Exploring the **Power** of a STEM Alliance

What's the Issue?

STEM alliances are an infrastructure of support within a community that drives forward engaging learning experiences in mathematics and science through the context of engineering and technology. As an alliance, the collective pursuit can be coordinated, measured, and improved thanks to the diverse representation of K-12, Career Tech and Higher Education along with business, community, and informal (out-of-school) education organizations.

As STEM alliances grow, they have the capacity to successfully engage today's youth; design and connect STEM learning opportunities; provide experiences in multiple settings; and encourage youth to pursue STEM career fields. Successful alliances leverage diverse and meaningful learning opportunities in and out of school creating an increasingly well-prepared and motivated workforce who are suited for careers in the five wealth-generating ecosystems[1] and complementary ecosystems.

This brief provides information and guidance for how a STEM alliance might be beneficial for a community.

Why It Matters To You

⤷ Improving access to and the quality of STEM education opportunities requires the collective effort of a broad collection of organizations.

⤷ Increased STEM education for students, including certifications, credentials, and associate's or bachelor's degrees are highly correlated to economic well-being.

⤷ STEM jobs are growing and the pipeline is not keeping up. Seventy seven percent (77%) of jobs created between 2010 and 2020 will require post-secondary education. Currently, only 54% of the Oklahoma workforce is prepared for these jobs.[2]

⤷ Manufacturing and high-tech jobs connected to Oklahoma's economic drivers are looking for communities that promote excellence in STEM education.

Recommended Actions

To better gauge the readiness of your region for a STEM alliance, consider reflecting on the following questions:

- Do regional stakeholders lack an understanding of STEM and its meaning for their region?
- Have regional key stakeholders and other key constituencies expressed concern with a lack of students entering the STEM workforce or being prepared to pursue STEM careers?
- Are there individual mathematics and science teachers in the region that are actively trying to cultivate critical thinking and reasoning skills through traditional mathematics and science classes?
- Are there individual schools or districts in the region that are looking to enhance their STEM efforts by implementing additional programs beyond mathematics or science classrooms?

If responses to the questions above lead you to believe that a focused effort by diverse stakeholders in the community might address the questions or better support existing efforts, you may have the right conditions for a successful STEM alliance.

To explore how a STEM alliance might be beneficial for your community, consider how the following sectors might contribute to and benefit from the efforts of a STEM alliance. Using a larger version of the table below, list responses for each sector might find value in a STEM alliance.

Business & Community	K-12 Education	Higher Education	Career Tech Centers

Reflection Questions

- Why might stakeholders from different sectors represented in the table have unique perspectives of the value of a STEM alliance?
- Are there common themes and shared priorities that emerge across the sectors represented in the table?

Things to Consider

Why is a STEM alliance needed? To explain the need, it can be useful to explore local education and economic data and think about what stakeholders in your community would see as their current and future workforce needs.

What work can a STEM alliance do? A STEM alliance can identify, prioritize and align education priorities to community workforce needs.

Who should be involved in a STEM alliance? Determining who should be a part of the leadership team and who is involved in the larger STEM alliance is essential to ensuring a quality STEM alliance. This is explored more in STEM Brief #3.

How can you get the STEM alliance going? A Launch Meeting for the STEM alliance can serve to create a shared understanding of STEM and focus the future work of the STEM alliance. This is explored more in STEM Brief #3.

References

1: More information about Oklahoma's wealth-generating and complementary ecosystems can be found at http://www.economicmodeling.com/wp-content/uploads/Deidre-Myers.pdf
2: Source: 2010 ACS; EMSI Complete Employment - 2011.4

Using a Framework for **Understanding** STEM

What's the Issue?

STEM is a phrase that has numerous and diverse meanings to individuals. Some individuals may see STEM as a set of skills that include critical thinking and problem solving. Others may include an emphasis on content related to science and mathematics. While, some may simply be wondering what STEM means at all.

As diverse stakeholders come together to form STEM alliances, it is essential to ensure that those initiating the alliance work together to gain a better understanding of what STEM is so they can better think about the goals they want to set for the work of the STEM alliance.

Because developing a shared definition has proved to be somewhat challenging, a framework is provided here to support developing, first, shared language about STEM. Through the activities recommended in this brief, emerging alliances will apply their new framework for understanding STEM to scenarios around them.

This brief provides information and guidance for better understanding the individual disciplines that make up STEM and the many versions of STEM in K-12 and beyond.

Why It Matters To You

⤵ The most significant challenges facing STEM education are a lack of clarity relative to the acronym's meaning and the need to develop shared understandings of STEM.[1]

⤵ STEM is a complex concept; multiple isolated and potentially interacting components can make it difficult to define. However, shared understandings can be reached and extremely valuable for a STEM alliance to consider.

⤵ Shared understandings of STEM within an alliance can:

- focus conversations;
- improve alignment of goals to identified needs;
- support determination of STEM drivers in communities; and
- lead to a better understanding of learning experiences that improve access to STEM career pathways.

Recommended Actions

To develop a shared understanding as individual disciplines and the cross-application designated by the acronym of STEM, complete the following activities:

- **Read** the blog post Turning It Up: A Framework for STEM Education.[2]

- **Analyze** the following videos and determine which version of STEM the activities represent using the STEM Sound Board.

  - ★ **Watch** the Teaching Channel video, Energy and Matter Across Disciplines[3]

  - ★ **Watch** the Teaching Channel video, Fun with STEM: The Catapult Project[4]

- **Talk** with a few STEM professionals in local industries and use the STEM Sound Board to determine which version of STEM occurs in their day-to-day work.

- **Become familiar** with an out-of-school program aimed at engaging K-12 students in STEM and use the STEM Sound Board to determine which version of STEM the program is targeting.

