

Young Scientist India

A Science & Innovation Magazine for School Students

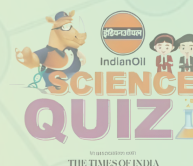
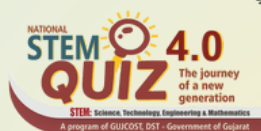
SCIENCE & INNOVATION

NAEST
NATIONAL ADVANCED EXPERIMENTAL SKILL TEST

THINQ
INDIAN NAVY QUIZ



Viksit Bharat
Buildathon



NMMS



COMPETITIONS & AWARDS



SCHOOL
INNOVATION
MARATHON



GURSARAN PRAN TALWAR
KAILAS NATH KAUL
VIJAY KUMAR KAPAHI

MIND MAPPING
CRITICAL THINKING
WEARABLE TECHNOLOGY
THE INNOVATION MINDSET

Young Scientist India

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From the Editor's Desk

Welcome, Young Scientists!

Greetings to all our bright and budding innovators. It brings me immense joy to present another edition of *Young Scientist India*. As always, even this month, we have curated some genuinely interesting and inspiring content designed specifically for your curious minds.

The most exciting section, both for us as writers and you as learners, is undoubtedly our **Training Modules**. This month, we focus on two pivotal techniques: "**Mind Mapping**" and "**Critical Thinking**." You might wonder why these are necessary. The answer lies in the journey of innovation itself; while creativity sparks the idea, critical thinking and mind mapping provide the structure to make that idea a reality. We often talk about innovation, but we rarely pause to ask *why* it is so important to embark on this path. Don't worry, we have that covered. Our article, "**The Innovative Mindset**," dives deep into the purpose behind the process.

I know that, down the line, many of you might be dreading going back to "boring" school subjects tomorrow morning. However, you might be surprised to learn that these schools have a not-so-boring history. When you read about how the education system was molded over centuries and how many dignitaries sculpted the perfect framework, you might actually change your mind! Do check out the article "**Systematic Organized Education System**."

Speaking of school subjects, how many of you open the Algebra chapter in Mathematics and think, "*Why am I even learning this?*" Well, I was once in your shoes. But our article on "**Algebraic Abbreviations**" actually makes the topic interesting and easy to digest. We cover the complete history of this profound Indian invention and explain how Algebra is actually relatable, useful, and very real in our daily lives.

Moving from math to magic—can you believe that just two numbers, when used correctly, changed the whole world? It is true. They are **Binary Numbers**. Read the article to learn how these numbers, which trace their oldest roots back to ancient India, became the core language of today's digital world.

Finally, our Cover Story this month is on the "**Science and Innovation Competitions and Awards**." These platforms are essential for shaping young ideas into future innovations. This article serves as a one-stop solution to kick-start your competitive journey. Also, don't forget to have a look at the innovations of your fellow students that were bravely presented on national platforms like the **GYS Avishkar Awards** and **Inspire Manak**.

I hope this issue inspires you to look at your textbooks and the world around you a little differently. Stay tuned for more such exciting content in the months to come.

Stay curious and keep creating!



Vennela Valiveti, B. Des.
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Wearable Technology

The Future You Can Wear!



Have you ever wished you had a personal AI assistant on your wrist or clothing that could track your deepest sleep, coach your workout, and even call for help if you fell? Well, stop wishing, because that future is **already here**. Welcome to the world of **Wearable Technology**—smart electronic devices you wear on or close to your body.

Wearables aren't just gadgets; they're the ultimate merger of **fashion, function, and cutting-edge science**. They help you stay healthy, informed, and connected by combining the comfort of clothing with the power of technology.

Today, your wrist is the dashboard for your life, turning everyday actions—like walking to school or sleeping—into valuable streams of data.

The Hidden Tech You Didn't Know Existed

In today's fast-developing world, we all know about the common wearable tech like **smartwatches** that let you call or text, and **fitness trackers** that count your steps and calories burned.

But did you know that wearable technology extends far beyond your wrist?

- **Smart Clothes (E-Fabrics):** These aren't just jackets; they have **sensors woven into the fabric** that can track your posture, monitor muscle activity, adjust warmth based on the weather, or even monitor your sports performance.
- **Implantable Devices:** These are small, smart devices placed inside the body to monitor serious health conditions and deliver accurate, real-time data, pushing the boundaries of biomedical engineering.
- **Smart Patches and Tattoos:** In the future, or even now in testing labs, tiny smart tattoos are being developed to non-invasively monitor things like glucose levels for diabetic patients. Imagine getting a subtle, temporary tattoo that keeps your health in check!

This shift shows that tech isn't something you carry anymore—it's something you wear, live, and breathe.

Your Wearable Arsenal: Types of Smart Gear

The world of wearables is massive and constantly growing, but here are the key players shaping your life right now:

1. Smartwatches and Fitness Trackers

These are the most popular devices. While smartwatches are feature-rich (time, date, calls, sleep monitoring, appointment alerts), fitness bands are simpler and focused primarily on health goals, tracking steps, heart rate, and calories. Many even have features to detect falls and call emergency services, making them useful for safety.



2. Smart Glasses and Headsets

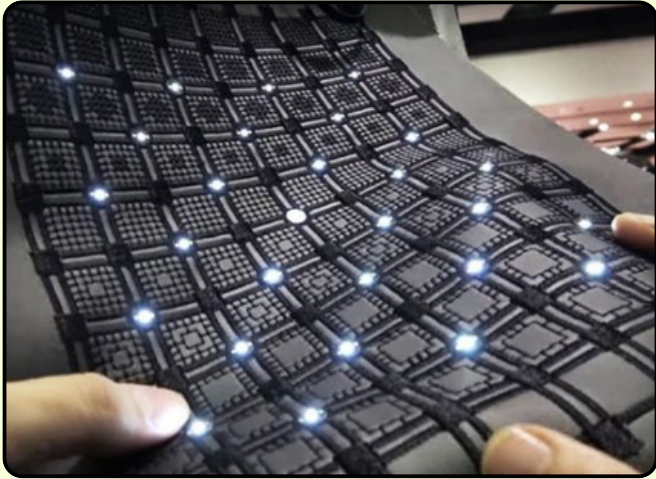
Devices like VR (Virtual Reality) and AR (Augmented Reality) headsets are opening up new worlds for learning.

- **Learning is Lit:** Students can use VR headsets to take **virtual tours of ancient cities**, explore outer space with simulations, or even practice complex technical skills in a safe 3D environment.
- **Hands-Free World:** Smart glasses can display directions, take hands-free photos, or even **translate languages instantly** right in front of your eyes. Future versions might even include smart contact lenses that can zoom in when you blink.

3. Biometric and Implantable Tech

These devices are the **superheroes of health monitoring**. Biometric wearables, like smart rings or advanced bands, use sensors that touch your skin to detect heart rate, body temperature, oxygen levels (SpO₂), and even your electrical heart activity (ECG).

This data is sent via Bluetooth to your phone, where apps translate it into easy-to-read health reports.



The Science Behind the Magic: How it Works

You might wonder how a small device on your wrist knows so much about you. It's a simple four-step process rooted in physics and computer science:

- 1. Sensors Collect Data:** Tiny sensors, often accelerometers for movement or optical sensors for heart rate, collect raw data (steps, temperature, heart rate) from your body.
- 2. Microprocessor Analysis:** A small but powerful chip called a microprocessor analyzes and crunches those numbers.
- 3. Connectivity Sends Data:** Wi-Fi or Bluetooth tools send the processed data to a server or your smartphone.
- 4. Apps Display Results:** The app on your phone takes that information and shows it to you in a fun, graphical, and easy-to-understand way, like how many calories you burned or the quality of your sleep.

Made in India: The Wearable Revolution

Wearable tech is not just a global trend; India is a major player, driven by innovative homegrown brands and startups.

- **Homegrown Brands Win:** Indian brands like Noise and boAt have rapidly become top vendors in the country, especially with their affordable yet feature-rich smartwatches and audio wear. Noise, for instance, has focused on localising its production, with 90% of its smartwatches being manufactured right here in India.
- **Health and Payments:** Indian innovation is making tech more functional.

1. The Smart Ring: IIT-Madras-incubated Muse Wearables launched the Ring One—a smart ring that lets users make instant and secure contactless payments simply by tapping it, without needing a phone, card, or wallet. It partners with NPCI to use the RuPay network.



2. Pocket ECG: Noida-based startup Agatsa developed **SanketLife**, a pocket-sized ECG device that screens heart conditions affordably.

His innovation is a game-changer for providing diagnostics in rural areas, bridging the healthcare gap.





- **Lifestyle Coaching:** **GOQii** is a famous Indian platform that integrates fitness trackers with personalised human coaching to help users make permanent shifts toward a healthier lifestyle.

These examples show that wearable technology in India is about **accessibility, affordability, and solving real-world challenges**—not just counting steps.

What's In It For You: The Benefits

Beyond the cool factor, wearable tech delivers some serious benefits:

- **Health and Fitness Coaching:** It encourages you to move, assists with monitoring chronic conditions like diabetes or blood pressure, and helps detect early signs of health problems by tracking heart rate and temperature.
- **Safety and Emergency:** Many devices act as a digital guardian, offering GPS tracking and the ability to call emergency services automatically if a fall is detected. Astronauts even rely on smart suits to monitor their health in the challenging environment of space.

- **Better Learning and Communication:** Smart translators and VR headsets make learning more immersive, while smart glasses and earbuds give you hands-free access to information and updates.

Your Future Career is Waiting!

Wearable technology is a revolution that needs minds like yours. If you're excited by this field, here are a few career paths you could explore:



- **Biomedical Engineer:** Design the health-focused sensors and implantable devices.
- **Fashion Technologist:** Blend clothing with smart technology and e-fabrics.
- **Software Developer:** Build the engaging apps that translate data into health reports.
- **AI Specialist:** Create systems that use the data from wearables to learn, predict, and adapt to individual user needs.

Wearable technology is the future you can literally put on. It's an exciting intersection of science, fashion, medicine, and engineering. By understanding how this tech works, you are already one step closer to shaping the next wave of innovation!

Think Taste - Drink Taste

Water plays an important role in our body mass, accounting for 70%. However, humans often don't drink enough water due to its lack of taste. "Think Taste Drink Taste" is a product designed to promote sufficient water intake.



It is a bottle cap design to which 4 essence tubes are attached, each tube containing different essences like strawberry, lemon, peach, orange, etc. More essences can be added. Similar to how perfumes work, the essence is present in liquid form.



When the lid of that tube is opened, it comes out in a gaseous form, which, when inhaled through the nose, the olfactory nerves present in the nostrils create a taste on the taste buds of the tongue. This makes a person drinking plain water feel the taste of flavoured water. For example, if lemon essence is used, the plain water would taste like lemon water.



