Round Robin Method
Model Making

Indian Space Odyssey
Smart Cities

Communicating
your Innovation

Young Scientist India

A Science & Innovation Magazine for School Students

Innovations at Workplace

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Young Scientist India

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Editorial

From the Editor's Desk

Hello, future innovators and curious minds!

Welcome to another action-packed edition of our magazine! This issue is a showcase of human ingenuity, from grand national efforts to the simplest tools we use every day. Get ready to be inspired by stories of breakthrough thinking and the relentless pursuit of knowledge. We've packed these pages with ideas that will challenge you to look at the ordinary and the extraordinary in a whole new light.

We deep dive into **India's Space Odyssey**. Learn how our nation is making giant leaps in space exploration, showing us that the sky is not the limit—it's just the beginning! Speaking of big ideas, our cover story explores **Innovations at the Workplace**, revealing how small, smart changes can revolutionise how we spend our days. We also look at **Smart Cities: Imagining Tomorrow's Urban Life**, exploring the technology and design that could make your future city cleaner, smarter, and more efficient.

It's one thing to have a brilliant idea, but another to share it. We explore the essential process of **Communicating Your Innovation**, offering tips on how to present your ideas effectively. We also present two training modules: the **Round Robin Method**, a great tool for collaborative thinking, and **Model Making**, a physical way to bring your abstract concepts to life.

You can read about **Diamond Mining**, a fascinating subject given that India has produced legendary gems for generations, and learn about the rich history of this complex science. Speaking of history, we celebrate two profound **Indian inventions** that still impact science today! The simple **Ruler** is celebrated for its foundational role in all science and design, an ancient tool whose earliest form was discovered in the Indus Valley. The **Crescograph**, a highly sensitive instrument invented by Sir Jagadish Chandra Bose, measures the growth of plants, proving that even nature's quietest progress is measurable.

Our magazine also takes you out into the natural world. Discover the important work behind **Systematic Bird Surveys**, which was greatly advanced in India by the legendary ornithologist **Salim Ali**, famously known as the "**Birdman of India**."

As always, we believe in celebrating the institutions and minds that drive this innovation. Don't miss the fascinating articles on **Indian Science and Innovation organisations** that shape India's research landscape: **ICAR**, **CDRI**, **VITM**, and the **Nehru Science Centre**. We also honour the incredible contributions of our **Indian Scientists** like **Conjeevaram Srirangachari Seshadri**, **Amitava Raychaudhuri**, **Bhamidipati Lakshmidhara Kanakadri Somayajulu**, and **Tej Pal Singh**.

Before you dive in, remember that science isn't just in textbooks—it's in what you do every day! Be sure to check out the exciting **activities and student innovation projects** featured in this edition to get your own creative engine running. We are always looking for the next big thing, and we look forward to publishing **your** groundbreaking project in our next edition! Happy reading, and keep innovating!

Vennela Valiveti, B. Des.
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Interior Designer
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Smart Cities

Imagining Tomorrow's Urban Life

Imagine a city where traffic jams are rare, trees line clean roads, and you can access your schoolwork or doctor online with just a few taps. That's not just science fiction, it's the future India is already building, thanks to smart cities! As students and young innovators, you are at the heart of this exciting transformation.

What is a Smart City?

A smart city uses technology, innovation and collective intelligence to improve the quality of urban life for everyone.

In a smart city, data from sensors and apps make daily life safer, cleaner and more convenient. In India, the Smart Cities Mission was launched in 2015 to transform 100 cities into models of sustainable development, citizen participation and high-tech living.

Smart Cities in India: The Vision

The main goal of India's Smart Cities Mission is to make cities more livable by fixing problems such as traffic congestion, pollution, waste and access to essential services.

Technologies like the Internet of Things (IoT), artificial intelligence (AI) and digital platforms help manage things like traffic lights, water supply, street lighting and even pollution levels automatically, all while using resources wisely.

Real Examples: Indian Innovations in Smart Cities

Here are some examples of how Indian cities are becoming smarter with innovations, especially easy to relate to for students:

1. Smart Classrooms and Digital Learning

Across more than 2,300 government schools in 71 smart cities, over 9,400 smart classrooms have been set up. These classrooms have digital whiteboards, tablets, online lessons and fun science experiments. In Noida and Pune, students even participate in live "virtual science fairs" or attend sessions from international experts without leaving their classrooms.

Did You Know? Some smart cities offer "smart libraries" where you can borrow e-books, attend coding workshops or learn robotics!

2. Waste to Wonder: Smart Waste Management

Cities like Indore and Surat use smart bins that send messages when they are full, ensuring timely garbage pickup and cleaner streets. Waste segregation drives and recycling initiatives, sometimes led by students, help convert waste into usable products like compost or biofuel.

3. Eco-Friendly Transportation

Pune and Bangalore have public bicycle-sharing systems with docking stations, allowing students to ride bikes to school or tuition and return them at the next stop.

Electric buses, "Green Corridors," and app-based ticket booking for metros make travel eco-friendly and reliable.

Public bicycle sharing docking station in Bangalore featuring ATCAG (Automated Tracking and Control of Green Assets), India's first automated system for convenient bike use.

4. Interactive Apps: Be a City Scientist!

Apps like Swachh Bharat Clean India and Safecity let you report littering or unsafe zones directly to officials. Some cities allow students to participate in "hackathons" to design new apps for city problems.

Fun Fact: Jaipur uses smart street lights with motion sensors that save energy and ensure safety after dark.

5. Green and Clean: Sustainable Cities

Smart parks in Chennai and Ahmedabad use moisture sensors to water plants only when needed, saving water. Rooftop solar panels in Hyderabad and Chandigarh help power streetlights and schools. Tree-mapping projects use QR codes on trees and scan the code to learn about the tree's species and importance.

Student-Friendly Projects

Smart city plans include internships and training for students. Programs like The Urban Learning Internship Programme (TULIP) offer thousands of young people a chance to work on real smart city projects.

In Agra, students helped set up "smart classes" in government schools and took part in micro-skill programs to upgrade their digital literacy.

Why Should This Matter to YOU?

Smart cities mean more opportunities for you to explore science, innovation and problem-solving.

Better Air and Water Quality: Sensors track pollution. Data helps planners take action, and clean air means healthier lives for everyone! Access to Digital Education: Even in remote areas, children can attend live classes or use e-libraries.

Safety: Smart cameras and emergency buttons make public places safer.

Less Pollution: More cycling, electric buses, and green buildings mean less pollution and a happier planet!

Did You Know?

The city of Coimbatore uses AI to manage water distribution, ensuring every home (including schools) gets just the amount needed whil**e** reducing wastage.

How Can You Get Involved?

- **Join School Innovation Clubs:** Start a project to monitor energy use or waste in your school.
- **Compete in City Hackathons:** Bring your tech ideas to help your city. Many smart cities have annual innovation contests for students.
- **Take Part in Cleanliness and Tree Plantation Drives:** Track impact using apps.
- **Explore Smart City Tours:** Visit local command centers or eco-parks and ask lots of questions!

- **Apply for Youth Internships:** Check out TULIP and similar programs for hands-on learning.

What's Next? The Future of Urban Life

India is now recognized globally for its innovative, cost-effective solutions from e-governance in Pune to the world-famous bicycle program in Chandigarh. The next frontier includes.

- **Giga-Fast Internet:** Public WiFi, free or affordable, in every community center and school.
- **Virtual Reality for Learning:** Imagine geography or biology lessons as VR adventures already piloted in some smart schools!
- **Artificial Intelligence for Safety:** Cameras that detect accidents in real-time and send alerts.
- **Smart Homes:** Sensors and voice assistants making everyday tasks easier for families.

Conclusion: Dream, Design and Build!

Being part of a smart city isn't just about enjoying cool technology. It's about using your scientific temper, curiosity and creativity to shape a better tomorrow. Every innovative question, every school project and every idea can help solve real urban challenges.

Remember! The India of tomorrow is not just being built by engineers or officials but by students like YOU who dare to imagine and act.

So look around, ask how things could be better and be the change-maker in India's smart, sustainable and student-friendly cities!

ENERGY CONSERVATION

Ayush Kumar has come up with an original idea for converting energy from one form to another. The main idea of his model is to generate electricity by using the kinetic energy produced by vehicles moving on the road. He suggests using speed breakers (speed barriers) fitted with a simple device that can capture this energy and convert it into electrical power.

To make the project work efficiently, the design needs to be adjusted based on the amount of traffic on the road where the device is installed. This will help ensure that the speed barrier moves continuously, allowing a steady generation of electricity. A thought of this nature is commendable.

**Ayush Kumar,
9th Class**

(Source: INSPIRE MANAK NLEPC 2012 Booklet)

A Portable Expandable Water Catchment System for Cantilevered Buildings

Tshering is from Gangtok, a city in Sikkim with abundant annual rainfall. But they still face water scarcity due to insufficient rainwater harvesting, and also regular damage to the water supply system due to earthquakes and landslides.

So, Tshering came up with a single-unit rooftop rainwater collection system, equipped with a collector pipe and basic filtration. This unit is designed to be installed on the cantilever section of a building.

In many buildings in those hilly regions, cantilevers are commonly left unused and are intended for maintenance tasks like painting. Her project helps in collecting rainwater that hits the side of the building while utilising this underused space. In addition to providing a source of usable water, the system prevents water accumulation, thereby reducing moss and weed growth and ultimately enhancing the building's exterior.

(Source: INSPIRE MANAK NLEPC 2012 Booklet)
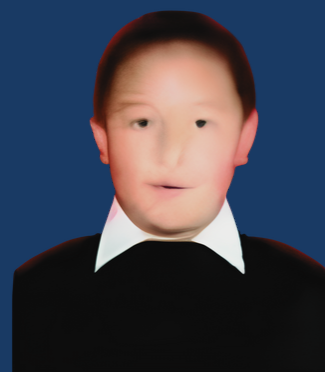
**Tshering Diki Bhutia,
10th Class**

Innovation Training Module
The Round Robin Method

Have you ever found yourself in a group project where one person does all the talking while the rest of you just nod along? Or maybe you have an awesome idea but feel shy to share it? Well, get ready to change that! We're about to introduce you to the **Round Robin Method**, a super simple yet powerful technique that's a game-changer for teamwork and creativity. It's not just a fancy term; it's a way to make sure everyone's voice is heard, a great way to generate ideas, and a surefire path to smarter solutions.

What's a Round Robin, Anyway?

Imagine a game of musical chairs, but instead of chairs, you're passing an idea from one person to the next. In the **Round Robin Method**, each person in a group gets a turn to speak, share an idea, or contribute to a discussion, going around in a circle, like a merry-go-round. The key rule? **No interruptions**. Everyone waits for their turn. This ensures that every single person, from the quietest to the most outgoing, gets an equal chance to contribute.

