Theory of Success

Created for Omaha STEM Ecosystem

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The collective voice of all stakeholder groups concludes that through Networking, Collaboration, Diverse Opportunities, and Community Awareness, OSE will foster success by bringing people to the organization, holding them active, growing the participation, and producing varied opportunities which support the STEM pipeline.

Established in 2016, the Omaha STEM Ecosystem (OSE) is a multi-stakeholder collaborative network (MSCN) with active members from six key stakeholder groups: Business, Government, Non-Profit, Education, Families, and Science Centers & Museums. This paper synthesizes the shared and nuanced understanding of what success means for OSE by all six key stakeholder groups. This theory of success describes the stakeholders' perspective of the value of what they gain from membership in OSE as well as how OSE fosters this shared value to all members. Thus, as a responsive organization, it is recommended OSE continue to align their future development with the OSE Theory of Success presented in this paper.

Background

The Omaha STEM Ecosystem (OSE) serves as a connecting agency to leverage the social capital of member stakeholders to address the STEM workforce gap by strengthening the availability of STEM pipeline learning opportunities. OSE seeks to bring diverse stakeholders from multiple sectors of the community together to promote high-quality STEM learning opportunities that will address the current and future workforce gap associated with STEM skill sets (Omaha STEM Ecosystem, 2019). In 2021, as OSE approached its 5th year of supporting this mission, it sought to evaluate its impact. Co-researchers Heather Daubert and Garret Higginbotham, in coordination with the Omaha STEM Ecosystem's Research and Advocacy Committee, began dialogue to perform a Collective Impact Evaluation for the organization. In studying the lifecycle of Multi-Stakeholder Collaborative Networks (Roloff, 2008), it was determined that the Ecosystem was yet in a *building* capacity of its operation and additional input was needed from stakeholders to determine what criteria by which to claim evidence of success.

Process

1. Researchers created the Omaha STEM Ecosystem (OSE) STEM Lexicon. This lexicon list of words and phrases was derived from content found in OSE internal and public-facing documents and content on the OSE website. It was important to create the OSE STEM Lexicon because when a multi-stakeholder collaborative network (MSCN) comes together without an agreed-upon common vocabulary, by default, each member will apply individual definitions based on personal experiences and biases.
2. Researchers interviewed members of all six key stakeholder groups. A total of 26 interviews were conducted in the spring and summer of 2021. Semi-structured interviews consisted of 4 key questions (1) Why are you involved in the Omaha STEM ecosystem? (2) When you think of the success of OSE, what does it mean to you? (3) How do you stay informed through the Omaha STEM Ecosystem? (4) How else are you staying informed of STEM? Participants were allowed to elaborate to maintain an open dialogue. The robust interview results were coded through many stages. The OSE STEM Lexicon was used in the first stages of coding.

   Coding Methodology

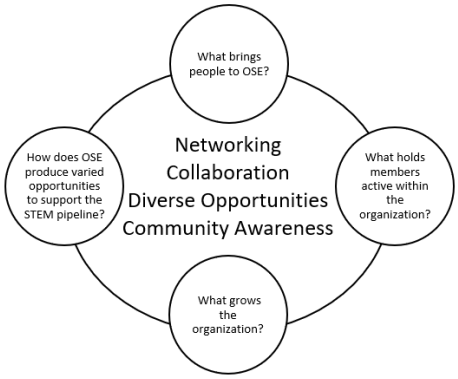
   Each of the six stakeholder groups described the value-add and success of OSE from their stakeholder perspective in several ways including Networking, Collaboration, Diverse Opportunities, and Community Awareness.

Percentage of Interviews in Which Success Factor Codes Were Present

Stakeholder Group	Collaboration	Community Awareness	Diverse Opportunities	Networking
Education (4 interviews)	75%	100%	100%	75%
Families (5 interviews)	40%	100%	60%	0%
Science Centers and Museums (5 interviews)	40%	80%	80%	100%
Business (4 interviews)	25%	100%	75%	75%
Government (4 interviews)	75%	100%	75%	50%
Non-Profit (4 interviews)	25%	50%	100%	75%

3. From the qualitative analyses, researchers identified a theory of value-add success for OSE. This OSE Theory of Success describes the stakeholders' perspective of the value of what they gain from membership in OSE as well as how OSE fosters this shared value to all members. Thus, as a responsive organization, it is recommended OSE continue to align their future development with the OSE Theory of Success. To do so, OSE will continue to reflect and program using the outer four questions in order to achieve the inner four components of shared success.

Theory of Success for Omaha STEM Ecosystem



Following is additional context and recommendations for each of the four components of value-add success: Networking, Collaboration, Diverse Opportunities, and Community Awareness. Recommendations are a synthesis of the interview results and best practices communicated in current literature.

