June 2025

Young Scientist India

A Science & Innovation Magazine for School Students

SCIENCE & INNOVATION ORGANISATIONS

DR. SURINDAR KUMAR TREHAN

DR. RAMAMURTI RAJARAMAN

DR. OBAID SIDDIQI

DR. PATCHA RAMACHANDRA RAO

REVERSE ENGINEERING

CONCEPT MAPS

AI AND TECHNOLOGY

DESIGN THINKING

Young Scientist India

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From the Editor's Desk

Namaste, young scientists!

It's hard to believe we are already on our sixth edition of **Young Scientist India**, but the past six months have been nothing short of incredible. We are so grateful for the amazing feedback and the love you have shown for our content. Every message of encouragement and every thoughtful idea you've shared with us fills our team with immense joy and motivates us to work even harder. We've been dedicated to bringing you inspiring stories and valuable information, and we promise, this is just the beginning. There's so much more innovation to explore, and we're excited to have you on this journey with us.

As your summer vacations come to a close, we hope you had a lot of fun. When I was in school, my main goal for the holidays was to play as many games and sports as possible. Those were definitely the golden days. But did you know that you can use science to master these sports? It's absolutely true. In this issue, you can dive into our article on **"Science in Sports"** to uncover the secret techniques behind our world champions. And don't forget to read the dedicated piece on our very own Indian invention—**Chess!** This fun, everyday game has so much potential that our Indian chess champions are now global superstars, and we'll show you how they do it.

Ever heard of **"Reverse Engineering"**? It's a concept where you get to be a detective, taking things apart to discover secrets that no one knew existed. Who would have thought becoming an innovator could be so much fun? Once you have all those ideas, you can use techniques like **Design Thinking** and **Concept Maps** to refine and organise your thoughts. We know your young brains have tons of creative ideas that could lead to the next big inventions. This edition also has an article to guide you on how to turn your school **Science Project into a Successful Startup**.

The future is all about **AI and Technology**. We hear this every day, but do you know how and why? Learn all about it in our feature article and be a step ahead in the tech world. This month's issue also celebrates some of India's geniuses like **Ramamurti Rajaraman**, **Patcha Ramachandra Rao**, **Obaid Siddiqi**, and **Dr. Surindar Kumar Trehan**, whose scientific contributions in nuclear physics, metallurgy, biology, and mathematics continue to make our country proud. We also shine a spotlight on one of the strong pillars of our country, the Indian Defence System, and its **"Akash Missile Weapon System"** that keeps us safe.

As our cover story highlights, **India's Science and Innovation Organisations** offer countless opportunities and training programs. These aren't just for college students; they have amazing experience programs and competitions even for high school students like you! To add to the list of many Indian Labs and Organisations, this month we have **ICMR**, **SRISTI**, and **Agastya Foundation**.

Finally, get inspired by the amazing **"Avishkars"** by students just like you, and challenge your mind with our fun puzzles and brain teasers. We hope this issue sparks your curiosity and inspires you to create, question, and explore. Happy reading, and keep innovating!

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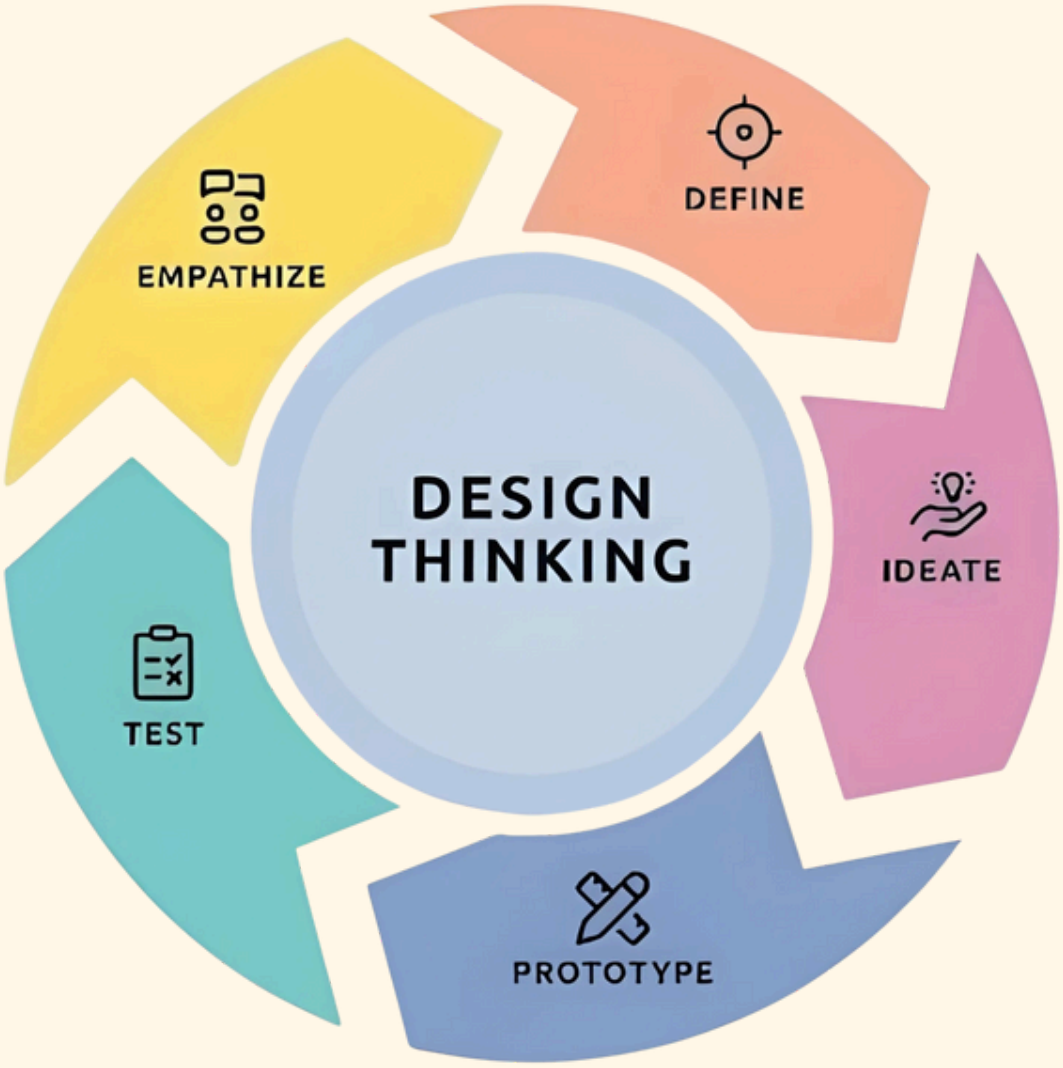
S&I Article

Design Thinking

A Scientific Approach to Innovation



Have you looked at a problem and thought, "There has to be a better way"? That's the spark behind **design thinking—a powerful** way to solve real-world challenges by combining creativity with logic.

So, What's "Design Thinking"?

Imagine you're building a super cool new app. Do you just start coding? Probably not, if you want people to actually use it! **Design thinking is a powerful**, human-centered approach to problem-solving and innovation.

Instead of just focusing on the problem itself, it emphasizes understanding the people affected by the problem (the users) and then creatively developing solutions for them.

The 5 Steps of Design Thinking

1. Empathise: understand the people you're designing for. *Observe, ask questions, and listen.*

2. Define: Clearly articulate the user's core problem. *What needs to be solved?*

3. Ideate: Brainstorm a wide range of creative solutions. *No idea is too wild!*

4. Prototype: Build a simple version of your idea. *Use drawings, models, or digital tools.*

5. Test: Evaluate the prototype with real users and improve it.

The Secret Power: A Design Thinker's Mindset

Beyond the steps, Design Thinking is a mindset. It starts with **curiosity:** asking "Why?" even about small things. Why is that process so clunky? Why do people struggle with this? Then comes **empathy** – truly trying to understand others' feelings and experiences, not just their words.

You learn to embrace **ambiguity**, knowing solutions aren't always obvious. You're comfortable with **failing fast**, seeing every "mistake" as a chance to learn and improve, not as an end. This collaborative, open-minded approach is what makes Design Thinkers truly innovative problem-solvers. It's a way of looking at the world, always seeking a better way.

Design Thinking Meets the Scientific Method

Design thinking is often seen as an artistic or creative process, but it **actually has a lot in common with the scientific method.**

Both are structured approaches to problem solving, but they differ in their focus and process. However, there is significant overlap, and in practice, the two methods can complement each other.

Aspect	Scientific Method	Design Thinking
Focus	Understanding & explanation	Innovation & problem-solving
Basis	Evidence and logic	Empathy and creativity
Process	Linear (often)	Iterative and flexible
Outcome	New knowledge or proof	Practical, user-friendly solutions

While the scientific method leads to understand the world, design thinking seeks to improve it, especially for people. One is more about discovery, the other about innovation, but both rely on a cycle of observation, testing, and refinement.

Design Thinking Fuels Innovation. Why?

Human-Centered: It begins with deep empathy for users, ensuring solutions address real needs rather than assumed ones.

Iterative and Non-Linear: Like scientific inquiry, design thinking is cyclical, allowing teams to revisit earlier stages as new data emerges.

Encourages Creativity: By focusing on desirability before feasibility and viability, it opens space for breakthrough ideas that might be overlooked in traditional, constraint-driven processes.

Cross-Disciplinary: It brings together diverse expertise, mirroring collaborative scientific research, to generate and refine innovative solutions.

Design Thinking in Education: Learning by Solving Real Problems

In education, design thinking helps students become **creative problem-solvers**, not just memorizers of facts.

"Design thinking in education turns you from a passive learner into an active creator."

In the classroom, it transforms traditional learning into an active, student-centred process focused on solving real-world problems, fostering creativity, and building critical thinking skills.

Real-Life Example 1: Smart Water Bottle

- **Problem:** Children are not drinking enough water during school hours.
- **Solution:** Smart bottle and smartwatch reminders.

Design Thinking Steps:

- **Empathize:** Lack of hydration leads to tiredness, poor concentration, and other health issues in children.
- **Define:** Children often forget to drink water during school hours.
- **Ideate:** Create solutions like smart bottles with reminders or alarms in smartwatches and fitness bands to prompt children to drink water.
- **Prototype:** Develop a bottle with a timer or built-in hydration tracker.
- **Test:** With these reminders, children rarely forget to hydrate themselves, leading to improved well-being and focus.

Real-Life Example 2: Clay Water Pots with Taps

- **Problem:** People drink water from clay pots by dipping their hands inside, which is unhygienic.
- **Solution:** Add a tap at the bottom of the pot.

Design Thinking Steps:

- **Empathize:** People were falling sick due to water contamination and wasting water in the process.
- **Define:** Dipping hands into the water pot is unhygienic.

- **Ideate:** Find ways to access water from the pot without direct contact.
- **Prototype:** Attach a tap to the bottom of the pot.
- **Test:** It works! The water is now accessed in a cleaner, safer, and more efficient way.

Real change through simple thinking!

Design Thinking Case Study:

Embrace Infant Warmer

- **Challenge:** Premature babies in rural areas of India were dying due to a lack of access to expensive incubators.
- **Approach:** Stanford students used design thinking to develop a low-cost, reusable baby warmer.
- **Outcome:** The Embrace Infant Warmer costs under $25, requires *no electricity, and has saved thousands of lives globally.*

Final Thought

Design thinking helps us solve real problems by understanding people's needs, coming up with creative ideas, and testing them out. It's a mix of being curious like a scientist and creative like a designer. By using design thinking, anyone can make a real difference in their school, community or the world.