Why Does It Matter? The Power of "Everyone"

Think about the last time you brainstormed an idea with your friends. Often, the loudest person or the one with the most confidence dominates the conversation. This can leave out some really amazing ideas from others who might be more reserved. The Round Robin method fixes this problem. It's about creating a safe space where every idea, big or small, is valued.

This technique is important because it:

- **Boosts creativity:** A diverse group of people, each with unique experiences, will come up with a wider range of ideas. Round Robin ensures you tap into that entire reservoir of thought.

- **Encourages equal participation:** No one is left out. This makes group members feel more engaged and invested in the final outcome.

- **Reduces "groupthink":** Groupthink is when people agree on an idea just to keep the peace, even if it's not the best solution. By giving everyone a turn, Round Robin challenges this, forcing a deeper exploration of ideas.

- **Improves communication:** It teaches you to listen actively. When you know you'll get a chance to speak, you're more likely to pay attention to what others are saying.

How It Works: A Simple Step-by-Step Guide

The process is as simple as 1-2-3!

- **Set the stage:** Gather your group and explain the topic. It could be anything from "How to reduce plastic waste in our school" to "What's a new product we can create for our science exhibition?"

- **Start the clock (or not!):** Decide who goes first. Then, go around the circle, giving each person a chance to share their idea. Encourage them to be brief and to the point.

- **No filters!:** The most important rule: at this stage, there are **no bad ideas**. Don't criticize, judge, or interrupt. The goal is to collect as many ideas as possible. You can filter and discuss them later.

After the initial round, you can go for another round to add more ideas or expand on the ones already shared. Once you have a good list, you can then open up the discussion for a more detailed analysis and select the best ideas to move forward.

When & Where Can You Use It?

You'd be surprised how often this technique is used, often without a fancy name. It's perfect for situations where you need to gather a lot of different perspectives quickly and fairly.

- **In the classroom:** Your teacher might use a Round Robin to have each student share their answer to a question, ensuring everyone participates.
- **In a business meeting:** Team leaders use it to get feedback from every member on a new project.
- **During a brainstorming session:** It's a fantastic way to generate a long list of ideas for a new product, a school event, or a social campaign.

This method is super flexible. You can use it when you're just starting a project to get initial ideas, or you can use it to get feedback on a prototype. Think of it as your secret weapon for any collaborative task!

Your Innovation Journey with Round Robin

For high school students like you, innovation isn't about inventing the next smartphone. It's about solving problems, big or small. The Round Robin technique is your secret superpower in this journey.

- **Got a social problem you want to fix?** Use Round Robin with your friends to brainstorm solutions for local issues, like organizing a clean-up drive or helping stray animals.
- **Building a science project?** Use it to list all the possible variables, experiments, or materials you can use.
- **Stuck on a creative writing assignment?** Gather your ideas using Round Robin to come up with different plot twists or character ideas.

The method teaches you to value every idea and to look for inspiration in the most unexpected places. It helps you see that innovation is a team sport, and every player has a crucial role.

Time to Play! An Activity for You

Ready to give it a try? Grab a few friends or family members and try this simple activity.

Topic: "How can we make our home or classroom more eco-friendly?"

Rules:

- Sit in a circle.
- Grab a piece of paper and a pen.
- Each person has 30 seconds to write down ONE idea on their paper.
- After 30 seconds, everyone passes their paper to the person on their right.

- Now, the person receiving the paper has to add another idea to the list. This could be an entirely new idea or an improvement on the one already written.
- Repeat this for 5-6 rounds.

At the end, you'll have a bunch of papers, each filled with multiple ideas contributed by everyone. See how many creative solutions you came up with together! This exercise not only generates ideas but also teaches you to build on the ideas of others, which is a key skill for any innovator.

So next time you're in a group, remember the Round Robin Method. It's your ticket to making sure every voice is heard, every idea is valued, and every project is a roaring success! Happy innovating!
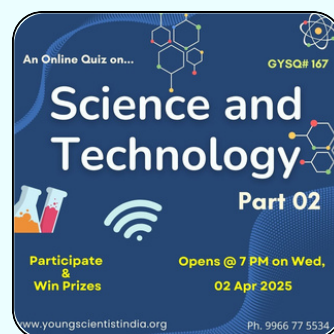

GYS WEDNESDAY SCIENCE QUIZ ONLINE
Building Science Temper towards Student Innovation

**Every Wednesday At 7 PM.
For students from Classes 6 to 10.
25 Multiple Choice Questions.
20 Minutes.**

To raise the Science Temper among students, there is a persistent effort in the form of Online Science Quizzes.

- A Quiz is published every week on Wednesdays at 7 PM promptly.

- Completely Online.

- 25 multiple-choice questions with pictures and animations on the syllabus of 6th to 10th grades to be answered in 20 minutes.

- A digital certificate is emailed if one scores 60% or more, and physical certificates are couriered to toppers each week.

- Cash vouchers are gifted to the best performers every month.

- Launched on 26 January 2022, over 45,000 quizzes were taken from all over the Country in 180 week,s and more than 14,000 digital certificates were issued to Students.

An Online Quiz on...   GYSQ# 167
Science and Technology Part 02
Participate & Win Prizes   Opens @ 7 PM on Wed, 02 Apr 2025
www.youngscientistindia.org   Ph. 9966 77 5534

An Online Quiz on...
Nutrition
Opens @ 7 PM on Wed, 03 Jan 2024
PARTICIPATE & WIN PRIZES
9966775534   www.getaservicetrust.org

Indian Scientist
Tej Pal Singh

(BORN IN 1944)

Imagine being able to look inside the microscopic machinery of your body to fight diseases. That's the world of **Professor Tej Pal Singh,** an Indian biophysicist who is a global leader in figuring out the **3D structures of proteins**—the tiny workhorses that run your cells!

Born in 1944, Dr. Singh's academic journey took him from the Indian Institute of Science to a fellowship with Nobel Laureate Robert Huber in Germany.

His Superpowers: Structure and Design

Dr. Singh's main mission has been **structural biology,** which means mapping the exact shape of proteins. Why does shape matter? Because a protein's shape determines its function, and a faulty shape causes disease!

- **Solving Protein Puzzles:** He determined the 3D structures of over 610 proteins, including key players like **Lactoferrin** and **Lactoperoxidase.** These structures are like architectural blueprints that he has shared globally through the **Protein Data Bank (PDB).**

- **Designing Smart Peptides:** He didn't stop at just mapping existing molecules; he created new ones! He developed **synthetic peptides** (small protein fragments) that can act as targeted drugs. These custom-designed molecules are now being used to create new treatments for major diseases like **Tuberculosis, Cancer, and Inflammation.**

- **Hunting Disease Biomarkers:** At AIIMS, he launched a program in **Clinical Proteomics** to find specific proteins that appear when a person is sick. These proteins act as **biomarkers**—like a disease's signature—paving the way for personalized medicine.

Legacy and Recognition

Dr. Singh's dedication to science has earned him top honors, including the G.N. **Ramachandran Gold Medal (2006)** and the **JC Bose Memorial Award (2005)**. He holds the unique distinction of being the first Indian to receive all six major **Ramachandran awards!** Having mentored over 83 Ph.D. students, Professor Singh has built a lasting legacy by shaping the future of biophysics and drug discovery in India.
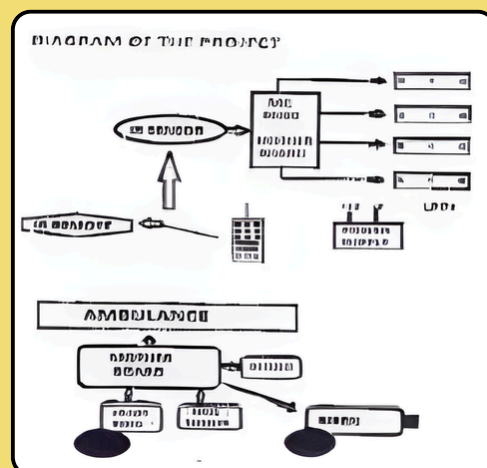
A Good Transport System with Smart Ambulance (2014)

The main aim of this project is to develop an intelligent ambulance system that can reach the hospital without delay, even in heavy traffic conditions. This project is especially designed for urban areas where traffic congestion is a major problem.

To make the project work efficiently, the design needs to be adjusted based on the amount of traffic on the road where the device is installed. This will help ensure that the speed barrier moves continuously, allowing a steady generation of electricity. A thought of this nature is commendable.

Additionally, this project proposes more feature like:

- Remote-controlled traffic signals to aid police during emergencies or criminal pursuits.
- Alcohol detection to prevent accidents and save lives.

- Electricity generation from road humps to support energy needs of traffic posts.
- Automatic streetlights to help in save electricity during night hours.
- Ambulances to receive accident alerts within a 5 km radius, helping them reach the scene faster and save more lives.

**Hrusikesh Patra,
7th Class**

(Source: INSPIRE MANAK NLEPC 2014 Booklet)

Rain Protecting Machine (2016)

Aarti developed a simple yet effective machine that operates on the motor-pulley principle, providing a convenient solution for drying clothes both indoors and outdoors, depending on weather conditions.

When a drop of water falls onto the tip of the sensor switch, the switch activates, completing the electric circuit. The motor then starts rotating in the anticlockwise direction, enabling clothes to dry inside the house.

**Aarti Kumari,
10th Class**

Alternatively, when the push switch is manually turned on, the motor rotates in the clockwise direction, and the attached plates move the clothes outside the house for drying.

(Source: INSPIRE MANAK NLEPC 2016 Booklet)

Cover Story

Innovation at Workplace

This month, we're pulling back the curtain on something truly exciting: how science and creativity are transforming the places where people work every day. Get ready to discover how innovation isn't just for labs, but for every office, factory, and startup that's building India's future!

What Exactly is "Innovation at Work"?

When you hear "innovation," you might picture a mad scientist in a lab coat inventing a new gadget. While that's certainly part of it, i**nnovation at the workplace** is much broader, especially in a dynamic country like India! It's about how organizations – from giant tech companies to small village co-ops – constantly find **smarter, faster, and better ways to do things.**

Think of it as applying your scientific curiosity and problem-solving skills to real-world challenges in a professional setting. It's about using scientific knowledge, new technologies, and creative thinking to:

Create awesome new products or services: Like developing a super-efficient electric scooter or a mobile app that helps farmers get better prices for their crops.

I**mprove how things are made or done:** Maybe finding a way to produce medicine faster and cheaper, or making a delivery system more eco-friendly.

Change how a business operates: Perhaps using data to predict what customers want before they even know it, leading to a whole new way of selling.

In essence, workplace innovation is where the exciting discoveries from science and technology meet the practical needs of businesses and society.

It's crucial because it helps companies grow, creates jobs, solves problems, and pushes India forward on the global stage!

