCRI mission is to advance glass and ceramic technology, making India a global leader in material science.

Conclusion

CGCRI is instrumental in developing innovative glass and ceramic materials, supporting industries like energy, electronics and healthcare. Through scientific research and sustainability efforts, it continues to shape the future of material science in India.


Innovation Training Module
FEEDBACK LOOPS
INTER-CONNECTIONS
SYSTEMS THINKING
CAUSALITY
HOLISTIC VIEW
ANALYZE PROBLEMS
IDENTIFY PATTERNS
FIND LEVERAGE POINTS
SEE THE BIG PICTURE

Why the World Is More Connected Than It Looks

When something goes wrong, we often search for a single cause.

- If traffic increases, we blame more cars.
- If exam stress rises, we blame the syllabus.
- If a river dries up, we blame less rainfall.

But real world problems rarely have single causes. They emerge from **many interconnected parts influencing one another over time.** When we try to fix such problems by addressing only one part, solutions often fail or create new problems.

This is where **systems thinking** becomes essential.

Systems thinking is a way of understanding the world not as isolated pieces, but as **interconnected systems**. It helps us see relationships instead of events, patterns instead of snapshots, and long-term consequences instead of quick fixes.

For innovators and scientists, systems thinking is not optional – it is foundational.

1. What Is a System?

A system is a set of parts that are connected and influence one another.

Examples include

- A school
- The human body
- A city's traffic network
- An ecosystem
- The education system

Every system has

- Elements (the parts)
- Connections (how parts interact)
- Purpose (what the system produces or maintains)

For example, a school is not just students and teachers. It also includes schedules, exams, rules, relationships, and expectations. Changing one element like assessment methods affects stress levels, teaching styles, and learning outcomes.

Systems thinking trains us to ask: *What are the parts here, and how do they influence one another?*

2. Events vs Patterns: Looking Beyond What Just Happened

Most people react to **events**

- A bad test score
- A traffic jam today
- A flood this year

Systems thinkers look beyond events to identify **patterns over time.**

Instead of asking, "Why did this happen today?", they ask:

- What has been happening repeatedly?
- What trends are forming?
- What is changing slowly beneath the surface?

One poor exam result is an event. Repeated anxiety before exams is a pattern. Innovation becomes possible when we understand **patterns created by the system,** not just isolated incidents.

3. Why Linear Thinking Is Not Enough

In school, we are often taught to think in straight lines:

Cause → Effect

This works for simple problems. But complex systems behave differently.

In systems:

- One cause can have many effects
- One effect can have many causes
- Effects may appear after long delays
- Solutions can change the problem itself

For example:

- Building more roads may reduce traffic briefly, but later increase it
- Studying longer hours may improve marks, but reduce curiosity and health

Systems thinking helps us move from **linear thinking** to **network thinking.**

4. Feedback Loops: How Systems Respond to Themselves

A key idea in systems thinking is the **feedback loop,** when actions produce results that influence future actions.

There are two main types

Reinforcing Feedback Loops

These amplify change.

- More screen time → less sleep → more tiredness → more screen time

Balancing Feedback Loops

These stabilise systems.

- Body temperature rises → sweating → cooling → stable temperature

Healthy systems balance both. Innovators learn to identify which loops are **strengthening a problem** and which can help **stabilise the system.**

5. Delays: Why Results Take Time

In many systems, actions and outcomes are separated by **time delays.**

Examples:

- Studying today affects results weeks later
- Tree planting affects the climate years later

Because of delays, people often:

- Lose patience
- Abandon good solutions too early
- Draw incorrect conclusions

Systems thinking reminds us that l**ack of immediate results does not mean lack of impact.**

6. Unintended Consequences: When Solutions Backfire

One powerful lesson of systems thinking is:

Today's solutions can become tomorrow's problems.

Examples:

- Extra homework improves discipline but increases stress
- Dams store water but damage downstream ecosystems
- Excessive exam coaching improves scores but weakens understanding

Systems thinkers always ask:

- What might happen next?
- Who else is affected?
- What new problems could appear?

7. Systems Thinking in Science

Science itself is built on systems.

- The human body is a system of organs
- Ecosystems connect living and non-living elements
- Climate is a global system of air, water, land, and energy

Understanding science deeply means understanding **relationships**, not just parts. Systems thinking turns science from memorisation into **meaningful understanding**.

8. Quick Fixes vs Lasting Solutions

Humans love quick fixes. Systems resist them. Quick fixes:

- Address visible symptoms
- Ignore deeper causes
- Work briefly, then fail

Systems thinkers focus on root causes and leverage points, places where small, thoughtful changes can create lasting impact.

9. Leverage Points: Small Changes, Big Impact

A leverage point is a place in a system where a small shift produces big results.