Sudoku Challenge 2506

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

Riddles 2506

1. I'm sometimes full, but I never overflow. What Am I?
2. I'm not alive, but I grow. I don't have lungs, but I need air. What am I?
3. I have cities but no houses, forests but no trees, and rivers but no water. What am I?
4. The more you take, the more you leave behind. What are they?
5. I fly without wings. I cry without eyes. Whenever I go, darkness flies. What am I?

(Answers on Back Cover Inside)

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Biodegradable Immuno-booster Cups

During the pandemic, there was a growing need for instant immune-boosting drinks that could be easily prepared, portable, and accessible anytime. In response, Adit developed biodegradable disposable cups coated with stevia, a natural sweetener that is 200 times sweeter than sugar and contains zero calories.

Adit Singh
6th Class

These cups have an embedded medicinal herb mixture, allowing users to carry them anywhere conveniently.

The ingredients are embedded at the bottom of the cup's interior and sealed with a mesh. The dried herbal mixture includes ginger, turmeric, tulsi leaves, cinnamon, black pepper, cloves, and lemongrass leaves. When hot water is poured into the cup, the ingredients come into contact with the water and instantly prepare a healthy decoction, providing an easy and effective immune-boosting drink.

(Source: INSPIRE MANAK NLEPC 2022 Booklet)

Universal Handle for Cleaning

Priyanshi has developed a multipurpose cleaning handle suitable for households, industries, educational institutions, and more. Traditional cleaning handles available in the market are typically designed for single-purpose use. In contrast, this innovative multipurpose handle is compatible with a wide range of cleaning equipment, including floor wipers, brooms, brushes, and grass brooms.

Its versatility eliminates the need for multiple handles, simplifying storage and reducing clutter. Whether used for indoor or outdoor cleaning tasks, the universal handle provides a sturdy and ergonomic grip, enhancing both efficiency and comfort for the user.

Priyanshikumari Kanubhai Thorat
7th Class

(Source: INSPIRE MANAK NLEPC 2024 Booklet)

Indian Scientist

Surindar Kumar Trehan

Shanti Swarup Bhatnagar Prize (1976)

4 APRIL 1931 - 9 SEPTEMBER 2004

Explore the fascinating work of Dr. Surindar Kumar Trehan, an Indian mathematical genius whose groundbreaking research helped us understand the swirling, magnetic universe. He was a true pioneer in **magnetohydrodynamics (MHD)**, a field that combines fluid dynamics with electromagnetism, providing insights into phenomena from stars to fusion energy. His profound contributions laid the foundational groundwork for modern plasma physics and astrophysics, establishing India's presence in these complex scientific domains.

Unravelling Cosmic Mysteries

Dr. Trehan's research was all about **stability**—understanding when things like magnetic fields in the Sun's corona or powerful cosmic jets remain stable, and when they might explode or unravel.

- He developed sophisticated mathematical tools to analyze the nonlinear stability of MHD systems, crucial for controlling plasmas in fusion energy research here on Earth and understanding distant stars.
- He also explored gaseous polytropes in magnetic fields, essentially simplified models of stars. His work showed how magnetic fields influence pressure and oscillations within these celestial bodies, offering critical insights into stellar structure and evolution.

His Legacy

Beyond his cosmic calculations, Dr. Trehan was a pillar of Indian academia.

- He received the prestigious **Shanti Swarup Bhatnagar Prize (1976)**, India's highest science honor, for his outstanding contributions to mathematical sciences.
- He served as Dean of the Faculty of Science at Panjab University and was a **CSIR Professor Emeritus**, shaping countless young minds. His leadership significantly boosted research and higher education in mathematics and physics across the nation.
- He also served as editor of the *Bulletin of the Astronomical Society of India*, enhancing the visibility of Indian scientific research globally.

Dr. Trehan's legacy continues to influence fields from astrophysics to fusion energy research, proving that profound mathematical insights can unlock the secrets of the universe.

Cover Story

SCIENCE & INNOVATION ORGANISATIONS

A world of scientific exploration and technological advancement awaits you. You might have seen images of advanced laboratories, futuristic drones, or satellites in orbit, thinking these opportunities are for a distant or exclusive group. In reality, this universe of innovation is right here in India, and it is ready for your participation.

Welcome to the exciting world of **Science and Innovation organisations!** These are groups or institutions that work to:

- Promote scientific research
- Support new ideas and inventions
- Solve real-world problems using science and technology

They bring together scientists, engineers, researchers, students, and industries to build a better and smarter future. *Why are they so important?* They fund and guide research, encourage young minds, and create innovative solutions that help our country develop faster. From school science labs to advanced AI/Robotics labs, these spaces are designed to help you tinker, experiment, and create.

These organisations are far more than just government buildings. They are the foundations for problem-solvers, the catalysts for new ideas, and the hubs for India's bright future.

From launching rockets to developing new vaccines and creating eco-friendly solutions, this is where significant progress is made. The most exciting part is that these organisations have **incredible opportunities for students like YOU!** Your journey in science and innovation can begin now, well before you reach college.

The Powerhouse Players: Who's Who in Indian Science

India is home to some of the world's most incredible scientific organisations, shaping our lives in ways we can't even imagine. Among the most prominent are the **Indian Space Research Organisation (ISRO),** which is renowned for its achievements in space exploration; the **Defence Research and Development Organisation (DRDO),** dedicated to advancing military technology for national security; the **Council of Scientific and Industrial Research (CSIR),** a vast network of labs covering everything from medicine to engineering; and the **Atal Innovation Mission (AIM),** which focuses on building a culture of entrepreneurship at the school level. Let's take a closer look at a few of these biggest names and what they're all about.

1. ISRO (Indian Space Research Organisation)

You've heard of ISRO, right? The folks who sent a rover to the Moon and a satellite to Mars! ISRO is the epitome of innovation and is a national hero for a reason. But here's the fun fact: they don't just hire rocket scientists. They have brilliant minds working on everything from designing satellite software to developing remote sensing applications that help our farmers. And their most exciting initiative for you is...

YUVIKA (YUva VIgyani KAryakram)

This "Young Scientist Programme" is a two-week residential program designed to give school children a taste of space science and technology.

Students get to visit ISRO centres, interact with top scientists, build model rockets, and even work on hands-on robotics and drone projects. Imagine getting to work inside ISRO's lab, building something with your own hands! It's an experience that can light up your entire future.

3. DRDO (Defence Research and Development Organisation)

The DRDO is all about protecting the nation by creating cutting-edge defence technology. Think advanced drones, missile systems, and even technology to protect our soldiers in extreme climates.

While their internship programs are often for college students, they actively support and sponsor science competitions and events for schools. The best way to get on their radar is to participate in science fairs and competitions that show off your problem-solving skills and technical know-how.

4. CSIR (Council of Scientific and Industrial Research)

CSIR is a giant network of 38 labs and 39 outreach centres across India, covering almost every field you can think of—from food and medicine to engineering and aerospace.

They have a brilliant "Jigyasa" program, a student-scientist connect initiative that links school students with CSIR scientists and their labs. Through this program, you can get a sneak peek into the world of professional research, do small projects, and see real-world science in action.

5. Atal Innovation Mission (AIM)

This one is a game-changer! An initiative by the Government of India, AIM is a nationwide effort to create a culture of innovation and entrepreneurship. Their flagship program for schools is the **Atal Tinkering Lab (ATL).** If your school has an ATL, you have access to a fantastic space with tools like 3D printers, robotics kits, and electronics. This is your personal workshop to experiment, fail, learn, and create anything you can imagine! The best part is that AIM hosts national challenges, where you can put your ATL creations to the test and win big.

More Initiatives for Young Innovators

The Department of Science and Technology (DST) leads several key initiatives designed to help young people explore their interest in science. A major program, the **INSPIRE Scheme**, is a broad effort to encourage bright students to pursue careers in science.

The **INSPIRE Awards - MANAK** program empowers students from Class 6-10 to submit original ideas, giving them a platform to turn their inventions into reality. For older students, the **Scholarship for Higher Education (SHE)** provides financial support to those who choose to study basic sciences in college. In addition, the **National Innovation Foundation (NIF)** works to find and support amazing ideas from regular people. Through programs like the **Dr. A. P. J. Abdul Kalam IGNITE Awards**, NIF helps kids showcase their innovative ideas and even assists with the process of getting them patented. All these programs are dedicated to sparking creativity and curiosity throughout India.

Your Path to the Lab Coat: How to Get Involved

You might be thinking, "This all sounds amazing, but how do I, a high school student, get my foot in the door?" Great question! These organisations are hungry for young talent, and they have made it easier than ever to get involved.

- **Participate in School Programs:** Many of these organisations, like ISRO with YUVIKA and AIM with ATLs, partner directly with schools. Keep an eye on announcements from your teachers and school administrators.
- **Join Science Fairs & Olympiads:** Every major organisation keeps an eye on national and state-level science fairs. Winning or even just participating in events like the National Science Olympiad or the Inspire Awards can get you noticed and open doors to special workshops and internships.
- **Embrace Online Learning:** Many of these organisations and affiliated platforms offer online courses and workshops. ISRO, for instance, has the Antariksh Jigyasa platform, which offers free online courses on space science. You can learn about everything from satellites to rockets right from your laptop!
- **Don't Fear the Project:** Remember the young innovators from our last issue? They didn't wait for an invitation. They saw a problem in their community and used their scientific knowledge to solve it. Start with a small project: maybe a low-cost water filter for your home or a simple circuit to automate a task. Every big idea starts with a small, personal project.

The Future is a Team Sport

Science isn't a solo mission. It's a team sport, and these organisations are the ultimate team. They bring together engineers, scientists, designers, and thinkers from all walks of life to tackle the biggest challenges facing India and the world. By getting involved, you're not just preparing for a career; you're joining a community of like-minded, passionate people who are all working towards a common goal.

So, the next time you feel like science is just a subject in a textbook, remember that it's a living, breathing world full of opportunities. The lab isn't a place you go to; it's a mindset you carry with you. Start with your curiosity, build with your imagination, and let India's incredible science and innovation organisations be your guide. The future isn't just waiting to happen; it's waiting for you to create it. So, go on, get tinkering!

Agastya Foundation

Imagine learning science not from a textbook, but by building, experimenting, and discovering for yourself! That's the powerful idea behind the **Agastya International Foundation**, a non-profit founded in 1999 by Ramji Raghavan in Bangalore, India. Agastya's mission is to revolutionize education for economically disadvantaged children and teachers by promoting hands-on STEM (Science, Technology, Engineering, and Mathematics) learning. Their goal is to ignite curiosity, creativity, and confidence in communities with limited access to such opportunities.

Their Mission: Igniting Young Minds

Agastya's core objectives are simple yet profound:

- **Spark Curiosity & Creativity:** Moving beyond rote learning to foster genuine excitement for discovery.
- **Boost Confidence:** Empowering students and teachers with practical skills and knowledge.
- **Reach Underserved Communities:** Extending quality education to rural and semi-urban areas.
- **Train Teachers:** Equipping educators to create engaging, innovative learning environments.

As of 2020, Agastya had already impacted over 12 million children and 250,000 teachers across 19 Indian states, making it one of the largest hands-on science education programs globally.

Innovative Programs in Action

Agastya achieves its mission through a range of unique initiatives:

- **Mobile Labs & Lab-on-Bike:** These innovative labs bring hands-on science experiments directly to remote schools.
- **Young Instructor Leader (YIL) Program:** This fantastic initiative trains exceptional students to become peer educators, fostering leadership and deeper understanding.
- **Campus Creativity Lab & Innovation Hubs:** These dedicated spaces, including astronomy centers and design thinking labs, encourage practical experimentation and innovative problem-solving.

