Explanatory Metaphor

STEM Fluency

A metaphor for how informal environments are important to STEM learning

The story you're telling:

To gain fluency in STEM subjects, children need immersive learning experiences outside of the classroom.

Strategically redirects thinking away from patterns such as:

• Attention Battery (Children Need to Recharge) • Back to Basics • Cultural Differences • Individualism • Math = Adding and Subtracting • Naturalism • Out-of-School Learning Is Inessential • STEM = Science Only

Concepts and ideas included in this frame element:

- **Learning STEM is like becoming fluent in another language:** Uses the analogy of a more familiar learning experience to characterize STEM subjects as skills acquired through hands-on practice in real-world situations.

- **Just like learning a foreign language, STEM fluency requires immersive learning opportunities:** Emphasizes the role and importance of out-of-school experiences as opportunities for in-depth engagement with STEM subjects.

- **High-quality interactions with "native speakers" help children to build STEM fluency:** Illustrates how children benefit from access to well-designed out-of-school programs that connect them with adult mentors who are proficient in STEM.

- **Just as early immersion leads to language fluency, early STEM experiences lead to mastery of STEM subjects:** Demonstrates the desirability of children's early exposure to STEM subjects.

Original research iteration:

- Out-of-school learning helps children and youth become fluent in Science, Technology, Engineering, and Math—what is called "STEM." Just as people need to be immersed in real-world situations to learn a language, children need to explore STEM outside of the classroom to fully understand and become fluent in these subjects. Out-of-school opportunities like afterschool clubs and summer camps immerse children in real-world STEM situations. When we immerse all young people quality out-of-school learning opportunities, we help them become fluent in STEM.
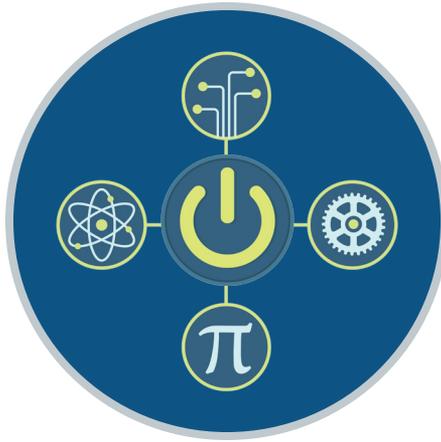
Explanatory Metaphor

STEM Activation

A metaphor for the motivating characteristics of effective informal learning experiences

The story you're telling:

Out-of-school learning experiences activate STEM learning and spark interest in these subjects by letting children and youth experiment with STEM ideas in hands-on, real-world situations.

Strategically redirects thinking away from patterns such as:

• Cultural Differences • Drive • Learning Hierarchy • Rechargeable Attention • Zero-Sum Game

To weave this metaphor into your communications, use words like these:

Activate   Fuel   Ignite   Incite

Kindle   Spark   Turn on

User Notes:

- FrameWorks recommends using this as a "metaphor kernel," which is more like a theme than a fully developed analogy. Don't make an explicit analogy to chemical reactions or catalysts. Instead, simply weave language related to activation into communications.

- Avoid any word choices that could call up thinking about individual learners' motivations or internal characteristics. Inspire interest is quite different from ignite interest. The former is mentalist/psychological, whereas the latter is material/ mechanical. Go techy, not fuzzy, when using this frame!
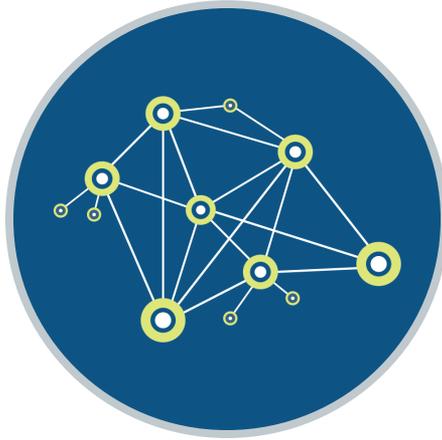
Explanatory Metaphor

STEM Ecosystem

A metaphor for the integral role of informal learning experiences in STEM education

The story you're telling:

Out-of-school learning opportunities function as an essential part of the STEM learning ecosystem.

Strategically redirects thinking away from patterns such as:

• Attention Battery (Children Need to Recharge) • Cultural Differences • Individualism • Naturalism • Out-of-School Learning Is Inessential

Concepts and ideas included in this frame element:

- **Children's STEM learning happens within a complex ecosystem of formal and informal education experiences:** Redefines STEM learning as a rich, complex activity that occurs both in and out of the classroom.

- **Just as an ecosystem's functionality depends on the inter-reliant roles of the plants and animals within it, STEM education works best when informal and formal learning work together:** Builds understanding of the interdependent relationship of different kinds of learning opportunities.

- **Out-of-school learning opportunities, such as afterschool clubs or summer camps, act like pollination points within the STEM learning ecosystem:** Defines informal STEM learning as important and essential to children's development of STEM knowledge and skills.

- **High-quality out-of-school STEM programs are part of a thriving learning ecosystem:** Connects the amount of access to strong informal STEM learning opportunities to disparities in children's education outcomes.