Why It's CRUCIAL: More Than Just a Good Idea

Innovation isn't just a nice-to-have; it's absolutely vital for several reasons:

Staying Ahead in a Fast World: The world is constantly changing. New technologies emerge daily! Companies that don't innovate get left behind. Think of a smartphone company that stops innovating – it quickly loses out to competitors with better features.

Solving Big Problems: India faces unique challenges, from healthcare access to sustainable energy. Workplace innovations provide solutions. A company developing affordable diagnostic kits or clean energy solutions is innovating for a better future.

Boosting the Economy: When companies innovate, they become more efficient, produce better goods, and often expand, leading to more jobs and a stronger economy for India.

Making Work Better: Innovation can also mean making workplaces safer, more inclusive, and more productive for employees.

EMPLOYEE EMPOWERMENT

PROVIDE RESOURCES

ENABLE DECISION-MAKING

ENCOURAGE FEEDBACK

RECOGNIZE ACHIEVEMENTS

Different Flavours of Innovation at Work

Innovation isn't a single thing; it comes in many forms, each crucial to a workplace's success:

Product Innovation: This is the most visible type. It's about creating entirely new products or significantly improving existing ones.

Example: Developing a new, biodegradable plastic that replaces traditional plastic, or designing an AI-powered educational platform that customises learning for each student.

Process Innovation: This focuses on making the "how" better. It's about improving the methods and workflows within a company to make things faster, cheaper, or more efficient.

Example: A factory uses robots to assemble products with greater precision and speed, or a hospital implements a new digital system to reduce patient waiting times.

Business Model Innovation: This is about fundamentally changing how a company delivers value and makes money. It's often less about a new product and more about a new way of doing business.

Example: A company might shift from selling software licenses to offering it as a subscription service, or a health tech firm might connect rural patients with urban doctors through telemedicine, bypassing traditional clinic visits.
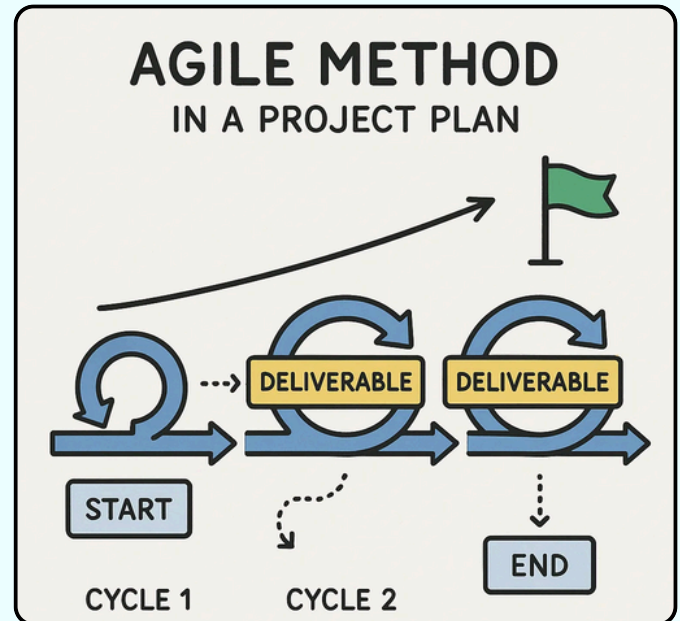
Marketing Innovation: This is about new ways to promote and sell products or services, reaching customers more effectively.

Example: Using virtual reality to let customers 'try on' clothes online, or creating highly personalized advertising campaigns based on AI analysis of user data.

The Unsung Heroes: Techniques You Might Not Learn in School

Many powerful techniques used in modern innovative workplaces aren't typically covered in high school textbooks, but they are super useful in real professional life. Here are a few:

- **Design Thinking:** This is a human-centered approach to problem-solving. Instead of just jumping to solutions, it involves:
- **Empathizing:** Really understanding the user's needs and challenges.
- **Defining:** Clearly stating the problem.
- **Ideating:** Brainstorming lots of creative solutions.
- **Prototyping:** Making quick, rough versions of solutions to test.

- **Testing:** Getting feedback and refining.

Why it's important: It ensures that innovations actually solve real problems for real people, leading to products and services that users love. It's taught in top design and business schools but is essential for every innovator.

- **Lean Startup Principles:** This approach, popular with new businesses and internal innovation teams, focuses on validated learning and minimizing waste.

Key Idea: Instead of building a full product, you create a "Minimum Viable Product" (MVP)— the simplest version with just enough features to test a core idea. You then get customer feedback, learn, and decide whether to "pivot" (change direction) or "persevere."

Why it's important: It saves time and resources by preventing companies from building things nobody wants. It's all about rapid experimentation and learning.

Data Analytics and A/B Testing: These techniques use data to make better decisions.

- **Data Analytics:** Using tools to examine large datasets to find patterns, trends, and insights. For example, analyzing customer purchasing habits to understand what products they're likely to buy next.

DATA ANALYTICS AND A/B TESTING

- **A/B Testing:** Presenting two slightly different versions (A and B) of a webpage, ad, or product feature to different groups of users to see which performs better.

Why it's important: It takes the guesswork out of innovation. Instead of relying on gut feelings, decisions are backed by hard data, leading to more successful innovations.

India's Innovation Success Stories

India is a hotbed of workplace innovation, with many companies leveraging science and creativity to make a real impact.

Affordable Healthcare Devices: Indian startups have innovated to create low-cost diagnostic tools, portable ECG machines, and affordable prosthetics. These are breakthroughs in materials science, electronics, and medical engineering that address a critical need for accessible healthcare. For instance, companies are developing AI-powered tools for early detection of diseases like diabetic retinopathy, bringing advanced diagnostics to remote areas.

Renewable Energy Solutions: With a massive drive towards sustainable energy, Indian companies are innovating in solar panel efficiency, smart grid technologies, and battery storage solutions. This involves deep science in materials physics, electrical engineering, and chemical engineering. For example, firms are creating advanced solar-powered irrigation pumps for farmers, making agriculture more sustainable.

FinTech Revolution: Indian companies are at the forefront of financial technology. Innovations like UPI (Unified Payments Interface) are a testament to robust computer science and network engineering, allowing seamless, instant digital transactions.
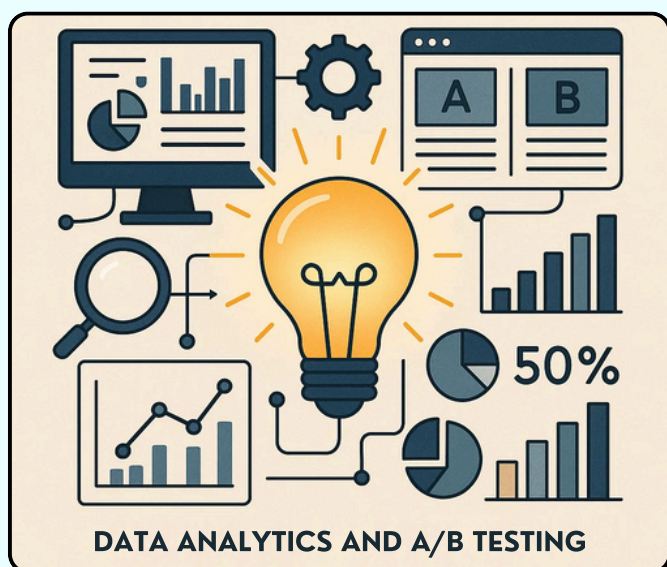
Mobile-first banking apps use cutting-edge cybersecurity and user interface design to make finance accessible to millions.

Agricultural Technology (AgriTech): Innovations here include developing drought-resistant crops (biotechnology), using drones for crop monitoring and pest control (robotics, AI), and creating mobile apps that provide real-time weather and market price information to farmers (data science, mobile computing). These directly apply agricultural science and IT to boost farm productivity and farmer income.

Electric Vehicles (EVs): Indian companies are investing heavily in EV innovation, from designing efficient battery packs (chemical engineering, materials science) to developing advanced electric motors and charging infrastructure. This not only tackles pollution but also creates a new industry.

These examples show how Indian innovators are taking scientific principles and technological advancements from the lab and applying them to create real-world value, solve pressing problems, and build a brighter future for the nation.

Conclusion: Your Role in India's Innovative Future

Innovation at the workplace isn't some distant concept; it's happening all around us, driven by people who are curious, observant, and unafraid to challenge the status quo. It's the practical application of scientific thinking to make things better, faster, and smarter.

As aspiring young scientists, your understanding of core scientific principles, combined with a willingness to learn new methodologies like Design Thinking or Agile, will make you invaluable to India's future workplaces. Every time you ask "Why?" or "What if?", you're taking the first step towards becoming an innovator. So keep observing, keep questioning, and get ready to innovate, because India's future depends on the brilliant ideas you'll bring to work!

Word Search 2507
Topic: Water Animals
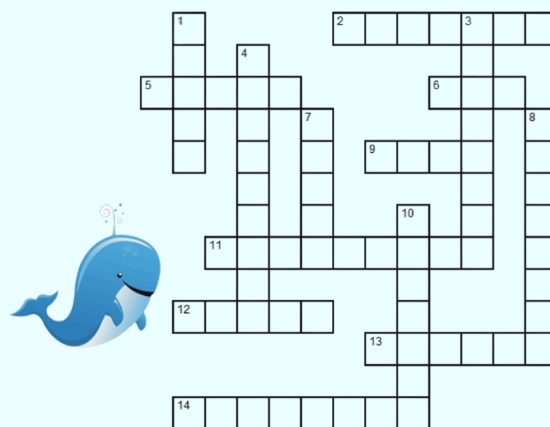
ACROSS
2. fat layer that keeps some marine mammals warm
5. fish use these to breathe oxygen from the water
6. name for a group of whales
9. ocean dwellers that lay eggs and have bones
11. what a shark has instead of bones
12. a shark has several rows of these
13. what younger whales are called
14. marine animals with soft bodies and no backbone

DOWN
1. small creatures that look like shrimp
3. how a whale or dolphin breathes
4. largest animal in the world
7. bioluminescent animals make their own
8. clams, oysters and scallops are all
10. ocean dwellers that birth live babies and nurse their young

(*Answers on Back Cover Inside*)

Eco-Friendly Agricultural Tools (2017)

Preeyam has developed a shoe equipped with a control switch. The user can place their phone in their pocket, connect one end of the charging cable to the phone, and the other end to the model in the shoe, allowing the phone to charge while walking.

This innovative design is highly cost-effective, requires no sensors, and helps conserve electricity by utilising energy that would otherwise go to waste.

**Anushri N,
7th Class**

(Source: INSPIRE MANAK NLEPC 2017 Booklet)

WATER SAVING AND ENERGY HARVESTING SYSTEM (2014)

In many places, especially remote areas, getting clean water every day is still a big challenge. To help solve this, water tanks are often built at a height so that water can flow down with strong pressure. But this strong pressure sometimes causes a lot of water to be wasted, especially in areas close to the tank.