Recognition and Partnerships

Agastya's pioneering approach has earned significant accolades, including the **Google Global Impact Award (2013)** and recognition among the **Top 100 Global Innovators by The Rockefeller Foundation**. They also received the **Innovation for India Award (2016)** from the Marico Innovation Foundation and the **Andhra Pradesh State Green Award (2019)** for their environmental efforts.

Their impact is amplified through strong collaborations with government bodies, corporate partners like Infosys Foundation and Wells Fargo, and educational institutions to reaches even more students across India.

Versatile Neck Fan

The student has developed a wearable cool neck belt designed to provide personal comfort, particularly in warm or hot conditions. This device features a lightweight, adjustable neck belt equipped with a built-in fan and a pillow-like cushion. The fan generates a gentle breeze to cool the neck and face, offering relief from heat and enhancing comfort.

Sakshi Bhardwaj
8th Class

The pillow provides additional support, making it a practical and versatile accessory. Portable and rechargeable, this neck fan can be used in various settings, offering an effective and convenient solution to stay cool and comfortable in different environments.

(Source: INSPIRE MANAK NLEPC 2024 Booklet)

Lotus Silk: A Natural Fabric

The lotus is considered a highly spiritual plant, and the lotus flower motif is widely used in textile designs. Natural fibres derived from the lotus hold great potential, especially as growing market demand can help ensure long-term sustainability for farmers who depend on their production.

Shiromani has introduced a mechanised process for producing lotus silk, replacing manual labour with advanced machinery to simplify and reduce production costs.

Shiromani Dahikar
10th Class

This innovative system incorporates steam fixation, high-speed stem cutting, fibre collection using vacuum technology, fibre storage, and waste separation. By automating these steps, the process maintains the unique qualities and properties of lotus silk while making it more affordable and accessible.

(Source: INSPIRE MANAK NLEPC 2024 Booklet)

Indian Inventions

Chess

India's Gift to the World and the Science of Strategy

Have you ever sat in front of a chessboard and felt like a general preparing for battle? The pawns are your foot soldiers, the knights are your cavalry, the rooks are your mighty chariots and the queen is your unstoppable force. Every move is a decision, every piece a weapon and every game a new war of wits. Chess is not just a board game. It's a way to train your brain in **focus, logic, planning and innovation**.

But here's the coolest part: this powerful game of brains and bravery was **born in India more than 1500 years ago**. Yes, the same chess that is now played in cafes, schools, world tournaments and even in space (astronauts have played chess onboard missions) started right here in our own land.

The Indian Roots of Chess: The earliest form of chess was called **Chaturanga**, a Sanskrit word meaning "four divisions", just like the four parts of an ancient Indian army: elephants, chariots, cavalry and infantry.

Chaturanga was played on an 8×8 board, exactly like modern chess, and each "soldier" had unique movement rules. The game later travelled to Persia (where it was called *Shatranj*), then spread across the Arab world and Europe, evolving into the chess we know today.

So, the next time you move a knight or castle your rook, remember: you're continuing a tradition started by Indian minds over a thousand years ago.

More Than a Game: The Science of Chess

At first, chess might look like just moving pieces around. But look closer—it's actually a **science lab for your brain!**

- **Mathematics:** Counting moves, calculating probabilities.
- **Physics-like thinking:** Predicting how things move when forces (your opponent's moves) act on them.
- **Logic and Pattern Recognition:** Spotting traps and repeating formations.
- **Decision-Making:** Choosing the best move under pressure.

Scientists call this **predictive thinking**, imagining future scenarios and planning accordingly. Astronauts, engineers and scientists all use the same skill every day.

Learning from India's Grandmasters

India isn't just the birthplace of chess—it's also home to some of the world's greatest chess brains today:

- **Viswanathan Anand** - The Tiger of Madras: India's first Grandmaster and former World Champion, known for lightning-fast calculations.
- **R Praggnanandhaa - The Teenage Genius:** Became a Grandmaster at just 12 and has already battled the world's top players.
- **D. Gukesh - The Record-Breaker:** In 2024, this Chennai teenager became the youngest ever winner of the Candidates Tournament, earning a shot at the World Championship.
- **Vaishali Rameshbabu & Koneru Humpy:** Proof that chess brilliance is not limited by gender, both are international stars inspiring young girls across the country.

Left to Right - Srinath, Pentala Harikrishna, Arjun Erigaisi, D. Gukesh, Vidit Gujrathi and R.Praggnanandhaa

Chess in Indian Schools: Building the Next Thinkers

More and more schools across India are introducing chess into classrooms and after-school clubs.

- In **Tamil Nadu**, chess is even a compulsory subject in some schools.
- In **Gujarat**, it's used to boost focus and exam performance.
- Thanks to apps like **Chess.com** and **Lichess**, even kids in rural villages can now practice against players worldwide.

Chess has become a **universal classroom**, where intelligence has no boundaries.

The Innovation Connection

Chess is also sparking fresh ideas among students:

- A student in Bengaluru built a **robotic chessboard** that moves pieces automatically using magnets and AI.
- A team in Chennai created a **talking chessboard for the visually impaired**, using sensors and voice feedback.
- A science project in Hyderabad proved how regular chess practice can improve exam scores through better memory.

You don't need to be a Grandmaster to innovate, you just need creativity and curiosity.

Conclusion: From a Game to a Way of Thinking

Chess is more than India's ancient gift to the world, it's a tool for **smarter thinking, sharper focus and endless innovation**.

So, the next time you sit at a chessboard, don't just play. **Experiment. Strategize. Dream**. Who knows? You might invent the next smart chess app, design a chess robot or even become India's next world champion.

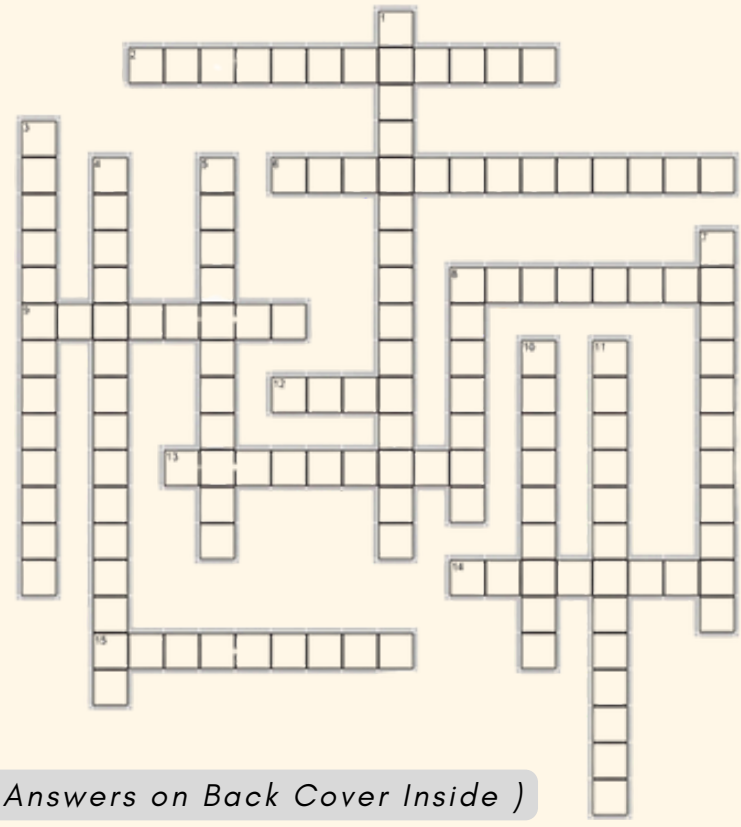
Remember, India gave the world this incredible game centuries ago. Now, it's your move.

Word Search 2506

Topic: Environment

Across

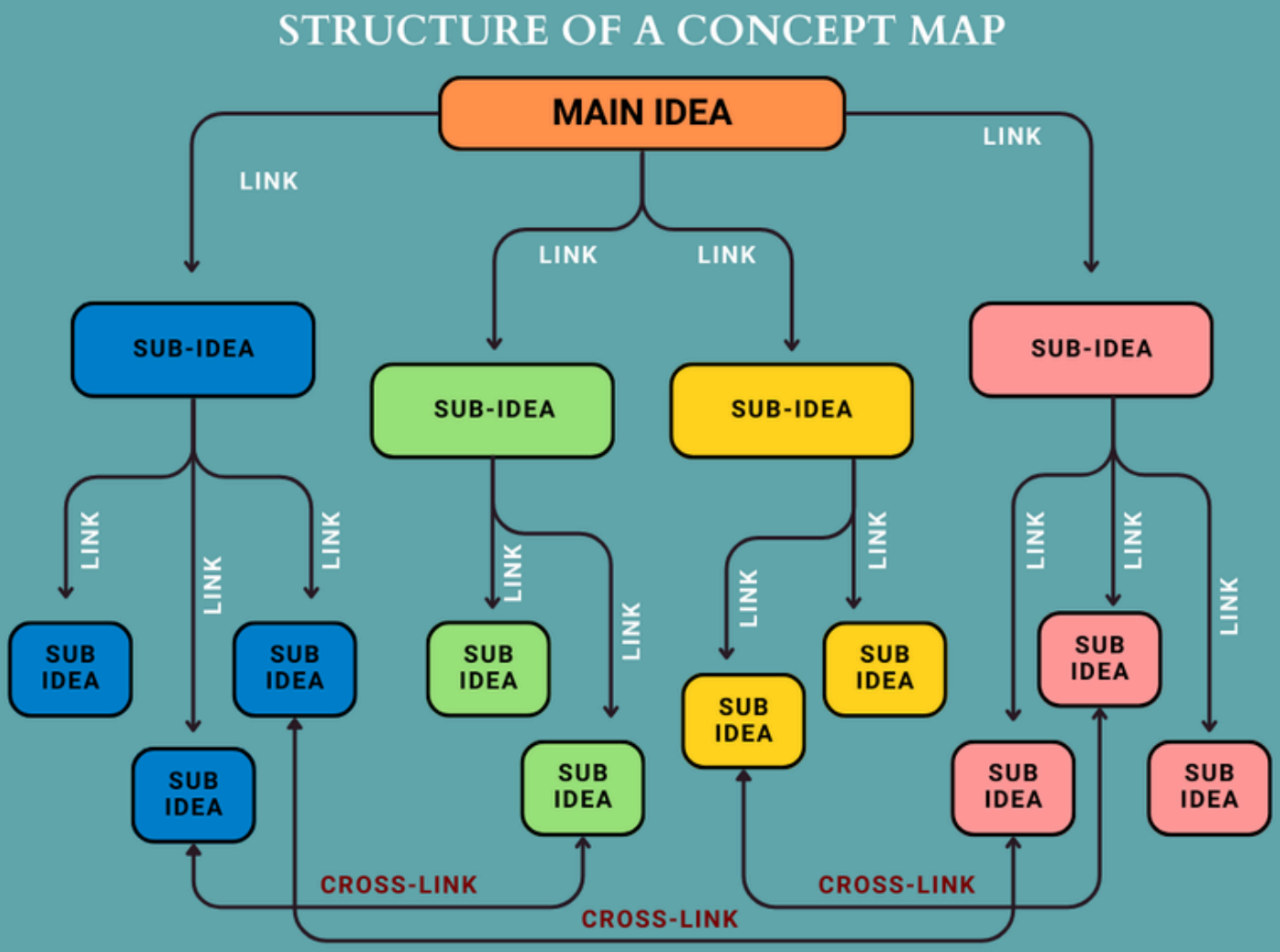
2. protecting, maintaining or improving natural resources, to keep them safe from destruction or degradation and conserve them for future generations
6. destruction of forests to make land for agriculture
8. the release or discharge into the air of pollutant substances such as gas or smoke
9. an area designated to receive household garbage, solid waste and construction debris
12. location where garbage, rubbish or waste is taken and just dumped, without environmental controls
13. the process of minimizing waste by recovering materials and transforming them into new products
14. rain mixed with sulphuric, nitric and other acids formed by gases released into the atmosphere when fossil fuels are burned
15. a community of plants, animals and other organisms living in an area which provides what they need in order to survive



(Answers on Back Cover Inside)

Down

1. a measure of the effect that human activities have on the climate
3. a gradual warming of the earth's surface temperature reportedly caused by the emission of gases that trap the sun's heat in the earth's atmosphere
4. gases that trap the heat of the sun in the earth's atmosphere, producing the greenhouse effect
5. fuels such as oil, coal and natural gas
7. the surroundings and external conditions that affect the growth and development of living things
7. the surroundings and external conditions that affect the growth and development of living things
8. the study of the relationship of living things (plants, animals and humans) with each other and with their environment
10. contamination of the air, water, or soil with substances that can cause harm to human health or the environment
11. capable of being broken down or decomposed by natural biological processes



Innovation Training Module

Concept Maps

A Tool to Unlock Your Thinking Power

Have you ever tried to revise for an exam and realized that even though you read the textbook, the information felt scattered and hard to connect? Or maybe you've had a brilliant idea for a science project but struggled to organize your thoughts clearly. If yes, then you're not alone! This is exactly where **Concept Maps** come to the rescue.

