Integrated Middle School STEM Curriculum Addressing the Three Dimensions of NGSS

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Michigan Science Teacher Association Annual Conference
Saturday, February 28, 2015 11:00 a.m.- 11:45 a.m.
Mi-STAR Goals:

• STEM literacy for all citizens
  • Improve STEM Knowledge & Skills
  • Increase lifelong interest in STEM
Design an integrated STEM curriculum for middle school.
Mi-STAR Team

- University Partners
- School Districts
- Individual Teachers
- Professional Societies
How can we improve knowledge and interest in science?
How can we improve knowledge and interest in science?

Allow students to DO science, not just learn about it.
Through the vision of…
Next Generation Science Standards

“Designed to make science education more closely resemble the way scientists work & think … ”

2012: National Research Council
Through the vision of...

**Next Generation Science Standards**

“Designed to make science education more closely resemble the way scientists work & think…”

2012: National Research Council

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![A FRAMEWORK FOR K-12 SCIENCE EDUCATION](image)

Performance Expectations
Translating NGSS into instruction through...

5 E Learning Cycle
Translating NGSS into instruction through...

Project Based Learning
How do we really get students to care about STEM?
How do we really get students to care about STEM?

Focus on relevant issues.
Importance of ‘MI’ Place
Write – Pair – Share

What topics are important in your community and/or to your students?

- Write at least three examples.
Write – Pair – Share

What topics are important in your community and/or to your students?

- **Pair** with a neighbor and discuss your answers.
  Are your partners’ issues similar to those in your community?
Write – Pair – Share

What topics are important in your community and/or to your students?

- Share your thoughts with the whole group.
21st Century Grand Challenges...
Relevant Topics According to STEM Professionals
Organized into...

Mi-STAR Themes
Organized into...

Mi-STAR Themes

Water Resources
Organized into...

Mi-STAR Themes

- Water Resources
- Energy & Earth Resources
Organized into…

**Mi-STAR Themes**

- Water Resources
- Energy & Earth Resources
- Sustainable Environment
Organized into...

Mi-STAR Themes

Water Resources

Energy & Earth Resources

Sustainable Environment

Earth & Space Systems
Organized into...

Mi-STAR Themes

- Water Resources
- Energy & Earth Resources
- Sustainable Environment
- Earth & Space Systems
- Food & Agriculture
Organized into...

**Mi-STAR Themes**

- Water Resources
- Energy & Earth Resources
- Sustainable Environment
- Earth & Space Systems
- Food & Agriculture
- Human & Public Health
Organized into…

Mi-STAR Themes

- Water Resources
- Energy & Earth Resources
- Sustainable Environment
- Earth & Space Systems
- Food & Agriculture
- Human & Public Health
- Infrastructure & Built Environment
Do your local topics fit any of the Mi-STAR Themes?

- Water Resources
- Earth & Space Systems
- Sustainable Environment
- Energy & Earth Resources
- Human & Public Health
- Food & Agriculture
- Infrastructure & Built Environment
Theme-Based STEM Curriculum is Naturally Integrated

Concepts from several STEM disciplines are taught in one unit around a central theme.
Mi-STAR Units: Putting it all together

NGSS PEs

Themes
Mi-STAR Units: Putting it all together

NGSS PEs

Themes

Unit Topic
Mi-STAR Units: Putting it all together

NGSS PEs → Unit Topic → Essential Question
Themes → Unit Topic
Mi-STAR Units: Putting it all together

NGSS PEs

Themes

Unit Topic

Essential Question

Engagement
Mi-STAR Units: Putting it all together

- NGSS PEs
- Themes
- Unit Topic
- Essential Question

Engagement ➔ Exploration ➔
Mi-STAR Units: Putting it all together

NGSS PEs
Themes
Unit Topic
Essential Question

Engagement Exploration Explanation
Mi-STAR Units: Putting it all together

NGSS PEs

Themes

Unit Topic

Essential Question

Engagement  Exploration  Explanation  Extension
Mi-STAR Units: Putting it all together

- NGSS PEs
- Themes

Unit Topic

Essential Question

Engagement → Exploration → Explanation → Extension → Evaluation
Mi-STAR Units: Putting it all together

NGSS PEs
Themes

Unit Topic

Essential Question

Engagement Exploration Explanation Extension Evaluation

Unit Project
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<tr>
<th>6</th>
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<tbody>
<tr>
<td>Earth in Space</td>
<td>Dynamic Landscapes</td>
<td>Water Cycles</td>
</tr>
<tr>
<td>Cycling of Energy &amp; Matter</td>
<td>Population Dynamics</td>
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<tr>
<td>Cells, Mutations, &amp; Diseases</td>
<td>Growth, Genes, &amp; Groceries</td>
<td>Energy from Wind &amp; Water</td>
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<tr>
<td>Weather &amp; Climate</td>
<td>Patterns of Life &amp; Extinctions</td>
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<td>Digital Devices</td>
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<td>Feeding the World</td>
</tr>
<tr>
<td>Energy Resources</td>
<td>Global Climate</td>
<td></td>
</tr>
</tbody>
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Your Turn!

Brainstorm an Integrated STEM Unit Topic

LS 2-3 / Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

ESS 3-3 / Design a method for monitoring and minimizing a human impact on the environment.
Would you like to get involved?
Complete a Mi-STAR Teacher Interest Form
Thank You!

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