# Design Thinking for Middle School STEM

STEM Education Workshop for Classes 6–8 Educators

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June 28, 2025

Organised by ANG Sahodaya School Complex

# Session Overview

- 90-minute workshop for Classes 6–8 teachers in Bhagalpur and Munger
- Focus: Integrate design thinking into CBSE-aligned STEM education
- Emphasizes experiential, student-centered learning
- Includes hands-on activities, assessment strategies, and resources
- Aligns with NEP 2020 and CBSE syllabus [3]

# Learning Objectives

- Understand design thinking principles for STEM education
- Design CBSE-aligned, experiential STEM lessons for Classes 6–8
- Develop rubrics for assessing creativity and collaboration
- Explore tools and resources for design thinking projects
- Build confidence in fostering 21st-century skills

# Session Schedule

| Time | Segment |
|---|---|
| 5 min | Opening Remarks and Objectives |
| 15 min | Design Thinking: Principles and CBSE Integration |
| 25 min | Designing STEM Lessons with Design Thinking |
| 25 min | Hands-On Activity: Lesson Plan Design |
| 20 min | Assessment, Resources, and Action Plan |

# Design Thinking Framework

- **Empathize**: Understand student or community needs
- **Define**: State a clear, CBSE-relevant problem
- **Ideate**: Brainstorm creative solutions
- **Prototype**: Build simple, tangible models
- **Test**: Test and refine based on feedback

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**Example**: Design a low-cost classroom cooler [6]

# Integrating Design Thinking with CBSE

- **Science**: Experiments (e.g., water filter, Class 6)
- **Mathematics**: Geometry, data handling (e.g., garden layout, Class 7)
- **Technology**: Coding in Scratch (e.g., science animation, Class 8)

Table: Example: Classroom Cooling Project

| **Stage** | **Activity** |
|---|---|
| Empathize | Interview peers on heat issues |
| Define | “How to cool classrooms affordably?” |
| Ideate | Brainstorm fans, shades, ventilation |
| Prototype | Build cardboard shade model |
| Test | Measure temperature change |

# Designing CBSE-Aligned Lessons

1. **Driving Question**: CBSE-relevant (e.g., “How to reduce school waste?”)
2. **Process**: Guide through design thinking stages
3. **Product**: Prototype, chart, or presentation
4. **Reflection**: Evaluate process and teamwork

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**Steps**: Select CBSE topic, create real-world context, integrate STEM, plan assessments [3]

# Example Lesson: Reducing School Waste

- **Driving Question**: How to reduce cafeteria waste?
- **CBSE Topics**: Science (Class 6: garbage), Math (Class 7: data handling)
- **Activity**:
  - Survey waste types (Empathize)
  - Define: Too much plastic waste
  - Ideate: Compost bins, reusable containers
  - Prototype: Model compost bin
  - Test: Graph waste reduction
- **Outcome**: Bar graph and prototype

# Hands-On Activity: Design a Lesson

1. **Groups**: 4–5 teachers
2. **Task**: Design a CBSE-aligned STEM lesson
3. **Components**:
   - Driving question (e.g., water conservation)
   - STEM integration (e.g., science + math)
   - Student product (e.g., prototype)
   - Rubric (4–5 criteria)
4. **Time**: 40 min design, 20 min peer review
5. **Prototype**: Build with cardboard, tape

# Assessment Strategies

Table: CBSE-Aligned Rubric

| **Criterion** | **Excellent (4)** | **Good (3)** |
|---|---|---|
| Scientific Understanding | Thorough CBSE concept use | Minor errors |
| Creativity | Highly innovative solution | Some originality |

- **Formative**: Monitor ideation, prototypes
- **Peer Feedback**: Critique group work
- **Reflection**: Write on design process

# Project Ideas for Classes 6–8

- Low-Cost Air Cooler: Heat transfer, area calculations
- Compost Bin: Waste management, volume, data handling
- Solar Lantern: Circuits, angle measurement
- Drip Irrigation: Water conservation, volume ratios
- Bridge Design: Forces, geometry
- Weather Station: Climate, statistical analysis
- Windmill: Renewable energy, speed calculations
- Soil Testing Kit: Soil chemistry, proportions
- Scratch Game: Coding, coordinates
- Flood-Resistant House: Materials, mensuration

# Resources

- **CBSE/NCERT**: Textbooks, lab manuals [8]
- **Digital Tools**:
  - Scratch (`https://scratch.mit.edu`)
  - GeoGebra (`https://www.geogebra.org`)
  - Canva (`https://www.canva.com`)
- **Physical**: Cardboard, tape, recycled materials
- **Professional**: IDEO Toolkit [6], CBSE modules

# Action Plan

- **Implement**: Design one lesson within 3 months
- **Share**: Join ANG Sahodaya WhatsApp group
- **Reflect**: Submit lesson outcome report
- **Connect**: Engage with SCERT Bihar, STEMpedia [10]

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# Thank you for your engagement!

Empower Classes 6–8 with creative STEM solutions!