Garv
9th Class

(Source: GYS Avishkar Awards 2023 Booklet)

Link for the project's video presentation

<https://www.youtube.com/watch?v=4fPN8efkfVM&t=19s>

A Healthy - Blackboard Duster

The "Healthy Black Board Duster" is a very simple and easy-to-use tool. No electricity or batteries are used. This project addresses a very common problem, chalk dust spreading all over while using a duster, and when inhaled, it causes many problems like asthma, allergy, hair loss, eye infections, etc.



A Healthy Black Board Duster is quite easy to make.



Chakka Chenna Sridevi
9th Class

The materials required are 1 box with two chambers (one big and one small), a sponge, and two iron nails & nuts. Attach the iron nails in the bigger chamber of the box. Roll a layer of sponge around each iron nail. Now cover the small chamber with a lid. While using this duster on a board, both the sponges rotate in opposite directions, and the chalk dust gets collected in the smaller chamber. This solution is tried and tested as well.

(Source: GYS Avishkar Awards 2023 Booklet)

Link for the project's video presentation

<https://www.youtube.com/watch?v=FcH3xNE9mJ0>

Indian Scientist

Gursaran Pran Talwar

Pioneer Who Turned Science into Service



(BORN IN OCT 2, 1926)

Imagine creating a vaccine that doesn't fight a disease—but prevents pregnancy safely by using the body's own immune system. Or discovering a cure that helps fight one of the world's oldest illnesses, leprosy. These aren't scenes from a science fiction novel—they are real breakthroughs by **Dr. Gursaran Pran Talwar**, one of India's most respected scientists and a global pioneer in **immunology and vaccine research**.

Born on **October 2, 1926**, in Hisar, Haryana, Dr. Talwar's journey in science began with a simple curiosity about how the human body protects itself. Immunology—the branch of science he mastered—is the study of our body's defense system, known as the immune system. It explores how our body recognizes and fights germs, infections, and even abnormal cells like cancer. Through this field, Dr. Talwar found ways to use the immune system itself as a tool to prevent and treat diseases.

Scientific Contributions

Dr. Talwar developed the **world's first birth control vaccine** based on the human chorionic gonadotropin (hCG) hormone. This immunological contraceptive was a revolutionary step in reproductive health—it was safe, reversible, and empowered women to make choices about their bodies. He also created **India's first leprosy vaccine** using a bacterium he discovered, *Mycobacterium indicus pranii* (MIP). This vaccine not only helped cure leprosy but also showed promise against tuberculosis, offering hope to millions.

Beyond his laboratory discoveries, Dr. Talwar transformed India's scientific landscape. He founded the **National Institute of Immunology (NII)** in 1981, shaping it into a hub of world-class research. As the **Director-General of the Indian Council of Medical Research (ICMR)**, he strengthened India's health research infrastructure and mentored generations of scientists. His leadership proved that excellence in science can thrive with passion, perseverance, and purpose.

Honors and Awards

Dr. Talwar's work has earned him prestigious honors, including the **Padma Bhushan (2001)**, the **Shanti Swarup Bhatnagar Prize**, and France's **Legion of Honour**. He has authored over **400 scientific papers and books**.

For students, Dr. Talwar's story is a shining example of how curiosity can change the world. He reminds us that every great discovery begins with a simple question—and that true innovation lies in using science to serve humanity.



Cover Story

Science & Innovation Competitions & Awards

Have you ever looked at a problem in your school or neighborhood and thought, “I wish I could fix that”? Or perhaps you’ve imagined building a robot, designing an app, or discovering something new in space? If so, then science and innovation contests are the perfect launchpad for your ideas.

Across India, thousands of young students are stepping beyond textbooks to explore, invent, and solve real-life challenges. These competitions are not just “events” – they are exciting journeys where creativity meets science, and imagination transforms into innovation.

Whether you are in Class 6 or Class 12, whether you love robotics, environmental science, coding, or space, there is a competition waiting to bring out the innovator in you.

Welcome to the world of Indian science and innovation contests, a world where curiosity is celebrated, ideas are transformed and young scientists like you shape the future.

Why Science & Innovation Competitions Matter

Science contests are not about memorising formulas or answering trick questions. They encourage you to **think**, **explore**, and **create** – the three pillars of real scientific learning.

Here’s what participation gives you:

- **Hands-on learning:** Turning ideas into models, prototypes, apps, or research projects.
- **Teamwork & leadership:** Collaborating, brainstorming, and dividing tasks creatively.

- **Exposure & recognition:** Opportunities to meet scientists, visit research labs, and represent India internationally.
- **Confidence & communication:** Presenting your ideas to judges builds public speaking skills.
- **21st-century skills:** Creativity, critical thinking, design thinking, problem-solving, and scientific temperament.

Most importantly, these competitions help you connect your knowledge with real-life applications; whether it's saving water, improving health, reducing plastic waste, or building a smart device for daily problems.



Major Science & Innovation Contests in India

Let's explore the biggest and most exciting competitions happening right now — each offering a unique way for students to explore science and innovation.

1. INSPIRE Awards - MANAK

Organised by: Department of Science & Technology (DST), Govt. of India

Target Group: Classes 6-10

The INSPIRE MANAK Awards aim to identify India's future innovators early.



Students submit **original ideas or inventions** that solve everyday problems, from farming challenges to home safety, healthcare, energy, and environmental protection.

Selected ideas receive **₹10,000** to build a working prototype. Projects then progress through **District → State → National** exhibitions, giving students real exposure to scientists and experts.

This is one of the largest innovation platforms in India, empowering lakhs of students every year.

2. AIM Viksit Bharat Buildathon

Organised by: Atal Innovation Mission, NITI Aayog

Target Group: School & college innovators, ATL & non-ATL teams



This national tech challenge encourages students to build solutions that support India's development goals.

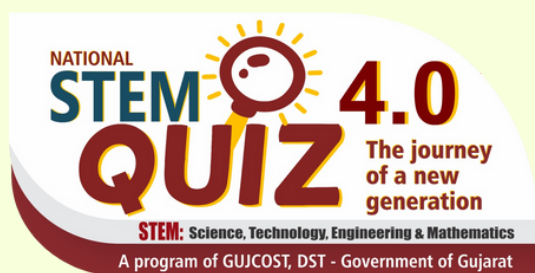
Participants work on pressing themes such as **AI for governance, health & nutrition, digital payments, agriculture, clean energy, and urban innovation.**

Teams get mentorship, access to tools, and opportunities to convert ideas into deployable products. Projects with high impact stand a chance to scale across the country – making it a space where ideas can become reality.

3. GUJCOST National STEM Quiz

Organised by: Gujarat Council on Science & Technology

Target Group: Primarily school students from Classes 6-12



This quiz fuels curiosity in Science, Maths, Technology, and Space through exciting question rounds and rapid-fire challenges. It helps students strengthen fundamentals in physics, chemistry, biology, astronomy, innovation, and everyday science applications.

Teams compete at the district and state levels before reaching the national platform. A great choice for learners who enjoy thinking fast, reasoning logically, and learning beyond textbooks.

4. Atal Tinkering Lab (ATL) Innovation Marathon

Organised by: Atal Innovation Mission, NITI Aayog

Target Group: Students of ATL schools (mostly Classes 6-12)

ATLs are creativity hubs where students experiment with:

- Robotics
- IoT
- Drones
- 3D printing
- AI and machine learning
- Sensors and electronics

The ATL Marathon challenges students to build tech-based solutions for themes like clean energy, agriculture, education, mobility, and community problems. Winners receive awards, mentorship, and even **internships** with world-class organisations.

5. Vidarthi Vigyan Manthan (VVM)

Organised by: Vigyan Prasar, NCERT & Vijnana Bharati

Target Group: Classes 6-11



VVM is a digital-age science examination that promotes:

- Scientific temperament
- Knowledge of Indian scientists
- Logical thinking
- Real-world application of science

The competition includes an **online exam**, followed by **state-level camps** and a **national-level convention**.

6. GYS Avishkar Awards

Organised by: GETA Young Scientist Program

Target Group: Classes 6th to 10th



These awards celebrate creative solutions to everyday problems, like it's water-saving devices, affordable tools for farmers, low-cost tech innovations or sustainability ideas.

Selected students receive national recognition to scale their innovations further. The competition inspires young minds to invent boldly and think practically.

7. ISRO Young Scientist Program - YUVIKA

Organised by: Indian Space Research Organisation (ISRO)

Target Group: Class 9 students



YUVIKA is a dream programme for space lovers! Selected students attend a **two-week residential program** at ISRO centres, where they learn about:

- Space science
- Satellite building
- Rocket technology
- Astronomy
- Hands-on experiments

Selection is based on academics, quizzes, sports, and extracurricular achievements. It is one of India's most prestigious STEM learning opportunities.

7. National Children's Science Congress (NCSC)

Organised by: National Council for Science & Technology Communication (NCSTC), DST

Target Group: 10-17-year-olds

NCSC is famous for its motto:

"Science for the People and People for Science."

Students investigate **real-life community problems** through scientific methods — like water scarcity, pollution, agriculture, or biodiversity. The idea is to learn science by doing it in the real world. It's one of India's most respected research platforms for school students.

International Competitions (Open to Indian Students)

India's best young minds also shine at global platforms. Here are the biggest ones open to Indian school students:

1. Google Science Fair

A fully online global competition where students submit projects that solve real-world problems using science or engineering. It is accessible, flexible, and perfect for self-driven innovators.



Who can apply: Ages 13-18

Why participate: Scholarships, mentorship, and global visibility.

2. Breakthrough Junior Challenge

Students create a short, creative video explaining a complex scientific or mathematical concept. It's a unique challenge that blends science with storytelling.

Who can apply: Ages 13–18

Why participate: One of the world's highest-value scholarships: **\$250,000** for the student and a **\$100,000** science lab for their school.

3. Regeneron ISEF (USA)

The world's largest pre-college science competition. Students present high-level research or engineering projects.

Entry from India: Through IRIS National Science Fair

Why participate: Global recognition, interaction with scientists, and scholarships up to **\$75,000**.

4. GENIUS Olympiad

Focuses on environment-related projects across science, robotics, art, or literature. Hosted by the Rochester Institute of Technology (RIT).



Who can apply: High school students

Why participate: International medals, certificates, cultural exchange, and potential scholarships.

5. Technovation Girls

Teams build mobile apps and AI-based solutions for community problems. It is one of the most empowering global competitions for young girls in technology.



Who can apply: Girls aged 10–18

Why participate: World-class mentorship, global pitch events, and awards that encourage tech-based social impact.

