ECOSPHERES

TOOLKIT

2021

STEM ecosystems™

powered by TIES

SPECIAL THANKS

To Nancy Peter, Lead of the Philadelphia STEM Ecosystem, who lead much of the research and writing of this toolkit.

Thanks to the Philadelphia Education Fund for giving resources and talent to this project.

INTRODUCING ECOSPHERES

Ecospheres are “Groups of STEM Ecosystems that are connected by geography, by audience, or by other unifying factors.” Like individual Ecosystems, Ecospheres support networking and collaboration, help reduce duplication, identify gaps in services, and foster equitable access to STEM resources.

Several Ecosystems have already joined together to form Ecospheres - whether or not they use the “Ecosphere” title. There are statewide Ecospheres, regional Ecospheres, Ecospheres and Ecospheres that have a common theme. And as with individual Ecosystems, Ecospheres vary in size, infrastructure, funding, and almost everything else.

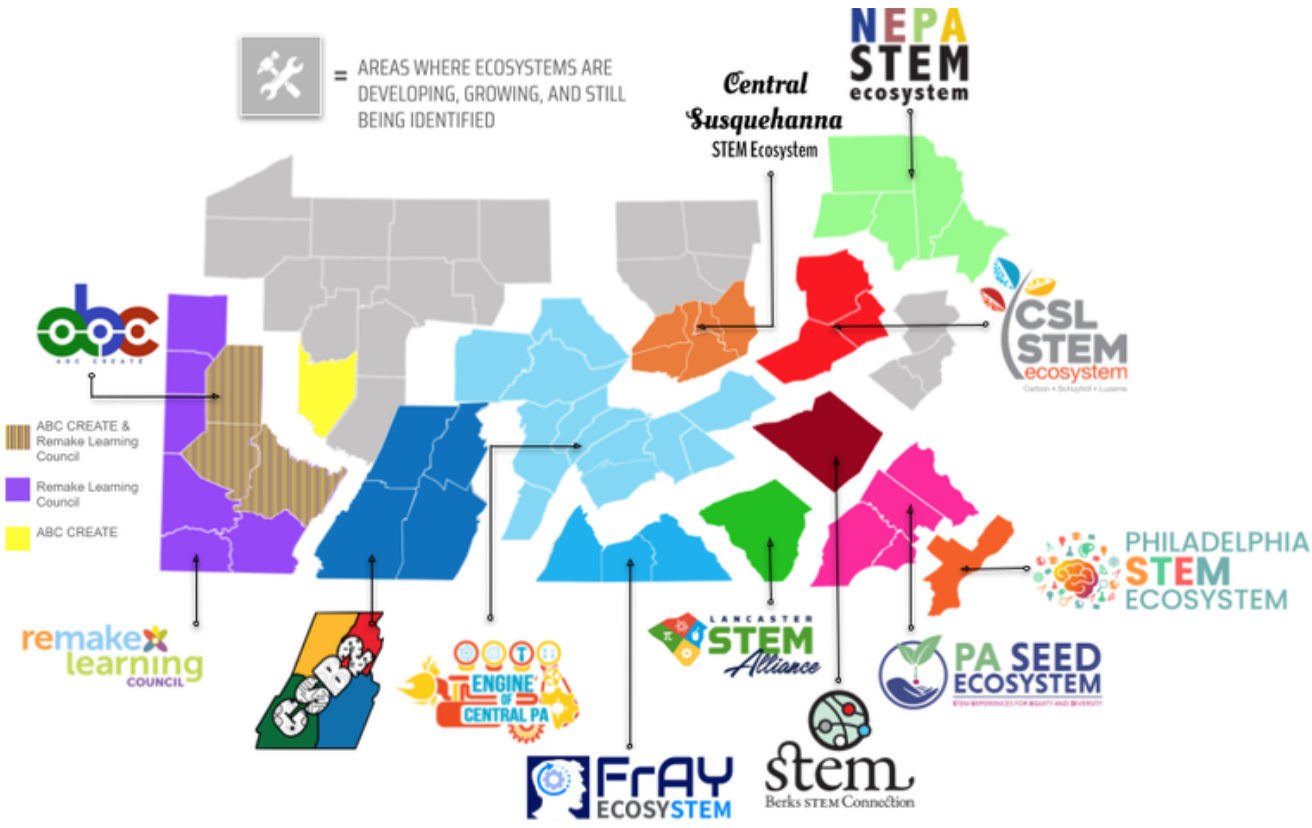
Unlike practice groups, workgroups, and affinity groups, Ecospheres are more formal, more organized, and more likely to be sustained over time. And Ecosphere are not intended to add a new, unnecessary layer of administration to our Ecosystem work; nor will they replace the national STEM Learning Ecosystem Community of Practice. As you read through Ecospheres Toolkit, you can decide for yourself whether creating an Ecosphere (or bolstering an existing Ecosphere) will add value to your Ecosystem work.

ECOSPHERES IN ACTION

To help you conceptualize your Ecosphere, we have provided an example of a statewide, regional, and thematic Ecosphere, below.

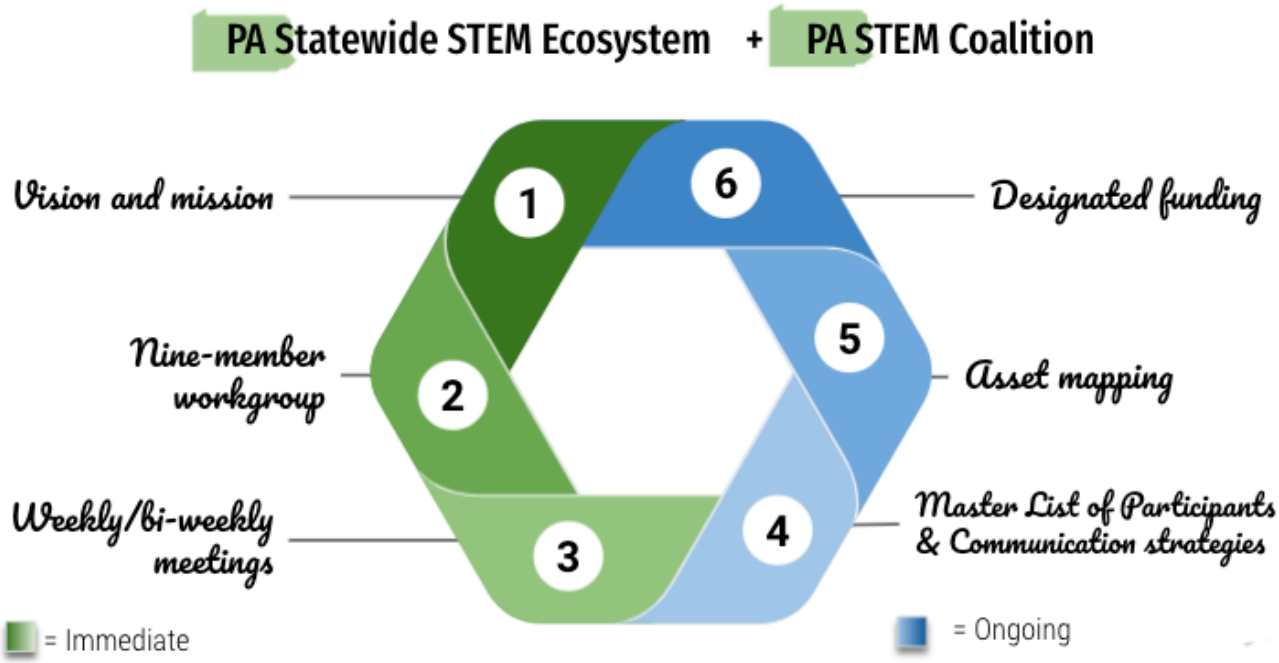
PENNSYLVANIA ECOSPHERE - STATEWIDE

An encounter in a “Lead STEM”Capstone Project ignited the formation of the Pennsylvania Statewide STEM Ecosystem (PSSE). Accelerated by the onset of the COVID-19 crisis, and in partnership with the Pennsylvania Department of Education, PSSE evolved into a collection of eight formal and several informal STEM Ecosystems across Pennsylvania. Through purposeful cooperation and collaboration, PSSE focuses primarily on creating professional networks and a stable community of practice. Its overarching goal is to ensure that all Pennsylvanians have access to quality STEM education and career pathways, so that they may become tomorrow’s leaders, influencers, and problem-solvers.



PENNSYLVANIA STATEWIDE STEM ECOSYSTEMS

In the fall of 2020, PSSE joined forces with the Pennsylvania STEM Coalition - a statewide, cross-sector network comprised of over 800 stakeholders. Similar to PSSE, the PA STEM Coalition strives to provide equitable access to STEM learning experiences for every learner - from early childhood through higher education.



PSSE and the PA STEM Coalition are administered by a 14-member Workgroup that meets every other week and represents Pennsylvania's diverse regions and perspectives. The Workgroup's signature activity is hosting bi-monthly STEM Coalition webinars that focus on timely STEM topics and attract between 30 and 120 attendees. PSSE also launched and integrated the results of a statewide STEM stakeholder survey; produced a national "Day One" Policy Memo; presented multiple workshops to diverse constituents; and participated in two multi-session strategic planning workshops. Lastly, PSSE is working on two complementary Asset Maps: one that identifies and provides details about Pennsylvania's formal and informal STEM Ecosystems; and another that identifies the locations of all 800+ STEM Coalition Members. Both Asset Maps have the common goal of identifying and, ideally, filling gaps in Pennsylvania's STEM resources, services, and supports.

MIDWEST ECOSPHERE - REGIONAL

The Midwest STEM Ecosphere was launched in 2013, in response to a request from industry representatives (Pioneer-DuPont [now Corteva], Collins Aerospace, and John Deere) - whose footprints transcend state and regional boundaries.

They asked, ***"Could you all share strategies and solutions to collectively benefit stakeholders across the states?"***

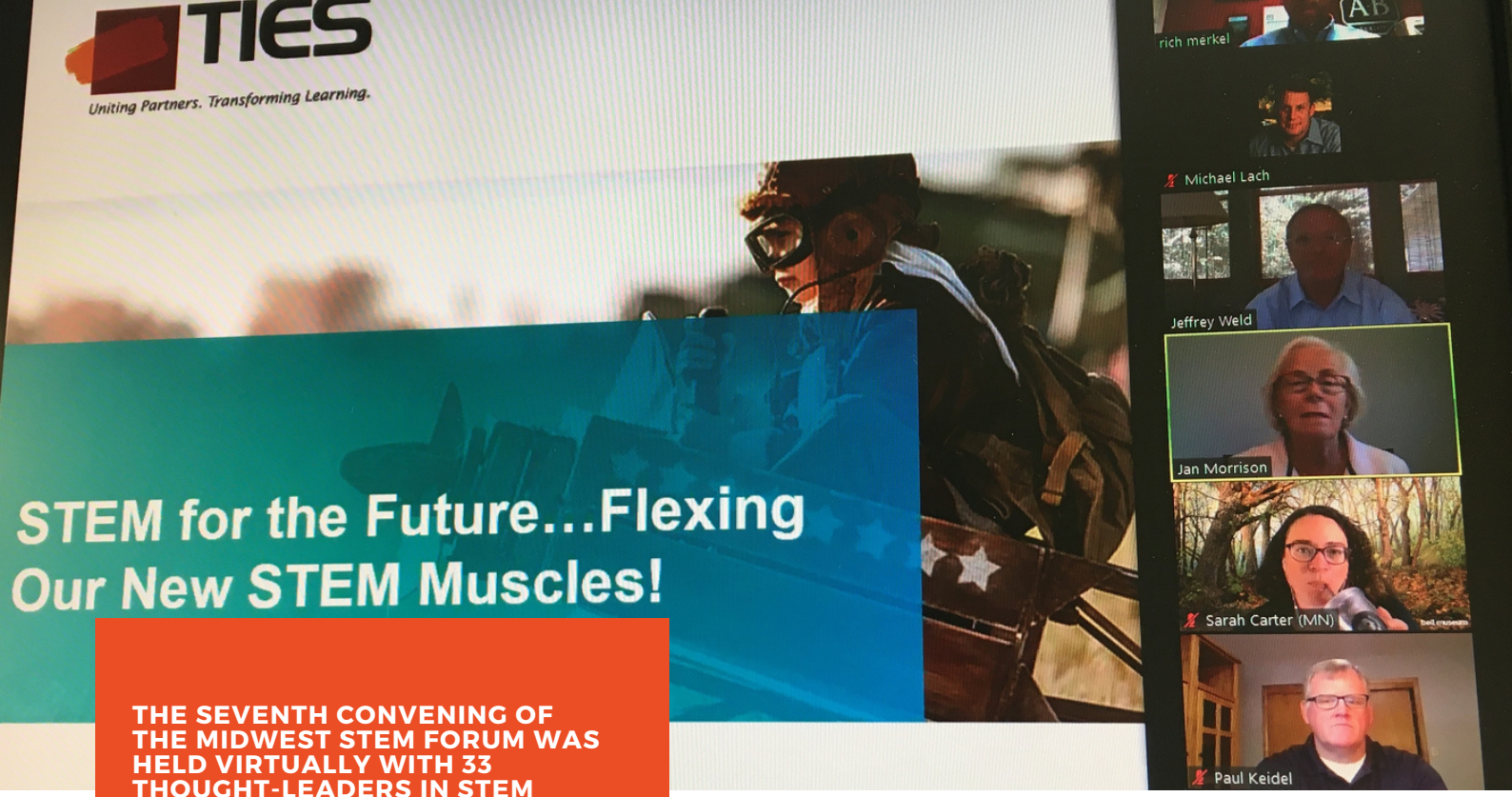
Sixteen STEM leaders from across the Midwest were convened in Iowa earlier this month to share best practices and learn from each other.