Examples:

- Changing incentives instead of adding rules
- Improving feedback instead of increasing control
- Shifting mindsets instead of forcing behaviour

Innovation is not about working harder – it is about **intervening smarter.**

10. Systems Thinking in Student Life

Students live inside systems every day:

- School timetables, exams, peer groups
- Family routines and expectations
- Social media algorithms and feedback

Systems thinking helps students:

- Understand repeating patterns
- See their role within systems
- Make thoughtful choices instead of reactive ones

11. A Simple Systems Exercise

Choose a familiar problem

- Exam stress
- School cleanliness
- Screen addiction

Ask:

1. What are the parts of this system?
2. How do they interact?
3. Where are feedback loops?
4. Are there delays?
5. Where might a small change help?

This trains the mind to see connections instead of assigning blame.

This trains the mind to see **connections instead of assigning blame.**

Indian Scientist

Waman Dattatreya Patwardhan

Padma Shri (1974)

(30 January 1917 – 27 July 2007)

When a fighter jet breaks the sound barrier, a rocket slices through the atmosphere, or engineers design objects to withstand extreme speeds and pressures, they rely on concepts from **applied mathematics and aerodynamics**. One of the Indian scientists who quietly shaped this world of high-speed science was **Waman Dattatreya Patwardhan.**

At first glance, mathematics may feel distant to students full of symbols and formulas on paper. But Patwardhan showed that mathematics can be deeply practical. His work helped explain how **air flows around fast - moving objects, especially at supersonic speeds**, where air behaves very differently from what we experience in everyday life.

When an aircraft flies faster than the speed of sound, it creates shock waves - sudden changes in pressure that can cause loud sonic booms and place significant stress on the aircraft.

Understanding these shock waves is essential to designing safer and more efficient planes and missiles.

Understanding these shock waves is essential to designing safer and more efficient planes and missiles. Patwardhan made important contributions to the mathematical theories that explain how these shock waves form, move, and interact.

So how does this connect to real life? The principles Patwardhan worked on are used in:

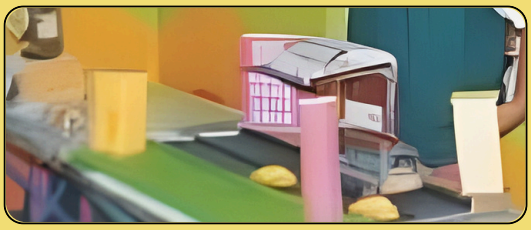
- **Aircraft design**, helping engineers reduce drag and improve fuel efficiency
- **Missile and rocket technology**, where stability at high speeds is critical
- **Space research,** where vehicles must survive extreme forces during launch and re-entry
- **Automobile and bridge design**, where airflow and pressure affect safety and performance

Patwardhan worked closely with India's growing scientific and defense ecosystem at a time when the country was building its own technical capabilities. His research supported India's efforts to become self-reliant in areas like **aeronautics and defence technology**, reducing dependence on foreign designs and expertise.

Beyond his technical contributions, Patwardhan was also known as a **teacher and mentor**. He believed that strong foundations in mathematics and physics were essential for innovation. Many of his students went on to work in engineering, research, and national laboratories, applying classroom concepts to real-world challenges.

For students, Patwardhan's life offers an important lesson: **math is not just about exams - it shapes the modern world.**

Wireless Energy In Transport In a Bus



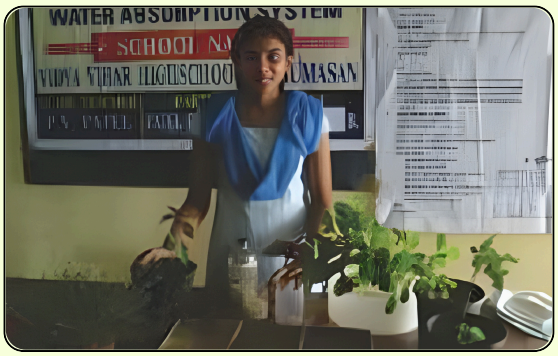
Wireless power transfer is the transmission of Electrical power from a power source to a consuming device without using solid wire or conductors. Wireless transmission is useful to power electrical devices.

In cases where interconnecting wires are inconvenient or hazardous. We can use this regularly, as it is pollution-free, friendly to the ecosystem, and of low cost.

(Source: INSPIRE MANAK NLEPC 2015 Booklet)

Z. Ram Gopal
8th Class

Water Absorption System



Introduction: Today, the world is facing a serious issue of water scarcity, especially in many Asian countries where rainfall is irregular and natural water sources are limited. This situation calls for innovative ways to use minimal water while achieving maximum crop yield in farming, gardening, horticulture, terrace gardens, and other agricultural activities. Sometimes, even people struggle to find enough water for daily use—imagine the condition of plants under such circumstances.