6. International Junior Science Olympiad (IJSO)

A prestigious competition for science-loving students aged 14–15, testing physics, chemistry, and biology through conceptual and analytical questions.



Entry from India: Through HBCSE Olympiad Programme

Why participate: Training camps, global exposure, and India's consistent track record of winning medals.

What Judges Look For (Common Evaluation Criteria)

Across competitions, judges look for:

- Originality & creativity
- Scientific method & technical understanding
- Real-world relevance
- Working model, prototype, or experiment
- Clarity of presentation & documentation
- Social or environmental impact

Even a simple idea can win if it is unique, meaningful, and well-explained.

How These Contests Shape Young Innovators

Science contests play a vital role in nurturing India's future scientists and innovators. They help.

- Spark curiosity and creativity
- Encourage problem-solving
- Discover hidden talents
- Promote innovation culture in schools
- Build scientific temper (as emphasised by Article 51A(h) of the Constitution)
- Make learning meaningful and applied
- Boost confidence and communication skills
- Involve teachers, parents, and communities
- Create future researchers, engineers, and entrepreneurs

In short, these competitions turn classrooms into laboratories of imagination.

Easy Tips for Students to Succeed

Here are simple ways to shine in any science or innovation contest:

Here are simple ways to shine in any science or innovation contest:

1. **Pick a meaningful problem** – something you care about.
2. **Be original** – think beyond what others have done.
3. **Research deeply** – read, observe, ask questions.
4. **Document everything** – keep notes, drawings, photos.
5. **Build a simple model** – even a basic prototype works.
6. Explain clearly – tell the story behind your idea.
7. **Practice your presentation** – confidence matters!

8. Work well in teams – share tasks and help each other.

9. Seek feedback – teachers and mentors can guide you.

10. Enjoy the journey – learning is the real reward.

Remember: Every great scientist started with curiosity.



Conclusion: Competitions Are Gateways to a Brighter Future

Science and innovation contests are more than just competitions; they are platforms of possibility. They empower students to imagine bold ideas, experiment fearlessly, solve real-world problems, and gain confidence to pursue careers in science, technology, engineering, research, and innovation.

Whether you win a medal or not, the experience transforms you. You begin to see the world differently, as a place full of problems waiting for your solutions.

So dream big. Build bravely. Think differently. The next big innovation might just come from you, and these contests could be your first step toward changing the world.

S N Bose National Centre for Basic Sciences, Kolkata

In the heart of Salt Lake, Kolkata, stands a remarkable institution that celebrates India's legacy of scientific brilliance, the S. N. Bose National Centre for Basic Sciences (SNBNCBS). Established in 1986 to honour Professor Satyendra Nath Bose, the legendary physicist who revolutionized quantum mechanics through his collaboration with Albert Einstein, the Centre is a vibrant hub for research in the physical and chemical sciences.

Over the past few decades, SNBNCBS has grown into one of India's leading autonomous research institutes under the Department of Science and Technology (DST), Government of India. Its mission is simple yet profound: to explore the mysteries of the universe through basic research and inspire new generations of scientists.

Where Ideas Take Shape

The Centre focuses on areas such as

- Quantum materials
- Soft matter
- Astrophysics
- Nanoscience and Photonics

This may sound complex, but it's what fuels tomorrow's technologies, from quantum computing to advanced materials and clean energy solutions.

The Centre also houses state-of-the-art laboratories with advanced instruments that allow scientists to study matter at the smallest scales. The Centre for Advanced Functional Materials, for example, investigates materials that can revolutionize electronics and clean energy solutions.



Connecting with Young Minds

What makes SNBNCBS truly special is its dedication to spreading scientific awareness. The Centre regularly organizes science camps, open days and lectures for students and teachers. These programs allow young learners to interact with scientists, visit research labs, and experience how scientific ideas turn into discoveries.

Through initiatives like INSPIRE internships and outreach programs, SNBNCBS helps school and college students understand that science isn't just about textbooks, it's about asking questions, experimenting and thinking critically.

Carrying Forward Bose's Legacy

Satyendra Nath Bose once said that science is a "continuous pursuit of knowledge." The Centre that bears his name carries this spirit forward every day. It reminds us that India's scientific journey thrives on curiosity, creativity and courage to explore the unknown.

So, the next time you wonder why the sky glows or how light bends, remember at SNBNCBS, someone might already be exploring the same question, turning curiosity into discovery.

Indian Scientist

Kailas Nath Kaul



(1905 – 1983)

Few scientists have combined knowledge, compassion, and national service as beautifully as Kailas Nath Kaul. A visionary botanist, naturalist, and environmentalist, Kaul was a world expert on palm trees (Arecaceae) and a key architect of India's scientific and environmental awakening. He founded the National Botanical Research Institute (NBRI) in Lucknow and inspired leaders like Indira Gandhi to champion environmental conservation.

"Science must live in the fields, not just in the laboratories." — K.N. Kaul

Building India's Green Science

Born in Lucknow in 1905, Kaul studied biochemistry and genetics in India and abroad, gaining a strong foundation for his scientific career. In 1948, he established NBRI, which became one of the world's top five botanical gardens. He also became the first Indian scientist at the Royal Botanic Gardens, Kew (UK) and collaborated with institutions like the Natural History Museum, London, and Cambridge University.

He led botanical surveys across India, from the Himalayas to Kanyakumari, and helped develop botanical gardens in Indonesia, Japan, Thailand, and Sri Lanka. His work made Indian botany internationally respected.

Science for People

Kaul used science to solve real problems. His Banthra Formula reclaimed thousands of acres of saline land in Uttar Pradesh, helping farmers grow crops in harsh soils. In the Thar Desert, he used aerial surveys to locate freshwater aquifers, solving long-standing water shortages.

He revived Mughal gardens in Jammu and Kashmir and, as Vice Chancellor of Chandra Shekhar Azad University, strengthened agricultural research. Through his Vigyan Mandir (School of Science) program, he promoted hands-on learning for students across India.

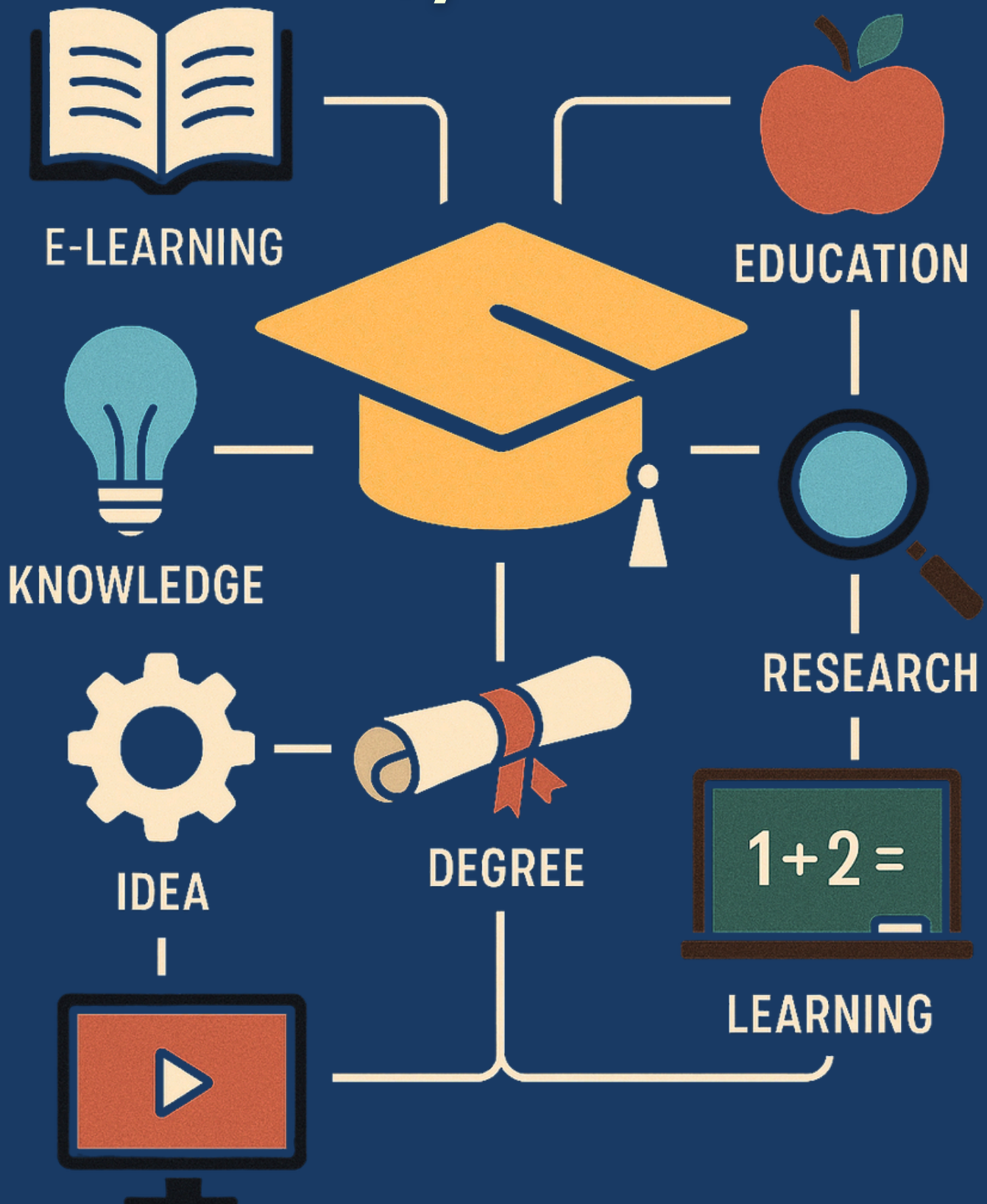
Freedom Fighter and Reformer

Kaul joined the freedom movement in 1930, working with Gandhiji and Khan Abdul Ghaffar Khan. He was jailed during the Civil Disobedience Movement, where he taught fellow prisoners. Later, he educated Dalit children and worked to end untouchability.

Honors and Legacy

Kaul received the Padma Bhushan in 1977, and the plant genus *Kaulinia* was named after him. The K.N. Kaul Institute of Life Sciences and K.N. Kaul Block at NBRI continue his legacy.

Systematic Organized Education System



Education is not just about books, classrooms or exams. It is the process that shapes our minds, values and vision for the future. Across centuries, human societies have realised that to make education meaningful, it must be **systematic, organised, and accessible** to all.

A **systematic organised education system** means a structured approach to learning, one that ensures uniformity, quality, and equal opportunity. It involves everything from a well-defined curriculum and trained teachers to proper assessments, governance, and infrastructure. This organised framework is what makes education a powerful force for national development and innovation.

What Is a Systematic Organised Education System?