As a result, the Midwest Ecosystems initiated yearly convenings entitled "***Midwest STEM Forums***," and held their 8th Forum in Augusts 2021. Their membership has been somewhat fluid because states, regions and organizations come and go as they are able. Currently, their members include Ecosystems from Michigan, Indiana, Illinois, Missouri, Kansas, Nebraska, South Dakota, North Dakota, Minnesota, Wisconsin, and Iowa.

Their membership also includes honorary Midwesterners such as Utah and Nevada; the city Ecosystems of Omaha, St, Louis, Kansas City; and industry representatives from the aforementioned companies and others.

Meetings are share-a-thons during which local, promising innovations are shared for others to "borrow."

For example, and as a result of the Midwest Ecosphere, Minnesota's "STEM Day At State Fair" was successfully replicated by Iowa for the past seven years. Yearly meeting agendas include additional best practices regarding evaluation/assessment, partner engagement, fundraising, legislative support, and specific programming (such as in computer science).



THE SEVENTH CONVENING OF THE MIDWEST STEM FORUM WAS HELD VIRTUALLY WITH 33 THOUGHT-LEADERS IN STEM FROM TEN STATES AND REGIONS.

THE REVIEW BELOW IS THE STORY ABOUT LAST YEAR'S CONVENING #7 - A FIRST AND HOPEFULLY LAST VIRTUAL RENDITION!

The need for inter-state collaboration in STEM was identified shortly after Iowa's STEM Council was established. John Deere, DuPont-Pioneer (now Corteva) and Rockwell Collins (now Collins Aerospace) advised that like many businesses, they cross borders into surrounding states and encouraged solutions for talent development and innovative thinking across the Midwest. They inspired the Council's administrative team to launch the Midwest STEM Forum.

The seventh convening of STEM leaders across Midwest states, known as the Midwest STEM Forum, was held virtually this past month. Participants included representatives from Colorado, Kansas, Illinois, Michigan, Missouri, Minnesota, Nebraska, Nevada, North and South Dakota, Utah, Wisconsin and Iowa, along with guests from the Teaching Institute for Excellence in STEM (TIES) and the Education Commission of the States (ECS). Corporate representatives included Collins Aerospace, John Deere and Boston Scientific.

STEM Council Executive Director Jeff Weld welcomed participants and gave an overview of the protocols and agenda. TIES Founder and Senior Partner Jan Morrison shared a vision for the future of STEM. The rest of the forum consisted of three sessions that covered the following topics:

Session 1:

- Adapting STEM education services and programming to the pandemic
- Equity and access to STEM
- High quality elementary STEM education

Session 2:

- Solving barriers to successful career pathways
- ROI for STEM via a cradle-to-career indicator
- Broad scale successes in computer science education

Session 3:

- Aligning policy and research pressures at the school level with visions of the Federal STEM Plan
- Out-of-school STEM
- Building a united front on STEM across a state and region with an encompassing vision

Each state has its own unique STEM landscape. The Midwest STEM Forum unites the region through conversation and collaboration that sparks opportunity to bolster STEM education at the regional level.

Rural Ecosphere - Thematic

Under even optimal circumstances, creating a healthy, functioning STEM Learning Ecosystem is a daunting challenge. It is no surprise, then, that creating a STEM Ecosphere, composed of rural and remote communities, is exponentially more difficult. Although geographically larger, rural communities often lack the infrastructure, resources, and opportunities available to their urban counterparts. As a result, children in rural and remote communities have fewer STEM learning opportunities than children in urban communities.

As part of a National Science Foundation Rural Activation and Innovation Network (RAIN) grant, the Arizona SciTech Ecosystem led a series of virtual conversations with other rural Ecosystems, including leaders from Pennsylvania, Oklahoma, New Mexico, Louisiana, Idaho, Texas, California, North Carolina, Kentucky, Kansas, Florida, Illinois, New York, North Dakota, Ohio, Maine, West Virginia, and Missouri.

A planning committee developed the agenda for a Virtual Rural Convening entitled *Empowering Rural Communities*, hosted in October 2020. This included a SLECoP survey to determine the most desired discussion topics. Three priority topics - Broadening Active Participation, Advocacy, and Student Voice - were selected as the central topics of breakout sessions for the October 2020 convening,, as well as for two subsequent meetings. In November 2020 and January 2021, rural leaders reconvened to further discuss the three priority areas and share new implementation strategies. The January session was specifically designed for Ecosystem leaders to discuss what they had learned, by piloting some of the Ecosphere ideas within their own communities.

Lastly, STEM Ecosystem leaders from North Dakota; British Columbia, Canada; New York; and Arizona lead a series of discussions on best practices in broadening participation. Asset mapping within a rural community was the primary focus of these sessions, including how to use the data and the role of asset mapping in Ecosystem decision making.

Ecospheres Toolkit

Ecosystems in Action

We have created our Ecospheres Toolkit so that Ecosystems can learn from one another's successes and challenges, review sample templates and frameworks, and use some or all of our suggestions to craft their own Ecospheres.

To create our Toolkit, TIES, the Philadelphia Education Fund (PEF), and The Philadelphia STEM Ecosystem completed a number of activities. We launched an online survey and asked Ecosystems if they were interested in or already involved in Ecospheres; if creating Ecospheres could provide added value; and if forming Ecospheres would generate additional challenges (Appendix A). To augment the survey, PEF conducted a comprehensive literature review related to Ecosystems, Ecospheres, and collective impact models. Lastly, TIES implemented a Design Studio in which we asked Ecosystem members to brainstorm measures of success, design principles, and design features. A summary of these activities and their findings is included in Appendix B.

CREATING AN ECOSPHERE

This section lists many key ingredients for creating an Ecosphere, however the exact recipe and sequence of steps will vary from group to group. Moreover, many of these items (such as Governance Structure, Outcomes and Measures) should be regularly revisited and revised.

1 ARTICULATE YOUR PURPOSE

Review the information above and the details in Appendix C. Why do you want to create an Ecosphere? What might an Ecosphere accomplish that an individual Ecosystem cannot? Will the main beneficiaries be Ecosystem leads, Ecosystem members, students and families, communities, or all of the above? Ask yourself "What is the problem that crating an Ecosphere will solve?" At the same time, be kind to yourself and do NOT commit to a set of objectives that will unrealistically increase your workload and will be difficult to achieve and to measure.

For many Ecospheres, scheduling dedicated strategic planning sessions has been extremely helpful in defining a vision, mission, and purpose. These sessions are often implemented by an external facilitator, and can take place before or during an Ecosphere's development – the ultimate iterative process.

EXAMPLE FROM THE FIELD

In July of 2020, The Pennsylvania Statewide STEM Ecosystem spent several weeks drafting its vision, mission, indicators of success, and activities. This document has served as PSSE's "compass' – as a reference when considering new projects, making important decisions, etc. The document is also a concise way of introducing the Ecosphere to others. And although the group continues to edit and update the information, its basic components have stood the test of time. [Appendix C]

2 IDENTIFY LEADERS & CORE PARTNERS

Ecosphere leaders and partners will change over time. However, it is critical to begin with a core group of individuals, organizations, and Ecosystems that believe in the work, can commit to the work, reflect diverse perspectives, and are in positions to sustain the work. For example, many successful Ecospheres are supported by core members representing schools and school districts, colleges and universities, and government offices and agencies – all of whom provide insight, diversity, and sustainability.

In addition, it is helpful to identify individuals who can take on leadership roles AND work collaboratively. Ecosystem work is often messy, amorphous, and definitely not for the faint of heart. Because of the number and diversity of Ecosystem representatives, Ecosphere work can be even more challenging. We recommend convening a core group of individuals who are congenial, professional, and diplomatic.

3

ESTABLISH A GOVERNANCE STRUCTURE

An ambiguous governance structure can quickly interfere with establishing and sustaining an Ecosphere. For example, essential decisions can be delayed indefinitely if no one is in charge and if a decision-making process does not exist. Similarly, participants' time can be wasted on revisiting priorities that, although identified and supported by the majority, are (often repeatedly) challenged by a few. A governance structure does not need to be authoritative and can be designed by the leadership team described previously.

And even if this infrastructure changes over time, it helps to initially identify these decision-making junctures and protocols, the distribution of roles and responsibilities, and individuals' expectations and accountability. A logical and reliable governance structure will provide guidance and security to Ecosphere leads and to their constituents.

EXAMPLE FROM THE FIELD

A simple (yet effective) governance structure can include a Leader or Coordinator, an Advisory Committee or Steering Committee, and Workgroups comprised of both Committee members and members-at-large (including Committee members in workgroups provides the necessary "connective tissue" between these groups and the Ecosphere leaders).In this model, Ecosphere members can provide input into decision-making, but the final determinations rest with the Leadership. [Appendix D]

4 GATHER STAKEHOLDER INPUT

Ecosphere constituents appreciate strong leadership but also appreciate opportunities to provide input, feedback, and reflections. Using the networks established by Ecosystems, Ecosphere leaders can design, implement, and summarize the findings from online surveys, live or virtual focus groups, and/or individual interviews – to ascertain members' needs, priorities, goals, and objectives. In general, constituents are more likely to respond to suggestions (such a list of possible projects) rather than to exclusively open-ended questions.

However, a good survey or focus group will combine specific questions with opportunities to provide general comments.

When gathering stakeholder input, it is important to:
1) summarize the goals of the survey, focus groups, or interviews; and offer to share the results;
2) state that, while all opinions will be considered, not all feedback will necessarily be used;
3) ask for contact information from any individual who may like to provide further comments or participate in additional Ecosphere activities; and
4) stipulate a deadline for responses.

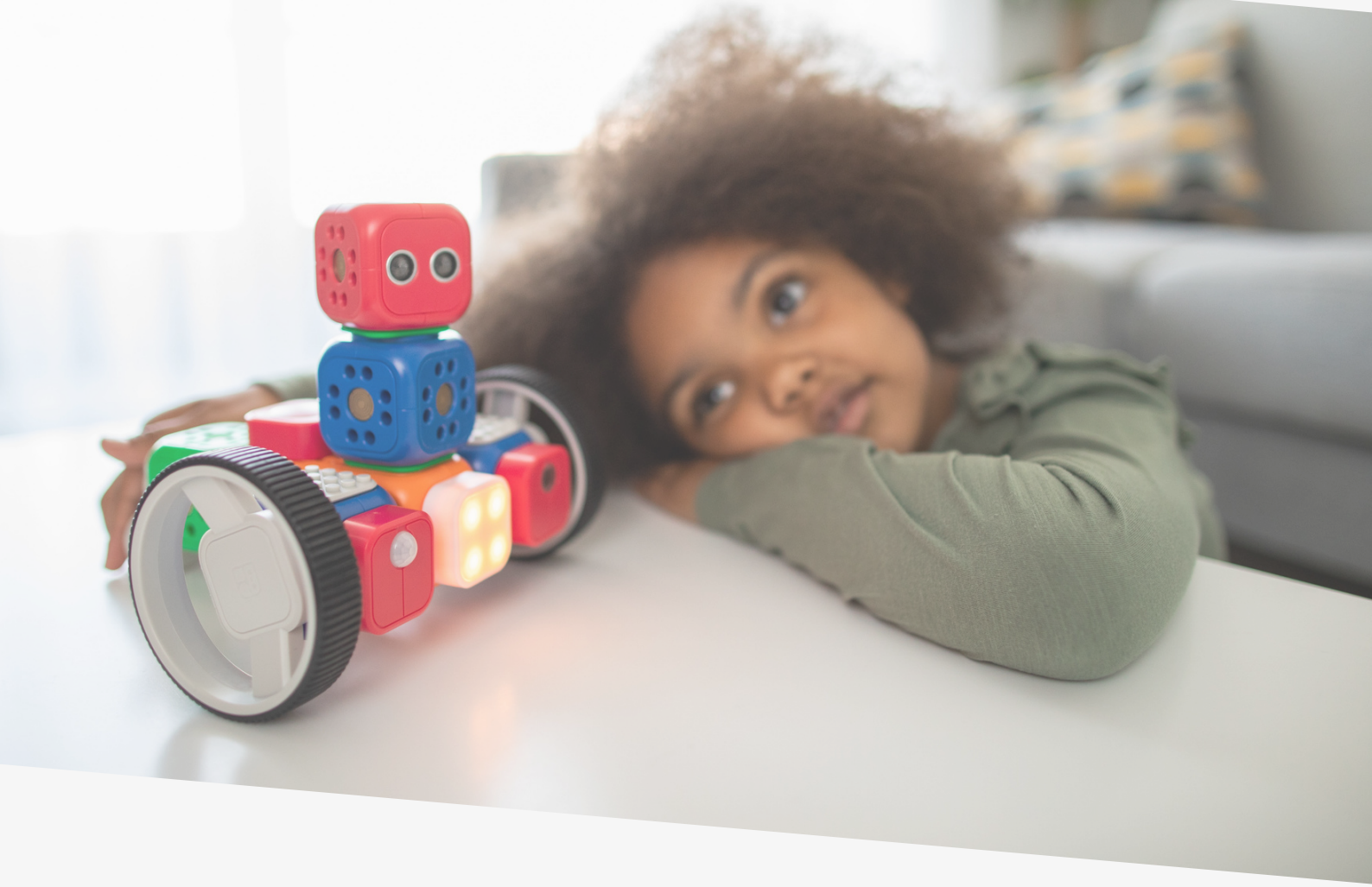
EXAMPLE FROM THE FIELD

In the winter of 2021, PSSE and the Pennsylvania STEM Coalition launched a Stakeholder Survey. A total of 160 individuals completed the survey - representing nonprofits, universities, schools and schools districts, big cities and small towns, and many other constituents.. And although the survey was originally intended to inform a PSSE "Day One Policy Memo," it provided excellent feedback regarding the needs and interests of Pennsylvania's STEM stakeholders – feedback that has since been used to craft PSSE services and activities. [Appendix E]

5 DECIDE ON THE WORK

Many Ecosystem leads have “day jobs,” and their Ecosystem and Ecosphere activities are above and beyond their core job descriptions. Ensuring projects that might be a "heavy a lift" or compete with other local Ecosystem activities should be avoided.