Think of a concept map like a map of your brain —showing not just the "places" (ideas) but also the "roads" (connections) between them. Let's explore this technique in detail through – the lens of **what, why, when, where, and how**, and see how it can play a big role in science, innovation, and everyday learning.

What is a Concept Map?

A **Concept Map** is a visual tool used to represent ideas and how they relate to each other. It usually starts with a **main concept** (like "Renewable Energy") at the center or top, and then branches out into sub-concepts (like "Solar," "Wind," "Hydropower"), which further branch into details (like "Solar panels," "Wind turbines," etc.).

In simple terms, it's a **diagram that connects knowledge**. It looks a bit like a family tree or a flowchart, but instead of people or steps, it connects concepts.

Why Use a Concept Map?

Because our brains don't store information like neatly arranged textbooks, they store it as a web of connections. For example, when you think of "Water," you may immediately think of "Rain," "Drinking," "Rivers," and "Hydropower."

Concept maps work the same way: they help you **see relationships between ideas**, making it easier to remember and apply knowledge.
Some key benefits are:

- **Better Understanding:** Helps you understand "why" things are connected, not just "what" they are.
- **Clarity in Thought:** Makes big, messy ideas clearer by showing them step by step.
- **Creativity Booster:** Sparks new ideas because you can see unexpected connections.
- **Memory Aid:** Visual representation makes learning faster and long-lasting.

When and Where to Use Concept Maps?

The beauty of concept maps is that they can be used **anytime and anywhere** you need to organize knowledge.

- **In Classrooms:** To revise chapters or summarise big topics like "The Human Digestive System" or "The Periodic Table."
- **In Science Projects:** To brainstorm and organize experiments, like planning a low-cost water filter model.
- **In Everyday Life:** Planning an event, organizing a debate, or even preparing for an exam.
- **In Research and Innovation:** Scientists and engineers use concept maps to connect existing knowledge and identify gaps where innovation can happen.

How to Create a Concept Map?

Making a concept map is simple and fun:

1. **Choose a Main Idea:** Start with the big topic you want to explore (e.g., "Climate Change").
2. **Identify Sub-Ideas:** Think of smaller topics related to it (e.g., "Causes," "Effects," "Solutions").
3. **Connect Them:** Draw lines or arrows to show how they are related. Write a short linking phrase like "leads to," "causes," or "depends on."
4. **Go Deeper:** Add more levels of details under each sub-topic.
5. **Make It Yours:** Use colors, shapes, or even doodles to make it engaging and memorable.

Why Concept Maps Matter in Science and Innovation?

Science and innovation are all about **making connections**—between problems and solutions, between old knowledge and new discoveries. Concept maps train you to think like an innovator.

For example:

- In **scientific research**, concept maps help identify missing links. A researcher studying renewable energy might map existing solutions and realize that hybrid systems (like solar + wind) are not fully explored. That gap could become a new innovation.

- In **technology development**, concept maps help in brainstorming. Startups often use them to plan product designs, identify user needs, and visualize potential improvements.

How to Use Concept Maps?

Example 1: CBSE Science Revision

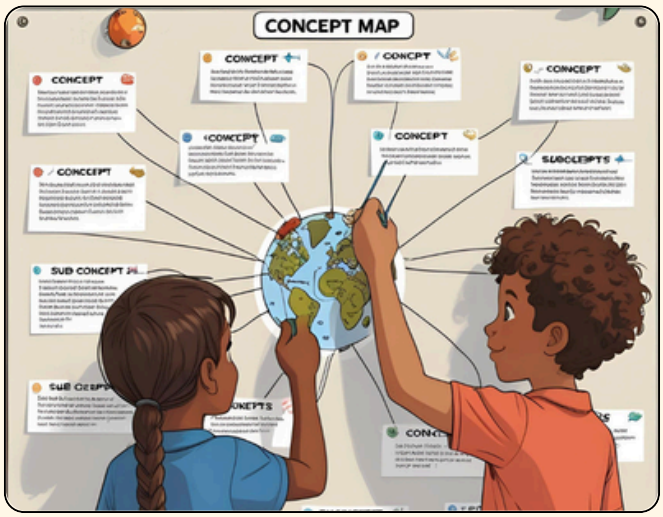
Imagine you're revising the chapter on "Electricity" for your Class 10 CBSE exam. You create a concept map:

- Main idea: **Electricity**
  - Sub-idea: **Ohm's Law** → V = IR
  - Sub-idea: **Current & Resistance** → Series circuits, Parallel circuits
  - Sub-idea: **Applications** → Electric bulbs, Heaters, Fuse
  - Sub-idea: **Safety Measures** → Earthing, Circuit Breakers

By mapping it, you can see how everything links together. Suddenly, instead of mugging formulas, you understand how they all fit into the bigger concept of electricity in daily life.

Example 2: Solving a Community Problem

Suppose your school wants to reduce plastic waste. A concept map could help brainstorm solutions:



- Main idea: **Plastic Waste**
  - Sub-idea: **Sources** → Bottles, Bags, Wrappers
  - Sub-idea: **Effects** → Pollution, Health issues, Harm to animals
  - Sub-idea: **Solutions** → Reuse, Recycle, Awareness campaigns
  - Sub-idea: **Innovation ideas** → Making eco-bricks, Promoting cloth bags

From this map, you might come up with a school project to collect plastic wrappers and turn them into eco-bricks for building benches in the playground. That's innovation powered by a concept map!

Wrapping Up

Concept maps may look like simple diagrams, but they are powerful tools to think, learn, and innovate. They help you not only **remember information better** but also **see hidden connections** that spark creativity. Whether you're revising for your board exams, planning a science project, or dreaming up a solution for India's future problems, concept maps can be your secret weapon.

So, next time you sit with your notebook, don't just write lines of notes; **draw your thoughts.** Who knows, the simple map you create today might guide you to the next big idea in science and innovation tomorrow!

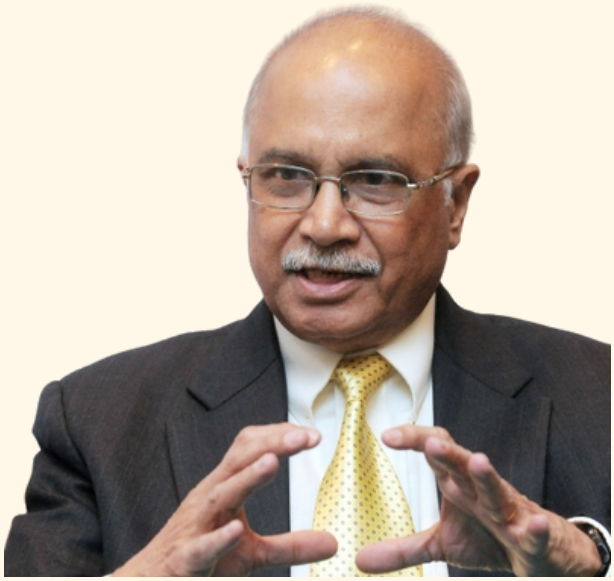
"Concept maps are like maps of your mind – they show how ideas connect."

"When you can draw it, you can understand it better."

Indian Scientist

Ramamurti Rajaraman

Padma Bhushan in 2014



(11 MARCH 1939 – 12 JULY 2025)

Professor Ramamurti Rajaraman was a true giant of Indian physics whose impact reached far beyond the lab. His academic journey took him from the University of Delhi to Cornell University, and he became a respected professor at Jawaharlal Nehru University, even holding visiting positions at top global institutions like Princeton and MIT!

His Superpowers in Science:

- **Unlocking Nuclear Secrets:** Imagine understanding the tiny building blocks of everything! Dr. Rajaraman was a wizard at nuclear physics, helping us grasp how atomic nuclei are put together. This knowledge is super important for things like nuclear energy and even understanding stars!
- **Exploring Quantum Worlds:** He delved into the strange and fascinating world of quantum mechanics, studying "solitons"— think of them as stable waves that behave like particles! His work here influenced everything from material science to high-energy physics.
- **Textbook Extraordinaire:** He literally wrote the book on "Solitons and Instantons," a go-to guide for advanced students worldwide!

A Champion for Peace:

Beyond his scientific brilliance, Dr. Rajaraman was a passionate advocate for a safer world. He played a crucial role in discussions about nuclear disarmament and non-proliferation, even advising the Indian government. He was a founding member of the International Panel on Fissile Materials, working tirelessly to control dangerous nuclear materials. He also frequently shared his insights through public articles on nuclear reactor safety and the risks of nuclear weapons accidents, emphasizing the importance of a responsible nuclear doctrine. His clear voice made him a prominent figure in public discourse on science policy and civil-military relations.

Awards and Legacy:

For his incredible contributions, he received India's third-highest civilian honor, the **Padma Bhushan**, and the prestigious **Shanti Swarup Bhatnagar Prize**. He mentored countless Indian physicists, leaving a lasting legacy in our nation's scientific landscape. Professor Rajaraman truly showed us that science can be a powerful force for both discovery and peace!

Indian Inventions

AI and Technology

Shaping Our Future

Hey future innovators! Ever wonder how your smartphone knows what song you'll love next, or how a self-driving car stays in its lane? The answer lies in two super cool forces: **Artificial Intelligence (AI) and Technology**. These aren't just fancy words; they're shaping our world at lightning speed, and guess what? You're right at the heart of it!

What's the Big Deal?

Let's break it down:

Technology (The "How-To" Tools)

Think of **technology** as all the awesome tools, gadgets, and systems we create to make life easier and more efficient. From the earliest wheel to the internet, it's about applying science to solve problems. Your smartphone, a solar panel, or the network delivering this article—that's all technology!

Artificial Intelligence (The "Smart Brains" Inside)

Now, imagine giving those tools a brain! That's **AI**. It's a branch of computer science focused on creating machines that can "think" and "learn" like us. This means they can understand language, recognise patterns, solve problems, make decisions, and even create new things. It's not about robots taking over but about empowering machines to perform tasks that typically require human intelligence.

Why Are They So Important?