Original research iteration:

- Out-of-school learning is an essential part of the ecosystem of education for Science, Technology, Engineering, and Math—what is called "STEM." Just as an ecosystem depends on all the plants and animals that make up the system playing their role, STEM education depends on in-school and out-of-school learning playing their roles and being connected. Out-of-school environments like afterschool clubs and summer camps are pollination points within the learning ecosystem—essential locations that children need to grow STEM knowledge and skills. Quality out-of-school STEM programs are part of a thriving learning ecosystem for all young people.

Collective Prosperity

Why does it matter? What's at stake?

The story you're telling:

STEM subjects power our economy and advance our society, building our shared prosperity.

Strategically redirects thinking away from patterns such as:

• Consumerism • Global Competition • Individualism

Concepts and ideas included in this frame element:

- Prosperity is both **social** and **economic**.

- Prioritizing STEM learning will result in a common good that **benefits us all**.

- Sense of urgency: **A bright future** depends on the priorities we set now.

- STEM builds the skills **our nation needs to thrive in the information age**.

User Notes:

- Avoid slipping into a Global Competition frame, as it cues fear rather than hope.

- Avoid slipping into an Individual Gain frame (for instance, by focusing on the higher salaries associated with STEM careers). Stick to collective benefits that accrue at the community, regional, or national levels.
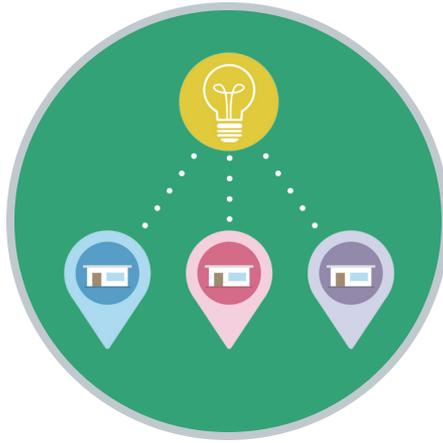
Value

Fairness Across Places

Why does it matter? What's at stake?

The story you're telling:

This matters because we believe all places should have the resources to support a fair chance.

Strategically redirects thinking away from patterns such as:

• Individualism • Mentalism • Self-Makingness • Separate Fates • Zero-Sum Thinking

Concepts and ideas included in this frame element:

- An equitable distribution of resources **benefits us all** because it allows us to maximize the potential of all.

- We have a strong cultural belief in **fairness** and ensuring fair access to opportunities for all.

- We can solve this problem and level the playing field by **changing conditions** to ensure that resources and opportunities are accessible across places.

- Our goal should be to ensure that region where all children, no matter where they live, have a **fair chance to reach their potential and become successful**.

- It's **responsible management** to ensure fair and equitable distribution of resources across places.

Future Preparation

Why does it matter? What's at stake?

The story you're telling:

"We need to ensure that our future leaders have the skills required to tackle the problems of tomorrow."

Strategically redirects thinking away from patterns such as:

• Back to Basics • Compartmentalization • Consumerism
• Passive Learning • Technology is Dangerous

Concepts and ideas included in this frame element:

- **Getting ready** for the **future** is a matter of preparation and planning.

- Collective **preparation** is needed for community/society level challenges.

- Today's students are our **future leaders** – we all have a stake in building an education system that fosters the skills we need our leaders to have.

- We must prepare children to take up their **social and civic roles** in our communities; this is one way we keep our democracy strong.

- Sense of urgency: We must plan now for a **complex and unpredictable future**.
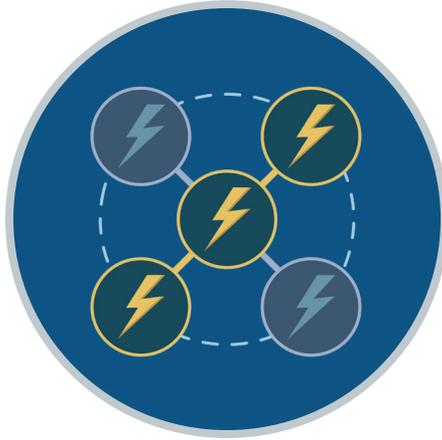
Charging Stations

A metaphor for educational opportunity and access

The story you're telling:

Learning opportunities are like charging stations. Presently, access to these stations varies greatly from one place to the next. We need to make powerful charging stations ubiquitous so every child can charge up to take an active role in their learning.

Strategically redirects thinking away from patterns such as:

• Consumerism • Separate Fates • Tangible Triad • Willpower • Zero-Sum Thinking

Concepts and ideas included in this frame element:

- **A complex network of infrastructure:** Frames inequitable outcomes as due to the system we've built, not the individual characteristics of students, teachers, or parents.

- **Unreliable or spotty charging systems:** Helps to communicate that inequity is a problem of access, opportunity, and systemic distribution of resources.

- **School as one of many charging stations – museums, parks, libraries, and after-school programs being others:** Helps to establish the full range of contexts that influence children's access to learning.

- **Power or reliability of a given station:** Opens up space to talk about school or program equity.

- **How we supply the "stations" we set up:** Funding, staffing, instructional resources are factors in whether neighborhood schools (or other stations) are reliable and powerful charging stations.

- **Differential access in different geographic spaces:** Taps into a "flavor" of fairness that Americans across the political spectrum find it difficult to argue against

- **Strengthening or repairing the network of charging stations:** Frames the issue as a collective issue – gives us all a stake since it is an infrastructure issue.