Thus, articulating the Ecosphere purpose (see “Articulate Your Purpose,” above) and gathering stakeholder input (see “Gather Stakeholder Input,” above) are two excellent steps towards identifying key Ecosphere activities. Asset Maps – maps that illustrate where ample STEM resources exist and where STEM resources are needed – can also help to define Ecosphere work. And Ecosphere activities can be as simple as convening Ecosystem leads on a monthly basis; or they can be as complex as creating an Ecosphere-specific website, generating a weekly Newsletter, hosting monthly members’ meetings, and establishing topical workgroups.



6

DIVERSITY, EQUITY & INCLUSION

Diversity, Equity, and Inclusion (DEI) is not simply an Ecosphere tagline or footnote. And DEI can mean different things in different environments. For example, statewide Ecospheres might make an extra effort to engage rural as well as urban Ecosystems; and regional Ecospheres may work especially hard to include small as well as large cities and states. And similar to creating robust Ecosystems, authentically inclusive Ecospheres do not "just happen" – they require insight, effort and perseverance. Fortunately, Ecospheres can utilize the experiences and networks of their Ecosystems to engage hard-to reach audiences, ensure that everyone has a place at the table, and genuinely solicit and respect multiple perspectives.

7 DEVELOP A COMMUNICATION PLAN

Our experience with both Ecosystems and Ecospheres is that, without consistent internal communication and external outreach, members quickly lose interest. Internal communication means scheduling and holding regular meetings, assigning a chair and a scribe, and promptly circulating meeting minutes. And in conjunction with efforts to "Establish a Governance Structure" (see above), internal communication also involves articulating roles and responsibilities and holding one another (and ourselves) accountable.

Similarly, broader Ecosystem members and constituents greatly appreciate regular communication and updates. This can be as simple as circulating or posting a calendar of events, or as sophisticated as developing an Ecosphere-specific web page or website. A communication plan might also include a mechanism through which members communicate with one another – so that the "leaders" are not continually expected to forward emails and announcements; and so members develop relationships with one another.

Ways to support member-to-member communication include creating and sharing a Google Group distribution list, posting members' emails on a members-only webpage, and/or facilitating online chats within an existing website

That said, we cannot emphasize enough the phrase communication PLAN – which, like everything else, will ebb and flow through trial and error. A plan should include how and when communication occurs, who is responsible for internal and external communication, whether or not the Ecosphere "censors" or applies filters to others' communication, and how regular communication will be sustained.

EXAMPLE FROM THE FIELD

An effective INTERNAL communication plan should recognize the Leadership members' communication preferences and include guidelines for inter-communication norms and mechanisms. An internal plan should also infuse guidelines (and deadlines) for taking, editing, distributing, and posting meeting minutes – as well as action steps and responsible parties. A strong EXTERNAL communication plan will include a consistent schedule of outreach efforts and regular opportunities for members' input. [Appendix F]

8

DEVELOP A SUSTAINABILITY PLAN

Often the terms “sustainability plan” and “dedicated funding” are used interchangeably. For sure, adequate funding – for staff time, a website, a designer, or other items - will help ensure that your Ecosphere can be both maintained and sustained over time. And as we all know from our Ecosystem work, it is not easy to identify funders who are interested in supporting infrastructures, who believe in a collective impact model, and who are not exclusively invested in student-level services and outcomes. Our single most important piece of advice in this realm is “Make friends before you need them.” Many successful Ecosystems and Ecospheres began their work with no funding, continued to engage foundation and philanthropic partners, and were eventually rewarded by dedicated funding.

That said, a reasonable distribution of essential tasks also contributes to sustainability. Once a core group of committed leaders has been identified, discrete tasks can be divided up and ensure that the work is sustained - independent of or while waiting for dedicated funding.

Lastly, refer back to “Identify Leaders and Core Partners.” As with a commercial mall, it is extremely helpful to have an “anchor” - in this case, a lead partner representing a school district, a government office, a major industry, or a foundation. These types of anchors are often successful in procuring additional resources, providing no-cost labor, and/or securing significant funding.

9

IDENTIFY OUTCOMES AND MEASURES

Like individual Ecosystems, Ecospheres may not/should not be responsible for achieving and measuring student-level or program-level outcomes. Instead, Ecosphere success will more likely focus on goals such as connecting previously unconnected constitutes, reaching marginalized or underrepresented audiences, and/or impacting policy on a larger scale.

Your fist step will be to review the aforementioned “Articulate Your Purpose,” through which you can identify your goals, outcomes, and objectives. The respective outcomes and measures will follow. For example, if one of your Ecosphere goals is to facilitate dialogue among different statewide Ecosystems, you might then administer a survey to ascertain whether members believe the Ecosphere improved that communication - and provide examples of that improvement. If a rural Ecosphere hopes to provide resources to overlooked rural populations, you could collect baseline data from specific regions and then measure change over time.

Some basic evaluation suggestions include:

1. Identify exactly what you want to measure before you begin your evaluation activities.
2. Do not collect more data than your organization, Ecosystem, or Ecosphere can process. And devise a plan for processing, analyzing, and summarizing your data before you begin.
3. Do not collect more information than you will use. This will greatly reduce respondent burden.
4. Respect self-reported data. Research demonstrates that self-reported data is reliable, as long as the respondents have no reason to “lie.”
5. When possible, use others’ measurement tools such as online surveys and interview protocols. These tools are often “research-based,” which will provide further validity to your findings.

When possible, engage an external evaluator. College students are wonderful, but they will still need guidance.

EXAMPLE FROM THE FIELD

In early 2019 - before there was a Pennsylvania Statewide Ecosystem- the Philadelphia STEM Ecosystem conducted an Ecosystem Impact Survey. This survey aimed to identify how belonging to the Ecosystem had increased members’ access to resources, opportunities to collaborate with others, ability to identify and procure funding, and similar benefits. Sixty-five individuals responded, providing confirmation of the Ecosystem’s usefulness and suggestions for improvement.[Appendix G &H]

Connecting Ecospheres to the STEM Learning Ecosystems Community of Practice

The STEM Learning Ecosystems Community of Practice hopes that Ecospheres will share their insights, successes, and challenges with one another! The members of our powerful network are keenly interested in our collective Ecosphere experiences. What are you doing? How have you done it? What have you learned? What do you need? And how can your Ecosphere experiences benefit others?

Xan Black

Please share a description of your Ecosphere, its goals, its operations, its key activities, and its lessons-learned with Xan Black, XanBlack@TiesTeach.org. As the Technical Assistance Lead for the national SLECoP, Xan is ready to support your work, answer your questions, and connect you to others who are equally passionate about Ecospheres.

Appendix

Appendix A

Ecospheres Survey Summary

Ecospheres Survey Summary
June 9, 2021

Ecosphere Overview

The STEM Learning Ecosystems Community of Practice, in partnership with TIES, The Philadelphia Education Fund (PEF), the Philadelphia STEM Ecosystem, and the Pennsylvania Statewide STEM Ecosystem, seeks to design and launch Ecospheres. For the purpose of this project, Ecospheres are defined as "groups of STEM Ecosystems that are connected by geography, by audience, or by other unifying factors." Ecospheres are established with the purpose of creating regional synergies and networks, developing sustainable collective impact models, and augmenting the national Community of Practice.

Developing Ecospheres will involve five phases. The first phase will consist of completing a literature review, gathering information on promising practices and gauging interest in the initiative. During the second phase, PEF will create a Guide Book to provide insights from past experiences and tools for creating and maintaining Ecospheres. The third phase will launch new national and international Ecospheres; and, once these Ecospheres are established, the fourth phase will ensure sustainability by providing technical assistance. Lastly, the fifth and final phase will evaluate the success of the Ecospheres initiative.

As part of Phase One, PEF created and distributed a survey to all Ecosystem leads, to determine which Ecosystems are already involved in Ecospheres and have experiences and expertise to share. In addition, PEF gathered feedback from Ecosystem members who are not currently part of an Ecosphere but are interested in establishing or participating in one.

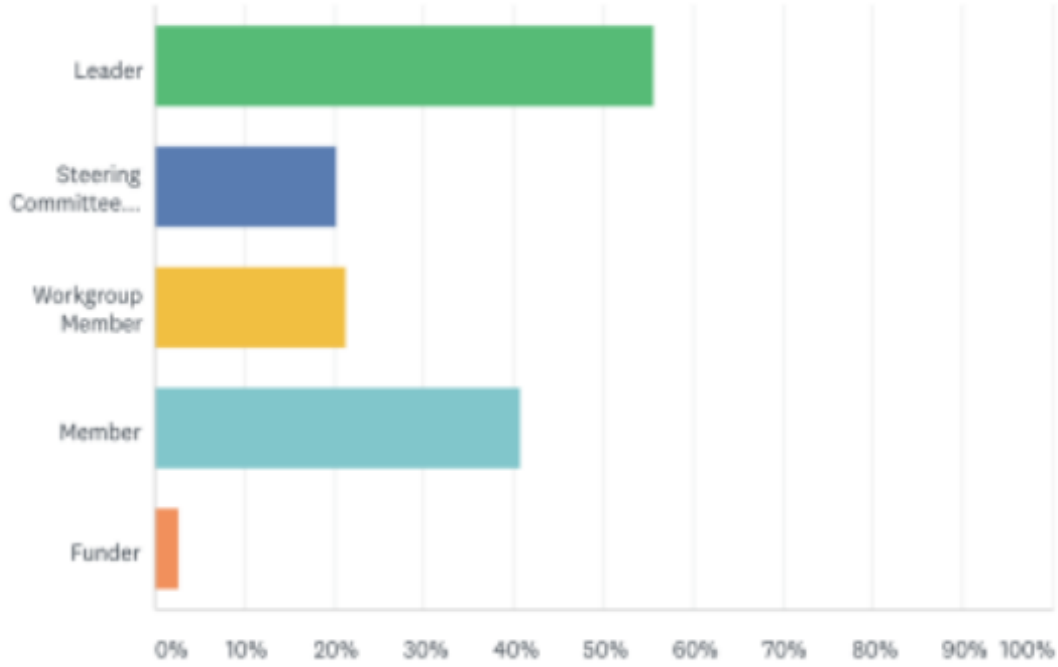
Survey Methodology

To determine affiliations with and interest in Ecospheres, PEF designed an online SurveyMonkey survey that TIES then distributed it to all international Ecosystems. The survey included 12 multiple choice and open ended questions. The survey remained open from May 10th to May 26th, 2021. After the survey closed, PEF staff downloaded and analyzed the data, to identify trends, ascertain interest in Ecospheres, and determine the perceived benefits and challenges of Ecospheres.