This project offers a smart solution using two separate pipelines from the water tank. One pipeline carries water to faraway areas and the other pipeline goes to nearby areas.

**Sanju Paul,
9th Class**

Now, here's the interesting part—to reduce the extra force of water in the nearby pipeline, a small turbine is installed at the right spot. This turbine slows down the water and stops it from splashing or overflowing.

But that's not all—it also generates electricity using the extra energy from the flowing water!

(Source: INSPIRE MANAK NLEPC 2014 Booklet)

Systematic Bird Surveys

Have you ever looked up at a bird soaring through the sky and wondered where it's headed, or why certain birds only appear during specific times of the year? Figuring out these fascinating questions about birds is what Systematic Bird Surveys are all about. This important scientific effort was greatly advanced in India by **Salim Ali**, famously known as the "Birdman of India."

Born in 1896, Salim Ali completely changed how we study birds. He conducted detailed surveys all over India, carefully recording different bird species and where they lived. His work, especially "The Book of Indian Birds", not only showed off India's incredible variety of birds but also sparked nationwide efforts to protect them.

So, what exactly is a systematic bird survey?

It's a structured way of watching and counting bird species in a particular area over a set period. This organized approach ensures the information collected is reliable and useful for scientific research, conservation projects, and managing wildlife.

These surveys are incredibly important because they help us:

- **Track Bird Populations:** We can see if the number of certain bird species is increasing or decreasing over time.

- **Check Habitat Health:** Birds are like natural barometers; their presence and well-being can tell us a lot about the quality of their environment, including food availability and pollution levels.

- **Follow Migration Patterns:** Surveys help us understand when and where birds travel, and how factors like climate change might be affecting their epic journeys.

- **Guide Conservation Efforts:** The data gathered directly helps scientists decide how best to protect endangered birds and restore the places they call home.

Different Ways to Count Our Feathered Friends

Just like there are many types of birds, there are different methods for these surveys, each suited for specific goals:

- **Point Counts:** Imagine standing still in a park for 5-10 minutes, counting every bird you see and hear around you. This is a point count! Repeating this at several spots helps scientists understand how many birds are in different areas.

- **Transect Surveys:** For larger areas like forests or grasslands, observers walk along a set path, recording birds they encounter within a certain distance. This is great for seeing how birds are spread out across a big landscape.

- **Nest Monitoring:** This involves carefully watching bird nests throughout the breeding season. Researchers collect data on how many eggs hatch, how many young birds survive, and what might threaten the nests. This helps us understand how successful birds are at raising their families.

- **High-Tech Surveys (Radar & Acoustic):** Sometimes, birds are hard to see, especially at night or over vast distances. Scientists use technology like radar to track large groups of migrating birds and audio recordings to identify species just by their calls, even when they're hidden.

- **Citizen Science:** This is where you come in! Programs like the Christmas Bird Count allow everyday people who love birds to help collect valuable data. By having many volunteers, these programs gather a huge amount of information that helps track long-term bird population trends across wide regions.

How These Surveys Are Done

To ensure the information collected is accurate and useful, bird surveys follow a careful process:

- **Choosing the Area:** Scientists first decide exactly where they'll conduct the survey, whether it's a small patch of woods or a large region.

- **Setting the Rules:** Clear guidelines are set for things like the best time of day to observe, how often to survey, and for how long.

- **Training Observers:** Everyone involved gets proper training to correctly identify bird species and record data consistently.

- **Recording and Analyzing:** Observations are carefully noted in field books or on electronic devices. This data is then analyzed to understand bird numbers and spot any changes over time.

- **Repeating Over Time:** For the best insights, surveys are repeated across different seasons or over many years. This helps reveal long-term trends in bird populations.

The Big Impact of Bird Surveys

The information gathered from systematic bird surveys has many important uses:

- **Bird Conservation:** It directly helps conservationists protect endangered bird species and their essential habitats.

- **Ecosystem Health Check:** Birds are sensitive to changes in their environment. Early signs of stress in bird populations can signal wider environmental problems.

- **Climate Change Research:** Surveys provide crucial data to understand how shifting climates might be changing bird migration patterns, breeding seasons, and where different species live.

- **Land Management:** The data helps inform decisions about how to best use and manage land, identifying areas that need protection or restoration.
- **Public Awareness:** These surveys, especially citizen science programs, engage people in nature, fostering a greater appreciation and desire to protect our natural world.

The Challenges

Even with all their benefits, systematic bird surveys face challenges:

- **Weather:** Bad weather can make it difficult or impossible to conduct surveys, leading to incomplete data.
- **Access:** Reaching certain bird habitats can be tough or expensive, limiting where surveys can be done.
- **Resources:** Conducting these surveys, especially long-term studies, requires significant time, people, and funding.

- **Observer Differences:** Variations in people's bird identification skills, even with training, can sometimes affect data accuracy.

In Conclusion

Systematic bird surveys are incredibly important tools for understanding birds and their connection to our environment. They provide essential data for protecting species, assessing the health of ecosystems, researching climate change, and guiding how we manage our land.

By using standardized methods and continuous monitoring, these surveys help us track trends and respond to environmental challenges. Whether conducted by professional scientists or dedicated citizen scientists, bird surveys are vital for ensuring the health and survival of bird species across the globe.

Riddles 2507

1. What has one eye but can't see?
2. What belongs to you, but others use it more than you do?
3. What flies without wings?
4. I am always running, but I never walk. What am I?
5. I go through cities and fields, but I never move. What am I?

(Answers on Back Cover Inside)

Sudoku Challenge 2507

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

Indian Council of Agricultural Research (ICAR)

Meet the Indian Council of Agricultural Research (ICAR), set up in 1929 – India's top body for agricultural science! It reports directly to the Department of Agricultural Research and Education under the **Ministry of Agriculture**, with the Union Minister of Agriculture serving as its president. ICAR leads the way in farming research, education, and helping farmers put new ideas into practice. It is, in fact, the largest network of agricultural research and education institutes in the world. Their main goal is to use scientific breakthroughs to benefit society. They team up with farmers, businesses, and even us, the consumers, to face huge challenges like feeding a growing population and adapting to climate change, aiming for a future with abundant, healthy food.

Guiding Principles and Key Achievements

ICAR's core objectives drive its mission:

- **Promoting Agricultural Research**: Conducting vital research across crop science, horticulture, animal science, fisheries, and more.
- **Strengthening Education:** Enhancing agricultural education quality through support, guidance, and fellowships.
- **Fostering Innovation:** Developing and transferring new technologies directly to farmers.
- **Ensuring Food Security:** Researching to enhance crop yield and quality for diverse, nutritious food sources.

ICAR's contributions have been monumental, transforming India from a food-deficient nation to a food-surplus one. They significantly supported the Green Revolution by developing over 5,000 improved crop varieties, including high-yielding, drought-resistant, and biofortified crops. ICAR also advanced animal husbandry and fisheries (making India the second-largest global fish producer) and promoted low-cost farm mechanisation. A vast network of **Krishi Vigyan Kendras (KVKs)** across districts facilitates direct technology transfer and advice to farmers.

Collaborations and Recognition

ICAR collaborates extensively with global bodies like FAO and CGIAR, and national institutions, including State Agricultural Universities and various ministries. This network enhances research, training, and policy development. ICAR recognises excellence through numerous annual awards like the **Rafi Ahmed Kidwai Award** and the **Jawaharlal Nehru Award**, highlighting its commitment to fostering agricultural innovation and securing India's sustainable food future.

Indian Scientist
Amitava Raychaudhuri

Shanti Swarup Bhatnagar Prize (1997)

BORN IN KOLKATA IN 1952

Meet **Professor Amitava Raychaudhuri**, an Indian theoretical physicist who spends his time thinking about the universe's biggest mysteries—the stuff that happens at the tiniest, most fundamental level! As an Emeritus Professor at the University of Calcutta, he is one of India's leading experts in particle physics and astroparticle physics.

After earning his Ph.D. from the University of Maryland, Dr. Raychaudhuri held research and teaching positions at prestigious places like the University of Oxford, Fermilab, and TIFR.

Unlocking the Secrets of Matter

Dr. Raychaudhuri's work often goes beyond the Standard Model—our current best theory for how all matter and three of the universe's forces work. He's searching for the next big breakthrough!Done-Indian Scientist 01

- **Matter vs. Antimatter:** Why is our universe made of matter and not an equal mix of matter and antimatter? Dr. Raychaudhuri tackled this using **Supersymmetry (SUSY)** models. His work on **CP-violation** in SUSY deepened our understanding of this fundamental imbalance.

- **Ghostly Neutrinos:** He made crucial contributions to models that explain why **neutrinos**—those tiny, almost massless particles that barely interact with anything—have mass and can change type. This influences large-scale experiments, like those exploring the potential of the India-based Neutrino Observatory (INO).

- **Extra Dimensions:** He explored **Grand Unified Theories** and models involving **extra dimensions**, which look for new ways to unify the forces and suggest new particles that future colliders might detect.

A Mentor and Leader

Dr. Raychaudhuri's influence extends through his leadership roles, including serving as Director of the Harish-Chandra Research Institute and Director of the S.N. Bose National Centre for Basic Sciences. He has mentored 11 Ph.D. students, shaping the future of theoretical physics in India. For his pioneering research, he received the Shanti Swarup Bhatnagar Prize (1997), India's highest science award**.**

India's Space Odyssey

Reaching for the Stars

India's journey into space is a story of vision, determination and the power of science to transform lives. From launching a tiny rocket in a small fishing village to landing on the Moon's south pole, India's Space Odyssey is proof that big dreams and bold ideas can shape the future even for those who start with very little. And now, get ready to explore the amazing achievements that have secured India's prominent place in space exploration.

The Early Steps: Rocket on a Bicycle

It all began in 1963, when India launched its first sounding rocket from Thumba Equatorial Rocket Launching Station (TERLS) in Kerala. The rocket was so light that its parts were transported on a **bicycle**! Dr. Vikram Sarabhai, often called the Father of India's Space Programme, led the team. He believed space technology could solve real problems for India, such as improving communication, weather forecasting and education even in the most remote villages.

Just a few years later, in 1969, the **Indian Space Research Organisation (ISRO)** was born, with a vision to use science for the benefit of every Indian.

Did You Know? ISRO's first office was set up in a tiny church in Thumba, Kerala!

Giant Leaps: India Enters Space

Aryabhata, India's first satellite, was launched in 1975 from the Soviet Union. While it wasn't launched from Indian soil, it marked a huge step towards self-reliance. Soon followed the **Bhaskara** series for Earth observation and INSAT/IRS satellites for communication, agriculture and disaster management.

These satellites made a huge impact: TV signals could reach the farthest villages; farmers got timely weather updates; today, even your GPS apps rely on Indian satellites!