Networking

Networking leads to trusting relationships and collaboration. Events which encourage networking and collaboration bring stakeholders together and are more likely to support the growth of OSE and future STEM-related opportunities for the community (Bryson et al., 2006).

Presence Within the Stakeholder Interviews

In analyzing the responses of the interviews, we found that the strongest focus on networking came from Science Centers and Museums. Specifically, they referenced wanting to connect their patrons and their staff with businesses and nonprofits to help provide real world linkages to exhibits presented in the museum. Education, Business, and Non-Profit stakeholders had a secondary level of interest in networking with Business and Non-Profit stakeholders having a greater emphasis on connecting with other stakeholder groups, co-promoting and complementing individual programs they currently

operate, and having some alignment with the values expressed by Science Centers and Museums in seeking contacts to provide context and application to existing programs offered in schools. Absent from a networking presence was the Family stakeholder group. The researchers interpret that a family conceptualization of networking falls more in-line with the Community Awareness construct of success.

What the Literature Suggests

Networking opportunities help foster partnerships which, without a prior relationship or connection, would otherwise be slow to form (Gibson et al., 2014). As people connect, relationships form which leads to safe places to express ideas and opinions (Kezar et al., 2017). When the relationship is new, stakeholders will rely on those individuals from prior relationships and networks to judge the trustworthiness of others involved (Bryson et al., 2006). Informal networks increase professional satisfaction and performance (Cross, et al., 2002), and establishing personal connections leads to peer-to-peer learning, opportunities to follow up and brainstorm about collaboration, and mentoring (Kezar et al., 2017).

Networking can serve as an early connector for the larger organization because it benefits each individual stakeholder as well as the larger multi-sector collaboration. Easterling et al. (2013) suggests that by bringing individuals and groups together in joint meetings to get to know one another and learn about one another's programming, there will be a short-term, immediate benefit for the consumers of the stakeholder-led opportunities, but not a long-term effect. This is where it is critical for an ecosystem to bring individuals together to network and create strong relationships so that the

organization can move to include collaboration and varied opportunities for stakeholders and their consumers.

Gibson et al. (2014) note that when agencies engage in collaboration to share both ideas for implementation and to align the individual services they provide, they are likely to better meet the needs of the consumer. This aligns with the Omaha STEM Ecosystems value of reducing silo- based implementation of STEM Learning by establishing connections and the opportunity for a continuum of STEM Experiences.

Implications

- continually recruit new members (and the ideas they bring) into the different stakeholder groups (Allen, Lewis-Warner, et al., 2020)
- provide regular networking opportunities for members and interested individuals
- serve as an active connecting agent amongst stakeholders based on common interests and needs

Collaboration

As the Omaha STEM Ecosystem fosters cross-stakeholder relationships, their next opportunity to sustain their members and organizations is in helping to establish meaningful collaboration. Collaborative partnerships within the network establish common goals, share resources, and develop social capital. In so doing, collaborations help balance risks and strengthen trust to facilitate the pursuit of common goals.

Presence Within the Stakeholder Interviews

The strongest presence for collaboration as a success factor was presented by Education stakeholders and Government stakeholders. The coding indicated that Education stakeholders had a resource-based emphasis on collaboration with other

stakeholders. They saw collaboration as a means to access and share resources that might enhance STEM learning but were beyond the scope of their ability to acquire individually. Government stakeholders saw OSE as the place where organizations with similar activities could connect and synergize. Through sponsorship, outreach, and support, they advocated for partnering and creating a coordinated system that brought multiple stakeholder groups together for a united purpose. The researchers also identified that Non-Profit and Business stakeholders identified success through collaboration to a lesser degree than others. The literature offers some suggestions to this relationship.

What the Literature Suggests

To have a long-term impact, the group will go beyond sharing ideas, and instead, come together to find gaps and replications, then create and expand opportunities from there (Easterling et al., 2013, p.106). Eventually new norms and processes may form. This will result in less disconnect between stakeholders and a joining together of new ideas and actions (Bryson et al., 2015; Clark and MacDonald, 2019). Through open, consistent communication and checkpoints, executive leaders can assess and suggest adjustment with the collaborative initiative as needed (Cross et al., 2002).

Trust generates collaboration, and according to Yin and Jamali (2020), collaboration generates value. “Developing trust and getting to know people is critical if STEM communities of practice are going to provide advice in the future and eventually become mentors” (Kezar et al., 2017, p. 233). You can have a well-managed organization, but without trust, it will likely not be a cooperative one. A well-connected teammate can help develop trust within the bigger organization (Bryson, 2006; Gibson et al., 2014). In a collaborative organization, ongoing trust building activities are essential

(Asera et al., 2017; Bryson et al., 2006; Kezar et al., 2017; Warsen, et al., 2018), but trust can be maintained during times of inactivity as long as there was trust before the pause (Davis, 2016). A lack of communication and misunderstanding of another partner's goals can erode trust and data sharing (Regional Educational Laboratory Program West, 2017).