Survey Results

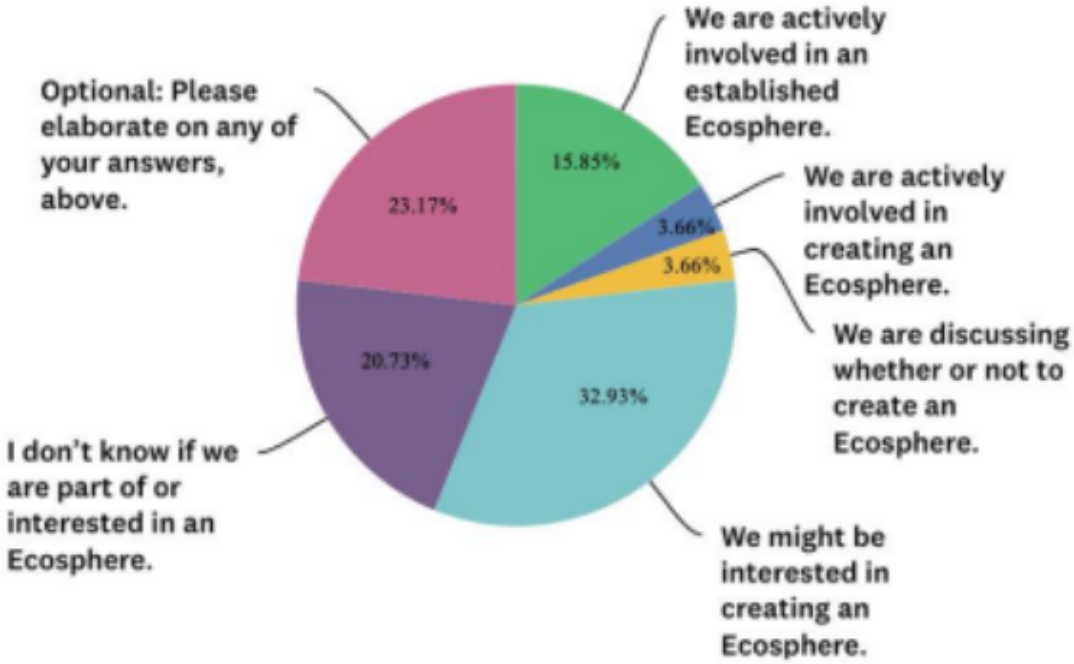
The following summarizes data downloaded from the online survey.

1. What is your role in your Ecosystem?



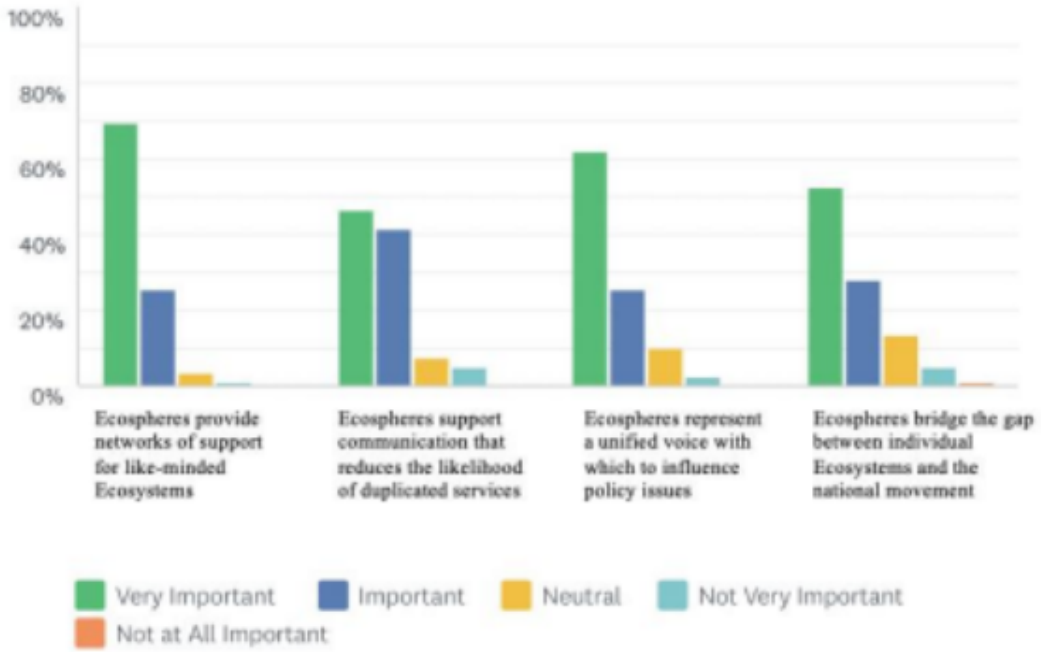
The majority of respondents indicated that they are leaders of their local STEM Ecosystem. Some respondents hold multiple roles in their Ecosystem.

2. To what extent is your Ecosystem already part of an "Ecosphere?"



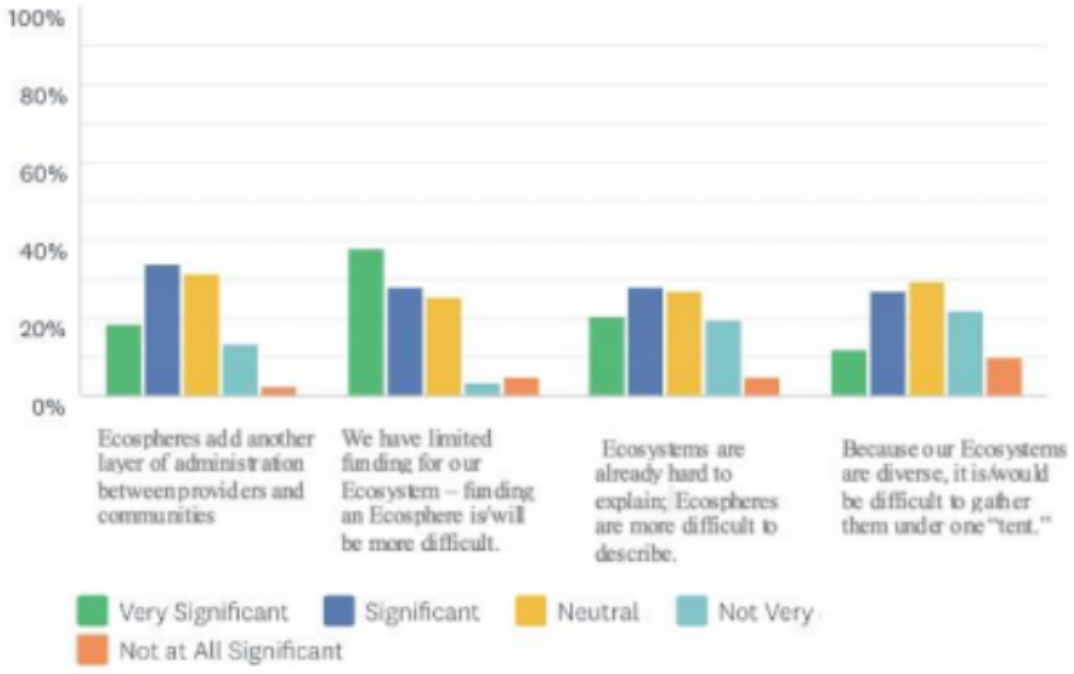
Nearly 20% of respondents are already involved in an established Ecosphere, or actively involved in creating an Ecosphere. About 1/3 of the respondents indicated an interest in creating an Ecosphere.

3. There are many benefits to creating Ecospheres. How important are the following to you (or your Ecosystem)?



The majority of respondents greatly value the unity and support that Ecospheres could provide.

4. There are also challenges associated with Ecospheres. How significant are the following to you (or your Ecosystem)?



Over 40% of respondents identified financial burden as a significant challenge in creating Ecospheres.

5. Please add any information about your experience with or your interest in Ecospheres.

Many of the respondents are interest in and support developing an Ecosphere due to the potential benefits of shared experiences and resources. Selected responses are listed below:

- "I believe that anything that we are able to do to connect and learn together will benefit our communities and strengthen our voices."
- · "Working regionally makes sense, especially out west where there are so many similarities (both challenges and assets)."
- "Interested but limited experience"

6. Are you familiar with any research that might inform our Ecosphere development process? If so, list it here:

Of the 31 respondents who answered this question, 17 indicated that they are familiar with research to inform the Ecospheres.

Summary

Respondent Characteristics
There were a total of 108 total responses, the majority of whom are Ecosystem leaders. Some respondents play multiple roles in their Ecosystems such as Leads, Steering Committee member, and funders. Respondents represented many areas of the United States including Hawaii, Idaho, Utah, Oregon, Florida, Michigan, Pennsylvania and Massachusetts, among others nationwide. There were no international responses.

Experiences and Perceptions
Fifteen percent of respondents are part of established Ecospheres, three percent are involved in establishing an Ecosphere, and thirty-three percent are interested in creating an Ecosphere. Many of the respondents believe that Ecospheres will provide forums through which to share information and resources. The biggest (perceived) barrier to creating Ecospheres is limited funding. Lastly, while there is a significant interest in Ecospheres, this is also a need for more information.

Conclusion

Overall, Ecosystem members support creating Ecospheres, understand the associated benefits and challenges, and are interested in receiving additional details and information.

Appendix B

Ecospheres Design Studio Summary

STEM Learning Ecosystems Community of Practice
Design Studio I: Innovation By Design™
ECOSPHERES™

Report Out

www.TIESteach.org

Intended Outcomes…

Fully understand and articulate the value of the Ecospheres™ to the CoP

Create the foundation from which to design out the Ecospheres and from the data collected

Create the Ecosphere design features and process to operate

3 Main Topics

What does success look like for Ecospheres?	Design Principles	Design Features
Breakout 1	Breakout 2	Breakout 3

What does success look like for Ecospheres?

Consensus

- **Resources:** are produced and consumed at a rate that sustains the ecosphere | jointly pursue funding for projects | policy work; (higher impact with collective voice)
- **Collaboration:** to avoid duplication of activities/purpose/efforts | similar interest or role (maybe as affinity groups) to ask shared questions | value of peer learning is high. |not competitors but excellerants to the work being done
- **Community:** systematize collaborations to make connections and collaborations more accessible | constant learning so that we are in a constant cycle of improvement | Sharing out learnings and STEM success stories in some sort of forum, so that we can package and share them out with the legislators and other stakeholders | Authentic inclusion and participation | language is digestible at all stages of legislations
- **Connectivity:** Collective messaging and goals for stakeholders to understand and are moving in same direction live narrative / common language | Ensuring that ecospheres doesn't create noise

STEM ecosystems

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Design Principles

Consensus

- **Accessibility:** Voluntary; Open to anyone with no prerequisites or affiliation with SLE | Porous | policy work; higher impact with collective voice | information is easily shared |
- **Universally Designed:** Clear focus | Diverse voices - students/parents/business | Authentic inclusion and participation | Value and promote collaboration to empowerment without being competitive | Operates as an apolitical organization | Promote coherence and not polarization | Nurture inclusivity - ecospheres are for all
- **Joint goals:** Alignment with a higher imperative/common goals/common purpose and will change as the spheres work towards solutions or recommendations | Promote high level common goals | Intentional |
- **Solution Oriented:** Recognizes multiple solutions | Respect diverse approaches | Data Driven / evidence-based | Elevate collective impact - shared measurement | Boost innovation within STEM

STEM ecosystems

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Design Features

Consensus

- **Interactive and responsive / Fluid**: allow to emerge organically as individuals agree to take the lead and spearhead a group | Focused on content area rather than geographic affiliation | geographic or topic related | May not need to fit one model, different ecospheres could have different focus and/or structure | Can join multiple Ecospheres | different members of ecosystems could join different ecospheres as their interest or expertise leads them | diverse - different ecospheres could have different focus and/or structure
- **Self Supporting:** champion to lead the work | Clear communication | pathway to create Ecospheres and to end them when work is completed | Can join multiple Ecospheres | Stages/problem-focused/time-bound |
- **Common/universal tools:** capture and share information for storytelling | Updated folder of resources - minutes, videos, etc. to share in a publicly facing folder to capture the work being done | Collective Impact Model

STEM ecosystems

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Design Features Cont'd

Consensus

- **Answers "What can we do better together that we can't do alone?"**
- **Focus on the gap that the Ecosystem cannot fill**
- **Suggested Groups / Project Teams:** K-12 to workforce | Leadership Support | Measured STEM | Geographic | Community Colleges w/ Leaders | Department of Ed or Policy | Blue Economy Ecosphere - coastal existence | Special Interest group model based on MAA Sigmas | Rural | ESSR Funds | Reaching isolated communities | Racial and gender equity | Advocacy
  - Identifying a coalition of people willing to work together rather than identifying a topic as first step

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Appendix C

PA Statewide STEM Ecosystem Description

Pennsylvania Statewide STEM Ecosystem

Vision:
All Pennsylvanians will have access to quality STEM education and career pathways, and become tomorrow's leaders, influencers, and problem-solvers.

Mission:
Through purposeful cooperation and collaboration, all Pennsylvania STEM Ecosystems will be aware of, will improve upon, and will provide equitable access to and inclusion in quality STEM education

Pennsylvania PDE Priorities:
- Diversify and increase the number of STEM-ready educators.
- Diversify and increase the number of learners who are included in high quality STEM experiences.

