

Mathematics in STEM and Project-Based Learning (PBL)

STEM Education Workshop for Secondary School Educators

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Session Overview

- Interactive workshop on integrating mathematics into STEM via PBL
- Aligns with CBSE 2025–26 roadmap and NEP 2020
- Draws on global best practices (MIT, Stanford, Tsinghua)
- Hands-on activities to design math-rich PBL experiences

Learning Objectives

- Examine mathematics' role in STEM through global case studies
- Develop math-centric PBL units aligned with CBSE standards
- Create assessment rubrics and differentiation strategies
- Build confidence in PBL frameworks for student engagement

Session Schedule

Time	Segment
5 min	Opening Remarks and Objectives
15 min	Mathematics in STEM: Global Perspectives
25 min	PBL Design Frameworks and Examples
15 min	Assessment and Differentiation in PBL
5 min	Summary, Q&A, Resource Sharing

Introduction: Mathematics in STEM

- STEM: Holistic integration of Science, Technology, Engineering, Math
- Mathematics as the backbone of logical reasoning and design thinking
- India's STEM push: IISERs (2006) and NEP 2020
- Interactive Prompt: *Which math concept do students find hard to relate to real life?*

Mathematics in STEM: Global Applications

- Algebra: Programming, circuit design [1]
- Geometry: Robotics, 3D printing [3]
- Statistics: AI, environmental modeling [2]
- Calculus: Optimization, energy analytics

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Activity: Think–Pair–Share: Apply a math topic to a STEM context

Project-Based Learning: Core Principles

- Driving Question: Open-ended, real-world focus
- Collaboration: Teamwork mirroring STEM workplaces
- Final Product: Tangible artifact (model, report)
- Reflection: Formative feedback and iteration

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Example: Designing a cost-effective water filter using linear equations

PBL Design: Group Task

- Select a CBSE-aligned math topic (e.g., ratios, geometry)
- Frame a real-world STEM context (e.g., waste management)
- Define deliverables and timeline
- Use tools: GeoGebra, Scratch, PhET Simulations

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Outcome: Draft a PBL lesson plan outline

Assessment in PBL

- **Rubric Design:**
 - Mathematical accuracy
 - STEM integration
 - Collaboration skills
 - Communication clarity
- **Peer Review:** Evaluate group PBL plans

Differentiation in PBL

- Scaffolded tasks for varied support
- Tiered questioning for diverse abilities
- Interest-based groupings for engagement
- Tools: Google Forms, Padlet, Seesaw

Wrap-Up and Resources

- Key Takeaways: Math in STEM, PBL design, inclusive assessment
- Digital Resource Pack:
 - Global case studies
 - Tools: GeoGebra, Desmos, Scratch
 - Lesson plans and rubrics
- Q&A and networking opportunities

References



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Thank you for your engagement!

Experiment, reflect, and share your PBL journey.