WI DPI STEAM Fellow

Designing and Writing Effective STEAM Lesson Plans:

A Step-by-Step Guide for Educators and Curriculum Designers

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For
Ctrl+Alt+STEAM - Rebooting Education Together

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STEAM education empowers students to become innovative problem-solvers by fusing creativity with critical thinking, preparing them to thrive in a rapidly evolving world.

*Thoughtful lesson planning enhances engagement and deep learning.

Topics

Understanding STEAM Education

“I can” explain what STEAM education is and how it connects science, technology, engineering, the arts, and math to solve real-world problems through creative and collaborative learning.

Step-by-Step Lesson Design Process

“I can” create a step-by-step lesson design process to develop effective STEAM lesson plans that integrate multiple disciplines, engage students in hands-on learning, and include clear objectives and assessments.

Tips for Successful STEAM Lesson Design

“I can” design and implement a successful STEAM lesson that integrates interdisciplinary concepts, engages students in hands-on activities, and fosters creativity and critical thinking.

Tools and Resources

“I can” use available tools and resources to design, reflect on, and revise my STEAM lesson plans to ensure they are effective, engaging, and aligned with learning goals.

Essential Questions

What is STEAM?

STEAM education is an interdisciplinary approach to learning that integrates Science, Technology, Engineering, the Arts, and Mathematics to foster creativity, collaboration, and real-world problem solving.

- **Integrated Learning Approach** – connects disciplines to deepen understanding and make learning more meaningful.
- **Project and Problem-Based Learning** – projects that require them to investigate, design, build, test, and reflect, mirroring real-world processes.
- **Balanced Focus on Process and Product** – emphasizes both the creative process (brainstorming, prototyping, revising) and the final outcome, valuing how students think and create as much as what they produce.

Benefits of STEAM?

STEAM education benefits students by nurturing critical thinking, creativity, and real-world skills, while empowering teachers to deliver engaging, interdisciplinary instruction that connects learning across subjects.

- Encourages **critical thinking** and **innovation** by challenging students to explore multiple solutions to complex problems.
- Promotes hands-on, **experiential learning** that connects classroom content to real-world applications.
- Cultivates **creativity** and **adaptability** by incorporating the arts to balance analytical and imaginative thinking.

Key Components of STEAM?

A STEAM lesson plan includes clearly defined learning objectives, standards alignment, interdisciplinary connections, hands-on activities, assessment strategies, and opportunities for creativity and problem-solving.

- **Interdisciplinary Integration** – Intentionally weave together concepts from science, technology, engineering, arts, and math to solve a central problem or explore a big idea.
- **Hands-On, Inquiry-Based Activities** – Engage students in active learning through experimentation, design challenges, and collaborative projects.
- **Assessment and Reflection** – Include both formative and summative assessments, along with opportunities for students to reflect on their learning and creative process.

STEAM Education

	Project-based	Inquiry	*Design Thinking	Collaboration
Science	✓	✓	✓	✓
Technology	✓	✓	✓	✓
Engineering	✓	✓	✓	✓
Arts	✓	✓	✓	✓
Math	✓	✓	✓	✓

***Design Thinking - empathizing, defining problems, brainstorming ideas, prototyping solutions, and testing them to innovate and improve real-world outcomes.**

Step-by-Step STEAM Lesson Design Process

	✓	✓	✓	✓	✓	✓
Step 1: Identify the Learning Goals and STEAM Standards	Align with state or national standards	Define measurable learning objectives across disciplines	Establish learning targets	Determine success criteria	Write essential questions	*Steps 1 & 2 could be flipped depending on content area, priorities and/or the flexibility of educational circumstances
Step 2: Select a Central Theme or Real-World Problem	Choose an engaging topic or driving question	Use problem-based or project-based learning approaches	Ensure relevance to students' lives and communities	Tailor the complexity of the problem to students' age and developmental stage		
Step 3: Determine Content and Disciplinary Connections	Map out how each STEAM area contributes to the lesson	Ensure authentic integration (not parallel play)	Consider balance between disciplines	Ensure Arts Integration (not Arts Enhancement)	Consider connections to prior learning	Include 21st-century skills
Step 4: Design the Learning Activities	Develop hands-on, inquiry-based tasks considering accessibility/budget	Scaffold activities for diverse learners	Integrate design thinking	List and gather needed materials and equipment	Practice the project and test for common misconceptions	Time project to plan for pacing and create learning resources
Step 5: Plan Assessment and Evaluation	Use formative and summative assessments for STEAM categories	Incorporate rubrics aligned with objectives	Allow for reflection and student voice	Plan for providing and gathering feedback	Reflect and make improvements	Add extensions