A systematic education system is one where learning happens through a planned and structured process. Governments or educational institutions design it carefully to make sure that all children, regardless of where they live, get access to similar quality education.

It includes:

- **A hierarchy of levels** – from preschool to university.
- **A standard curriculum** – designed by boards or ministries.
- **Trained teachers** – who understand both subjects and pedagogy.
- **Assessments and evaluations** – that measure what students have learned.
- **Governance systems** – that ensure rules, policies, and quality control.

In simple terms, it is the backbone that keeps learning fair, organized and effective.



Types of Education in the System

India's education system recognizes different kinds of learning – because not all knowledge comes from textbooks.

1. **Formal Education** – Structured learning that happens in schools, colleges, and universities.
2. **Non-formal Education** – Training and skill programs offered by NGOs, community centers, or vocational institutes.
3. **Informal Education** – Learning through life: from family, media, or experiences.
4. **Special Education** – Tailored teaching for students with physical or mental challenges.

Together, these forms of education ensure that learning continues throughout life, inside and outside the classroom.

A Journey Through History: From Gurukuls to Global Classrooms

The idea of systematic education is not new. It has evolved over thousands of years across cultures and civilizations.

Ancient India – The Gurukul System:

Dating back to the Vedic period (~1500 BCE), students lived with their gurus, learning everything from philosophy and astronomy to mathematics and logic. Though informal, it was deeply organised and holistic.



China – The Confucian Model:

Confucius (551-479 BCE) believed education was the path to moral perfection. His model introduced discipline, ethics, and civil service examinations — a highly organised structure that influenced East Asia for centuries.

Greece – The Philosophical Foundations:

Thinkers like Plato and Aristotle founded the world's earliest "academies" and "lyceums," establishing the concept of curriculum and subject-based education.

Medieval Europe:

Church and cathedral schools began formal education for clergy, which later evolved into famous universities like Oxford and Bologna setting the stage for higher education.

The Birth of Modern Education Systems

The first **modern, state-controlled, systematic education system** was born in **Prussia (Germany)** in the 18th century under **Frederick the Great**.

This model introduced ideas that we still follow today:

- Fixed curriculum
- Trained teachers
- Age-based classes
- Standard textbooks
- State-funded education for all

This Prussian model inspired education systems in the United States, Japan, and later, British India.

India's Education System Under British Rule

The modern Indian system traces its roots to the British colonial period. In 1835, Lord Macaulay introduced an English-based, exam-focused education policy aimed at creating an administrative class.

This led to the establishment of universities like:

- University of Calcutta (1857)
- University of Bombay (1857)
- University of Madras (1857)

While it created the foundation for modern schooling, it also narrowed education to memorization and examinations. Later Indian thinkers worked to reform this.



Reformers Who Shaped Modern Education

- **John Dewey (USA):** Advocated learning by doing – focusing on creativity and exploration.
- **Horace Mann (USA):** Known as the “Father of the American Public School System.”
- **Rabindranath Tagore (India):** Criticized rote learning and founded Santiniketan, promoting learning through nature and art.
- **Mahatma Gandhi:** Introduced Nai Talim – combining education with work, values, and community service.

These reformers showed that education should not just inform minds but also transform lives.

India’s Modern Education Framework

Post-independence, India made education a national priority. The **National Education Policy (NEP) 2020** restructured learning to be flexible, interdisciplinary, and innovation-driven.

It encourages:

- Coding and design thinking in schools
- Multilingual learning
- Integration of technology
- Equal opportunities for all genders and backgrounds

Boards like **CBSE** and **ICSE**, along with state boards, continue to standardise and modernise curricula. Programs like **Atal Tinkering Labs**, **Digital India**, and **Skill India** bring hands-on innovation directly into classrooms.

Conclusion

The systematic organized education system we have today is not the work of a single inventor – it is the result of centuries of evolution, shaped by kings, philosophers, reformers, and teachers across the world.

In India, this system continues to grow stronger – blending ancient wisdom with modern innovation. It ensures that every student, whether in a city or a village, gets a fair chance to learn, dream, and innovate.

Riddles 2508

- 1.What has many teeth but can’t bite?
- 2.What has hands but can’t clap?
- 3.What has to be broken before you can use it?
- 4.What gets sharper the more you use it?
- 5.What goes up but never comes down?

Sudoku Challenge 2508

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

(Answers on Back Cover Inside)

Mini Mobile Tower

The student has developed a multipurpose gadget designed to address various challenges encountered during travel, particularly in isolated areas. Comprising multiple components, each equipped with specialised features, this innovative device offers effective solutions for diverse situations.

The first component provides assistance to individuals in danger in remote areas by establishing a strong network based on the principles of electromagnetism and aluminum foil, ensuring long-lasting connectivity.

The second component supplies power to charge mobile phones in areas without electricity. Another feature allows users to retrieve missing documents through a QR code that stores scanned copies of important documents. Additionally, the device includes an automatic communicator that sends alert messages to designated emergency contacts.



A special chip integrated into the mobile and radar system helps reduce radiation emitted by the device. By combining multiple functions, this gadget offers an affordable, user-friendly, and environmentally conscious solution to various travel-related challenges. Its portability makes it convenient to carry, ensuring accessibility whenever needed.

(Source: INSPIRE MANAK NLEPC 2024 Booklet)



Anas Faizan
8th Class

Saree Folding Machine

A saree is a traditional Indian garment for women, consisting of a long, wide piece of cloth that many women own in abundance. However, folding, washing, and handling sarees can be time-consuming, and many women today have limited time for these tasks. To address this problem, Riya designed the Sari Folding Machine.



This machine is not only helpful for individuals but also benefits society, including garment merchants and laundry businesses. It saves both time and labor while being affordable and efficient. In the future, additional features can be added, such as drying wet sarees, counting the number of folded sarees, or even transforming it into a fully automated robot or motor-operated device.

(Source: INSPIRE MANAK NLEPC 2023 Booklet)



Riya Mahesh Mahangade
8th Class

Planetariums in India

Have you ever looked up at the night sky and wondered what lies beyond those twinkling stars? Planetariums are magical places that bring the universe closer to us, helping young minds like yours explore the mysteries of space, stars and planets without leaving Earth!

A planetarium is a dome-shaped theatre where the night sky is projected using advanced technology to simulate stars, planets, and galaxies. With an incredible 360-degree view that surrounds you completely, it feels like you are actually travelling through space while sitting comfortably in your seat.

A Journey Across India's Planetariums

India has several planetariums that inspire budding scientists and astronomers. One of the most famous is the **Nehru Planetarium in New Delhi**, established in 1984. It hosts fascinating sky shows about the solar system, black holes and India's space missions. Students often gather here to watch live projections of celestial events like solar and lunar eclipses.

Down south, the Jawaharlal Nehru Planetarium in Bengaluru is a hub of astronomical learning. Operated by the Bangalore Association for Science Education, it organises popular "Know Your Stars" programs and public sky-watching sessions where telescopes are set up for everyone to gaze at planets and constellations.

In Mumbai, the **Nehru Science Centre and Planetarium** offers interactive experiences that blend science and fun.

The Birla Planetariums in Kolkata, Chennai and Hyderabad are also among India's oldest and most visited. The Birla Planetarium in Kolkata, opened in 1963, is one of Asia's largest and conducts multilingual shows to reach students from all backgrounds.



Learning Beyond Classrooms

What makes planetariums special is how they transform complex concepts into awe-inspiring visuals. Instead of reading about galaxies, you see them swirling above you. Instead of imagining a rocket launch, you experience it. This immersive form of learning helps young people understand astronomy, physics and even mathematics in exciting new ways.

Many planetariums now collaborate with schools, conduct space camps, and organize quizzes and astronomy fairs, encouraging students to think critically, ask questions, and explore the unknown.

The Universe Awaits You

Planetariums are not just theatres of stars, they are gateways to imagination. Every visit sparks curiosity, and curiosity is the first step in science!



S&I Article

The Innovation Mindset

How to Build a Student Mindset Towards Innovation?

In a world that's changing faster than a WhatsApp message can go viral, science and innovation aren't just cool subjects in a textbook; they are the **superpowers** you need to solve real-life problems and truly improve quality of life. Think of it this way: the industries of tomorrow, from AI and space tech to health tech, are built on fresh, creative ideas. To keep up with global progress and be the next generation of researchers, entrepreneurs, and leaders, you need to develop one crucial thing: **The Innovation Mindset**.

It's not some complex, jargon-filled concept. It's simply the mental framework that fuels **creativity, experimentation, and problem-solving** with a bold, forward-thinking attitude. Instead of just passively memorising facts, this mindset empowers you to be an active creator, an inventor of solutions.

Why This Mindset is Your Golden Ticket

The question isn't if you should develop this mindset, but how fast. Why is it so essential for high school students today?

1. Future-Proof Your Career

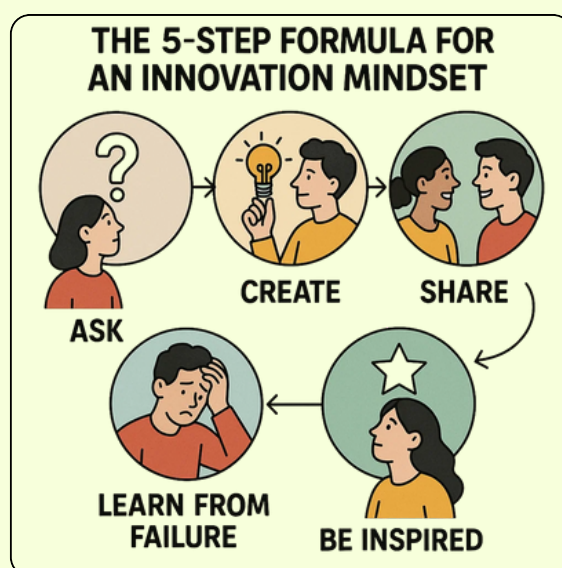
The jobs your parents have might not even exist a decade from now. The future needs thinkers, creators, and innovators, not just people seeking routine jobs. By training your mind to innovate, you are making yourself indispensable to the industries driving economic growth, whether that's engineering, business, medicine, or education. Students with this mindset become great leaders and thinkers.

2. Become a Real-World Problem Solver

An innovative mindset teaches you how to think critically and find creative solutions to problems, rather than simply relying on old answers. It's about handling real-life challenges with smart ideas, like designing a water-saving method for your school or figuring out an effective recycling plan. It boosts your creativity in science, technology, art, and even daily life.

Your Innovation Training Ground: The 5-Step Formula

So, how do you actually build this powerful mindset? The great news is you don't need a fancy lab. You can start right now, in your classroom, home, and community.