Technology is the engine of progress. It has:

- **Connected the World:** Imagine talking across the planet instantly!
- **Revolutionized Learning:** Online courses and digital libraries mean you can learn anything, anywhere.
- **Improved Healthcare:** From advanced diagnostic tools to new surgeries, technology helps us live healthier.
- **Boosted Efficiency:** Doing things faster and better, whether manufacturing cars or managing traffic.

AI takes technology to the next level, making it smarter:

- **Personalized Experiences:** Like streaming services suggesting movies you'll love – that's AI understanding you.
- **Solving Complex Problems:** AI can analyze massive data to find solutions for climate change or disease.
- **Automating Tasks:** AI handles repetitive jobs, freeing us for creative work.
- **Enhancing Human Abilities:** AI isn't replacing us; it's giving us superpowers, like helping doctors or artists.

When and Where Did All This Start?

While the idea of intelligent machines has been around for centuries (think myths of robots!), modern **AI** really kicked off in the **mid-20th century**. The term "Artificial Intelligence" was coined in **1956**. Since then, it's been a roller coaster of breakthroughs, accelerating thanks to powerful computers and huge amounts of data.

You can find **AI** and **technology everywhere**! In your pocket (smartphone), home (smart speakers), school (learning apps), and even space (Mars rovers). Seriously, it's hard to find a corner of modern life untouched by them.

How Are They Changing Our Present and Future?

The changes are already massive and speeding up.

In the Present:

- **Education:** AI-powered tutoring personalizes your learning.
- **Healthcare:** AI helps doctors diagnose and treat illnesses.
- **Entertainment:** AI recommends content and powers realistic video game characters.
- **Work:** AI is automating tasks, changing jobs and how we work.

In the Future:

- **Smart Cities:** Imagine cities where traffic flows perfectly and services are super-efficient, thanks to AI.
- **Personalized Healthcare:** AI could create treatments just for you, based on your unique body.
- **Exploration:** AI will be key for exploring distant planets.
- **New Jobs:** Many new jobs will pop up, needing skills in developing and managing AI and tech.

Some Awesome Innovations and Breakthroughs!

- **DeepMind's AlphaFold (AI):** This AI revolutionized biology by accurately predicting how proteins fold, impacting drug discovery.
- **Large Language Models (AI):** Tools like ChatGPT or Google's Gemini can understand and generate human-like text, answer questions, write stories, and even code!
- **CRISPR Gene Editing (Technology):** This allows scientists to precisely edit DNA, opening possibilities for curing genetic diseases.
- **Quantum Computing (Technology):** A futuristic computing type that could solve problems too complex for today's supercomputers, revolutionizing medicine and materials.
- **Self-Driving Cars (AI + Technology):** Cars that navigate roads safely without human help are becoming real, thanks to advanced AI and sensors.

India's Role in the Tech Game

Guess what? India is a huge player in the global AI and technology scene! We've got tons of super-smart engineers, and our government is really pushing for digital growth with projects like the **"India AI Mission."**

This mission is all about building a strong AI ecosystem and making high-quality data available. Indian startups are coming up with -

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INDIAai
A MEITY INITIATIVE

cool new ideas, and big global tech companies are investing heavily here. India is even leading the world in how quickly people are gaining AI skills – a clear sign that we're serious about being a future tech leader!

The Flip Side: Threats to Be Aware Of

While this tech is super exciting, it's also smart to know about some challenges and potential downsides, so we can use these powerful tools wisely:

- **Job Changes:** As AI gets better at routine tasks, some jobs might shift or even disappear. We need to be aware of these changes and adapt by learning new skills for the evolving job market.
- **Privacy Worries:** AI systems often use lots of our personal information. This raises questions about how your data (like what you search or where you go) is collected, stored, and kept safe. Being mindful of what we share online is more important than ever.
- **AI Can Be Biased:** AI learns from the data it's fed. If this data has hidden biases from the real world, the AI can unfortunately make unfair decisions. We need to push for fair and unbiased AI development to ensure it helps everyone equally.
- **Fake Stuff (Deepfakes):** AI can create super realistic fake pictures, videos, and sounds. Imagine a video of someone saying something they never did! This makes it harder to tell what's real online and could spread false information. Staying critical and questioning what we see is vital.
- **Smarter Cyberattacks:** Bad guys can use AI too, creating super convincing fake – emails (phishing) or sneaky computer viruses. This makes it tougher to stay safe online, so being extra careful about digital security is our best defense.

Staying Ahead of the Game!

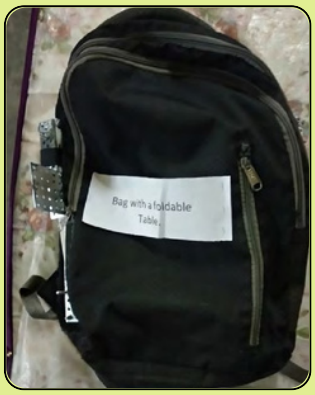
So, how can you harness this power and not get left behind?

- **Be Curious & Keep Learning:** The tech world changes fast. Read articles, watch documentaries, and explore new tools.
- **Develop Digital Literacy:** Understand how to use software, navigate the internet safely, and critically evaluate online information.
- **Learn the Basics of Coding:** Even fundamental concepts (like Python) give you a huge advantage in understanding and building with tech.
- **Embrace Problem-Solving:** Technology and AI are tools for solving problems. Think about challenges and how tech could offer solutions.
- **Think Critically About AI:** AI is powerful, but not perfect. Understand its limits, potential biases, and ethical implications.
- **Collaborate and Create:** Get involved in projects, hackathons, or clubs. Learning from peers is invaluable.
- **Focus on "Human Skills":** While AI handles repetitive tasks, human skills like creativity, critical thinking, empathy, and adaptability become even more valuable.

The future is here, powered by AI and technology. By understanding and using them responsibly, you're not just preparing for the future – you're actively shaping it! So go forth, explore, and innovate! The world is waiting for your brilliant ideas.

Bag with a Foldable Table

Habakku once visited a bank where renovation work was in progress, and people struggled due to the lack of space and tables to fill out slips and forms. This inspired him to design a simple, practical solution - a bag with an integrated table.



He created a canvas bag containing a detachable plastic tabletop with foldable legs, which can be easily stored inside the bag when not in use. The design is user-friendly, portable, and cost-effective. This innovative idea can be conveniently used by professionals from various fields, such as engineers, businessmen, and researchers.

Habakku R. Sangma
10th Class

(Source: INSPIRE MANAK NLEPC 2021 Booklet)

Backrest for Side-Seated Women

In India, two-wheelers remain the most affordable mode of transportation. However, women wearing sarees and elderly people often face the risk of losing balance and feeling uncomfortable while riding as the second passenger on motorcycles. Recognising this issue, Charan developed a back support attachment.

To create this device, two rectangular iron plates (one measuring 6 cm x 16 cm and the other 6 cm x 22 cm) were welded together to form a sturdy frame.

A 35 cm rod was drilled with two holes on each side and welded onto the frame. Finally, rubber clamps and a car headrest seat were inserted into the holes and assembled onto the motorcycle's back seat.

This simple yet effective tool enhances the safety and comfort of passengers who sit facing sideways while riding on motorcycles.

Padigala Charan Teja
9th Class

(Source: INSPIRE MANAK NLEPC 2022 Booklet)

S&I Article

How to Turn Your Science Project Into a Startup?

Every student remembers the moment something clicked. A magnet levitates, a circuit lights up. That thrill? It's magic. Now, what if that magic went beyond the classroom?

What if your science project became more than a grade booster and turned into a startup? You might think "But I'm just a student!" That's what Krtin Nithiyanandam thought, until his science project on early Alzheimer's detection won global innovation awards.

Turning a science project into a startup isn't just for scientists in lab coats or Silicon Valley geniuses. With curiosity, creativity and a little planning, you can take your school project and launch it into the world as a real solution to real problems. Let's learn how you can do it step by step!

Find the Real-World Problem

Before anything becomes a product, it starts as a problem-solver. Ask yourself:

- What problem does my project solve?
- Is this a problem people actually care about?
- Who benefits from this solution?

Example

Project: Smart Dustbin that opens on motion

Problem: Reduces contact with waste, prevents disease spread

Real-world use: Hospitals, schools, public places

Don't stop at "cool." Go for "useful". If your project makes life easier, faster, safer, cheaper or greener, you might be on to something big.

Talk to Your Target Users

A startup succeeds when it helps real people. So go talk to them.

Find your audience:

- Did you build a home energy saver? Talk to homeowners.
- Designed a farming tool? Visit local farms.
- Created a study app? Ask classmates what features they'd love.

Ask questions like:

- Would you use something like this?
- What do you currently use?
- What don't you like about your current options?

Don't worry if your idea isn't perfect yet. These conversations are your lab tests.

Prototype. Break It. Fix It. Repeat.

A prototype is your first working version. Not perfect. Not final.

Just enough to show the concept. Your goal is to go from "idea" to "thing you can touch, test, and improve."

What you'll need

- A simple design (paper + glue + recycled parts count!)
- Feedback from users (Yes, again!)

Fun Fact

Thomas Edison made over 1,000 prototypes before inventing the working light bulb. Your first version isn't supposed to be perfect.

Learn the Basics of Business (Without Getting Bored)

You don't need to be Elon Musk to launch a startup, but you should know a few essentials:

Think like a mini-CEO

- Who will buy it?
- What problem does it solve?
- How will you make it?
- How will you sell it?

- How much will one unit cost to make?

This step turns you from "innovator" to "entrepreneur".

Master the Art of Pitching

Now it's time to tell your story and make people care. Whether you're talking to a friend, a teacher or an investor, you need a pitch: a quick explanation of your idea.

Your pitch should answer:

- What's the problem?
- What's your solution?
- Why is it unique?
- What's next?

Example Pitch:

"I built a wearable air quality sensor for asthma patients. It alerts users before pollution spikes so they can avoid attacks. It's cheaper than existing models, works offline and fits in your pocket."

Practice in front of the mirror, record yourself, pitch at science expos, YouTube or even Instagram reels!

Build Your Digital Presence

You don't need a big office or a fancy logo. In fact, you just need visibility.

Here's how to begin:

- Create a simple website.
- Post videos and get on social media.

Your project might inspire others, or attract mentors, funders and customers.

Funding Your Innovation (Without a Bank Loan)

You're a student. Your budget = snacks + textbooks. So, how do you afford materials, software and tools?

Good news: There are tons of funding options just for young innovators. Try these options.

- **School innovation grants:** Ask your science teachers or innovation clubs.

- **College incubation cells:** Many colleges support promising school projects.
- **CSR funds:** Some companies donate to student-led tech/social ideas.

And don't underestimate family and friends. A small pool of well-wishers can help fund your first prototype.

***Tip**: Keep a record of how you spend every rupee. It builds trust with future funders.*

Explore Competitions, Grants & Awards

Competitions aren't just about medals, they're platforms for feedback, visibility and funding.

Some amazing opportunities:

- GYS Avishkar Awards
- INSPIRE Awards—MANAK
- IGNITE Awards – National Innovation Foundation (India)
- IRIS National Science Fair
- CSIR Innovation Awards for School Children
- Atal Tinkering Lab (ATL) Marathon
- Google Science Fair
- CBSE Science Exhibition
- National Children's Science Congress (NCSC)
- TCS InnoVita & Ignite
- Youn Scientist India by Space Kidz
- DRDO & ISRO Competitions
- Kishore Vaigyanik Protsahan Yojana (KVPY)

These competitions often offer:

- Scholarships
- Lab access
- Mentorship
- Patenting assistance
- Even seed money for your startup!

***Pro Tip:** Start with local expos or school events. Build confidence. Then aim global.*

Protecting Your Idea (Without a Legal Degree)

If your project is truly unique, consider intellectual property protection.