Building Rockets, Setting Records

ISRO's dream was to launch satellites with Indian technology. In 1980, the **SLV-3** rocket carried the **Rohini-1** satellite into space, making India one of the few countries capable of launching satellites.

The development of **PSLV** and **GSLV** rockets allowed India to carry even heavier satellites and undertake more complex missions. In 2017, India set a world record by launching **104 satellites in a single PSLV mission** proving Indian engineering could achieve global feats and at a fraction of the cost spent by richer nations.

Explorations Beyond Earth

In 2008, **Chandrayaan-1** became India's first Moon mission and discovered water molecules on the lunar surface, a finding celebrated worldwide.

Though **Chandrayaan-2**'s lander lost communication in 2019, its orbiter still sends back valuable lunar data. The journey continued with Chandrayaan-3 in 2023, when India became the first nation to land a spacecraft near the Moon's south pole, a historic moment for Indian science and innovation.

Mars Mission Marvel

Mangalyaan or the **Mars Orbiter Mission (MOM)**, launched in 2013, made India the first Asian nation to reach Mars and the first in the world to succeed on its very first attempt.

Astonishingly, the entire mission cost less than the budget of many Hollywood films, showing that smart engineering and creativity can overcome financial hurdles.

Real-Life Benefits for You

Indian satellites do much more than explore space they help people every day on Earth:

Disaster Management: Satellites track cyclones, floods and forest fires, sending early warnings that save lives.

E-Learning: With satellite-based digital education, children in remote villages attend classes just like in city schools.

Fishermen's Safety: Satellites share information about weather conditions and fish-rich zones, improving safety and livelihoods.

Farmer weather alerts, village TV and Google Maps all use services from satellites launched by ISRO!

Space for Students: Your Journey Starts Now

You don't need to wait to be a scientist to be part of ISRO's mission. Across India, students have:

- Built and launched CubeSats (tiny satellites) with help from ISRO.
- Participated in the **Young Scientist Programme (YUVIKA)** to visit ISRO centres, meet experts and see launches up close.
- Joined school science clubs, made model rockets and took part in astronomy quizzes.
- Used ISRO's online learning tools to deepen their knowledge in science and technology.

Fun Fact: The first Indian in space, **Rakesh Sharma** (1984), described India from space as "Saare Jahan Se Achha" ("The best in the world!"). He practised for spaceflights underwater to simulate zero gravity!

Looking to the Future

India's ambitions are growing:

Gaganyaan: Training is underway for India's first crewed mission. Soon, "Vyomanauts", Indian astronauts will orbit Earth in an Indian spacecraft.

Aditya-L1: India's first mission to study the Sun.

Analogue Research Stations: Practice bases are being created in Ladakh to simulate Moon and Mars environments.

And it's not just ISRO, many Indian startups and school teams are inventing new tools in navigation, robotics and even artificial intelligence for space applications.

India sets a world record by launching 104 satellites in one mission

Take the Next Step

Innovation in space doesn't just mean building rockets. It might mean coding software to process satellite images, designing new communication systems or analyzing environmental data. Every question you ask and every experiment you try is a small step towards a giant leap.

India's Space Odyssey shows that dreams, teamwork and curiosity can lead to remarkable achievements. Every student who asks a question, builds a model rocket or studies the stars can someday be the one to launch India's next mission.

So look up at the night sky and imagine yourself as part of the next big breakthrough. Remember! Many ISRO scientists and Indian startup founders first dreamed of space as students like you!

Keep questioning, keep building and keep reaching for the stars!

National Innovation Month (July)

Innovation Month (July) is a dynamic initiative promoting creativity and problem-solving through **workshops, hackathons, and STEM fairs**.

This month-long event significantly advances **STEM education and technological progress** by showcasing inventions in science and technology (robotics, AI, etc.) and providing a platform for young innovators. It aims to:

- **Enhance Creativity & Critical Thinking:** Encourage students and professionals to think outside the box and develop essential problem-solving skills.
- **Inspire Youth:** Engage students through activities and competitions to foster curiosity and innovation.
- **Support Solutions:** Focus on sustainable technology to address societal and environmental challenges like pollution.
- **Foster Collaboration:** Promote networking, mentorship, and knowledge sharing among innovators, scientists, and industry experts.
- **Cultivate a Culture of Innovation:** Highlight the value of R&D and encourage investment in creative solutions.

Conclusion

Innovation Month sparks curiosity, drives scientific progress, nurtures future innovators, and encourages solutions to societal challenges, celebrating human ingenuity.

Indian Scientist

Conjeevaram Srirangachari Seshadri

Padma Bhushan (2009) and Shanti Swarup Bhatnagar Prize (1972)

29 FEBRUARY 1932 – 17 JULY 2020

Get ready to meet a true legend of Indian mathematics: **Professor Conjeevaram Srirangachari Seshadri!** Born in Kanchipuram, Dr. Seshadri was a brilliant mind who didn't just solve problems; he completely reshaped the field of **algebraic geometry**.

Think of geometry as shapes and algebra as equations. Algebraic geometry connects these two worlds, and Dr. Seshadri's work built some of the most important bridges!

His Superpowers in Math

- **The Narasimhan–Seshadri Theorem:** A foundational result developed with M. S. Narasimhan, this theorem is a cornerstone in modern mathematics, connecting complex geometry with deep algebraic ideas.

- **The Seshadri Constant:** Named after him, this concept is a vital tool used by mathematicians worldwide to measure certain properties within algebraic geometry.

- **Standard Monomial Theory:** He helped develop this framework, which is like a special decoding system that connects geometry to the advanced study of symmetry groups. His significant advancements in Geometric Invariant Theory are recognised globally, establishing him as a pioneering figure in the study of Schubert varieties and moduli spaces. He had a profound influence on research at institutions like the Tata Institute of Fundamental Research (TIFR).

His Superpowers in Math

Dr. Seshadri wasn't just a world-class researcher; he was a passionate **institution builder**. After a long career at TIFR, he founded the **Chennai Mathematical Institute (CMI)** in 1989. He pioneered a unique model in India, integrating top-tier undergraduate education directly with research, shaping the next generation of mathematical talent!

For his intellectual rigour and leadership, he was awarded the **Padma Bhushan (2009)** and the **Shanti Swarup Bhatnagar Prize (1972)**. He was also elected a **Fellow of the Royal Society (FRS)** and a Foreign Associate of the U.S. National Academy of Sciences. Beyond math, he was a dedicated enthusiast and performer of **Carnatic music**, proving that genius can harmonise both logic and art!

Visvesvaraya Industrial & Technological Museum

Imagine a place where you can make electricity flow, launch rockets, and even meet a life-size dinosaur—all under one roof! That's exactly what you'll find at the Visvesvaraya Industrial & Technological Museum (VITM) in Bengaluru, Karnataka.

Named after **Sir M. Visvesvaraya**, one of India's greatest engineers and visionaries, the museum was officially inaugurated by Pandit Jawaharlal Nehru on July 14, 1962. Built to inspire curiosity and scientific thinking among students, the museum is now managed by the National Council of Science Museums (NCSM)

Discovering Science Through Fun: Inside the Visvesvaraya Industrial & Technological Museum (VITM)

under the Ministry of Culture, Government of India. It continues to be a favourite destination for students, teachers, and families who love to learn through fun and discovery.

VITM features several exciting galleries that make science come alive! **The Engine Hall** showcases working models of turbines, pumps, and engines, while **the Electro Technic Gallery** lets you experiment with electricity, circuits, and magnets.

The **Fun Science Gallery** offers hands-on exhibits and optical illusions, and **the Space Gallery** takes visitors on a journey through rockets, satellites, and India's space missions. **The Biotechnology Gallery** explores genes, DNA, and modern inventions, while **the Science for Kids Gallery** makes learning enjoyable for younger children.

One of the museum's most innovative projects is the **Mobile Science Exhibition (MSE)**—a traveling science museum on a bus that reaches schools in remote and rural areas. VITM also features an **Innovation Hub, a Mini Planetarium (Taramandal)** for stargazers, and regularly hosts science shows, lectures, and workshops to encourage creative thinking.

With its interactive exhibits, vibrant atmosphere, and endless learning opportunities, VITM truly shows that science is not just about books—it's about imagination, exploration, and discovery. So, next time you're in Bengaluru, make sure to visit this exciting world of science and innovation!

The Crescograph

Listening to the Secret Life of Plants

Have you ever wondered if plants can feel, react and respond to the world around them? We know they need sunlight, water and soil, but what if they also sense touch, sound or care? More than a century ago, an Indian scientist built an instrument to prove this. It was called the crescograph.

Invented by Sir Jagadish Chandra Bose, the crescograph was a simple yet powerful tool that measured the growth of plants and showed how they react to their surroundings. Through it, Bose revealed a truth that amazed the world, plants are sensitive living beings, not passive greenery.

What is a Crescograph?

The word "crescograph" comes from *crescere*, meaning "to grow." It is an instrument that measures plant growth. Bose's device could magnify tiny plant movements up to **10,000 times**, recording them as curves on smoked glass. For the first time, invisible plant responses became visible and measurable.

Why Was It Important?

Before Bose, many believed only animals could respond to their environment. Plants, they thought, were silent and still. But with the crescograph, Bose showed that plants:

- Bend towards light
- Change growth with chemicals or fertilizers
- React to touch or wounds
- Are influenced by vibrations and sounds

This discovery was revolutionary. Plants were no longer seen as passive; they were revealed as **active, responsive organisms.**
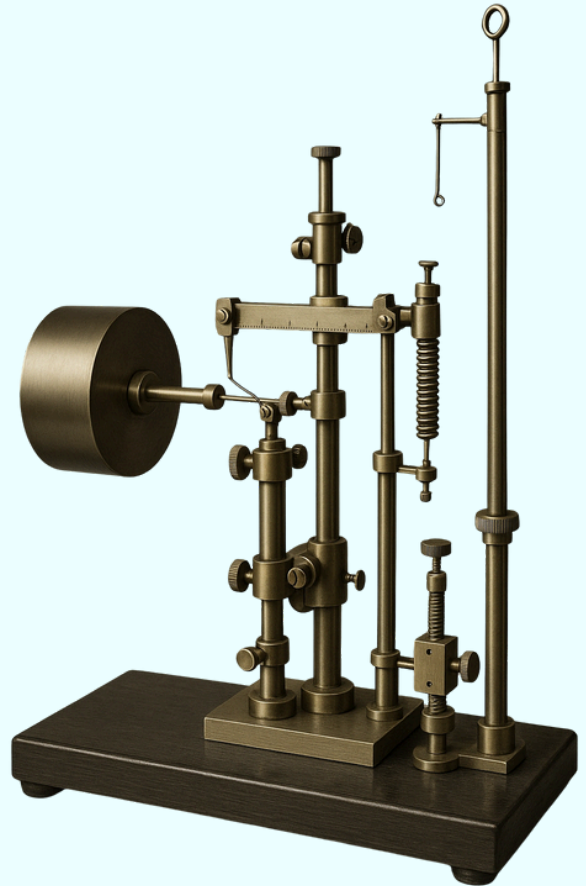
How Did It Work?