Step 1: Ask the Bold Question

Innovation begins with curiosity. Don't be afraid to express your thoughts, and especially, don't be afraid to ask **"Why?"** or **"What if?"**. Your classroom should be a hub for open discussion and curiosity. When you're encouraged to explore ideas freely and ask questions, the door to innovation swings wide open.

Step 2: Learn by Doing (Hands-On is Key!)

You can read all the instructions in the world, but nothing beats doing the actual experiment. Hands-on learning, science experiments, and working on real-life projects help form the crucial idea of '**learning by doing**'. Think of it like building a mini startup lab in your mind; you're constantly experimenting and testing. Using digital tools like coding apps and robotics kits makes this modern and fun.

Step 3: Present, Share, and Collaborate

Innovation thrives on teamwork and empathy. Get comfortable presenting your ideas in class, school exhibitions, or science fairs. This not only builds your communication skills but also inspires your peers and gets you feedback that can make your idea 10x better.

Step 4: The Mindset of the Phoenix: Rise From Failure

This is perhaps the biggest secret: **Failure is not the opposite of success; it's part of the learning curve.** When an idea or project doesn't work, you shouldn't feel sad or stop trying. Instead, you should see it as a valuable chance to learn something new, correct the error, and try again. Success truly comes after many tries, and learning from your mistakes builds both confidence and strong problem-solving skills.

Step 5: Find Your Role Models (and Become One)

Look up to people who have walked this path. Innovation doesn't just happen in a vacuum; it's inspired by those who dared to try. In India, role models are everywhere:

- **Dr. A.P.J. Abdul Kalam:** The "Missile Man" continues to inspire millions to dream big and work hard.
- **Kiran Mazumdar-Shaw:** She showed that global businesses can start small in India, innovating in biotechnology with a relentless spirit.
- **Your Teachers:** They are your first mentors, creating the safe space where your journey begins.
- **Local Entrepreneurs:** People who solve everyday problems in your community with smart, simple ideas are innovators too.

Made in India: Young Innovators Inspiring Us All

To truly grasp the power of this mindset, look no further than young Indian students who turned their school projects into real-world solutions.

1. Vinisha Umashankar (Tamil Nadu)

At just 14, Vinisha saw a problem: street ironing carts that rely on polluting coal. Her solution? She designed a **solar-powered ironing cart**. This invention uses solar panels to generate electricity, making it eco-friendly and cost-effective.

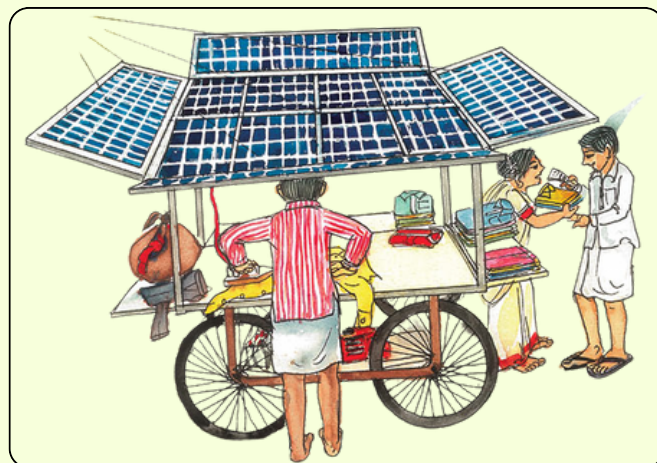


Image Source: <https://nif.org.in/innovation/solar-ironing-cart/1114>

That's innovation improving the environment and the economy at the same time!

2. Harshwardhan Zala (Gujarat)

Harshwardhan was also 14 when he created a prototype for a landmine-detecting drone. His invention uses sensors and cameras to scan dangerous areas, offering a safer way to deal with landmines. His bold idea even led to him signing a ₹5 crore Memorandum of Understanding (MoU) with the Gujarat government to develop the drone further!



3. Siddharth Mandala (Self-Defense Tech)

Siddharth spent five years developing "Electro Shop," a wearable **self-defence device**. This device can electrocute attackers and simultaneously send alerts to family and the police during emergencies.

These stories show that you don't need a PhD or decades of experience to create something impactful. You just need a problem, a forward-thinking attitude, and the courage to experiment.

Your Impact on Tomorrow

When you master the innovation mindset, you're doing more than just getting good grades. You're securing a brighter future for everyone.

- **Technological Advancements:** You'll create new technologies that improve daily life, communication, and healthcare.
- **Social Improvement:** You'll help solve massive social problems like poverty, healthcare inequality, and access to resources.

The goal is to transform every classroom into a launchpad for real-world impact. When you feel confident and proud to see your ideas working, you're ready to share even more.

The future is bright, and it belongs to the innovators who dare to imagine boldly, act fearlessly, and reflect deeply. Your innovative journey starts now!

Your Next Step: Go Compete!

To take your journey further, check out our Cover Story on "Science and Innovation Contests and Awards".

These competitions are the perfect training ground, forcing you to practice all five steps of the Innovation Mindset—especially Hands-On Learning and Rising From Failure—turning your classroom theories into award-winning, real-world solutions.

These events make you tougher and more confident, preparing you to become the future's global problem-solvers and business leaders.

Indian Inventions

Algebraic Abbreviation

When you solve a math problem like $2x + 3 = 7$, you are using something that began in ancient India: algebraic abbreviation. It's the art of representing numbers and operations through symbols and letters instead of long sentences. This powerful idea made mathematics faster, smarter, and universal, and its roots lie deep in the Indian tradition of learning and logic.

From Words to Symbols: How Algebra Began

Thousands of years ago, before symbols like x , y , or $+$ were invented, mathematicians wrote equations entirely in words. Imagine having to write this:

"A number, when doubled and increased by three, gives seven."

That's quite long, right? But when you write it as $2x + 3 = 7$, the idea becomes simple and clear.

This is the magic of algebraic abbreviation. It means using letters, signs, and symbols to represent mathematical operations and unknown numbers. In this system, " x " is the unknown (which we call a variable), and the equation is like a small puzzle waiting to be solved. By replacing words with symbols, we can solve many similar problems just by changing the numbers without rewriting everything.

India's Ancient Mathematicians: The Original Innovators

India has a long and proud history in the field of mathematics. Ancient scholars didn't just use numbers; they shaped how we think about them.

Around 500 CE, the great Indian mathematician **Brahmagupta** introduced letters and abbreviations to represent unknown quantities in his book *Brahmasphutasiddhanta*.

He used Sanskrit letters like "ya," "ka," and "na" to stand for unknowns, just like how we use "x," "y," and "z" today. He also defined the rules of zero, positive and negative numbers, and equations.

Brahmagupta's symbolic style inspired later scholars like **Bhaskara II**, who expanded these ideas further in his works Lilavati and Bijaganita (literally meaning "the seed of calculation").

Centuries later, these Indian methods spread to the Islamic world through translations, where the word "al-jabr" (meaning "restoration") gave rise to algebra. From there, it travelled to Europe, and now, it's part of every student's education worldwide. So the next time you see an equation, remember you're continuing an Indian scientific tradition that began more than 1,400 years ago.

Why Algebraic Abbreviation Is Important

Algebraic abbreviation makes mathematical ideas compact, logical, and easy to handle. Here is why it is essential:

- **Saves Time and Space:** It replaces long paragraphs with short formulas.
- **Universal Language:** Symbols can be understood across countries and languages, just like music or science.
- **Encourages Logical Thinking:** Algebra trains your brain to find patterns, connections, and relationships.

Simple Examples in Education:

- **Geometry:** The formula for the area of a rectangle, $A = l \times b$, is an abbreviation instead of writing "area equals length multiplied by breadth."

- **Speed:** $\text{Speed} = \text{Distance} \div \text{Time}$ is a form of abbreviation that helps us calculate quickly.
- **Science:** Newton's formula $F = m \times a$ (Force = Mass \times Acceleration) is algebra in action.

Algebra Around You: From Daily Life to Future Tech

You might not notice it, but algebraic abbreviations are everywhere in daily life:

- **Banking Apps:** When interest is calculated, formulas like $SI = (P \times R \times T) \div 100$ are used.
- **Cooking:** Doubling a recipe means multiplying quantities in an algebraic relationship!

Why It Matters to Young Innovators?

Understanding these abbreviations builds not only math skills but also innovation skills. Every field, from physics to computer programming, uses algebraic expressions.

- **Coding:** Every computer program uses logic and symbols based on algebraic principles.

Developing computational thinking is a key to future technologies like AI and robotics. India's legacy in mathematics proves that big ideas often begin with small symbols.

Conclusion

Algebraic abbreviation is more than just a way to shorten math problems; it's a way of thinking clearly and expressing ideas efficiently. From Brahmagupta's Sanskrit letters to modern equations, this invention shows how India's mathematical wisdom shaped global knowledge.



Innovation Training Module

Mind Mapping

Organize Your Thoughts

Hello students! Are you looking for a smarter, faster, and more fun way to take notes, study for exams, and understand complicated topics? Mind mapping is a simple, yet powerful technique that helps you organize ideas visually. It uses diagrams organizing ideas around a central theme. Instead of writing lists, you use keywords, short phrases, colors, images, and lines (like branches of a tree) to connect ideas to the theme. This method makes it easier to understand, remember, and

present your thoughts, especially during science and innovation projects. Mind mapping makes studying more effective and less stressful.

A mind map is a diagram that starts with a central idea in the middle, with branches radiating outward to represent subtopics, concepts, or related information. Each branch can further split into smaller branches, creating a tree-like structure that shows relationships between ideas.

Mind maps help students in summarizing chapters, preparing for exams, or organizing research. Aid professionals in project planning, meeting notes, or strategy development. Assist creative people in brainstorming storylines, designs, or marketing campaigns.

Benefits

Mind mapping is an exceptionally powerful tool for learning. High school students can benefit from Mind Mapping in many ways:

- **Boosts Memory & Recall:** By using color, images, and keywords, information sticks better. Studies suggest mind mapping can boost retention by 10-15%.
- **See the Big Picture:** Puts an entire chapter or topic onto a single page, showing you how all the different concepts are connected. Clarifies Complex Ideas.
- **Sparks Creativity:** The non-linear, radial structure encourages the free flow of ideas, helping you generate new thoughts,

solutions, or ideas quickly for essays, projects, or creative writing.

- **Exam Preparation:** Summarize entire chapters into one page for quick revision.
- **Efficient Note-Taking:** Replaces long, boring notes with visual summaries. You only jot down keywords and essential ideas. Since you only write down keywords, note-taking is faster. This saves time and keeps you actively engaged.
- **Better Essay & Project Planning:** Helps you structure your thoughts clearly before you start.
- **Facilitates Collaboration:** In group projects, a shared mind map provides a clear, visual record of all ideas and tasks, making it easier for team members to contribute, track progress, and see how their work fits into the main goal.
- **Effective Problem-Solving:** By mapping out challenges and possible solutions, it supports logical and creative thinking.