Implications

- initially prioritize impacts on stakeholder experiences over impacts on the broader organization
- consider small projects for big wins with trust-building and collaboration
- allow stakeholders to participate flexibly as commitment is developed
- facilitate ongoing communication within and between the stakeholder groups
- maintain regular check-ins between committee leadership and the executive committee
- allow time for collaborations to move from networking to joint learning and innovation

Diverse Opportunities

Given the Omaha STEM Ecosystem's goal to strengthen the STEM pipeline, providing diverse opportunities represents a critical factor in building upon the strength of organizational stakeholders and increasing participant stakeholders' access to relevant STEM learning. As diversity represents a broad yet salient social value, it is important in leveraging its success to consider the way in which it manifests within the OSE STEM Lexicon.

Presence Within the Stakeholder Interviews

The researchers' coding of interviews found that the stakeholders who focused most on Diverse Opportunities were the Education stakeholder group and the Non-Profit stakeholder group. Science Centers and Museums additionally had a strong, though lesser presence of this factor of success. Application of the code was primarily to recognize a variety of kinds of learning opportunities also conceptualized as a variety of ways to learn and progress the sophistication of STEM Skills. Though a lesser emphasis toward success, a secondary interpretation of Opportunity Diversity held an equity lens that was also present in the Community Awareness success factor. This emphasis was on geographic diversity of opportunities, breaking down structural barriers to participation such as location, and supporting equity of access across traditionally underrepresented participant groups.

What the Literature Suggests

Literature regarding diversity of STEM opportunities hints to both advantages and challenges. A diverse group of members may lead to a varied vernacular and priorities. Members are likely to gravitate toward individuals and organizations who share a similar lexicon and working style. This makes it easier in the initial phases, but more difficult for the bigger communication between the different stakeholder groups (Cross et al., 2002; Reypens, Livens, and Blazevic, 2016). Establishing a common lexicon across the organization facilitates communication and opportunity to create more diverse offerings (Reypens, Livens, and Blazevic, 2016).

While consensus may be more challenging to achieve, bringing together a diverse group of stakeholders encourages a more realistic view of the problem, and a better sense

of the local context (values, politics, assets) surrounding it. Members are more likely to challenge the generally accepted way of doing something and better able to see the bigger picture (Easterling et al., 2013; Hearld et al., 2019; Kezar et al., 2017). By remaining open-minded to new ideas, values, and viewpoints, the group is more likely to move towards innovation and possible solutions (Davis, 2016; Hearld et al., 2019; Irfan, 2021; van Tulder et al., 2016; Washbourne et al., 2020).

In terms of ensuring diverse opportunities for students, a cross-sector collaboration should prioritize growing *interest* in STEM-related activities, particularly of students in the early adolescent years (Falk & Dierking, 2018; Falk et al., 2016; Maltese and Tai, 2011). Traphagen and Traill's (2014) working paper *How Cross-Sector Collaborations are Advancing STEM Learning*, suggests STEM learning ecosystems can support STEM interest by establishing multiple touchpoints across a variety of learning spaces, including schools, after school programs, science centers, at-home discovery, summer experiences, and exposure to adults within a child's family and peer groups. Participation in these spaces increases exposure and encourages children to engage and become more knowledgeable regarding STEM (Falk & Dierking, 2018; Falk et al., 2016, Morrison and Fischer, 2018; Traphagen and Traill, 2014).

Leveraging diversity of opportunities to draw additional participants was also noted as a significant benefit in the *Synergies research-practice partnership: a 2020 vision case study* (Falk et al., 2016), by focusing on interest-based, STEM learning in an Out of School Time (OST) program which was seen to provide a diverse context from the traditional school setting. Diverse role models will also allow participants to see opportunities for their own future STEM learning through structured mentorship (Falk et

al., 2016). By seeking input from all participants and expressing value in their responses, stakeholders are better equipped to shape activities to match student interest, including a direct time for students and fellow stakeholders to meet with mentors for discussions on careers and how to get there (Kezar et al., 2017).

Implications

- ensure OSE provides unique resources to facilitate access to STEM opportunities
- assist individuals and organizations in securing funding for equitable access and participation
- actively connect with stakeholders to remove barriers to participation
- seek to partner with existing mentorship programs or develop their own network of STEM mentors
- ensure internal committees are composed of individuals from diverse professional backgrounds and demographics

Community Awareness

At its core, community awareness represents the Omaha STEM Ecosystem's goal to serve as a source for both identifying high quality STEM experiences and a resource for individuals and organizations seeking access to those opportunities. Success for the Omaha STEM Ecosystem occurs in actively bringing its stakeholders together through these elements of mutual trust.