The crescograph used a system of levers. The tip of a plant was attached to the lever and as it grew or responded, the movement was magnified thousands of times. Later, Bose used electrical circuits to show plants transmit tiny signals, similar to **nerve impulses in animals.**

Simple Examples for Students

To make it clearer, let's connect Bose's work with things you see.

Sunflowers: They track the Sun. The crescograph could measure the growth inside that allows them to turn.

Touch-Me-Not Plant: Leaves fold when touched. Bose showed this reaction travels like an electric signal.

Fertilizer Test: One plant given nutrients grows faster, something the crescograph could detect early.

Music and Growth: Students experimenting with plants and music are following Bose's early hints.

The Science Behind It

Plants, like animals, generate electrical signals when stimulated. Bose proved that these signals cause measurable changes in growth or movement. His work showed how deeply connected all life is.

The Impact of the Crescograph

Bose's invention had wide effects

- It advanced the study of plant physiology.
- Helped agriculture by showing plant reactions to soil, chemicals and light.
- Inspired scientists to build better tools, leading to today's advanced sensors and AI-based plant studies.

Try It Yourself

You can try a mini version of Bose's idea

- Take two identical potted plants.
- Place one in sunlight, the other in shade.
- Measure their growth with a ruler daily.
- Plot the data on graph paper.

This small project gives you a taste of the crescograph's purpose **making the invisible visible.**

The Future Outlook

Today, scientists use plant signals to

- Study climate change impacts on crops.
- Create smart farming systems.
- Build plant biosensors to detect pollution.

The seed planted by Bose's crescograph continues to grow in modern science.

Conclusion

The crescograph was more than an invention; it was a new way of looking at life. Sir Jagadish Chandra Bose showed the world that plants are not silent objects but living beings, responsive and sensitive.

For young innovators, the lesson is clear: even the most ordinary things hide extraordinary secrets if we dare to look closely. So the next time you see a plant, remember within its leaves and stem is a story of growth, response and life, waiting for the next curious scientist like you to discover.
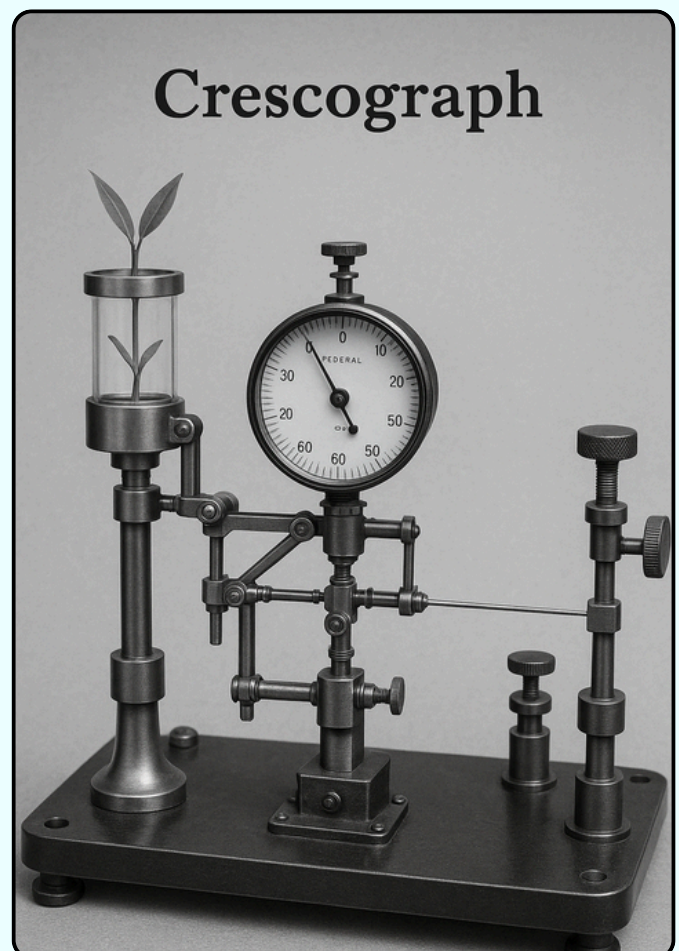
Communicating Your Innovation

Your Journey From Spark to Spotlight

Have you ever built a simple science project, come up with a cool way to solve a problem, or had an idea that could make life better? That's an innovation! But an idea becomes truly powerful only when it's shared, explained, and remembered. Many students create brilliant models or ideas for science fairs, but only a few know how to communicate their innovation effectively or document the steps they took to reach their final result.

This article will help you learn how to clearly communicate your ideas and record your innovation journey so that others can understand, learn from, and even help improve your idea.

Why Communication Matters

A great idea that is never shared is like a book that's never opened. Even the best invention needs a good explanation to inspire others. Communicating your idea helps you gain valuable feedback, support, and recognition. Ultimately, science isn't just about what you do —it's about telling the story of what you did.

Steps to Communicate Your Innovation Clearly

Every innovation solves a problem. Begin by stating the problem you observed. For example, "In my school, many taps were left open after use, wasting water."

Next, explain your idea simply using everyday language, as if you're talking to a friend. Use diagrams or models because a picture can often explain more than words. Draw neatly, label parts, and show how your idea works.

Afterwards, highlight what makes your solution special. Is it cheaper? Easier to use? Made from recycled materials? Then, share the results or benefits of your innovation. Did you test it? What did you find?

Finally, prepare a short presentation or script for events like a science fair. In just 2-3 minutes, make sure you answer three key questions:

1. What is the problem?
2. What did I make?
3. How does it help?

Simple Tips for Good Communication

- **Speak Clearly**: Take your time; don't rush your explanation.
- **Use Body Language**: Point to your model or a chart to help your audience visualize your ideas.
- **Be Confident:** Be proud of your innovation, no matter how simple it is.
- **Listen to Questions:** Questions mean people are interested, so don't get nervous!
- **Use Examples:** Relate your project to daily life to make it more relatable.

Documenting Your Innovation: Why It Matters

Documenting means writing down your entire journey—your thoughts, steps, and lessons learned. It helps you track your progress, improve your ideas over time, and makes it easier to apply for future patents, competitions, or grants. It also allows other students to learn from your work.

What to Include in Your Innovation Journal or File

- **Project Title:** A clear and catchy name, like "Auto-Tap: A No-Electricity Water Saver."
- **Date and Place:** Note when and where you started to create a timeline.
- **The Problem:** Write down what inspired your idea.
- **Brainstorming Ideas:** List all your initial thoughts, including the ones you didn't use. This showcases your creative process.
- **Materials Used:** List everything you used, from plastic bottles to rubber bands.
- **Steps Taken:** Provide a step-by-step account of your process, including challenges and how you solved them.
- **Observations and Results:** Document how your project worked during testing and what could be improved.
- **Feedback from Others:** Note suggestions from teachers, friends, or family.
- **Changes Made:** Explain any improvements you made to your design and why.
- **Photos and Drawings:** Include clear pictures and labeled diagrams of your model.
- **Learnings and Future Plans:** What did you learn from this project, and what are your next steps?

Presenting Your Work

For science exhibitions, use a poster or display board to present key points, including the problem, solution, images, and benefits. Have your prototype ready, and use your detailed documentation to explain your process to judges.

Inspiration from Legends

Dr. A.P.J. Abdul Kalam was a brilliant missile scientist, but what truly set him apart was his ability to simplify complex ideas. He made science exciting for everyone, from students to world leaders. The lesson here is clear: no matter how big your idea, if you can explain it simply, it becomes incredibly powerful.

Dr. M. S. Swaminathan, a renowned geneticist, is known as the "Father of the Green Revolution in India." He developed high-yield wheat varieties and meticulously documented and shared his research. His work transformed Indian agriculture, showing that innovation combined with clear communication can have a massive impact.

These legends prove that great ideas, well-communicated, can change the world.

But you don't have to be a legend to make a difference! **Ramesh Sharma**, a Class 10 student from Madhya Pradesh, built a wind-powered water pump from scrap material. He diligently maintained a notebook with designs, test results, and pictures.

His clear documentation and passion helped his project earn a national innovation award. This proves that documenting even a small project with clarity can lead to national recognition.

Final Thoughts for Every Young Innovator

Innovators, listen up! Your idea, no matter how small, is a big deal. The true magic happens when you **share and document** it. Think of communication as the bridge between your project and the world, and documentation as the memory of your discovery. By writing it down and explaining it to others, you protect your idea, build confidence, and inspire your peers. So, whether it's a solar fan or a new app, don't just build it—share it. You're not just creating a project; you're building the future, one idea at a time.

Indian Scientist
Bhamidipati Lakshmidhara Kanakadri Somayajulu

Shanti Swarup Bhatnagar Prize (1978)

MARCH 5, 1937–DECEMBER 19, 2016

Meet **B.L.K. Somayajulu,** an Indian geochemist who was the ultimate detective of the deep ocean! Using tiny clues found in rocks and water, he pioneered the field of **nuclear oceanography,** fundamentally changing how we understand Earth's marine processes.

Born in Visakhapatnam, Dr. Somayajulu completed his Ph.D. in Bombay before honing his skills at prestigious places like BARC Training School, the Tata Institute of Fundamental Research (TIFR) and the Scripps Institution of Oceanography in the USA. He later became a key figure at the **Physical Research Laboratory (PRL)** in Ahmedabad, where he led research for over two decades.

Unlocking Ocean Secrets with Atoms

Dr. Somayajulu's scientific superpower was using **radioisotopes**—atoms with unstable nuclei—as tracers. Imagine them as tiny, timed clocks he used to measure things in the ocean that are otherwise invisible!

- **Measuring Ocean Speed:** He developed innovative methods to study how fast things grow at the bottom of the sea, like **manganese nodules** (rocky lumps rich in metals), and how quickly mud accumulates (sediment accumulation rates).

- **Deep-Sea Mixing:** His techniques helped measure how ocean water mixes with the seabed and how currents carry material across vast distances, a process called **advection-diffusion mixing.**

- **Global Expeditions:** His expertise took him around the world! He participated in major international voyages, including the **GEOSECS Indian Ocean Expedition** and the **Antipode Expedition** to the South Pacific, bringing back data that formed the foundation of modern marine science.

Legacy and Institution Building

Dr. Somayajulu was an exceptional leader. He was instrumental in establishing Accelerator Mass Spectrometry (AMS) facilities in India, bringing cutting-edge technology home. For his groundbreaking work, he received the Shanti Swarup Bhatnagar Prize (1978), India's top science award, and the MoES National Award for Ocean Science & Technology (2006). He authored over 100 peer-reviewed articles and mentored seven Ph.D. scholars, laying a strong foundation for India's nuclear geochemistry and oceanography programs.