Mind Mapping can be used for Specific Tasks in a Classroom

Academic Goal	How to Use a Mind Map
Note-Taking in Class	Write only keywords and connect them as the teacher speaks. Don't worry about order; you can re-order/connect later
Essay Planning	Central Idea = Your Thesis Statement. Main Branches = Your Body Paragraph Topics. Sub-Branched = Supporting Evidence, Quotes, or Examples.
Exam Revision	Central Idea = The Subject/Unit Name. Main Branches = Key Chapters/Topics. Sub-Branched = Formulas, Definitions, Dates, or important figures.
Project Planning	Central Idea = The Project Goal. Main Branches = Tasks, Materials, Team Members, Deadlines, and Potential Challenges.

Example

Here is an example to show you how a mind map helps in exploring, understanding, and solving problems systematically.

Central Idea: Reducing Back Pain for Farmers During Weeding

1. Problem Understanding

- Farmers bend for long hours while weeding
- This leads to back pain and body strain
- Productivity reduces due to discomfort
- Improper posture and heavy tools are major reasons

2. Existing Tools and Their Limitations

- Hand-held weeders: require bending
- Long-handle weeders: sometimes heavy
- Power weeders: costly and not easily available
- Some tools are not ergonomic or comfortable to use

3. Idea Generation

- A lightweight long-handle weeding tool
- Adjustable height to match different users
- Built-in seat support for comfort
- Use of lever system to reduce effort
- Adding a rotating blade for easier weeding

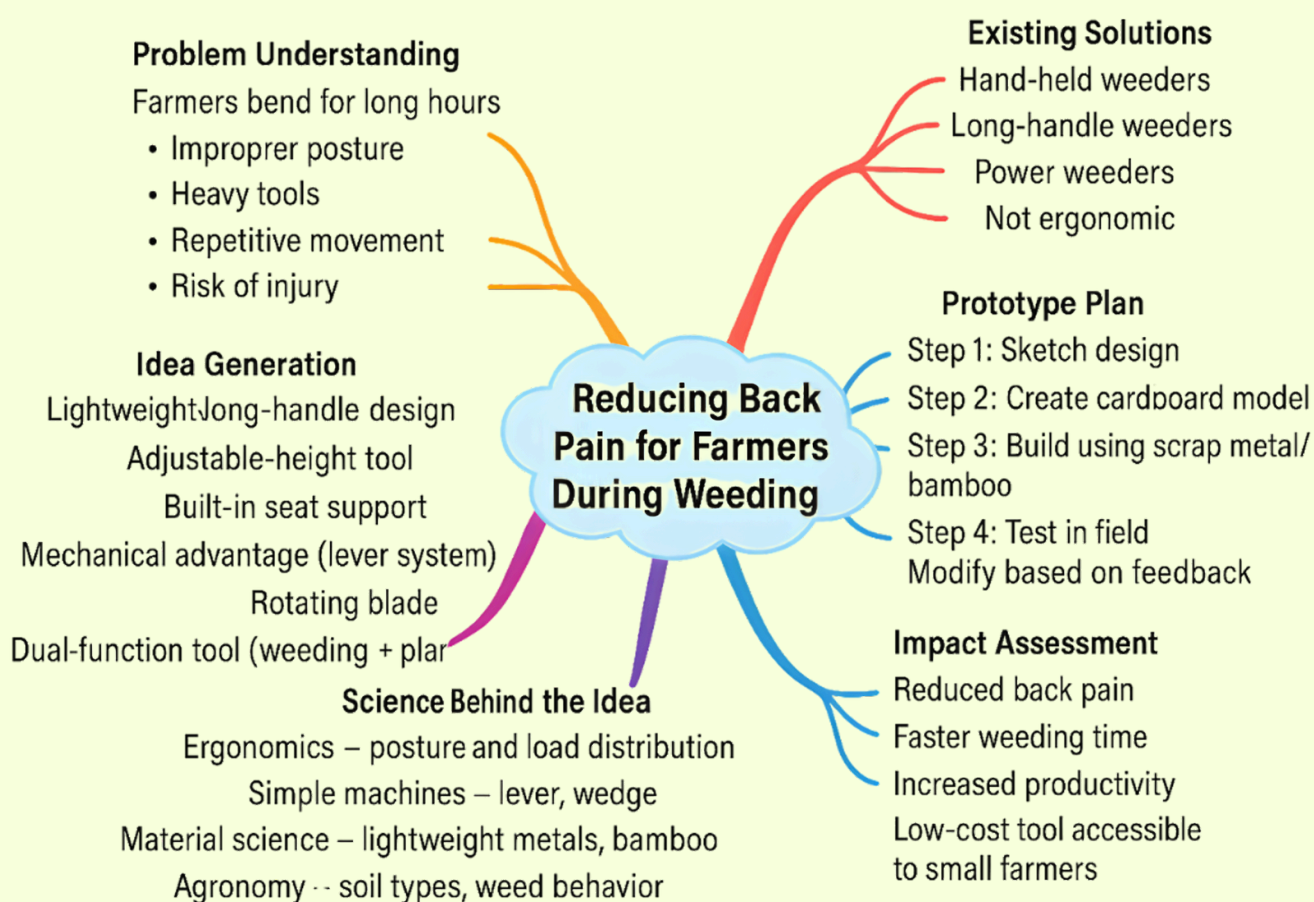
4. Science Behind the Idea

- Ergonomics helps design tools that are comfortable and safe to use
- Principles of simple machines (like levers) reduce effort
- Material science helps find lighter, stronger materials
- Agronomy explains soil and weed behaviour

5. Prototype Development Plan

Step 1: Make a rough sketch of the tool

Step 2: Build a small cardboard model to test the concept



Step 3: Create the model using bamboo or scrap metal

Step 4: Test the tool in a real farm setting

Step 5: Improve the design based on farmer feedback

6. Impact Assessment

- Farmers will experience less back pain
- Weeding will become faster and easier
- Small farmers can afford the tool
- Uses sustainable and local materials

5-Step Mind Mapping Guide

5-Step Mind Mapping Guide: You can create a mind map on paper or on a whiteboard.

Step 1: Start at the Center - The Topic: Place the main subject, idea, or central question in the **exact center** of your page. Draw a simple picture, symbol, or use a few colors to make this central image stand out.

Step 2: Create Main Branches - Primary Ideas: From the center, draw thick, flowing, and curved lines radiating outwards like tree branches. Each branch represents a **main category** or **primary idea** related to your central topic. Write a single, bold **keyword** on top of each main branch. Avoid full sentences!

Step 3: Add Secondary Branches - Subtopics: Draw thinner branches growing out of your main branches. These represent the details, sub-topics, or supporting facts for that main idea. Branch out showing **hierarchy** of information.

Step 4: Use Color, Images, and Symbols: Use a different color for each main branch and all its sub-branches. Add small drawings, icons, arrows, or symbols next to your keywords.

Step 5: Review and Refine

Teachers' Kit - Lesson Plan

Grade Level: 8-10

Duration: 45-60 minutes

Subject Integration: Science, Innovation, Design Thinking, Agriculture

Teaching Method: Discussion, Mind Mapping, Hands-on Model Making

Topic: Reducing Back Pain for Farmers During Weeding

Learning Objectives: By the end of the lesson, students will be able to:

- Identify real-life problems faced by farmers during weeding.
- Understand the role of ergonomics, simple tools and machines.
- Apply idea-generation techniques.
- Explain the steps involved in building and improving a prototype.
- Assess the impact of an innovative solution on farmers' health and productivity.

Materials Needed: Chart paper or board, Sketch pens, markers, cardboard, scissors, tape, bamboo sticks, straws, Video or image of farmers weeding (optional)

Lesson Flow

1. Introduction (5-7 minutes): Begin with a question, "Have you ever seen farmers bending for long hours in fields? What challenges do you think they face?" Show a short video/image of farmers weeding. Explain that the class will explore solutions.

2. Develop and Review Mind Map (8-10 minutes): Facilitate building a Mind Map. Show the mind map (using projector or board). Explain each branch briefly. Encourage students to ask questions:

- **Problem Understanding:** Why farmers get back pain.
- **Existing Tools:** What tools exist and why they are not perfect.
- **Idea Generation:** Possible new solutions.
- **Science Behind:** Ergonomics, levers, material science.
- **Prototype Steps:** How to build and test tools.
- **Impact Assessment:** Benefits of the improved tool.

3. Group Activity – Idea Sketching (10-12 minutes): Divide students into groups of 3-4. Ask them to sketch their own **weeding tool** using ideas from the mind map. Remind them to consider Comfort, Height adjustments, Light materials, Easy design. Teacher circulates and assists.

4. Prototype Demo (12-15 minutes): Students build a mini model using cardboard, straws, sticks, or scrap materials. It does not need to work—only demonstrate the concept (e.g., long handle, support, lever system). After building, each group explains what problem their design solves, how it reduces effort, and what improvements could be made.

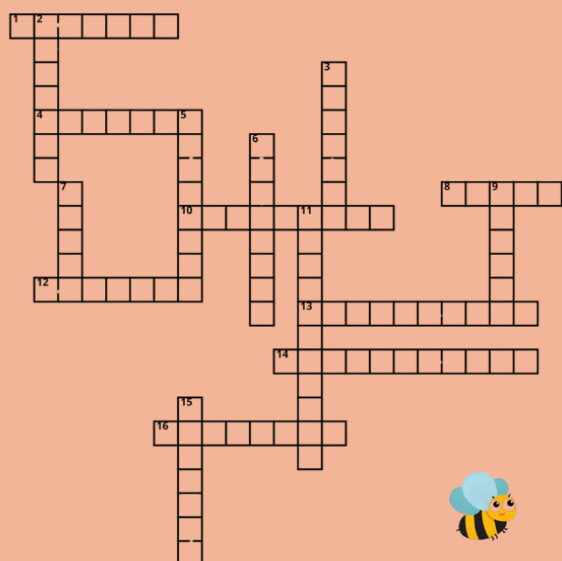
5. Reflection & Impact Discussion (5 minutes): Ask students, “How would this design reduce back pain?”, “How could small farmers benefit?”, or “What materials make a tool sustainable and affordable?” Make connections to real-world rural challenges.