Indicators of Success:
[Note: The "PA STEM Ecosystem Leaders" are the individual Ecosystem heads]
[Note: The "PA Statewide STEM Ecosystem" is the new statewide Ecosystem]
As a result of creating and implementing the Pennsylvania STEM Ecosystem:
- PA STEM Ecosystem Leaders will create professional networks, partnerships, and a stable community of practice · PA STEM Ecosystem Leaders will have access to local, regional, and national STEM resources and opportunities PA STEM Ecosystem Leaders will develop successful mechanisms for disseminating these resources to their constituents – particularly those with limited access.
- PA STEM Ecosystem Leaders will recognize STEM education gaps and, as a result, collaborate on new projects while avoiding duplication of efforts.
- The PA Statewide STEM Ecosystem will engage corporate, civic, government, partners, as well as other stakeholders historically absent from these conversations.
- The PA Statewide STEM Ecosystem will reach out to and authentically involve parents, children, youth, families, and community members.
- The PA Statewide STEM Ecosystem will positively influence policy development and funding decisions.

Pennsylvania Statewide STEM Ecosystem

Activities:

Weekly Friday Morning Ecosystem Call
Participants: Current and prospective Ecosystem leads and DOE representatives

Objectives:
- Learn about current PDE programs and initiatives
- Share updates, and promising practices among Ecosystem Leaders
- Share information from the National Ecosystem movement
- Address current issues and challenges
- Develop tangible mechanisms for gathering and disseminating data and resources

Formats
- Whole-group conversations
- Small-group breakout sessions
- Guest speakers

Monthly Friday Morning Coalition Calls
Participants: All PA STEM stakeholders (including members of the former PA STEM Coalition)

Objectives:
- Learn about current PDE programs and initiatives
- Learn about the National and PA Ecosystem movements
- Share updates and promising practices
- Address current issues and challenges

Formats
- Whole-group conversations
- Small-group breakout sessions
- Guest speakers

Other
- Draft and edit documents that champion PA STEM education and PA STEM Ecosystems.
- Participate in statewide workgroups and committees whose goals are to bolster STEM education

Appendix D

Sample Ecosphere Governance Structure

STEM ecosystems™ powered by TIES

Supporting networking and collaboration, reducing duplication, identifying gaps in services, and fostering equitable access to STEM resources

Ecosphere Steering Committee

5 Workgroups

- Computer Science
- Community Engagement
- Diversity, Equity, and Inclusion
- Policy and Advocacy
- Workforce Development

- Workgroup topics are determined by the Ecosphere members
- Workgroups meet monthly or bi-monthly
- Workgroups tackle projects that are relevant, useful, and manageable; and reflect the members' interests & have end products

Members

- Formal and Informal Ecosystems
- Schools and School Districts
- Nonprofits and Community Groups
- Business and Corporations
- Government Agencies
- Individual Stakeholders
- Colleges and Universities
- Philanthropists and Funders
- STEM Consults
- STEM Intermediaries

Appendix E

Sample Internal Email Guidelines

Ecospheres
Sample Internal Email Guidelines

- Generally speaking, the Ecosphere uses email as a tool for communication or to complete project requirements.

- Email also may be used to document or clarify responses.
- All communications should demonstrate respect and trust in one another.

- When possible, send an email 24 - 48 work week hours in advance of a needed response.

- The terms **RESPONSE NEEDED** (include deadline) or **ACTION REQUIRED** (include deadline) or FYI can be included in the subject line to help clarify and communicate expectations.

- The terms **URGENT** and **TIMELY** can be included in the subject when we have a tight deadline - but should be used sparingly and with discretion.

- Do not expect an immediate response to content posed in every email. Recognize that some email recipients may not read and/or address content of email until the topic appears to be most relevant/timely (example -- some may only check emails from Nancy on the day or morning before a meeting).

- Reply ALL should be used with restraint:
  - When ALL truly need to be informed.
  - When ALL truly need to respond.

- Use individually addressed emails to follow-up with those who may not have responded as needed.

- Use individually addressed emails when only individuals need to have the email content.

- Use deadlines for tasks and responses and when possible to communicate those at the preceding meeting, so team members will know what to expect in terms of timelines and anticipated workflow. Be patient and trust that team members will honor their commitments or will reach out to communicate that they are struggling to complete their task.

- When possible, acknowledge receipt of an email, even if a longer response will be delayed.

- Make sure that the subject line fits the content of the email (especially when using an email chain to begin a new discussion).

- This set of internal email communication guidelines can and will be revisited regularly, to ensure that it still meets the Ecosphere's needs.

Appendix F

PSSE Policy Memo

Date: August 31, 2021
To: Day One Project
From: Pennsylvania Statewide STEM Ecosystem
Re: STEM Policy Memo

The Pennsylvania Statewide STEM Ecosystem (PSSE) is pleased to present this policy memo which is based on a stakeholder survey implemented in winter 2021. The survey collected data from 160 of stakeholders, comprised of a diverse sampling of professionals working as principals, teachers, formal and informal STEM educators, consultants, program managers, heads of professional development, school counselors, superintendents, assistant superintendents, and more. This memo is intended to help inform and guide the Biden/Harris administration as the administration designs and implements policies pertaining to STEM Education.

Summary

Based on the stakeholder survey, the Pennsylvania Statewide STEM Ecosystem (PSSE) recommends four distinctive priorities to guide the Biden/Harris administration's vision for STEM Education.

1. Ensure diversity, equity, and inclusion in STEM education with a focus on race, gender identity, socio-economic status, ability, and geographies.
2. Encourage the integration of STEM content across disciplines such as art, history, literacy, in both formal and informal learning environments;
3. Invest in high quality, accessible professional development for teachers and other STEM educators; and
4. Support initiatives that provide young people with a strong understanding of and access to the multitude of STEM careers and career pathways.

By ensuring that all citizens have equitable access to high-quality STEM education, encouraging the integration of STEM fields with arts and humanities, working to ensure that educators are provided with opportunities for STEM professional development, and promoting a broader understanding of and access to possible careers in STEM, the administration is poised to create sustainable and impactful change in STEM education.

Challenge and Opportunity

The following paragraphs highlight the top four STEM priorities, including challenges and opportunities, as selected by PSSE survey respondents.

Ensure diversity, equity, and inclusion in STEM education. Every child deserves to receive high quality STEM instruction, regardless of factors such as socio-economic status, ability, geographies, and other factors that may limit access to STEM learning opportunities and limit opportunities to excel in STEM fields. Despite efforts to expand equity and inclusion in STEM, an imbalance remains in in who has the privilege of seeing themselves represented in STEM education and STEM careers. In Pennsylvania in 2020, only 13% of the post-secondary degrees in computer science and 9% of the degrees in engineering were awarded to students of color.[1] Only 11% of students taking Advanced Placement Exams (AP Report Card) in were black and Latinx students.[2] In comparison to their white male counterparts, women and people of color remain underrepresented in many STEM-related careers throughout the United States, with women accounting for only 15% of engineers and

1 Education Commission of the States – Vital Signs
2 College Board - 2020 Report Card

architects, and Latinx and black individuals accounting for only 8% and 9% of total workers in STEM fields respectively.[3]

The switch to remote learning at the onset of the COVID-19 pandemic underscored just how limited access to broadband and computing technologies is in some Pennsylvania communities, and how this can hinder learning. The School District of Philadelphia, for example, serves so many students who lack access to laptops and internet that, following school closures due to COIVD-19, the schools, city, and businesses had to work together to create a program to provide over 35,000 students with free technology and broadband access to make virtual learning plausible.[4]

Encourage integrating STEM content with other disciplines. STEM disciplines are often depicted as existing in their own distinct academic sphere, separate from other subjects that are traditionally more aligned with the arts and humanities. While this may highlight the extent to which these fields relate to and inform one another, it can also prevent a full understanding of the integral role that STEM research, knowledge, and methodology play in many other fields of study. This creates knowledge silos in which a more fluid exchange of information and ideas could be advantageous. Educators may not feel adequately equipped to showcase the interconnectedness and overlap that naturally exist between these different subjects, reinforcing and perpetuating barriers between disciplines and inhibiting students from achieving a more holistic understanding of STEM topics, STEM-related careers, and the role STEM plays in the world.

Invest in professional development for in school and out – of – school time STEM educators. Survey respondents felt that lack of time, money, and resources hindered their ability to participate in adequate professional development. To ensure that students are receiving the knowledge and skills that they need to succeed, it is crucial that educators have access to high quality professional development opportunities. By investing in professional development for teachers, out-of-school-time providers, and educators, and by ensuring that all educators feel confident in their abilities to teach STEM topics and incorporate best practices into their existing curricula, the administration will make a direct investment in the future of our nation as a leader in STEM education.

Support initiatives that provide an understanding of and access to the multitude of STEM careers and career pathways. When young people plan for their careers, it can be difficult to conceptualize exactly what kind of jobs exist, as well as the steps they need to take to get there. At the same time, there are currently a wealth of STEM jobs that employers are finding difficult to fill. To help close this gap, it is important to expose children to the wide variety of different professions that exist within STEM fields, and provide them with examples of tangible actions that they can take to actualize their goals of developing a successful career.

Plan of Action

Surveyed stakeholders proposed the following types of solutions to address these important challenges.

Ensure diversity, equity, and inclusion in STEM education. To increase diversity, equity, and inclusion in STEM education and STEM careers, the administration should invest in programs that work to engage more young

3 Pew Research Center- STEM Jobs See Uneven Progress in Increasing Gender, Racial and Ethnic Diversity
4 Generosity- Bridging the Digital Divide: An Equity Saga

girls, people of color, and other underrepresented populations in STEM activities to help foster an interest and an investment in STEM. It is also crucial that federal funding is distributed to schools in an equitable manner so that students from all socio economic backgrounds have access to STEM programming.

During the COVID crisis, sites in Pennsylvania such as Propel Charter Schools and the Sunrise of Philadelphia strove to provide accessible, inclusive, programming by offering virtual and in person Out-of-School-Time programming, starting at 7 AM each day. In these programs, youth of all backgrounds were given access to technology and real-world learning experiences, wraparound Social and Emotional Learning (SEL) activities, STEM programming, and service learning.

The administration should also provide technology and technological training to schools, educational organizations, and families living in communities where access may be limited. The City of Philadelphia's PHLConnectED program, which united the city, schools, Google, and Comcast to provided free internet and computer access to low-income students presents a model for how the administration can work with other stakeholders to make education more equitable for students without access to technology.

Integrate STEM content with other disciplines. With the recent popularity of "STEAM" (including arts in STEM curriculum), a number of programs have already begun to integrate STEM learning with other subjects, taking a more interdisciplinary approach to instruction. The administration should strive for a model of education that acknowledges the natural overlap between different fields of study. This can be achieved by investing in initiatives that provide non-STEM educators with training on how to effectively integrate STEM programming into the work they already do, and in programs that braid together different disciplines in their programming.

NEPA STEM Ecosystem has mentored several districts in how STEM learning and STEM concepts blend smoothly with content-area priorities. Working with their local intermediate unit, NEIU 19, the Ecosystem provided STEM field trip experiences to over 1000 5th grade students who had historically scored low on state testing in ELA and Math with hands-on robotics and cryptography experiences to reinforce important math concepts and create practical applications for the math and ELA concepts the students needed to learn in order to score proficient on state testing.

Invest in professional development for teachers and other STEM educators
The administration should work to ensure that school districts, OST providers, and other STEM education institutions have access to the funds and resources needed to provide educators with regular, high quality professional development. This professional development should directly integrate science and engineering practices of current researchers, scientists and engineers in collaboration with R1 academic institutions and/or research and development sectors of business/industry. It is also critical that non-STEM teachers have access to the professional development needed to successfully integrate STEM topics into their own teaching.

Penn State Center for Science and the Schools is a leader in transforming precollege STEM education, contributing to the university's land-grant

mission in a 21st-century context by leveraging the research being done at Penn State. CSATS works with Penn State scientists and engineers to develop, implement, assess, and disseminate outreach programs for educators to 1) engage in research problems and phenomena 2) implement best practices of scientists and engineers into curriculums, and 3) develop authentic research activities and experiences for precollege students. To learn more, visit: https://www.csats.psu.edu/

The Philadelphia Education Fund's "Teacher in the Workplace" initiative provided formal and informal educators in the area with opportunity to visit local energy industries and participate in STEM curriculum development workshops, explore STEM careers and career pathways, and create a sustained community of practice.

Provide an understanding of and access to STEM careers and career pathways The administration should provide youth with a comprehensive, easy-to-understand landscape of the types of jobs and career pathways that are available within STEM. This can be accomplished by promoting and investing in a curriculum that incorporates career planning into formal and informal learning environments. This programming should highlight the variety of different pathways that are available to achieve a fulfilling career and articulate the different steps students can take to achieve their desired careers. It is also critical that youth have the opportunity to network and explore different types of STEM careers by investing in partnerships between schools, OST providers, business and industry, and STEM Ecosystems.

One example of such a network already operating in Pennsylvania is the Career Ready PA Coalition, which connects K-12 educators, STEM professionals, businesses, military, workforce, and post-secondary education stakeholders to share best practices, resources, and professional development opportunities that will arm students with the knowledge and skills they need to plan for their future careers.