Types of IP to explore:

- Patent – for inventions and products
- Trademark – for names, logos, slogans
- Copyright – for original designs, software code, and content
- Don't worry—you don't need a lawyer to get started. You just need awareness.

Let's Go — From Lab Table to Launchpad

You're not just building models. You're building solutions. Every startup begins with a simple idea, often born in a lab, garage or school bench. The next step?

Believing that it matters. So, take that science project off the shelf. Dust it off. Improve it. Talk to people. Pitch it. Share it.

This isn't just about marks. It's about impact. You're not just a student. You're a creator, an innovator, maybe even a future CEO. And it all starts with the spark in your hands right now.

Legacy and Impact

Dr. Trehan's work contributed significantly to astrophysics, plasma physics, and applied mathematics. His studies have influenced research in fluid dynamics, magnetohydrodynamics, and mathematical physics.

Indian Scientist

Obaid Siddiqi

Padma Vibhushan in 2006 and Padma Bhushan in 1984

(7 JANUARY 1932 – 26 JULY 2013)

Imagine a world where we can unravel the very instructions that make us who we are—our genes! That's the extraordinary realm of Professor Obaid Siddiqi, a true pioneer of Indian biology and genetics whose groundbreaking work put India on the global map of neuroscience!

Dr. Siddiqi's journey took him from an early education in India to a Ph.D. at the University of Glasgow. He didn't just stop there; he collaborated with scientific giants like Alan Garen and Seymour Benzer, leading to discoveries that changed how we see the world.

His Superpowers in Science

- **Cracking the Genetic Code:** Imagine finding the "stop" signs in our body's instruction manual! Early in his career, Dr. Siddiqi helped uncover "nonsense mutations," which were crucial for understanding how our genes tell cells to build proteins.
- **Unlocking Brain Secrets with Fruit Flies** His most famous work involved tiny fruit flies (Drosophila). By studying their genes and behaviour, he discovered "temperature-sensitive paralytic mutants." This breakthrough was like finding a secret switch to control neural activity, opening up the entire field of neurogenetics! His work revealed how genes influence our senses, like taste and smell.

Building a Scientific Powerhouse

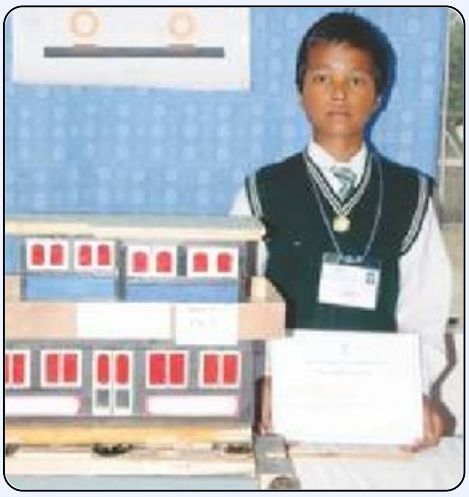
Dr. Siddiqi wasn't just a brilliant researcher; he was an incredible institution builder.

- In 1962, he founded the **Molecular Biology Unit at TIFR in Mumbai,** a major step for modern biology in India.
- Later, in 1992, he established and led the renowned **National Centre for Biological Sciences (NCBS) in Bangalore**. These institutions became hubs for scientific excellence, shaping generations of Indian scientists.

Awards and Legacy

For his immense contributions, Dr. Siddiqi received India's second-highest civilian honor, the **Padma Vibhushan (2006)**, and the **Padma Bhushan (1984)**, along with the prestigious **Shanti Swarup Bhatnagar Prize**. He was also elected a **Fellow of the Royal Society (UK)** and a **Member of the U.S. National Academy of Sciences**, recognizing his international stature.

EarthQuake-Prood Building



Roland Benjamin Nongtdu
7th Class

The objective is to protect buildings (only a couple of storeys) from earthquakes. As per Newton's law, the body at rest will remain at rest if no external forces are acting on it. So, if a building is protected from the movement caused by the earthquake, it can be safe.

To achieve this, at the bottom of the building, two metallic chassis of the same size are placed one above the other. Between them, several concave trays are fixed facing one another, one from the top and one from the bottom, with a metallic spherical shell sandwiched between the trays. These sets of balls and trays are placed and bolted along the entire length and breadth of the chassis and the cross members of the chassis.

During an earthquake, the lower chassis shares the motion of the ground and just rolls under the balls, while the upper chassis remains more or less at rest, protecting the building above.

(Source: INSPIRE MANAK NLEPC 2012 Booklet)

Airbag Protection System for Bikers

Vishnu was standing at a crossroads when he witnessed a road traffic accident involving a bike and a car. The car's airbag system protected its occupant, but the biker, despite wearing a helmet, was injured. This incident inspired Vishnu to develop an airbag system for bikes.

He designed an airbag suit integrated with crash sensors, piezo buzzers, microcontrollers, transformers, switches, and other components.

In the event of a crash, the sensors detect the impact, and the inflator automatically deploys the airbag jacket within 0.5 seconds. This innovation has the potential to significantly reduce injuries in road traffic accidents.

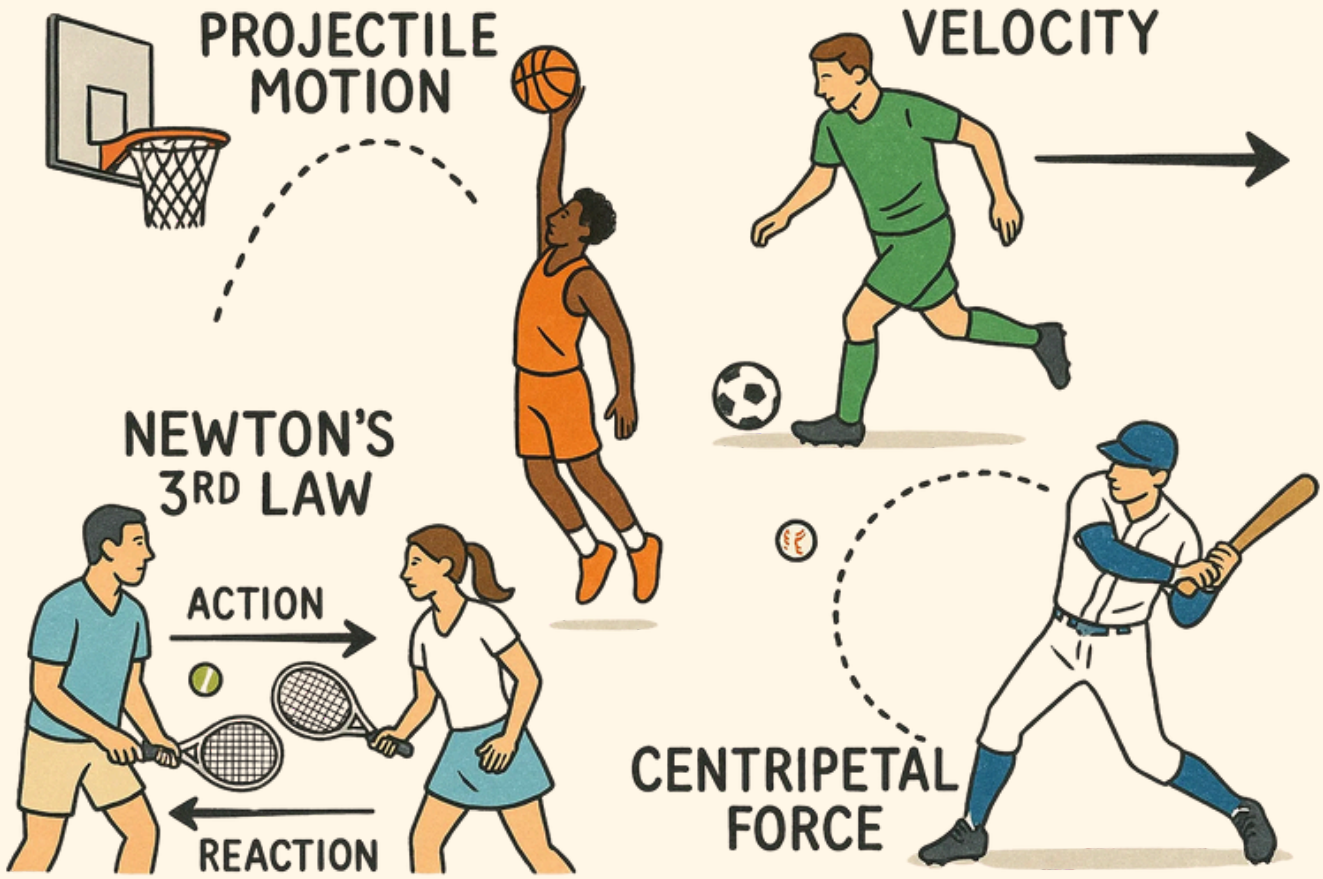
G. Vishnu Vardhana Reddy
10th Class

(Source: INSPIRE MANAK NLEPC 2021 Booklet)

S&I Article

Science in Sports

The Unseen Power Behind Every Game



Every sport you play is powered by science, especially physics. Whether you're hitting a cricket ball, kicking a football, or racing on a track, you're constantly using principles like **motion, energy, and force**. Excelling in sports isn't just about raw talent, it's about mastering technique.

And science is precisely what perfects that technique. From the optimal angle of a basketball shot to the aerodynamics of a sprint, physics plays a key role in improving performance, boosting efficiency, and gaining a competitive edge.

Cricket: A Symphony of Force

In cricket, Newton's Laws are always in play. When a batsman hits a six, the bat applies force to the ball. According to Newton's Second Law (F=ma), the speed and direction of the ball depend on the swing speed and bat angle.

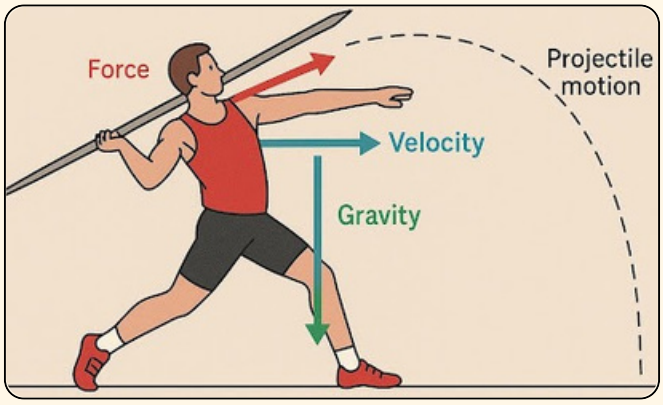
Hitting the "sweet spot" helps transfer energy more efficiently, making the ball travel farther. The famous "**Helicopter shot"**, pioneered by **MS Dhoni,** is a marvel of science, combining fast reaction, powerful wrist motion, and circular force, all using Newton's laws and rotational physics.

Physics Experiment Idea for Cricket:

Use a tennis ball and two bats of different weights. Observe which bat hits farther and think about the physics behind it.

Javelin Throw: Mastering Angles and Momentum

When an athlete throws a javelin, they are expertly using force, motion, and angles – all part of physics. The **run-up speed** is crucial, as a faster run builds more momentum, which then transfers to the javelin. Studies show that a **release angle** of around 30 to 36 degrees yields the best flight and distance. **Aerodynamics** plays a key role too; the javelin's slender shape cuts through the air, reducing resistance and allowing it to glide farther. Finally, perfect **balance and timing** ensure maximum throw distance and prevent fouls. These actions are all guided by physics concepts like Inertia, Force, and Angular Motion.



Badminton: Speed and Prediction

The badminton smash travels incredibly fast, over 400 km/h in professional games. Players don't rely on reflexes alone but also on prediction. They anticipate opponents' movements and racket angles – a skill known as **predictive response**. Physics helps coaches train athletes to reduce their reaction time using drills focused on speed and angles.