Patel Divyani Bhikhabhai
12th Class

To address this challenge, this project uses diaper technology, which applies a mixture of cotton and sodium polyacrylate as a water-absorbent material. This substance can store water and release it slowly, helping plants survive longer with less frequent watering. This project not only offers a practical solution but also sparks curiosity and scientific interest among students, demonstrating the role of science in solving real-world problems.

Rationale Behind the Construction of the Exhibit: Air, water, and sunlight are nature's most valuable gifts. Although two-thirds of the Earth's surface is covered with water, the amount of freshwater available for human and agricultural use is increasingly insufficient. With rapid urbanisation and industrialisation, water consumption has grown significantly, leading to scarcity.

Many regions experience inconsistent rainfall, which adversely affects agricultural productivity. This water absorption system provides an effective solution for agricultural nurseries, horticulture, and home gardening by conserving water while supporting healthy plant growth.

(Source: INSPIRE MANAK NLEPC 2016 Booklet)

Central Food Technological Research Institute (CFTRI)

Central Food Technological Research Institute (CFTRI) is one of India's most respected scientific institutions working in the field of food science and technology. Located in Mysuru, Karnataka, CFTRI was established in 1950 and operates under the Council of Scientific and Industrial Research (CSIR). The institute plays a key role in improving the quality, safety, and availability of food in India.

Food is a basic need for everyone, and CFTRI works to ensure that food is **nutritious, safe, affordable, and long-lasting.** Scientists at CFTRI study different types of foods—grains, fruits, vegetables, milk products, bakery items, and traditional Indian foods—and develop better ways to process, preserve, and package them. This helps reduce food waste and ensures that people get healthy food throughout the year.

One of CFTRI's most important areas of work is **food processing technology**. Fresh foods like fruits and vegetables spoil quickly if not handled properly. CFTRI develops methods to dry, freeze, can, or package foods so that they stay fresh for longer periods. These technologies are especially helpful for farmers, food industries, and small entrepreneurs, as they help increase income and reduce losses after harvest.

CFTRI also focuses strongly on **nutrition and health**. Scientists here work on improving the nutritional value of food by adding essential vitamins, minerals, and proteins. The institute has developed special foods for children, pregnant women, elderly people, and patients with specific health needs. Such research supports national programs related to child nutrition and public health.

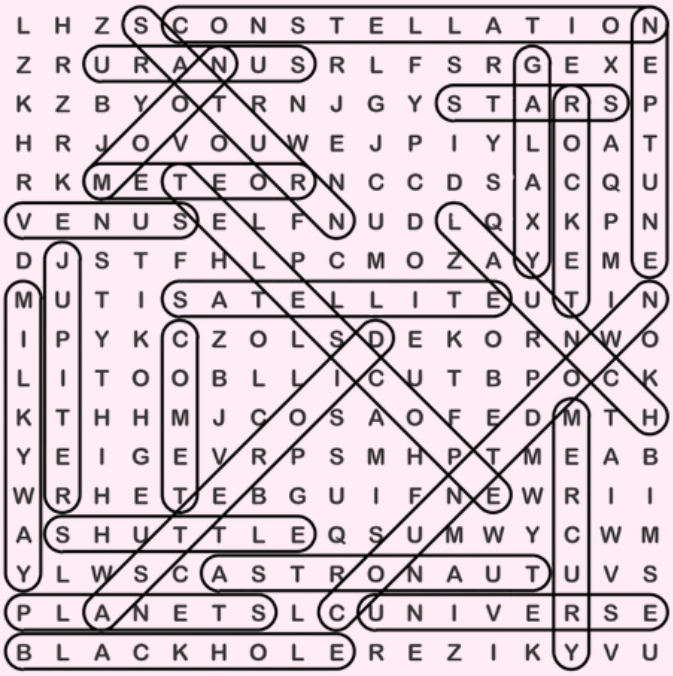
Another important contribution of CFTRI is in **traditional and indigenous foods**. India has a rich variety of traditional foods, and CFTRI studies these foods to improve their quality and shelf life without losing their taste or cultural value. This helps take Indian foods to global markets while keeping them safe and standardized.

Education and training are also a major part of CFTRI's mission. The institute trains students, food technologists, and entrepreneurs through courses, workshops, and internships. School and college students often visit CFTRI to see laboratories and learn how science is applied in everyday food items like bread, biscuits, noodles, and snacks.

Solution
Sudoku Challenge 2511

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

Solution
Word Search 2511



Riddle 2511 Answer

1. A Candle **2. A Mountain** **3. Wind** **4. Gravity** **5. Iron**

GYS CHARAKA SCIENCE MEDAL

A National Online 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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