Remake Learning Days Across America is an innovative learning festival for families and youth. Taking root in 17+ regions, these hands-on and engaging events are designed for kids of all ages at libraries, schools, tech centers, museums, play spaces, community centers and more every April and May. The Pennsylvania Department of Education joined Remake Learning Days in their first annual Career Ready PA Backpack Challenge. The Career Ready PA Backpack Challenge is an opportunity for students to obtain artifacts for their career portfolio by participating in festival events with PA Remake Learning Days events. Pennsylvania hosted Remake Learning Days across several regions and ecosystems including: ENGINE of Central PA, Northwestern PA, PA SEED in Southeastern PA, and Remake Learning in Southwestern PA.

Conclusion

In conclusion, the Pennsylvania Statewide STEM Ecosystem (PSSE) hopes that the Biden/Harris administration will consider the priorities recommended above and act to address these items. Although we have listed them separately, each of these issues are intrinsically intertwined, and positive change made about any of these topics will organically strengthen and reinforce efforts that address others.

Appendix G

Philadelphia Ecosystem Impact Evaluation Survey

Introduction

The Philadelphia STEM Ecosystem was established in 2015, and is one of 63 national STEM Ecosystems. The overarching goal of The Philadelphia Ecosystem is to "increase collaboration within, reduce duplication of, identify gaps in, and promote access to STEM education. Our Ecosystem currently has a 10-member Steering Committee, 6 Workgroups, and over 250 members.

You are receiving this survey because you are a formal member of the Philadelphia STEM Ecosystem. Please take 10 minutes to identify how the Philadelphia STEM Ecosystem has impacted your programs, your organization, your community, and your students. We will share the results of this survey with our members, and your feedback will help us to improve and sustain our important work.

AND: If you provide your contact information at the end of this survey, we will enter you into a drawing for a $100 gift card.

General Information

* 1. What best describes the organization in which you work? (choose ONE option)

- [ ] Individual school
- [ ] School district
- [ ] Nonprofit or community organization
- [ ] College or university (as faculty or staff)
- [ ] College or university (as a student)
- [ ] Workforce development agency
- [ ] Business or corporation
- [ ] Government office or agency
- [ ] Philanthropic agency
- [ ] I am currently not employed at an organization
- [ ] I am self-employed
- [ ] Other (please specify)

* 2. How do you spend MOST of your work hours? (choose ONE option)

- [ ] Direct-service (I work directly with K-12 or college-age students)
- [ ] Administration (I oversee staff and programs)
- [ ] Capacity-building (I support others' programs)
- [ ] Research and/or evaluation
- [ ] Fundraising and/or marketing
- [ ] Policy and Legislation
- [ ] Philanthropy
- [ ] Not applicable
- [ ] Other (please specify)

* 3. How long have you (personally) been a Philadelphia STEM Ecosystem member? (choose ONE option)

- [ ] Less than 1 year
- [ ] Between 1 and 2 years
- [ ] Over 2 years
- [ ] Not sure

* 4. Are additional staff in your organization members of the Philadelphia STEM Ecosystem? (choose ONE option)

- [ ] Yes
- [ ] No
- [ ] Not sure
- [ ] Not applicable

5. Over the past 3 years, have you personally participated in:

	Yes	No	Not Sure
The Ecosystem Steering Committee	☐	☐	☐
An Ecosystem Workgroup	☐	☐	☐
An in-person Ecosystem meeting	☐	☐	☐
An Ecosystem conference call	☐	☐	☐
An Ecosystem sponsored event	☐	☐	☐

Access to Resources

* 6. Recruitment. As a result of participating in the Philadelphia STEM Ecosystem, have you or your organization recruited:

	Yes	No	Not Sure
Full-time or part-time staff?	☐	☐	☐
Consultants?	☐	☐	☐
Adult volunteers?	☐	☐	☐
K-12 or college-level student volunteers or interns?	☐	☐	☐
K-12 or college-level student participants?	☐	☐	☐
Other staff or volunteers? (please specify)	☐	☐	☐

* 7. Funding. As a result of participating in the Philadelphia STEM Ecosystem, have you or your organization:

	Yes	No	Not Sure
Learned about new funding sources?	☐	☐	☐
Applied for new funding sources?	☐	☐	☐
Received new funding?	☐	☐	☐
Created a new funding opportunity (if you are a funder)?	☐	☐	☐

Access to Resources

* 6. Recruitment. As a result of participating in the Philadelphia STEM Ecosystem, have you or your organization recruited:

	Yes	No	Not Sure
Full-time or part-time staff?	☐	☐	☐
Consultants?	☐	☐	☐
Adult volunteers?	☐	☐	☐
K-12 or college-level student volunteers or interns?	☐	☐	☐
K-12 or college-level student participants?	☐	☐	☐
Other staff or volunteers? (please specify)	☐	☐	☐

* 7. Funding. As a result of participating in the Philadelphia STEM Ecosystem, have you or your organization:

	Yes	No	Not Sure
Learned about new funding sources?	☐	☐	☐
Applied for new funding sources?	☐	☐	☐
Received new funding?	☐	☐	☐
Created a new funding opportunity (if you are a funder)?	☐	☐	☐

* 8. Professional Development. As a result of participating in the Philadelphia STEM Ecosystem, have you or your organization:

	Yes	No	Not Sure
Participated in a professional development workshop, conference, or special event?	☐	☐	☐
Provided one or more professional development opportunities?	☐	☐	☐
Identified or hired a professional development facilitator?	☐	☐	☐
Recruited participants for professional development activities?	☐	☐	☐

* 9. Program Materials. As a result of participating in the Philadelphia STEM Ecosystem, have you, your organization, or your program:

	Yes	No	Not Sure
Procured new equipment or materials?	☐	☐	☐
Accessed lesson plans or curricula?	☐	☐	☐
Accessed meeting or event space?	☐	☐	☐

What other items have you been able to access?

* 10. Partnerships. As a result of participating in the Philadelphia STEM Ecosystem, have you or you or your organization:

	Yes	No	Not Sure
Partnered with other Ecosystem members on programs, grant proposals, or other activities?	☐	☐	☐
Partnered with individuals or organizations, outside of the Ecosystem, on programs, grant proposals, or others activities?	☐	☐	☐

11. Consider your responses to the questions above. Please provide ONE example of how your Ecosystem participation has benefited your/your organization's recruitment efforts; has helped you access funding; has enhanced your professional development activities; has helped you procure physical resources; AND/OR has resulted in new partnerships.

12. Consider our overarching goals regarding increasing collaboration, decreasing duplication, identifying gaps, and increasing access to STEM education. Is our Ecosystem making progress toward those goals? How, why, or why not?

13. Please provide any additional comments, examples, or other information that speaks to the impact of your Ecosystem participation.

Contact Information (optional)

Providing your contact information is helpful but optional. However, to enter the drawing for a $100 gift card, you must provide your name and email address.

Last Name

First Name

Organization

Program Name (if different from organization)

Thank You!

Thank you for completing our Philadelphia STEM Ecosystem evaluation survey. We hope to gather, download, analyze, and report back on these findings as soon as possible.

Thank you for helping us improve the STEM Ecosystem!

Appendix H

Philadelphia STEM Ecosystem Impact Evaluation Report

Philadelphia Education Fund

Philadelphia STEM Ecosystem Impact Evaluation Report

June, 2019

Philadelphia Education Fund
McKinney Center for STEM Education

Introduction

Ecosystem Overview

Established in 2015, the Philadelphia STEM Ecosystem is a collaboration of over 250 individuals from more than 50 institutions and departments who are deeply invested in science, technology, engineering, and mathematics (STEM) education. Along with 83 other STEM Ecosystems located in the United States, the Philadelphia STEM Ecosystem operates on the conviction that the success of students in STEM is unequivocally beneficial for society.

To effectively execute its model of collective impact, the Philadelphia STEM Ecosystem is supported by the STEM Funders Network as well as its backbone organization, the McKinney Center for STEM Education at the Philadelphia Education Fund (PEF). As the backbone organization, the McKinney Center is responsible for administering the Ecosystem, with duties including but not limited to:

- setting the vision and mission;
- facilitating communication and connections among Ecosystem members; and
- ensuring the continuance of the local Ecosystem movement.

In its organizational role as a nonprofit organization located in the heart of Philadelphia, the McKinney Center aims to promote access to STEM education and confront the historical and structural barriers facing students, especially those of marginalized identities. The goal of the Philadelphia STEM Ecosystem, which is to inspire ALL students to succeed in STEM by drawing on the rich STEM resources of the Philadelphia region, is carried out through its concrete and strategic mission: *to increase collaboration within, reducing duplication of, identifying gaps in, and promoting access to STEM education.*

Ecosystem Infrastructure and Strategy

The Philadelphia STEM Ecosystem consists of a 10-member Steering Committee, 6 Workgroups, and over 250 members that work together with the Philadelphia Education Fund. Each component of the Ecosystem plays a role in making progress towards these goals:

Backbone Organization. As the Backbone Organization,. PEF facilitates connections between Ecosystem members and ensures the continuance of the local Ecosystem movement; this is carried out through extensive online communication and dissemination of the Ecosystem's work through a web presence. As the backbone organization, PEF sets the mission and vision of the Ecosystem.

Steering Committee. As a collective of stakeholders actively engaged in guiding the ecology of the Philadelphia STEM Ecosystem, the Steering Committee consists of a representative from the backbone organization and a chair from each of the Workgroups. The Committee discusses matters raised by local and national Communities of Practice, assesses progression of Ecosystem objectives, and determines new initiatives or curative actions through ongoing communication and the 10 meetings it holds each year.

Workgroups. Workgroups consist of smaller collectives of Ecosystem members and are critical to the Ecosystem's overall strategy. Focused around topics of interest, Workgroup members are asked to define specific goals related to STEM education in Philadelphia and proceed to carry out actions toward those goals. Members incorporate their diverse lived experiences around the topic to determine goals and a plan of action to be accomplished within a year. Workgroups can be chaired by any members of the Ecosystem. Workgroup chairs work with the backbone organization to recruit members, facilitate discussion and communication within the Workgroup, set meeting times and schedules, and report directly to the Steering Committee. Evaluation of Workgroups' progress occur yearly, after which they may either continue or disband.

Current Workgroups include:

- *Computer Science*: Bridging the digital divide to create pathways into the tech workforce o Education for Sustainability: Cultivating responsible citizenship
- *Professional Development:* Empowering STEM educators to impact students o Social Justice: Creating access and inclusion for all communities
- *STEM Through Sport:* Building strong STEM interest through sports
- *Workforce Development:* Building STEM career skills and connections

A previous Workgroup was:

- Community Partnerships: Building coalitions to enrich STEM learning

Members. All Ecosystem members are stakeholders actively engaged in local STEM education efforts, and part of a diverse spectrum of individuals and organizations: schools and school districts, intermediaries and community-based groups, museums and environmental centers, colleges and universities, government agencies, businesses and corporations. Attending member meetings 2-3 times per year and optional meetings and webinars, members receive updates and continual communication from the backbone organization and engage in cross pollination with Workgroups. In addition to supporting different levels of involvement including options to serve on the Steering Committee or be a part of a Workgroup, the Ecosystem serves individual members as a network to disseminate information and resources and influence STEM education, policy, and funding.

Evaluation Methodology

In order to evaluate the effectiveness and impact of the Philadelphia STEM Ecosystem, PEF designed and distributed an online SurveyMonkey form to formal members of the Philadelphia STEM Ecosystem. This survey included a combination of multiple choice and open-ended questions to gather information on how the Ecosystem has impacted its members' programs, organizations, communities, and students. The survey collected responses from January 18th, 2019 through February 6th, 2019. After the survey was closed, the data was then downloaded and analyzed to pinpoint trends, attitudes, and feedback from respondents regarding their experiences and levels of satisfaction as Ecosystem members.