Your Path as a Young Sports Scientist

So, how can you, as an aspiring young scientist, begin exploring this exciting field?

- **Observe Actively**: Pay close attention to how your body moves and how your equipmentbehaves during any sport you play or watch. Notice how different angles, speeds, and forces affect outcomes.
- **Create Science Projects:** Design your own experiments to test principles like spin, force, or reaction time. You can use simple, everyday materials to explore complex ideas.

- **Innovate:** Think critically about existing sports equipment. How could basic science concepts be applied to design better, safer, or more efficient gear?

And guess what? You can absolutely build a career in this dynamic field! Careers in sports science, biomechanics, sports engineering, and data analytics in sports are growing incredibly fast. Scientists in these roles work directly with elite athletes to improve performance, design smart wearable technology, analyze vast amounts of player data, or develop safer protective gear. Interestingly, even fields like space and defence research often look to sports-science technology and expertise to train soldiers or astronauts.

Conclusion

Sports are brimming with hidden science. Every athlete, whether they realize it or not, is utilizing physics with every move they make. By understanding the science behind the game, students like you can not only improve your own performance but also spark incredible innovations that could shape the future of sports.

Imagine discovering the next breakthrough in athletic training or designing a piece of equipment that changes the game forever! India needs both brilliant players and smart scientists, and you have the potential to be both.

World Environment Day
5th of June

Established in 1972, World Environment Day is a global event celebrated to raise awareness and encourage action for environmental protection. Led by the United Nations Environment Programme, it addresses urgent issues like climate change, plastic pollution, deforestation, biodiversity loss, and sustainable living. The theme emphasises land restoration, drought resilience, and reducing plastic waste, highlighting that caring for nature is not just a government responsibility.

Hey students!

World Environment Day is your chance to become a hero for our planet. This day helps you connect what you learn in science class about climate change and pollution to real-life action.

- Creates Awareness: Learn about major global issues.
- Encourages Hands-On Learning: Participate in clean-ups or plant trees.
- Develops Key Skills: Enhance your creativity and problem-solving through projects.
- Inspires Lasting Habits: Start eco-friendly habits that last a lifetime.
- Motivates Future Careers: This day might even spark an interest in environmental science or other related careers.

Indian Scientist

Patcha Ramachandra Rao

Shanti Swarup Bhatnagar Prize in 1985

(21 MARCH 1942 – 10 JANUARY 2010)

Dr. Patcha Ramachandra Rao was an extraordinary Indian metallurgist, educator, and scientific administrator whose profound contributions shaped materials science for over four decades.

Born in 1942, his unique journey saw him serve as a student, faculty member, and eventually Vice-Chancellor at Banaras Hindu University, showcasing his deep commitment to academia and research.

A Career of Leadership and Breakthroughs

Dr. Rao's groundbreaking work includes being the first outside the USA to conduct experimental research on the **rapid solidification** of metals. This innovative technique cools molten metals incredibly fast, leading to the creation of **metallic glasses** and quasicrystals – materials with extraordinary properties vital for aerospace and electronics. He also spearheaded **biomimetic synthesis**, pioneering eco-friendly ways to create inorganic materials like hydrophobic apatite for bone grafts and dental implants, laying the foundation for green nanotechnology in India.

Dr. Rao's distinguished career included pivotal leadership roles, where he:

- Directed the **National Metallurgical Laboratory**, guiding crucial research.
- Served as **Vice-Chancellor of Banaras Hindu University**, initiating significant academic and infrastructure development.
- Became the **First Vice-Chancellor of the Defence Institute of Advanced Technology**, establishing vital programs.

Honours and Lasting Impact

Dr. Rao's immense contributions were widely recognised. He received:

- The prestigious **Shanti Swarup Bhatnagar Prize** for Engineering Sciences (1985).
- The **National Metallurgist Award** (2004).
- The **INSA Materials Science Prize** (1997).

He authored over 200 research papers, held numerous patents, and inspired countless students through his mentorship.

A fellow of every major Indian science academy and prestigious international bodies, Dr. Rao's legacy continues to shape materials science and inspire future innovators in India.

Innovation Training Module

Reverse Engineering

Become a Tech Detective!

Ever seen a magic trick and immediately wanted to know how it's done? Or watched a cool movie stunt and tried to figure out the special effects? That's the same kind of curiosity that drives **reverse engineering**! It's the super-cool process of taking something apart—whether it's a gadget, a game, or even a social problem—to figure out how it works. You're basically a detective for innovation, uncovering the secrets hidden inside.

What's the Big Deal with Reverse Engineering?

Think of it like this: most inventions come from a blueprint, which is called **forward engineering**. But with **reverse engineering**, you get the finished product and work backward to create the blueprint yourself! It's like taking a fully assembled puzzle apart to understand how each piece fits. The goal is simple: learn from the best to become the best!

At its core, reverse engineering is a step-by-step process. You observe a product, deconstruct it to see its parts, analyze how they all work together, and then document everything you've learned. The goal isn't just to make a copy; it's to gain deep, practical insights. This process is a superpower for learning and creating!

- **You get to be a master learner:** Instead of just reading about electronics, you can open a broken gadget and see the components with your own eyes. This makes learning a treasure hunt and gives you practical insights into why certain design choices were made.
- **You can build better things:** By understanding how something works, you can spot its weaknesses. You might figure out how to make a device smaller, more energy-efficient, or add a brand-new feature no one else thought of.
- **You help keep us safe:** Cybersecurity experts are like digital superheroes. They reverse engineer viruses and malware to understand how they work, so they can create better defenses and protect all of us.

When and Where Can You Use This Skill?

The great thing about reverse engineering is that it's not just for engineers in a lab. You can apply it to almost anything you encounter in your daily life.

- **Mechanical Products:** Take apart an old computer mouse or a kitchen appliance to understand its gears, levers, and mechanisms.
- **Electronics:** With proper safety, you can examine a circuit board to identify components and understand how they're connected.
- **Software & Apps:** You can analyze the user interface and user experience of an app to understand its features, navigation flow, and how it handles information. This can lead to ideas for creating a new educational app with a more engaging design.
- **Processes & Systems:** It's not just for physical things! You can reverse engineer a system like a school's recycling program or the process of a food delivery app to identify bottlenecks and improve them.

Why Reverse Engineering Is Valuable for Student Innovation Projects

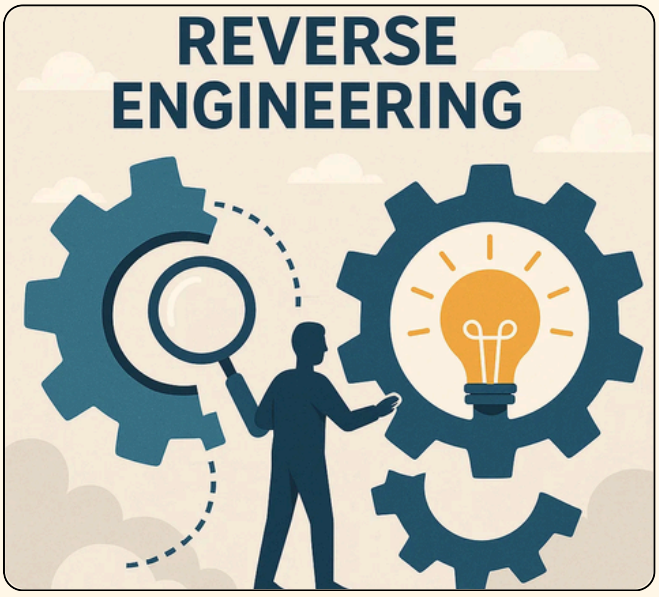
Reverse engineering offers numerous benefits for students. It's one of the best ways to gain **deep learning and practical understanding** that goes beyond textbooks.By taking something apart, you get hands-on insights into design and operational principles. This process also sparks inspiration and idea generation by helping you identify an existing product's strengths and weaknesses.

It also hones your problem-solving skills and can be a cost-effective way to learn about complex mechanisms without needing to invent everything from scratch. Ultimately, this technique empowers you to become an innovator who can not only use technology but also improve and create it.

In the Real World...

Reverse engineering is all around us, and it's been a huge part of India's story of innovation!

- **ISRO, Our Space Heroes:** Our very own **Indian Space Research Organisation (ISRO)** is a master of this.



When they started, getting foreign technology was expensive and difficult. So, our brilliant scientists and engineers studied the available components and satellite systems, figured out how they worked, and then used that knowledge to build our own amazing rockets like the PSLV. This helped India become a global leader in space exploration without relying on others.

- **Mahindra's Farm Power:** Remember the famous **Mahindra** tractors? In the early days, they were based on foreign designs. But by reverse engineering those models, Mahindra's engineers learned to build tractors specifically for Indian farmlands—tougher, more fuel-efficient, and just right for our farmers. That's how they became a world leader!

The Ground Rules: Playing Fair

While being a tech detective is cool, it's important to play by the rules. In India and many other places, it's perfectly legal to reverse engineer a product to understand it or to make sure your product can work with it

(like how different headphones work with your phone). But, you can't just copy the design and start selling it as your own. The real goal is to use what you learn to create something new and original, not to imitate.

Ready for Your Mission?

Here are two fun activities to help you get a taste of reverse engineering.

Activity 1: Deconstruct a Toy Car! (Tech-based)

This activity is a hands-on way to understand how a mechanical and electrical system works.

1. **Deconstruct:** Grab an old, broken toy car that you're allowed to open. With an adult's help, use a small screwdriver to carefully take it apart.
2. **Analyze:** Look inside! You'll see different components like a small motor, some gears, a battery compartment, and a few wires. Can you figure out how the electricity flows to make the car move?
3. **Innovate:** Based on what you've seen, how could you make the car better? Maybe add a light, make it faster, or create a different way to control it!

Activity 2: Unpack a Local Problem! (Non-Tech)

Reverse engineering isn't just for gadgets! You can use the same mindset for social issues.

- **Observe:** Pick a problem in your neighborhood, like traffic congestion near your school. What are the symptoms? Long queues of cars, buses running late, and frustrated students.
- **Deconstruct:** What are the root causes? Too many cars? Not enough buses? People not following traffic rules? A narrow road?
- **Analyze:** How do these causes connect? For instance, maybe a lack of good bus service forces more people to drive, which makes the traffic worse.
- **Innovate:** Now, become the problem-solver! Think of a solution that addresses the root cause. Could a carpooling plan work? A new bike lane? Or maybe an awareness campaign about traffic rules? This is how you use reverse engineering to create positive change in the world!

Reverse engineering is all about being curious and creative. It's a skill that empowers you to go beyond just using technology, it helps you build and shape it. So, go on, be a tech detective, and start uncovering the secrets of the world around you!

> "Reverse engineering is not just about taking things apart; it's about discovering how ideas are built, so we can build even better ones."

Indian Council of Medical Research (ICMR)

Established in 1911, the Indian Council of Medical Research (ICMR) stands as India's premier medical research organization. Its vital mission is to align research with National Health priorities, tackling challenges from communicable diseases and nutritional disorders to non-communicable diseases and maternal health. Operating through **30 permanent research institutes** nationwide, ICMR consistently provides scientific solutions to India's most pressing health issues.