Indian Inventions
The Ruler
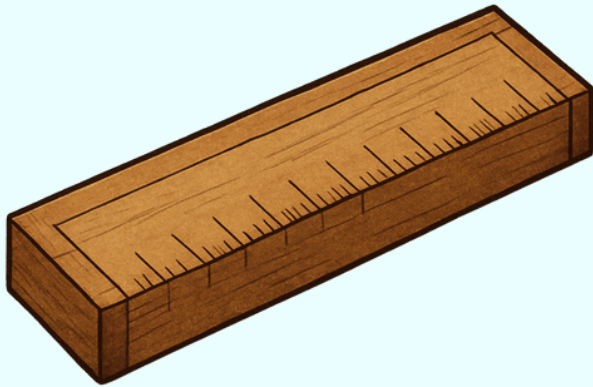
Rulers were first used by the Indus Valley Civilisation prior to 1500 BCE. Made of ivory, the rulers found during excavation reveal the remarkable accuracy of decimal subdivisions on it. It was primarily used to make measurements in a straight line and some excavated rulers were often made from wood as well. Rulers are used by every school-going child right up to professionals in the work field.

Ruler: The oldest ruler was made of ivory and found in the Indus Valley civilisation.

A Glimpse into History

Archaeologists have found ivory rulers from the Indus Valley Civilization, dating back more than 4,000 years. These rulers, discovered in places like Mohenjo-Daro, were marked with precise divisions as small as 1.6 millimeters, an accuracy that rivals even modern instruments!

Imagine a Harappan engineer measuring bricks with a ruler, ensuring each was uniform so that walls, houses and drainage systems fit perfectly. This accuracy was one reason why the Indus Valley cities were so well planned, with straight roads, standardized bricks and advanced drainage systems. In other words, the humble ruler helped shape entire cities!

Why Rulers Matter

Measurement is the backbone of science. Without it, there can be no accuracy, no comparison and no progress. A ruler helps us:

- Draw straight lines in geometry.
- Measure distances in experiments.
- Build things with correct proportions.
- Standardize trade by ensuring fairness in length-based goods.

For example, when you're in a science lab measuring the length of a pendulum string, a few millimeters can change the outcome of the experiment. Or when an architect designs a house, every centimeter matters for safety and stability. The ruler makes such precision possible.

Standard Geometry Box with Ruler

Rulers in Daily Life

Let's think beyond the classroom. Can you imagine cricket without a ruler? When the pitch is prepared, its length (22 yards or 20.12 meters) is measured precisely. Without rulers, pitches could vary wildly, changing the game's fairness. Similarly, in tailoring, a ruler (or tape measure) ensures your school uniform fits properly.

Even in technology, whether designing a smartphone or a rocket, rulers, scales and precise measurements are essential at every stage.

From Ancient Ivory to Modern Steel

The first Indian rulers were made of ivory. Later, rulers were crafted from wood, bronze and other metals. Today, you see rulers made of plastic, steel and even digital forms in software like CAD (Computer-Aided Design). But the principle remains the same: dividing a straight edge into equal units for measurement.

In fact, engineers and scientists today use highly advanced rulers called **vernier calipers** and **micrometres** that can measure objects accurate to fractions of a millimeter. All of these are direct descendants of that ancient Indian invention.

Examples Students Can Relate To

1. **Cricket Bat and Ball Size:** The cricket bat you use in the playground has official size limits. These are measured using rulers and scales.
2. **School Projects:** Whether you're making a model of the solar system or drawing a bar graph, your ruler ensures neatness and accuracy.
3. **Technology:** The screen size of your mobile phone is measured diagonally in inches using the principle of a ruler.

The Future of Measurement

Modern technology is taking rulers into new dimensions. Digital rulers, laser measuring devices and even AI-driven tools allow us to measure with greater speed and accuracy. But the core idea is still the same, breaking down space into standard, repeatable units.

India, being the birthplace of the ruler, continues to contribute to measurement sciences through fields like nanotechnology, where scientists measure objects far smaller than the width of a human hair.

Measuring Cricket Pitch

Conclusion

The ruler is a reminder that sometimes the simplest inventions have the greatest impact. Born in India during the Indus Valley Civilization, it has become a universal tool for learning, building and innovating. For students, it is more than just a piece of plastic in your geometry box, it is a legacy of Indian science and a symbol of precision and fairness.

Science & Innovation Lab

Nehru Science Centre

Imagine a place where science comes alive—where you can explore electricity, sound, motion, and even step into the world of a volcano or a tornado! Welcome to the Nehru Science Centre (NSC) in Worli, Mumbai, India's largest interactive science museum. Named after India's first Prime Minister, Jawaharlal Nehru, the centre has inspired curiosity, creativity, and scientific thinking among students, teachers, and families for decades.

The idea for the NSC was conceived in the late 1960s as a modern science and technology museum, and it began taking shape in 1977 with the 'Light and Sight' exhibition. Two years later, in 1979, a sprawling Science Park was built, bringing outdoor interactive exhibits to life. The centre was officially opened to the public on 11 November 1985 by then-Prime Minister Rajiv Gandhi, becoming a benchmark for science education in India.

Spanning 14 acres, the NSC features more than 500 hands-on and interactive exhibits covering diverse topics such as energy, mechanics, sound, kinematics, and transportation. The indoor galleries include immersive experiences like "Light and Sight," "Sound and Hearing," and the "Hall of Nuclear Power," while the outdoor Science Park lets visitors explore physics and engineering concepts amidst lush greenery with a variety of plants, trees, and shrubs.

The NSC also organizes the 3D Science Show and the Science Odyssey Film, engaging audiences with visual presentations that make complex scientific ideas easy to understand and fun for all ages.

Educational programs, workshops, competitions, and seminars are regularly conducted to nurture curiosity and scientific thinking, particularly among students.

As part of the National Council of Science Museums (NCSM), NSC serves as the Western Zone Headquarters, overseeing five other centres in Nagpur, Bhopal, Dharampur, Calicut, and Goa. Its skilled team designs and develops high-quality exhibits and programs, ensuring visitors always have exciting, hands-on experiences with science and technology.

With its interactive galleries, outdoor science park, and endless learning opportunities, the Nehru Science Centre proves that science is not just a subject—it's an adventure waiting to be explored. So, the next time you're in Mumbai, step into this amazing world of innovation, discovery, and imagination, where every corner sparks curiosity and learning!
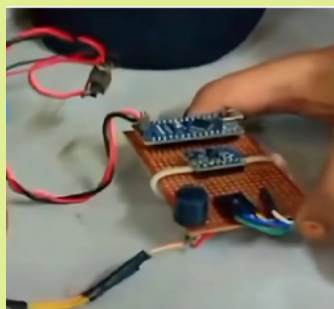
Alert Device Headgear

Alert Drive Headgear is a device that alerts a sleepy vehicle driver to become attentive. Driving without full consciousness results in the loss of lives due to accidents. Despite trying multiple methods, one can fail to stay awake inside the vehicle. This might lead to fatal accidents and deaths.

To alert the driver, a circuit board is designed and attached to the cap of the driver. Whenever the cap is bent down above a certain angle for a predetermined duration, the circuit sends an alert to the driver by using vibration and buzzer sensors. These sensors are connected to an Arduino Nano and an

ADXL accelerometer, which are mounted on a PCB circuit board. This project aims to prevent accidents like the case of her uncle and make the roads safer for everyone.

**Alfiya Shafiqullah Khan,
10th Class**

(Source: GYS Avishkar Awards 2024Booklet)
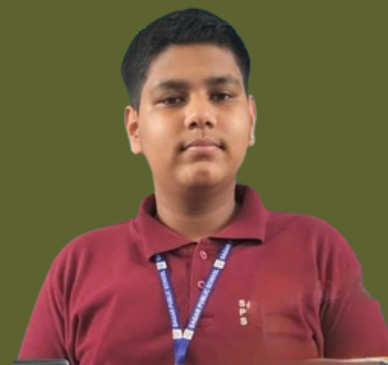*https://www.youtube.com/watch?v=abxxFJ-Fz3Q&t=97s*
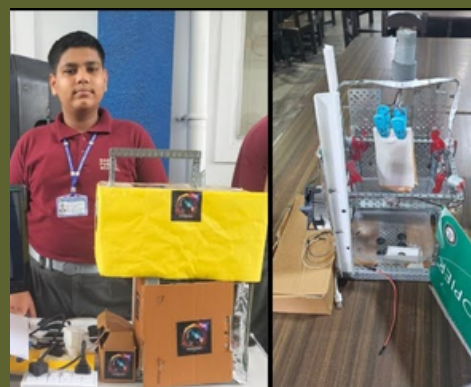
Automatic Clothes Dryer

Insufficient clothes drying due to a lack of sun and space, especially during the rainy season, leads to health-related issues. It is overcome by an automated drying system, which provides a controlled environment to dry the clothes most efficiently. It is a convenient, efficient, and hygienic solution for drying clothes by optimising the drying conditions and eliminating any manual intervention.

**Daksh Dubey,
11th Class**

The Automatic Cloth Dryer is designed to efficiently and hygienically dry clothes. It features a rotating clothes hanger to facilitate even drying from all sides, four fans, and a humidifier to accelerate the drying process.

The combination of all these devices results in optimal drying during all weather conditions.

(Source: GYS Avishkar Awards 2024Booklet)

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

Innovation Training Module

Model Making

From Imagination to Creation

Tired of just reading about science and innovation? What if you could actually build what you're learning? That's the magic of **model making**. It's not just a hobby; it's a dynamic way to bring your textbook knowledge to life, solve problems, and turn your wildest ideas into tangible creations. Get ready to swap the boring lecture for a hands-on adventure!

Why Models Are Cooler Than Textbooks

Ever tried to understand the structure of a DNA molecule or the flow of an electric current just by looking at a diagram? It can be tough! Models change that. They let you hold a concept in your hands, giving you a deeper, more intuitive understanding than any flat image can.

Think of it this way: a textbook tells you a story, but a model lets you step right into it. You're not just a passive reader; you become the creator, the engineer, and the problem-solver. Building a model forces you to ask questions a book can't answer: "How do I make this part stay here?" or "What's the best way to show this process?" These are the questions that make you a true innovator.

The Secret Superpower of Great Minds

Almost every great invention started as a model. From the first airplane prototypes built by the Wright brothers to the miniature cityscapes used by architects, models are the secret sauce of innovation. Why? Because they're a safe, cheap, and effective way to **test, fail, and improve.**

Imagine a famous architect designing a new, futuristic stadium. They don't just start building! They create a small-scale model first. This model lets them see the design from every angle, check for potential flaws, and even present the idea to clients. This process of creating a physical representation, getting feedback, and refining the design is the core of real-world innovation. Model making is your chance to practice this exact process.

It's All About Hands-On Learning!