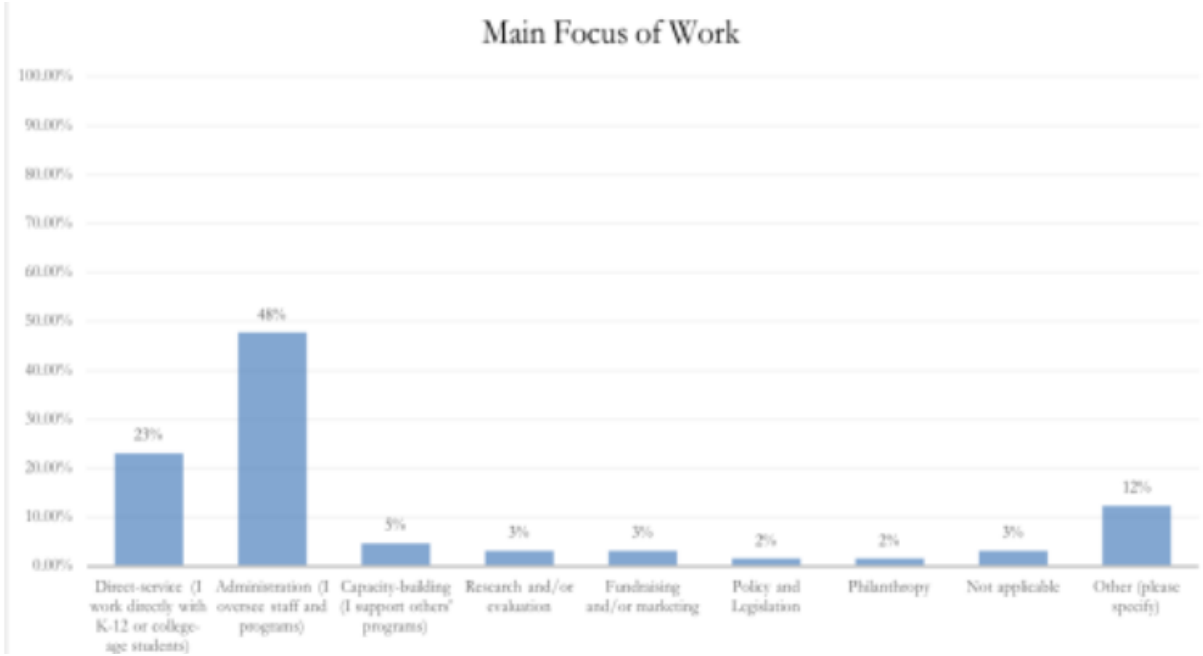
Evaluation Results

Out of 252 formally registered Philadelphia STEM Ecosystem members, 65 responded to the survey—representing approximately 25.8% of the group. The responses to 10 multiple choice questions and 3 open-ended questions are graphically or textually represented and interpreted below. A more complete analysis of each question is included as **ATTACHMENT A.**

1. What best describes the organization in which you work?

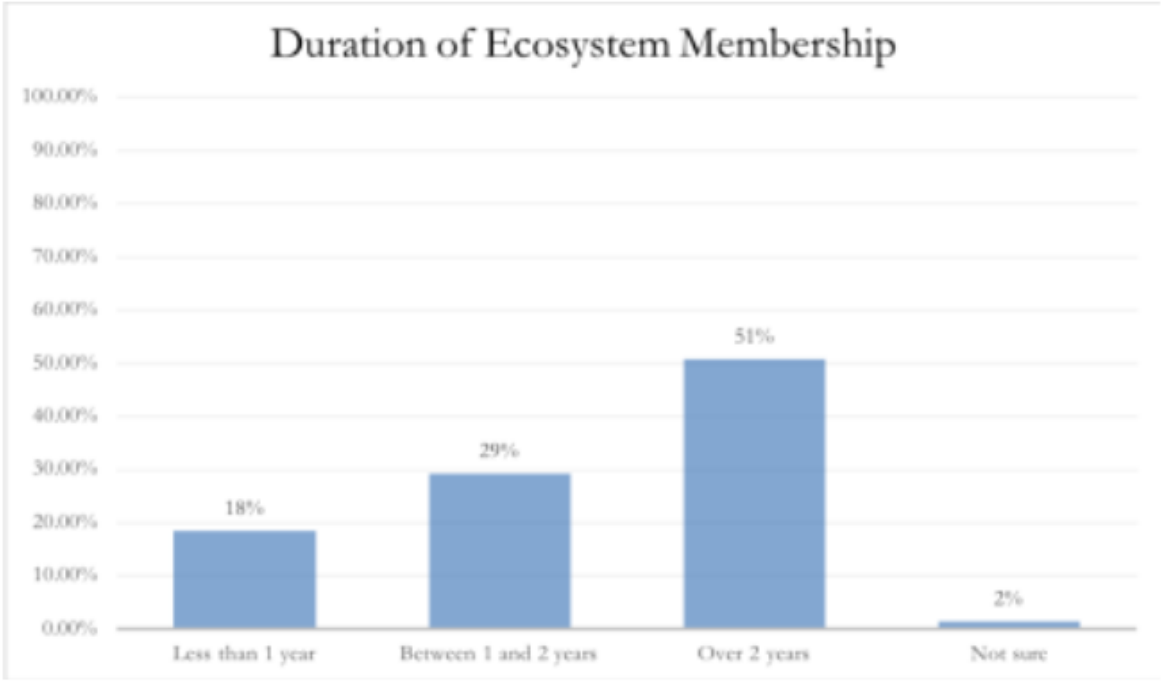
The most commonly represented organization type among Ecosystem members is the nonprofit or community organization.

2. How do you spend MOST of your work hours?



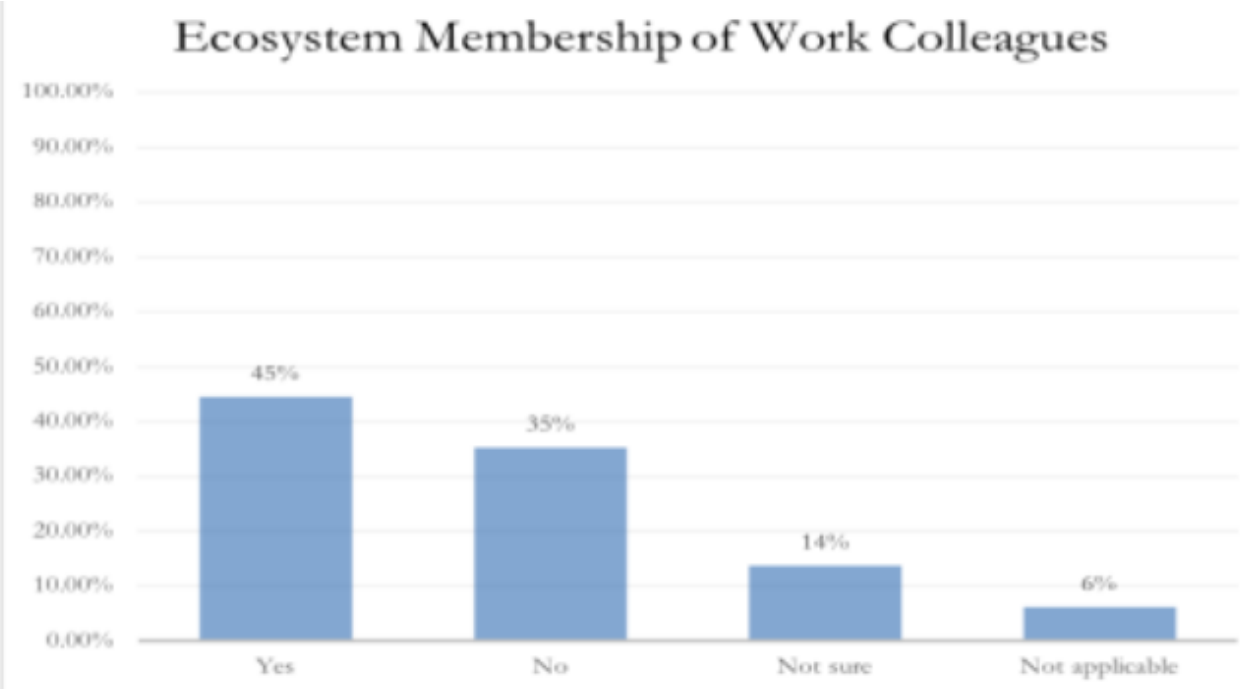
Nearly half of the respondents are administrators, overseeing staff and programs as their primary task.

3. How long have you (personally) been a Philadelphia STEM Ecosystem member?



Over half of the respondents have been Ecosystem members for over two years.

4. Are additional staff in your organization members of the Philadelphia STEM Ecosystem?



Less than half are aware of fellow staff members at their respective organizations who are also members of the Philadelphia STEM Ecosystem.

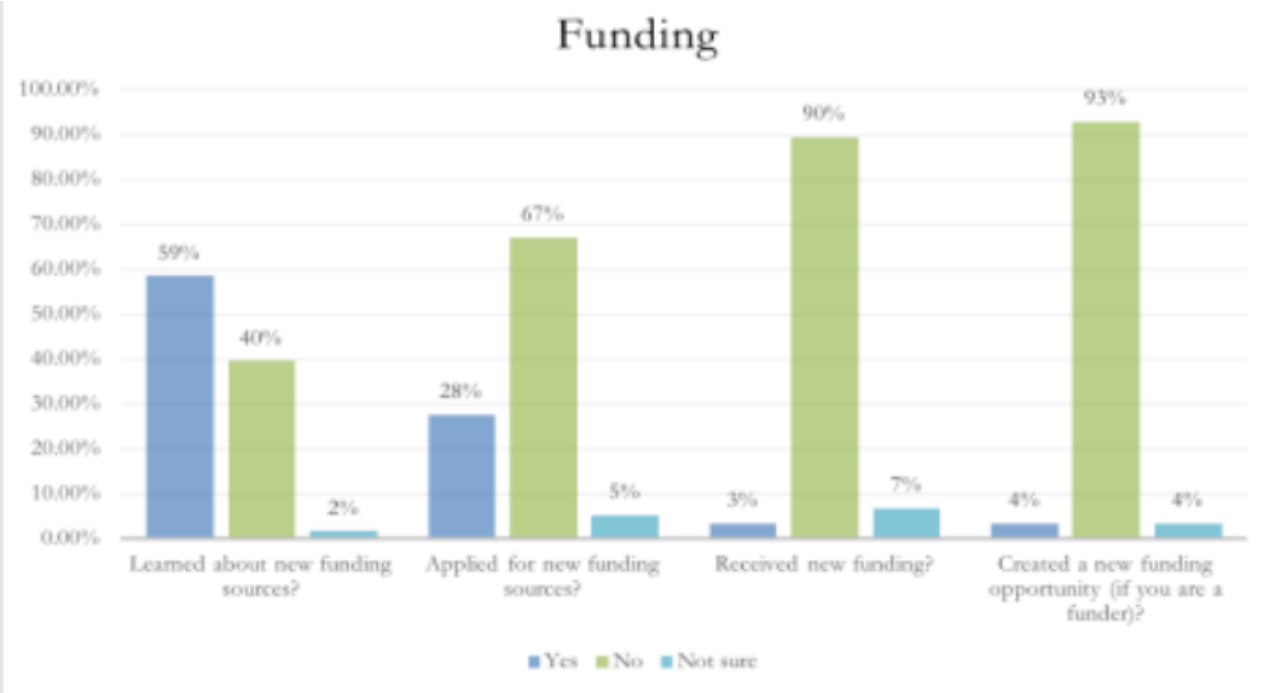
5. Over the past 3 years, have you personally participated in:

The majority of Ecosystem members have participated through in-person Ecosystem meetings, have attended an Ecosystem-sponsored event, and have participated in an Ecosystem Workgroup.

6. As a result of participating in the Philadelphia STEM Ecosystem, have you or your organization recruited:

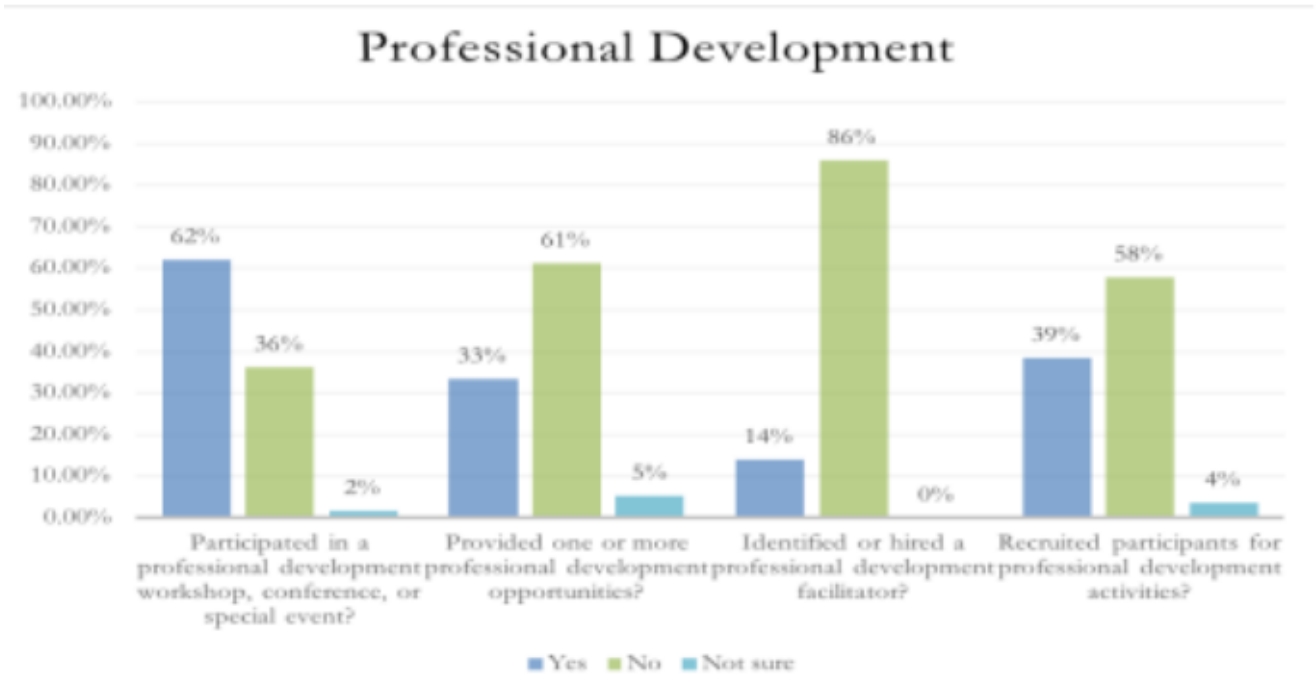
Recruitment for members' organizations is not currently a major function or product of the Ecosystem.