Presence Within the Stakeholder Interviews

In analyzing the responses of the interviews, the researchers found that Community Awareness was the strongest focus amongst the combined stakeholder set. Furthermore, it was present in 100% of the interviews across the Education, Family,

Business, and Government stakeholder groups. Analysis of the codes identified two sides of trust for successful Community Awareness, 1) Trust by STEM learning providers that OSE will help to bring participants, and 2) Trust by participants that OSE will actively help them locate opportunities that would meet their needs and interests. Interviews from both the Education and Family stakeholder groups wanted an easy way to find opportunities and an easy way to understand where in the learner's continuum of STEM skill the opportunities would align. Stakeholders from Business and Government carried a greater focus on the return on investment for their support of STEM learning opportunities toward creating a STEM proficient workforce pipeline.

What the Literature Suggests

Raising awareness of opportunities for STEM Learning beyond the scope of existing stakeholders and participants has posed a challenge for STEM Ecosystems across the country. As part of the *STEM Learning Ecosystems Discussions Series* webinar leadership of several large ecosystems discussed (STEM ecosystems, 2019), a subsequent summary *Building and Strengthening STEM Learning Ecosystems: A Growing Guide to Success* (2019) provides recommendations for ecosystems. Recommendations largely focused on effective communication skills such as a consistent and predictable modes of sharing the work, opportunities, and success occurring within the ecosystem's network of stakeholders, making plans for how to communicate an integral part of event and learning activity planning, and engaging in active solicitation of feedback both from current participants (STEM ecosystems, 2019) and the community to align offerings with expressed community needs and interests (Femi Vance et al., 2016).

"Finding creative and meaningful ways to engage public audiences is a hallmark of informal STEM education" (Allen & Peterman, 2019, p. 31). By maintaining a heavy social media presence, producing op-eds, speaking at forums, and sending press releases, ecosystem stakeholders have the opportunity to provide multiple opportunities for the community to hear the ecosystem's name and purpose. Ecosystems can also gain credibility by promoting the work of the different partners within the ecosystem. Not only does this build good faith within the ecosystem, but it gets the ecosystem's name out in the community and tied with another well-known organization without having to create specific content with it (STEM ecosystems, 2019).

Implications

- actively leverage stakeholder relationships to expand OSE's name recognition and public presence within the community
- coordinate strategic communication practices with stakeholders providing STEM opportunities
- plan the publicity associated with the event alongside the activity itself
- continue to develop OSE's brand as a recognized and trusted connector to STEM opportunities
- maintain a pulse on public STEM interest and strategically act to address workforce gaps

Next Steps

Having identified a commonly used lexicon, factors of organization success, and a theory of implementation, the Omaha STEM Ecosystem is positioned to pursue a next phase in its organizational life cycle (Roloff, 2008). Stakeholder interviews identified

formative measures by which the organization could gauge its current progress with networking, collaboration, diverse opportunities, and community awareness. By applying the lexicon which emerged from both organizational communication and stakeholder voice, the organization now has the opportunity to identify agreed upon measures for ongoing impact evaluation.

The Omaha STEM Ecosystem is already engaged in active opportunities for stakeholder feedback through community roundtables. One question to consider may be if participation in those roundtables represents the diversity of views and perspectives that stakeholders encouraged and the literature suggests would help to grow local STEM learning participation. Such diversity will likely factor into future measures of impact based on participation and the satisfaction (or level of interest/engagement) of participants which leads them to return.

Furthermore, in building upon the framework of bringing participants, holding members, growing the connections within the organization, and producing varied opportunities, OSE will likely wish to consider what measures represent a quantifiable approach and what measures represent a quality of experience. The literature and interviews suggest that both are important to the stakeholder network. Though not discussed in this review, the researchers recognize that OSE has developed tools by which stakeholders can self-evaluate their role in the ecosystem. The literature also provides examples where other ecosystems have adopted common measures of impact as a part of their own lifecycle as a Multi-stakeholder Collaborative Network (Allen, Brown, et al., 2020; Allen, Lewis-Warner, et al., 2020; Falk et al., 2016; Femi Vance et al., 2016).

Finally, as the Omaha STEM Ecosystem continues to execute its strategic plan and develop its formal business plan, the researchers recommend using the developed Theory of Success for continued planning and progress monitoring. Continued awareness of stakeholder perspectives can assist the organization in targeting partnerships, strategically targeting communication, and playing an active role in influencing the growth of STEM learning opportunities.

Further Reading:

For further details and analysis, please see the working dissertations of Heather Daubert and Garret Higginbotham, available upon request or future publication.

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