6. Assessment (During Activity + Exit Question): Perform a **Formative assessment** on Participation in group discussion, Quality of sketch and model, and Understanding of scientific principles. Put an **Exit Question** like **“Name one reason farmers experience back pain and one idea to reduce it.”**

Conclusion

Mind mapping is a great tool for organization, brainstorming, and improving comprehension among school students. It is essentially a thinking tool that mirrors how our brains naturally connect ideas. It involves creating a diagram that starts with a central idea and branches out into related subtopics, using lines, symbols, keywords, colors, and images. This non-linear approach is particularly helpful to students in Note-Taking in Class, Essay & Project Planning, Exam Revision, and so on.

Word Search 2508



(Answers on Back Cover Inside)

Across

- [1] The science of organisms and their environment
- [4] Natural or made without chemicals
- [8] Sun energy
- [10] Things like air, water, and sell together
- [12] To reuse the materials
- [13] A layer of gases surrounding a planet
- [14] The surroundings in which an animal or plant lives
- [16] A place to dispose of garbage and other waste material

Down

- [12] A mixture of various decaying organic substances
- [3] No longer living
- [5] Protection from loss, harm, or depletion
- [6] To keep something in its original state
- [7] A layer in the Earth's atmosphere
- [9] Trash or waste material spreading on the ground
- [11] Capable of being supported
- [15] The natural home of an animal, plant, or other organisms

Child Lock - LPG Cylinder

A student observed that many fires are caused by LPG cylinder leaks and decided to develop a safety device to address this issue. The student designed a gadget that ensures the cylinder regulator is always turned off when not in use, whether the user is away from home or simply not using the gas. Even if the stove knob is accidentally left on, this mechanism prevents gas from leaking through the regulator. The device is also equipped with a lock to prevent children from operating it without parental supervision.



Harit Chanchani
9th Class

Made of durable iron plates, it is sturdy, long-lasting, and unlikely to break, making it usable for many years. Additionally, the manufacturing cost is very affordable, at less than ₹150. The design is compact, easy to operate, and simple to install.

(Source: INSPIRE MANAK NLEPC 2022 Booklet)

Ceiling Fan Lifting Tool

First, a stand is prepared with detachable parts. Two ladder-like stands are made and connected using bolts and nuts. A top base is then constructed, with a jack-like structure positioned at its center. This top base is mounted on the ladder. An auto clutch wire and a wheel are used to operate the jack, allowing it to be raised or lowered. With this tool, a single person can lift and install a ceiling fan without physically holding it.



Additionally, it can be used for multiple purposes: holding a paint bucket during painting, supporting a cement container or basket during plastering, lifting weights, or simply as a ladder for use in shops or homes. Since its parts are detachable, it is easy to carry and requires minimal storage space. The manual tool can also be upgraded into a powered version by attaching a motor and wheels, making lifting tasks even easier. The stand can be easily moved around the room during painting or plastering work.



Dasari Ashok
9th Class

(Source: INSPIRE MANAK NLEPC 2021 Booklet)

Indian **Inventions**

Binary Numbers

From Ancient India to Digital India



When you send a WhatsApp message, crush a level in a video game, or stream your favourite song, you are using a language that is over 2,000 years old.

It might surprise you, but the idea behind digital computing didn't start in Silicon Valley. It began in ancient India. Around **200 BCE**, the scholar **Acharya Pingala** described the earliest form of binary in his Sanskrit text, the Chanda Shastra.

***The Poet's Code:** Long before electricity existed, Pingala showed how the rhythm of poetry - using patterns of short and long syllables - could be mathematically calculated. He essentially created a system of two states, which we now recognize as the ancestors of **0** and **1**.*

It is a matter of immense pride that India gave the world both **Zero** and **Binary code** - the very DNA of the digital age.

What Exactly Are Binary Numbers?


We are used to the **Decimal System** (Base-10), which uses ten digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

The **Binary System** (Base-2) is different. It is a "secret language" that uses only two digits: **0** and **1**.

In the decimal system, position matters (ones, tens, hundreds). In binary, position also matters, but each step is a **power of 2** (1, 2, 4, 8, 16, etc.).

Decoding the Matrix

Here is how a computer reads the binary number **1011**. Binary to Decimal Conversion (Example: $1011 = 11$)

1	0	1	1
2^3	2^2	2^1	2^0
8	0	2	1
 = 11 (decimal)			

Why Do Computers Love Binary?

Why don't computers just use 0-9 like us? It comes down to hardware.

Computers are made of billions of tiny switches called **transistors**. A switch is either **ON** or **OFF**. It's very hard for a switch to be "slightly on" or "halfway off".

- **0** = Switch is OFF (No electricity)
- **1** = Switch is ON (Electricity flows)

Because of this, binary is the most reliable way to store and send data. It creates a clear, unambiguous signal that doesn't get confused by noise.

Binary in Action

Everything on your screen is actually just a pile of 0s and 1s disguised as something else:

- **Text:** Each letter you type has a binary ID card. In ASCII code, the letter 'A' is stored as 01000001.
- **Images:** A photo is a grid of pixels. Each pixel's colour is defined by a string of binary code.

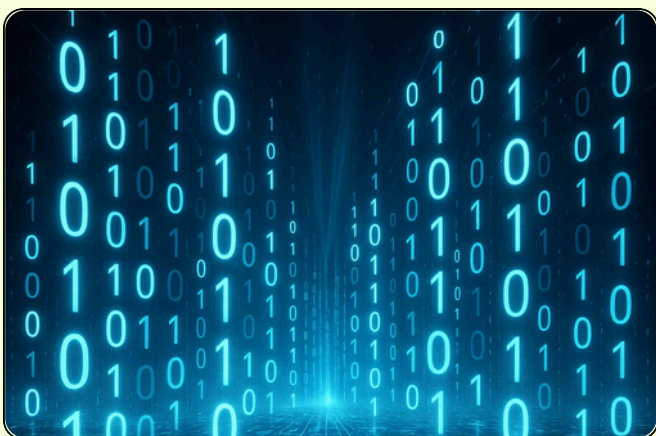
- **Music & Video:** Your MP3s and MP4s are just massive streams of bits (binary digits) that your phone decodes into sound and light.

Math with Only Two Numbers

Just like you learn addition in school, computers do math in binary. The rules are surprisingly simple:

- $0 + 0 = 0$
- $1 + 0 = 1$
- $1 + 1 = 10$ (Write 0, carry the 1)

Your computer's processor does billions of these little calculations every single second to run your apps and games!



Try It Yourself!

Want to convert a regular number into binary? Use the "**Divide by 2**" trick.

Let's convert the number 13:

1. $13 \div 2 = 6$ (Remainder **1**)
2. $6 \div 2 = 3$ (Remainder **0**)
3. $3 \div 2 = 1$ (Remainder **1**)
4. $1 \div 2 = 0$ (Remainder **1**)

Now, read the remainders from bottom to top: 1101.

That is 13 in binary!

India: The Past and Future of Binary

India is not just the birthplace of binary; it is currently one of its biggest power users. The code that Pingala hinted at is now running the nation:

- **Aadhaar:** Your digital identity uses binary to store biometric data (fingerprints and iris scans) for over a billion people.
- **Space Tech:** When ISRO's Chandrayaan-3 landed on the Moon, it communicated with Earth using streams of binary data.
- **UPI Payments:** Every time you scan a QR code to pay, binary data travels securely between banks to make the transaction happen instantly.

Pros and Cons of the System

Advantages

- **Simplicity:** Only two states (On/Off) to manage.
- **Reliability:** Works well even with electrical interference.
- **Scalability:** Works for tiny sensors and massive supercomputers.

Challenges

- **Not Human-Readable:** A string like 1101001 is hard for us to read quickly.
- **Length:** Binary numbers get very long, very fast.
- **Complex Translation:** Real-world data (like colours) must be carefully converted.

Conclusion: The Power of Two

From the ancient verses of Varanasi to the server rooms of Bengaluru, the journey of binary is incredible. It teaches us that you don't need complexity to build something magnificent. You just need a solid foundation—even if that foundation is just a **0** and a **1**.

Vijay Kumar Kapahi



JAN 21, 1944 – MAR 16, 1999

Few scientists have expanded India's view of the universe like Dr. Vijay Kumar Kapahi. One of the country's leading astrophysicists, he was known for his pioneering work in radio astronomy, quasars, and cosmology. As Director of the National Centre for Radio Astrophysics (NCRA), he helped India listen to the cosmos and was honoured with the Shanti Swarup Bhatnagar Prize (1987), one of India's highest scientific awards.

Early Life and Education

Born in Quetta (then British India) on 21 January 1944, Kapahi completed his schooling and earned a B.Sc. from St. Joseph's College, Bangalore under Mysore University. He later joined the BARC Training School in Mumbai and began working with the Radio Astronomy Group at TIFR in 1963, mentored by the legendary Govind Swarup. His Ph.D. from Bombay University (1975) focused on the structure of radio sources in the universe.

Scientific Contributions

Kapahi's research reshaped how we understand radio galaxies and quasars.

Using the Ooty Radio Telescope, he discovered that galaxies appeared smaller in earlier cosmic times, offering vital clues about how the universe evolved.

He was among the first to study Compact Steep-Spectrum (CSS) radio sources, leading to the influential "unifying scheme" for radio galaxies and quasars, showing that how we see them depends on the angle from which we observe. His expertise extended to imaging solar radio bursts and exploring distant objects through Very-Long-Baseline Interferometry (VLBI).

Major Projects and Collaborations

Kapahi helped build two of India's most important scientific instruments:

- Ooty Radio Telescope (ORT) – one of India's earliest and most innovative radio telescopes.
- Giant Metrewave Radio Telescope (GMRT) – near Pune, still among the world's largest low-frequency radio observatories.

He collaborated globally with the Carnegie Institution, Jet Propulsion Laboratory (USA) and Dwingeloo Radio Observatory (Netherlands). His research appeared in top journals and is cited by astronomers worldwide.

Mentorship and Legacy

A passionate mentor, Kapahi guided young astronomers including Prajval Shastri, Dhruva Jyoti Saikia and Ramana Athreya. He co-founded the Joint Astronomy Programme at IISc and served as President of the Astronomical Society of India (1997–1999).

Innovation Training Module

Critical Thinking

Everyone's Hidden Super Power



Imagine if your brain came with a built-in detective mode — one that helps you spot clues, ask sharp questions, and solve tricky problems with confidence. Good news: it does. That mode is called **critical thinking**, and it might just be the most powerful skill you can develop, especially if you're curious about science, innovation, or simply figuring out how the world works.

But what exactly is critical thinking, and why does every scientist, inventor, and creative problem-solver swear by it?

So, What Is Critical Thinking?

In simple terms, **critical thinking means carefully examining information instead of accepting it as-is**. It's about asking:

- Is this really true?
- How do I know?
- What evidence supports this?
- Could there be another explanation?

Think of it as the mental version of zooming in and double-checking details before making a move. This skill protects you from falling for false claims, helps you make better decisions, and fuels your ability to create new ideas — the stuff innovation is made of.