Pioneering Contributions to Public Health

ICMR has made immense contributions to India's public health landscape:

- **Infectious Disease Control:** A cornerstone of India's **COVID-19 response**, ICMR was key in developing **COVAXIN**, the first indigenous vaccine, and coordinating INSACOG for genome sequencing. They also significantly advanced **Tuberculosis** diagnostics (like TrueNat) and **HIV/AIDS** surveillance.
- **Nutrition & Innovation:** Through national surveys, ICMR provides crucial data for schemes like Mid-Day Meal, addressing deficiencies. They've developed low-cost diagnostic kits for various diseases and affordable vaccines like **Rotavac**.
- **Surveillance & Policy:** ICMR establishes vital networks like Viral Research and Diagnostic Laboratories (VRDLs) for early disease detection and provides crucial health recommendations and ethical guidelines to the Ministry of Health.

Global Collaborations and Recognition

ICMR actively collaborates with global giants like the WHO, US CDC, NIH, and the Gates Foundation, enhancing research, sharing data, and shaping international health policies on issues like Antimicrobial Resistance. Nationally, they partner with IITs, CSIR, and state governments. ICMR's swift COVID-19 response, including vaccine development, earned them **COVID-19 Excellence Awards** and **WHO Recognition** for global contributions.

They also support young scientists through fellowships, fostering the next generation of researchers.

ICMR remains at the forefront, safeguarding and advancing India's health through rigorous scientific inquiry.

Care's Animals on Roads: Enhancement of Safety

Stray animals pose a significant threat to road safety and animal welfare in India. The aim is to reduce accidents involving animals and promote the well-being of both animals and humans.

This project proposes a comprehensive approach that involves two components. First being the utilization of nylon belts with fluorescence to enhance the visibility of animals to drivers, especially in low-light conditions, and ensure the comfort and well-being of the animals. Secondly, the integration of sensors (like accelerometers, gyroscopes, GPS and various others) to detect accidents and communicate with veterinary services. This device also aims to keep track of the pet animals and inform the owner when they cross a certain area marked by the user.

Ayushman Sahoo
12th Class

(Source: GYS Avishkar Awards 2024Booklet)

https://www.youtube.com/watch?v=abxxFJ-Fz3Q&t=97s

Smart Umbrella

In the metropolitan area, about 70% of the population uses umbrellas in their daily lives to protect themselves from the heat of the sun. The Smart umbrella harnesses solar power to provide a cool environment during harsh conditions and provides the location of hawkers/vendors to the customers.

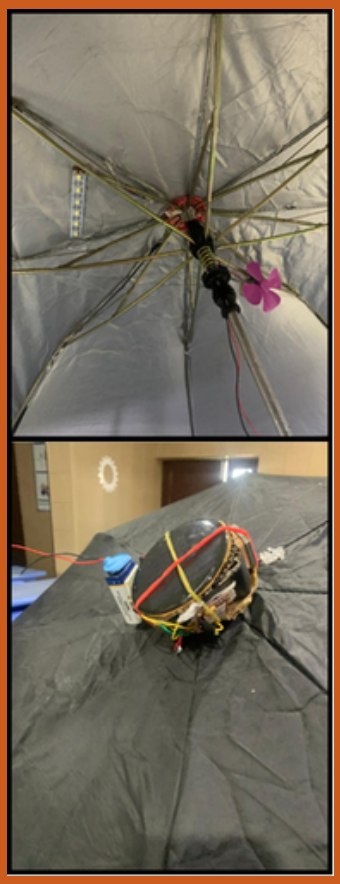
The electricity produced is stored in rechargeable batteries and is used to power a light and a fan. A GPS tracker is placed in the umbrellas of vendors to give their location to the customers.

Mayuri Sharma
9th Class

Solar umbrellas are sustainable and environmentally friendly, which helps to reduce dependence on non-renewable energy resources and contributes to a cleaner, greener environment.

(Source: GYS Avishkar Awards 2024Booklet)

https://www.youtube.com/watch?v=ywPXKZYJcHs&t=72s



Indian Inventions

Akash Missile Weapon System

Imagine standing in an open field, looking up at the endless blue sky. Suddenly, a threatening aircraft zooms toward you, fast and loud. Before it can come closer, a sharp whoosh echoes across the air. From the ground, a missile leaps upward like a fiery arrow, streaking straight toward its target. In a matter of seconds, the sky is safe again.

That lightning-fast protector? It could very well be **India's own Akash Missile Weapon System**. Developed by India's Defence Research and Development Organisation (DRDO), Akash is a medium-range surface-to-air missile system (SAM) designed to protect our airspace from enemy aircraft, drones and cruise missiles. Think of it as a shield in the sky, one that can spot, track and destroy incoming aerial threats before they cause harm.

Unlike fighter jets that chase enemy planes, Akash stays on the ground and works like a vigilant guardian, always ready to launch a missile when danger approaches.

Why Akash is Special

- **Made in India:** Akash is one of the first fully indigenously developed missile systems in India. Almost 96% of its components are made in India, which makes it a symbol of self-reliance **(Atmanirbhar Bharat)**.
- **Speed Demon:** The missile travels at around Mach 2.5 (2.5 times the speed of sound). That's about 3,000 kilometers per hour, fast enough to chase down fighter jets and drones.
- **Deadly Reach:** It can strike targets up to 25-30 kilometres away and at altitudes up to 18 kilometres.

- **Multi-Target Hunter:** Thanks to its powerful Rajendra radar, Akash can track 64 targets at once and guide missiles to intercept multiple threats simultaneously.
- **All-Weather Warrior:** Rain, fog, or blazing heat, the Akash system can operate in all weather conditions, day or night.
- **Cost-effectiveness:** One of the primary advantages of the Akash missile system is its cost-effectiveness compared to other global air defense systems.

The Brains Behind Akash

The Akash Missile Weapon System isn't just about the missile. It's an integrated network of components that work like a team:

- **Rajendra Radar:** The "eyes" of the system, spotting incoming threats from far away.
- **Command Control Unit:** The "brain", which decides which targets to engage and when.
- **Missile Launchers:** The "muscles", firing Akash missiles within seconds of detection.
- **Missiles:** The "arrows", guided by radar all the way to their target.

Together, they form a shield bubble over the protected area, ensuring no enemy aircraft can slip through unnoticed.

A Warrior That Evolves

The Akash system has gone through several upgrades to stay ahead of modern threats:

- **Akash Mk-1:** The original version, inducted into the Indian Army and Air Force.
- **Akash Mk-1S:** An improved version with a seeker head for even more accurate targeting.
- **Akash-NG (Next Generation):** A sleeker, lighter and more powerful version with a range of up to 70 kilometers, better mobility and faster reaction time.

This means Akash isn't just a one-time invention; it's an evolving system designed to keep pace with the future of warfare.

Akash in Action

The Akash system has already been inducted into the **Indian Army and Indian Air Force,** deployed across sensitive zones to defend against hostile aircraft.

It's also drawing interest from other countries, making it not just a shield for India, but also a potential **export success story**.

Most recently, Akash played a **major role in Operation Sindoor (2025)**, where India relied on indigenous air defense systems to protect the skies from drones and missiles. Its reliable performance during the operation proved that Akash is not just a laboratory success, it's a **battle-tested guardian of the nation's airspace.**

The Big Picture

The Akash Missile Weapon System is more than just a machine. It represents **India's journey in defense technology**, from importing weapons to building our own advanced systems. For young innovators and future scientists, it's proof that with persistence, teamwork and vision, a nation can achieve technological independence.

So next time you look up at the sky, remember: somewhere out there, Akash might be watching over it—silent, swift, and ready.

Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI)

Discovering brilliant ideas in unexpected places is the foundation of SRISTI. Founded over 26 years ago in India, SRISTI is a non-profit organization dedicated to finding and supporting incredible grassroots innovations and eco-friendly solutions, particularly from rural and economically disadvantaged communities.

Associated with the Honey Bee Network, SRISTI champions biodiversity, traditional knowledge, and creative minds often overlooked by formal systems.

What SRISTI Aims to Do

SRISTI works to:

- **Promote Grassroots Innovations:** Discover and support unique inventions from people without formal training.
- **Document Traditional Knowledge:** Identify and share valuable traditional practices, especially from rural and tribal areas.
- **Enable Sustainable Development:** Encourage eco-friendly and inclusive technologies.
- **Protect Innovators' Rights:** Help innovators secure intellectual property rights (IPR) for their creations.
- **Connect Innovators:** Link grassroots thinkers with universities, labs, and industries.
- **Foster Youth Creativity:** Inspire innovation in students through programs like the IGNITE awards.

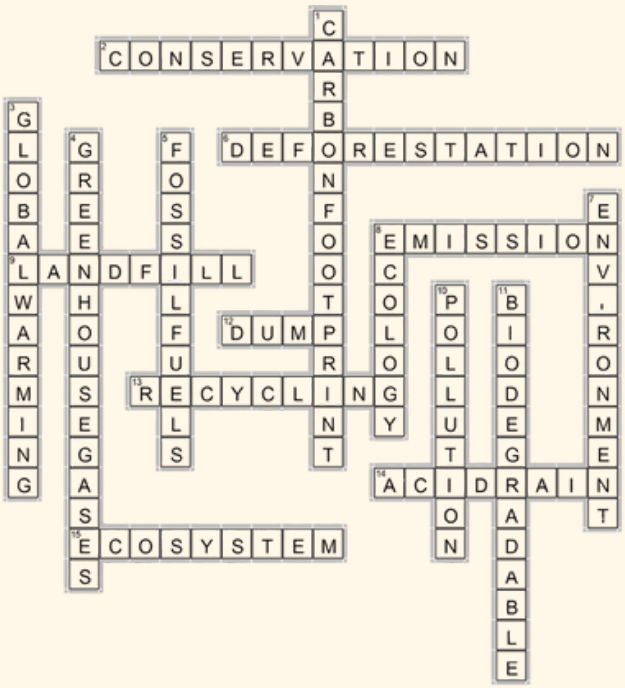
Programs, Collaborations, and Recognition

SRISTI brings its mission to life through various programs and powerful collaborations. They work closely with organizations like the **National Innovation Foundation (NIF)** and the **Honey Bee Network** to document, promote, and scale innovations. Their partnerships extend to government bodies, educational institutions, and corporate sectors to help commercialize sustainable technologies.

SRISTI's impactful work has earned numerous accolades, including **National Innovation Foundation (NIF) Awards, IGNITE Awards, WIPO Recognition, and UNDP Recognition. They also offer fellowships** providing financial support, expert mentorship, and networking opportunities to nurture new ideas and encourage indigenous knowledge dissemination.

SRISTI truly empowers those with knowledge but limited resources, helping their innovations flourish and make a real difference in the world.

Solution
Word Search 2506



Solution
Sudoku Challenge 2506

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

Riddle 2506 Answer

1. The Moon 2. Fire 3. A map 4. Footsteps 5. A cloud

Science & Innovation Competitions to Watch

GYS Avishkar AWARDS 2025

Last Date: 10-August-2025

inspire — Innovation in Science Pursuit for Inspired Research

Submissions Open

VIDYARTHI VIGYAN MANTHAN — SCIENCE TALENT SEARCH

INDIA'S LARGEST SCIENCE TALENT SEARCH FOR NEW INDIA USING DIGITAL DEVICES

Mock Test in September

NATIONAL CHILDREN'S SCIENCE CONGRESS

Submissions Open

GYS Avishkar AWARDS 2025

A National Science Projects Competition

Theme: Low Cost Grassroots Innovation

Mode: Online Video Submission (3 to 7 mins)

Eligibility: Students from Classes 6 to 12

Winners: Certificates, Trophies, Cash Prizes

Attention: Guide Teachers are Rewarded

Rs. 1,00,000 One Lakh Rupees Cash Prizes

1 **₹ 20,000** for Student
₹10,000 for Guide Teacher

2 **₹ 15,000** for Student
₹10,000 for Guide Teacher

3 **₹ 10,000** for Student
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