Let's ditch the theory for a minute and get practical. Model making is the ultimate hands-on learning tool. Instead of just memorizing facts, you get to apply them.

For example, when you're building a model of the solar system, you have to think about scale and proportion. You'll intuitively learn that Jupiter is much bigger than Earth without just reading the numbers. When you're making a model of a volcano, you can actually simulate an eruption, understanding the science of pressure and chemical reactions in a way that's unforgettable.

This kind of learning sticks with you. It's not just about getting good grades; it's about building a foundation of practical knowledge and critical thinking that will help you in every aspect of your life.

The Secret Superpower of Great Minds

Model making is a continuous journey of solving problems. You'll encounter many "what if" moments. For instance, you might be building a model of a bridge and find that the paper you're using for the main supports is bending and can't hold the weight.

REAL — MODEL
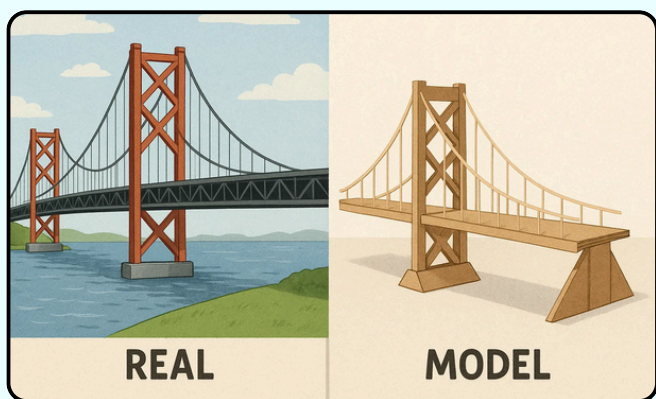
This is a crucial learning moment! You'll quickly realize that you need a stronger material. Your next attempt will likely involve using sturdier cardboard or popsicle sticks, instinctively applying the concept of structural integrity. This trial-and-error process is where true learning happens—it teaches you to think on your feet, adapt, and innovate.

A Simple Challenge to Get You Started

Ready to put this into practice? Here's a challenge that will make you think like a real innovator.

Your Mission: Design a "Smart Home" for the Future

- Pick a Problem: Choose a common problem faced in Indian households today. Maybe it's water scarcity, electricity usage, or managing household waste.
- Sketch Your Idea: On a piece of paper, brainstorm and sketch out your "smart" solution. It could be a rain-sensing window that closes automatically, a system that reuses water, or a smart dustbin that sorts waste.
- Gather Materials: Look around your house for simple, everyday items. Cardboard boxes, plastic bottles, old wires, bottle caps, straws—everything is a potential building block!

- Start Building: Assemble your model. Don't worry about perfection. The goal is to make a physical representation that clearly shows how your innovation works. Use arrows, labels, and different colours to explain the process.
- Present Your Vision: Once your model is ready, show it to your family or friends. Explain the problem you chose and how your "smart home" solution solves it. You can even create a small demo!

This isn't just a fun activity; it's a complete innovation cycle. You identify a problem, brainstorm a solution, build a prototype, and then present it to an audience. This is exactly what engineers and designers do every day.

More Than a Model: Building a Mindset

Model making teaches you something invaluable: the power of making mistakes. Your first design might not work. Your materials might not hold together. But that's okay! Each failure is a learning opportunity. You'll learn to be resourceful, patient, and persistent.

Theory — Model
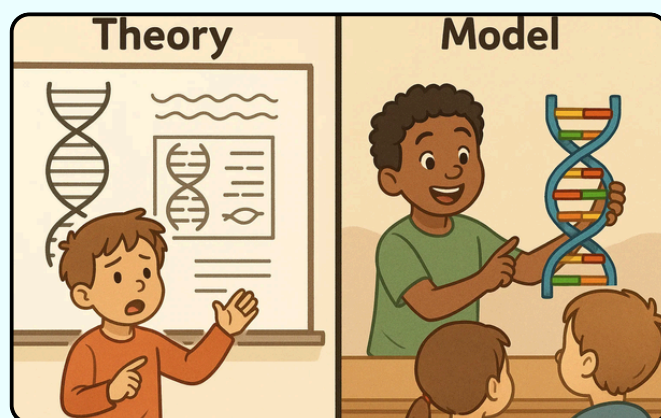
So, next time you have a big idea, don't just let it stay in your head. Grab some cardboard, glue, and a pair of scissors, and start building. You'll be amazed at how this simple, hands-on process can transform the way you think, learn, and innovate.

Classroom Glow Board (2023)

B. Rajesh noticed that some students were unable to see the teacher's writing on the green board due to light glare. In smart classrooms, projector screens or large TV screens are usually placed at the centre, while green boards are kept to the sides for occasional use. To address this issue, he designed an improved board. He used a square mesh of metal wire (2x2 inches) to provide support at the back of the display sheet. Additionally, he installed a light-reflective white sheet behind the frame, positioned about 2 inches behind the batteries or cells, to provide even backlighting across the display.

A rechargeable battery powers the lamp, and the board can also function as a projector screen. While it costs about the same as a conventional board, it offers much greater functionality and efficiency.

(Source: INSPIRE MANAK NLEPC 2023 Booklet)

**B Rajesh Sahu,
9th Class**

Charge Your Phone as You Walk , Run and Exercise

Preeyam has developed a shoe equipped with a control switch. The user can place their phone in their pocket, connect one end of the charging cable to the phone, and the other end to the model in the shoe, allowing the phone to charge while walking.

This innovative design is highly cost-effective, requires no sensors, and helps conserve electricity by utilising energy that would otherwise go to waste.

**Preeyam Das,
6th Class**

(Source: INSPIRE MANAK NLEPC 2021 Booklet)

Central Drug Research Institute

Have you ever wondered how new medicines are discovered and tested before they reach hospitals and pharmacies? The Central Drug Research Institute (CDRI), located in Lucknow, Uttar Pradesh, is one of India's most important scientific institutions dedicated to this mission. Established in 1951 under the Council of Scientific and Industrial Research (CSIR), CDRI works to discover, develop, and deliver new and affordable medicines that improve human health.

CDRI's scientists focus on solving major health challenges by researching diseases like **cancer, diabetes, infections, neurological and reproductive disorders, and even viruses.** They also explore India's vast biodiversity to find natural compounds that might become the next generation of life-saving drugs. The institute studies these discoveries through every stage of drug development — from identifying potential molecules to conducting preclinical studies and clinical trials.

Over the years, CDRI has made many landmark contributions. It developed **Arteether**, an antimalarial drug; **Centchroman**, a non-steroidal oral contraceptive; and **Rifampicin**, a life-saving drug for tuberculosis. Its researchers also played a major role during the **COVID-19 pandemic**. These innovations have helped make healthcare more affordable and reduced India's dependence on imported medicines.

CDRI's advanced laboratories use cutting-edge tools like bioinformatics, molecular biology, and AI-based drug design.

The institute also partners with pharmaceutical companies and global research organizations to ensure that its discoveries reach the market as affordable medicines.
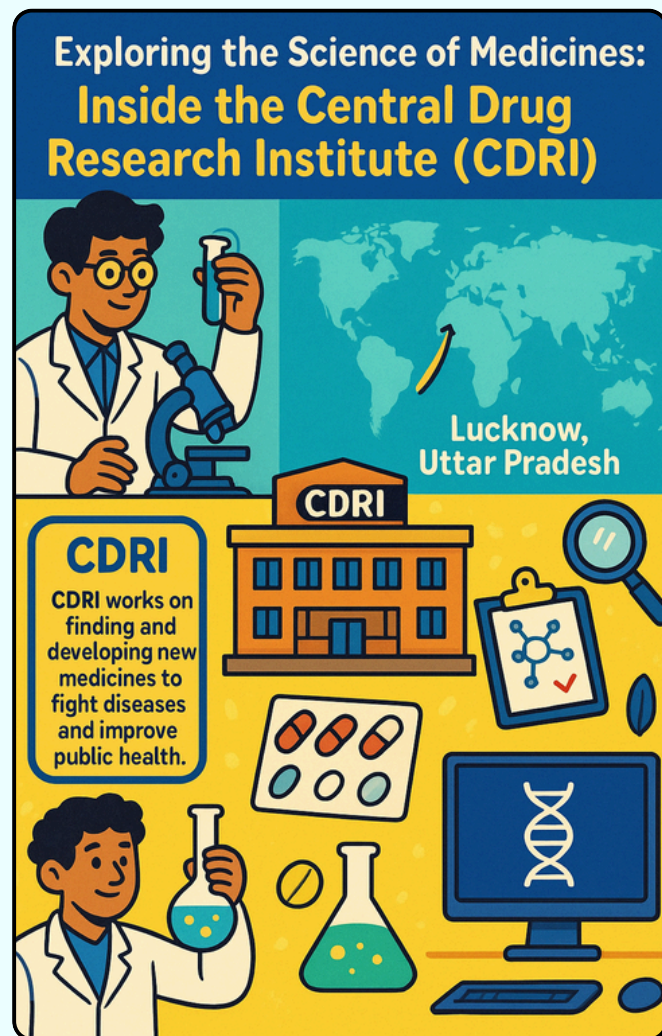
Beyond research, CDRI trains future scientists through **PhD programs, internships, and workshops**, inspiring young minds to enter the world of biomedical research.

With over 10,000 research papers, thousands of trained scientists, and several globally recognized drugs, CDRI stands as a shining example of how Indian science continues to heal the world—one discovery at a time!

Solution
Word Search 2507
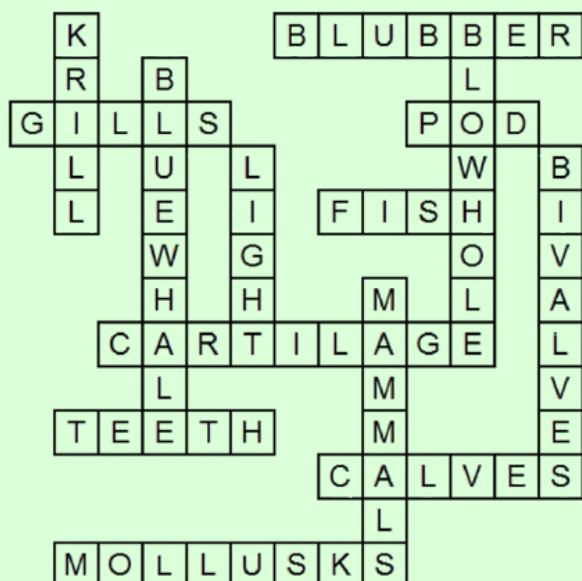
Solution
Sudoku Challenge 2507

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

Riddle 2507 Answer

1. A Needle   2. Your Name 3. Time 4. River 5. Road

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Cash Prizes: ₹ 15,000, ₹10,000, ₹ 5,000, 5 x ₹ 1,000

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