Why Does Critical Thinking Matter?

Because our world is packed with information, some of it is reliable, some of it is half-cooked, and some of it is... well, totally made up. Whether you're evaluating a viral reel "science hack," choosing a research topic, or designing a new invention, critical thinking helps you cut through the noise and reach clearer, smarter conclusions.

Scientists use it to interpret data. Engineers use it to troubleshoot.

Inventors use it to evaluate whether their wild ideas might actually work in real life. And students use it every day — often without realising it.

Simple, Everyday Techniques to Strengthen Your Critical Thinking

The good news? You don't need a lab coat or a massive brain to practice critical thinking. Here are some easy, practical ways to build the habit:

1. Ask "Why?" Like a Curious Kid



If you've ever met a five-year-old, you know they can ask "why?" 50 times in a row. Annoying? Maybe. Effective? Absolutely.

Each "why" you ask pushes you deeper into the reasoning behind something. For example:

- A friend claims, "Energy drinks boost brain power."
- You: "Why? What ingredients do that? Has anyone studied it?"

Suddenly, you've moved from accepting a statement to investigating it.

2. Look for Evidence (Not Just Opinions)

Evidence is the foundation of scientific thinking. Before believing a claim, ask:

- Where's the proof?
- Is it from a trustworthy source?
- Is it based on data, experiments, or expert analysis?

For instance, if you see an ad saying a gadget "improves memory instantly," look for actual studies. Not customer reviews. Not hype-filled marketing. Real evidence.

3. Compare Different Points of View

Critical thinkers don't just listen to one side; they examine multiple angles. Let's say your team is deciding how to build a robot for a school competition.

One member suggests wheels for speed. Another votes for legs to climb obstacles. A critical thinker says:

"Let's list pros and cons for each design, test small prototypes, and then decide."



Comparing alternatives helps you discover the strongest solution — or even combine ideas into something better.

4. Pause Before Reacting

In science (and in life), your first reaction is not always your best one. Slowing down gives your brain a chance to analyse instead of jumping to conclusions.

Example: You see a dramatic headline like "New Smartphone Chip Makes Devices 10x Faster!"

Instead of instantly believing it, you pause and think:

- Ten times faster than what?
- Did independent testers confirm this?
- Is this just marketing exaggeration?

Congratulations — you just used critical thinking in under 10 seconds.

5. Break Big Problems Into Smaller Pieces

Large problems can feel impossible... until you chop them into mini-problems. Scientists do this constantly.

Imagine you're designing a water-filter prototype for a science fair. The big question is:

"How can I build a filter that works well and is affordable?"

Break it down:

- What materials remove impurities?
- Which ones are inexpensive?
- How will water flow through the system?
- What volume should it handle?

Each small question gets you closer to a solid, workable design.

Critical Thinking and Innovation: The Dream Team

Here's the secret behind every cool invention: innovation is not just creativity — it's creativity that has been tested, questioned, refined, and grounded in reality. That's where critical thinking comes in.

Inventors don't just think of ideas. They evaluate them. They look for weaknesses. They explore alternatives. They adjust based on results.

Think of famous innovators:

- **Elon Musk** didn't accept the assumption that rockets must be single-use; he questioned it, examined costs, and developed reusable rockets.
- **Marie Curie** didn't rely on existing beliefs about radiation; she tested, proved, and transformed scientific understanding.
- **Steve Jobs** didn't settle for devices that were "good enough"; he asked how to make them simpler, faster, and more intuitive.

Their breakthroughs came from combining imagination with disciplined, logical thinking. Critical thinking takes your ideas from "maybe" to "wow."

A Note on Mind Mapping: Your Visual Critical Thinking Ally

You might have read about Mind Mapping in this magazine. Guess what? It's a fantastic ally for critical thinking! While critical thinking is the mental process of analysing and evaluating, mind mapping is a visual tool that can make that process easier and more effective.

When you lay out your thoughts, questions, evidence, and different perspectives on a mind map, you're literally giving your critical thinking a visible roadmap. You can see connections, spot missing information, and identify opposing ideas much more clearly than in a linear list. It helps you organise the complexity of a problem, making it easier for your brain to dissect and critically assess each part. So, use mind mapping as your visual assistant to power up your critical thinking!

Final Thought: Your Brain Is a Studio, Not a Storage Box

Critical thinking isn't about memorising facts — it's about actively using your brain to question, analyse, and create. It's the skill that helps scientists make discoveries, helps innovators build new technology, and helps you navigate a world full of information.

And the best part? You already have the ability. You just need to practice.

So next time you face a claim, a challenge, or a crazy idea — turn on your inner detective. Ask the tough questions. Examine the evidence. Explore different angles.

That's how you think critically. And that's how you innovate.





Indian **Inventions** Diamond Mining

More Than Just Sparkly Gems!

While most people think of diamonds as jewellery, these remarkable stones also play a crucial role in science, technology, and cutting-edge innovation.

What is Diamond Mining?

Diamond mining is the process of extracting diamonds from the Earth. These precious stones are formed deep underground over billions of years and brought closer to the surface by natural forces like volcanic eruptions. Miners then dig, sort, cut and make them into diamonds.

Types Of Diamond Mining

- Alluvial Mining
- Pipe Mining
- Marine Mining
- Artisanal Mining
- Tailings Reprocessing

Advantages of Diamond Mining

Diamond mining drives economic growth by generating significant revenue, creating numerous jobs, and stimulating local businesses.

It funds critical infrastructure development like roads, schools, and hospitals, while also supporting community programs that improve living standards and social welfare in mining regions

Diamonds in Science

Super Strong Tools: Diamonds are the hardest substance on Earth. They are used in cutting and drilling through hard materials, Industrial machinery and even space exploration

Studying the Earth: Tools like the diamond anvil cell use diamonds to recreate extreme pressures found deep underground. This helps scientists understand Earth's core and study material behaviour under extreme conditions

Quantum Technology: Diamonds with tiny flaws (called nitrogen-vacancy centers) are used to build quantum sensors for precise measurements and future-ready quantum computers

Diamonds in Technology & Innovation

- **Medical tools** (surgical equipment, implant coatings)
- **Clean energy research** (like nuclear fusion)
- **Advanced electronics** (handling heat, lasting longer)
- **Optical instruments** (due to transparency and durability)
- **Space Electronics** (extreme heat and radiation surviving capabilities)

Innovation in Diamond Mining

Indian scientists and industries are using diamonds to push the boundaries of research.

- Using **earthquake (seismic) data** to locate diamond-rich zones underground

- Focusing on lab-grown diamonds for high-tech applications
- Enhancing efficiency and sustainability in extraction and processing

Problems with Traditional Mining

- Soil erosion and water pollution
- Wildlife displacement
- Greenhouse gas emissions
- Lab-grown diamonds reduce ecological damage

Lab-Grown Diamonds: The Future is Here

Not all diamonds are mined from the Earth. Many are now made in high-tech labs using methods like **HPHT** (High Pressure High Temperature) and **CVD** (Chemical Vapor Deposition).

The necessity of lab-grown diamonds

- Physically and chemically identical to natural ones
- More sustainable and eco-friendly
- Cheaper and purer, making them ideal for research



India's Historical Legacy in Diamond Innovation

India was the world's earliest source of diamonds and pioneered techniques in cutting and polishing as early as the 6th century. Ancient mines in Golconda and the Krishna River Valley produced legendary gems like the Koh-i-Noor and Hope Diamond.

Modern Mining in India

Today, the Majhgawan mine in Panna, Madhya Pradesh, is India's only large-scale operational diamond mine. Other resources are found in states like Chhattisgarh and Karnataka.

Surat: The Diamond City

- Processes **90% of the world's diamonds**
- Combines traditional craftsmanship with modern tech



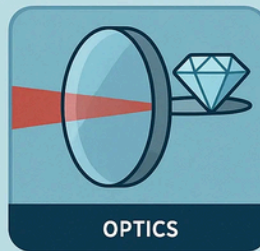
APPLICATIONS OF DIAMONDS IN SCIENCE



QUANTUM COMPUTING



PRESSURE DETECTION



OPTICS



THERMAL MANAGEMENT

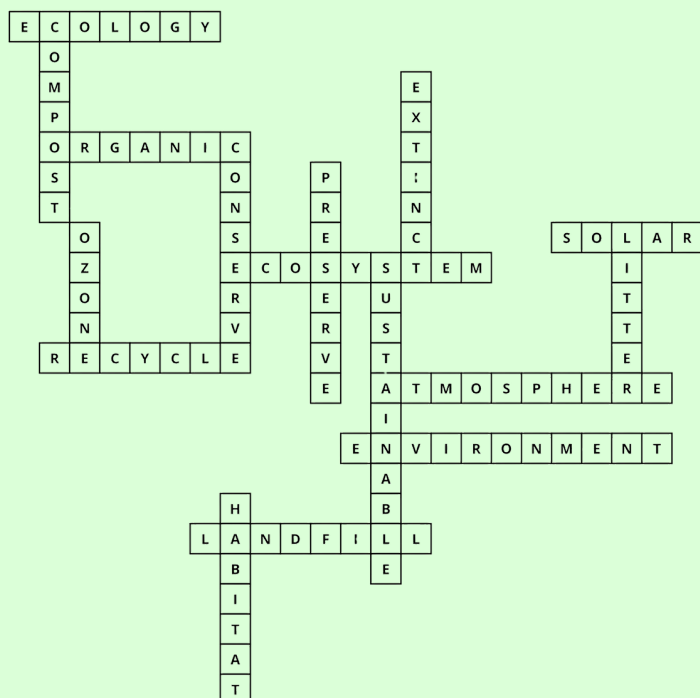
- Home to thousands of diamond factories
- Employs nearly a million people. Generations of skilled artisans
- Features the world's largest diamond trading hub, **the Surat Diamond Bourse**, established in 2023 by Mr Narendra Modi
- Adoption of AI and laser-based grading and polishing
- A growing hub for lab-grown diamond processing
- Major contributor to India's economy

Conclusion

Diamond mining is vital not just for jewellery, but for scientific and technological progress—enabling studies of Earth's interior, creating ultra-strong tools, and advancing electronics, quantum computing, and medical devices. Diamonds are also crucial in space and radiation-resistant technologies.

India has been a pioneer in diamond innovation, from ancient mines to modern labs, leading in processing and trade through hubs like Surat, and now embracing sustainable practices with the growing use of lab-grown diamonds.

Solution Word Search 2508



Solution Sudoku Challenge 2508

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

Riddle 2508 Answer

1. A Comb 2. A Clock 3. An Egg 4. Your Brain 5. Your Age



Last Date: 10-August-2025



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