Tips for Successful STEAM Lesson Design

STEAM Tips

- Start with small integrations and build complexity
- Collaborate across content areas
- Encourage student-led inquiry and iteration
- Embrace flexibility and unexpected outcomes
- Connect to real-world problems
- Use open-ended questions

STEAM Tips

- Incorporate multiple entry points
- Build in reflection time
- Integrate the arts intentionally
- Leverage technology thoughtfully
- Focus on process over perfection
- Integrate Student Voice and Choice
- Celebrate and share outcomes

STEAM Lesson Tools and Resources

WI DPI Template

WI DPI STEAM Lesson Plan Template

Ai for Education

Lesson plan and assessment generators

STEAM Resources

STEAM websites and curriculum banks

Collaboration Tools

Collaboration platforms for students

“Tech” Tools

Apps and tech tools that support STEAM

Videos & Virtual

Video libraries and virtual lab tools

“As STEAM teaching flourishes across Wisconsin, education will evolve into a dynamic pursuit of wonder, where curiosity ignites innovation and every student is empowered to shape a more thoughtful, interconnected future.”

Thank you!

I welcome your questions, thoughts, and reflections as your insights help shape stronger, more meaningful STEAM learning experiences. Feel free to connect with me afterward or reach out at a later time to collaborate further. ~ Jennifer Handrick

Contact
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STEAM Resources

- WISELearn Resources - STEAM
- iMAGINE STEAM
- Scholastic – STEM/STEAM
- STEM Forward – K-12 resources
- TeachEngineering
- Edutopia Resources for STEAM
- TinkRworks STEAM Curriculum

STEAM Resources - Apps and Tech Tools

- 3DBear AR: 3D design and augmented reality merge in creative, interactive app (K-12)
- Hello Ruby: Crafty, mostly screen-free approach to computer science (2-5)
- Gizmos & Gadgets: Empowers kids to invent, build, and control wirelessly (2-8)
- 3D Slash: Minecraft-like 3D modeling (and printing) (2-12)
- SAM Labs: Kids use block code and wireless blocks to program, design, and create (K-8)
- Design Squad Global: Fun engineering problems encourage classroom competition, innovation (3-8)
- Teachable Machine: Creative intro to machine learning and AI doesn't require code (3-12)
- Tinkercad: Simple yet powerful online CAD tool turns kids into makers (3-12)
- Instructables: Endless collection of DIY projects; good for sharing and inspiration (6-12)
- SketchUp: Make learning meaningful through 3D design (6-12)
- Make: Fuel creative makers with project ideas, reviews, and community (8-12)

- Curipod: AI-generated interactive lessons and presentations.
- Eduaide.Ai: Generates standards-aligned lesson plans, exit tickets, rubrics, and more.
- MagicSchool AI: Tailored tools for teachers including lesson plans, IEPs, parent emails, and formative assessments.
- LessonPlans.AI: Simple AI assistant for building detailed lesson plans with objectives, standards, and activities.
- Brisk: AI-powered curriculum planning tool that assists with weekly lesson outlines, differentiated activities, and formative checks.
- Khanmigo by Khan Academy: AI tutor and teacher assistant for lesson support, formative checks, and curriculum ideas.

STEAM Resources - Collaboration Tools

- Padlet: Collaborative virtual bulletin board for brainstorming, sharing media, and organizing ideas.
- Canva for Education: Collaborate on graphic design, presentations, and STEAM project visuals.
- Google Docs/Slides/Sheets: Real-time editing and commenting on research, data collection, and presentations.
- Miro: Digital whiteboard for mapping out projects, mind maps, and design thinking.
- Aggie.io: Collaborative online drawing tool—great for illustrating STEAM projects or digital storytelling.
- Google Drawings: Lightweight drawing and diagramming tool that integrates with Google Workspace.

STEAM Resources - Video Libraries and Virtual Lab Tools

- PBS LearningMedia – A vast collection of standards-aligned videos, interactives, and lesson plans.
- Science Friday Educate – Engaging science videos, podcasts, and classroom activities.
- PhET Interactive Simulations – Over 125 free, research-based simulations across physics, chemistry, biology, math, and earth science.
- LabXchange – Free platform offering virtual lab activities combining simulations and multimedia.
- BeyondLabz – Virtual science labs with customizable presets and built-in worksheets. via UCF Virtual Lab resources
- STEMulator – Interactive 3D virtual world platform covering science, engineering, and mechanical systems.
- DoITPoMS – University of Cambridge resource featuring materials science virtual labs and learning modules.