Reflection Questions

- Has your perspective of STEM shifted upon reading the blog post and analyzing the videos, professions and/or out-of school programs? If so, how?

- If not, how did the vision of STEM from the blog post support your original perspective of STEM?

- How can it be valuable for diverse stakeholders invested in the STEM Alliance to have a common framework, like the STEM Sound Board, to move alliance work forward?

- How do K-12 science or mathematics classes categorized as S_ _ _ or _ _ _ M support student pathways into STEM careers?

- How would an after-school program that incorporates mostly _ _ e _ versions of STEM fit within your STEM alliance goals?

Things to Consider

How might the the National Research Council's report[5] inform the work of a STEM alliance? The report provides an analysis of existing approaches to integrated STEM education, identifying impact of integrated approaches on a number of significant factors.

What versions of STEM exist in K-12 STEM Education? STEM education includes the individual disciplines of mathematics and science as well as the purposeful integration and application of mathematics and science with technology and engineering. STEM Education is driven by problem solving, discovery, exploratory project/problem-based learning, and student-centered development of ideas and solutions.

What version of STEM experiences do local businesses and colleges/universities believe will prepare students for pathways to careers or degrees in STEM? Better understanding the STEM needs of local businesses coupled with what colleges/universities believe will prepare students for careers or degrees in STEM will allow an alliance to better pin-point efforts to support students filling the STEM pipeline.

References

1: Bybee, R. (2013). The Case for STEM Education: Challenges and Opportunities.
2: Neill, T. & Patrick, L. (2016). http://okmathteachers.com/stemframework
3: https://www.teachingchannel.org/videos/cross-discipline-lesson-achieve
4: https://www.teachingchannel.org/videos/stem-lesson-ideas-catapult-project
5: http://www.nap.edu/catalog/18612/stem-integration-in-k-12-education-status-prospects-and-an

Organizing a STEM Alliance for **Impact**

Flickr: Kabsik Park

What's the Issue?

For a STEM alliance to activate and become a successful organization, a lot of factors have to be considered early in the development process. Without the right focus, key members, or organizing structure, it is an all too common fate of working groups to never evolve past the discussion phase of the critical work that must be accomplished to effectively impact the system.

Determining the key members of an alliance and at what level they will be involved, is one of the most important things to consider prior to launching an alliance. Diversity of members within the alliance can benefit the work of the group by incorporating new ideas, perspectives, and connections.

This brief provides information and guidance for how a lead organizer and leadership team can ensure a successful launch of an alliance.

References

1: Adapted from Bell, P., Neill, T., Penuel, B., Shaw, S. 2016. Advancing Coherent and Equitable Systems of Science Education (ACESSE). Boulder, CO. Download at http://goo.gl/3B93wr.

2: Watch a webinar at http://goo.gl/yFDPU7 and read more at http://goo.gl/CPdDmg.

3: Read more at http://goo.gl/fXPMPl.

Why It Matters To You

⌟ The task of aligning the education and STEM pipelines is a very complex process. Fixing one point of the range of factors that influence the system cannot make much difference unless all parts of the system are improved at the same time. No single organization, however innovative or powerful, can accomplish significant change alone. Instead, an ambitious mission must exist to coordinate improvements. The Collective Impact of a STEM alliance focuses the entire community on a single set of goals, measured in the same way.

⌟ Read more about Collective Impact at http://collectiveimpactforum.org.

Recommended Actions

Once you're ready to launch a STEM alliance, here are a few steps to ensure the success of your Launch Meeting.

SIX or MORE weeks before launch, the lead organizer should prepare a short introductory statement regarding the need for establishing an alliance.

SIX weeks before launch, the lead organizer should use the Influencer Map[1] to identify a three- to four-member, diverse Leadership Team comprised of education, business, and community representatives. The lead organizer should confirm meeting space for the Leadership Team meetings and the Launch Meeting.

FIVE weeks before launch, the Leadership Team should meet to:

- Collectively review STEM Alliance Brief #1 and consider how an alliance would benefit the community.

- Walk through STEM Alliance Brief #2 to develop shared understandings of STEM.

- Complete the Influence Map to determine what stakeholders to invite to an alliance launch meeting.

FOUR weeks before launch, the Leadership Team should create the agenda for the meeting and share and send an invitation to those identified as essential stakeholders from the Influence Map. Keep in mind, your agenda may include activities and information from STEM Alliance Briefs #2 and #3.

ONE week before launch, the lead organizer should connect with invitees to ensure understanding about the details and goals of the Launch Meeting.

Reflection Questions

- How might a Leadership Team benefit from using the Influencer Map as a tool to ensure key members are invited to participate in a STEM alliance?

- How might collective impact strategies enhance the overall efforts of an alliance?

- How do you ensure an alliance moves work beyond the discussion phase?

Things to Consider

What might be a common agenda of the alliance? Common agendas often address the vision, sub-goals, and key levers for advancing the agenda. Early on, this should be very malleable.[2]

How might the alliance establish shared measurement? While this can be complex and costly, the emerging alliance can identify what information is currently available and determine realistic, timely goals. If data sets are unavailable, the alliance may create a sub-goal focused on creating, gathering, and reporting needed data.

How might the alliance work to foster mutually reinforcing activities? Different from an organization-focused planning process, a community-focused strategic planning process and alignment techniques provide a systematic way to enable multiple organizations to find their most productive role in a larger, shared strategy.[3]

What structures and expectations will encourage continuous communication all stakeholder of the alliance? Communication plans include in-person meetings, ongoing conversations, and information sharing both across and beyond the alliance.

How will the alliance ensure there is a dedicated backbone team? The backbone team must have time and capacity to ensure the work of the organization moves forward by conducting the day-to-day work of the STEM alliance, and it should be comprised of people who are passionate about the work.