7. As a result of participating in the Philadelphia STEM Ecosystem, have you or your organization:



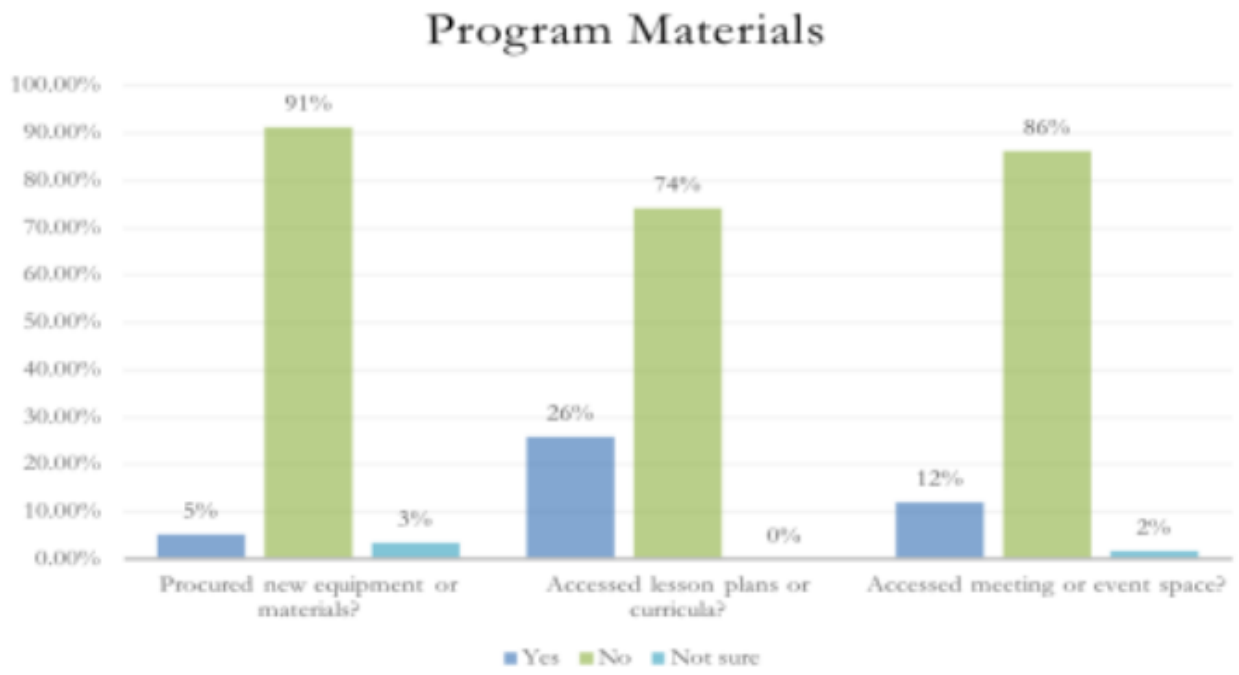
While Ecosystem members are likely to learn about new funding opportunities, they are less likely to create new funding opportunities or receive new funding.

8. As a result of participating in the Philadelphia STEM Ecosystem, have you or your organization:



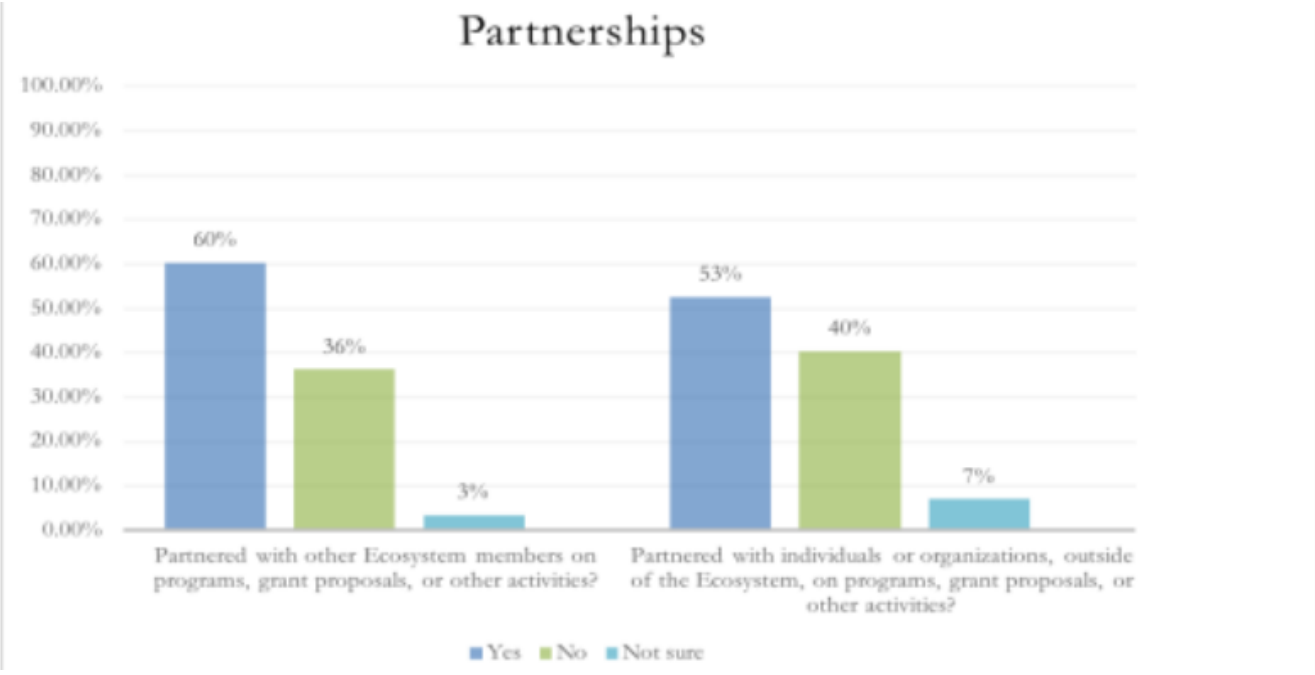
The Ecosystem is utilized primarily as a direct provider of professional development to its members, rather than a platform for members to create their own professional development events.

9. As a result of participating in the Philadelphia STEM Ecosystem, have you, your organization, or your program:



Most members have not accessed equipment, materials, lesson plans, curricula, or event/meeting spaces.

10. As a result of participating in the Philadelphia STEM Ecosystem, have you or your organization:



Most respondents indicated that they have partnered with other Ecosystem members or outside individuals or organizations.

11. Consider your responses to the questions above. Please provide ONE example of how your Ecosystem participation has benefitted you or your organization's recruitment efforts; has helped you access funding; has enhanced your professional development activities; has helped you procure physical resources; AND/OR has resulted in new partnerships.

Out of 65 total survey participants, 38 provided responses to this open-ended question. The following are sample comments relevant to each category. See ATTACHMENT B for a complete list and analysis of responses to this question.

How Ecosystem participation has benefitted respondents and their organizations' recruitment efforts:

- "Information about our activities were shared and promoted to the larger ecosystem, which attracted new members and awareness."
- "We were able to recruit participants for a STEM based PD opportunity for teachers last summer."

How Ecosystem participation has helped respondents access funding:

- "The Ecosystem has introduced us to other professionals in the STEM field. It has helped us build relationships and we have submitted grants together through these new relationships."

How Ecosystem participation has helped respondents enhance professional development activities:

- "By participating in the PD working group my organization was able to design a PD for science teachers last summer. This resulted in the training of 12 local science teachers and hiring of PT instructors for informal science learning environments."
- "By co-chairing the PD workgroup, I have been able to gain a better sense of what STEM PD opportunities are available in the Philly area and then convene PD providers to share ideas and best practices. By having knowledge of the local STEM PD network and opportunities, I am better informed to support STEM teachers who graduate from the STEM teacher prep program that I direct. Also, by working with STEM PD providers in the region to improve alignment of their teacher PD, I aim to enhance ongoing learning opportunities for STEM teachers so that the PD translates into classroom practice that affects student learning. The STEM Ecosystem provides me with a forum to volunteer to improve STEM PD in ways that are related to but not explicitly part of my full-time job..."

How Ecosystem participation has helped respondents procure physical resources:

- *"We've benefited from our Ecosystem partnership by having access to research and resources that we use as guidelines for our internal program development."*
- *"Having the opportunity to meet outside of program activities to catch up and know more about each other's work is what we gain. Material benefits of these experiences are negligible yet doesn't negate the time invested for the possibility of future impacts..."*

12. Consider our overarching goals regarding increasing collaboration, decreasing duplication, identifying gaps, and increasing access to STEM education, is our Ecosystem making progress toward these goals? How, why, or why not?

Out of 65 total survey participants, 42 provided responses to this open-ended question. The following are a selection of sample comments regarding the Ecosystem's fulfillment of its goals as well as areas for growth. See ATTACHMENT C for a complete list and analysis of responses to this question.

Regarding the Ecosystem's progress towards its goals:

- "I believe it inspires more collaboration. From the vantage of a longstanding science educational institute we've worked with many partners over the years. It has not opened new partnerships but strengthen previous ones as we have this common time to consider our impact from a larger context through the STEM ecosystem. As for decreasing duplication, identifying gaps and increasing access I can't speak to those directly but will say all the folks I know doing this work could do more with more funding. We are collaborating and have been but we are only so many people and people power is expensive. Hands-on science education is also expensive; materials and busing for experiences. We collaborate out of necessity to run our programs with bare essential funds."
- "Increase collaboration? Yes. STEM Ecosystem events that also provide space for networking allows members (including me) to share information and consider ways to collaborate. The PD workgroup is a good example of increased collaboration between PD providers, individuals involved STEM teacher prep, school district officials, and others to improve STEM PD. I don't have a good example as to how the Ecosystem has decreased duplication. By creating a database of PD providers, the PD workgroup was able to identify local assets and gaps for STEM teacher learning. I don't have empirical evidence that directly shows that the Ecosystem is increasing student access to STEM education."

Regarding the Ecosystem's shortcomings and potential areas of improvement:

- "The ecosystem has shared goals with the Philadelphia Science Festival network. It would be interesting to see how the two groups might better coordinate, as there are so many shared members and participants, to meet some of the goals. The overall purpose of the ecosystem isn't always clear--being open and communicative about the opportunities presented through the ecosystem would be helpful."
- "Philadelphia is a huge complex system and I think that the ecosystem has established a framework to achieve these goals. We still feel that there is significant competition for resources (financial) and audience (recruiting and retaining teachers for programs). It is still challenging for us to collaborate with other organizations in Philadelphia, I would say mostly because organizations as a whole are working from a scarcity mindset and true collaboration will require some significant cultural shifts."

13. Please provide any additional comments, examples, or other information that speaks to the impact of your Ecosystem participation.

Out of 65 total survey participants, 20 provided responses to this open-ended question. See ATTACHMENT D for a complete list of responses.

Selected comments:

- “Having a formal organization that brings together individuals invested in STEM learning enables Philly to have a forum to share info, generate new ideas, and consider what people across different sectors can do to improve STEM learning. The STEM Ecosystem as an organization helps people who may not normally cross paths or reach out to each other, to do so in the interest of student STEM learning.”
- “I serve as an 'at large' member of the STEM Ecosystem SC and provide input to discussions/decisions that the SC make. I believe the SC plays an important bridging role between the 'backbone organization' and the ~250 members of the Ecosystem. It can work with the backbone organization to develop the Ecosystem's agenda and annual plans and continue to increase the impact it delivers. The SC can also ensure that the 'backbone organization' is transparent in its use of any funding it receives and that it remains 'independent' of the organization of which is it a member.”

Summary

Respondent Characteristics

The 65 Ecosystem members who responded to the survey represent a quarter of the total population. The majority of the respondents represent non-profit and community organizations and work in administrative roles, with less representation from educators and classroom teachers. Over half of the respondents have been Ecosystem members for over 2 years, while 45% of respondents know work colleagues who are also Ecosystem members.

Access to Resources

Members are most likely to interact with the Ecosystem via participation in meetings, events, and professional development. These resources are more likely to impact Ecosystem members themselves than to have far-reaching impact on members' organizations. This is demonstrated through the relatively uncommon occurrence of volunteer and employment recruitment. Resources gained through the Ecosystem are more information-based, such as lesson plans and toolkits. Material resources, such as funding, are less common through the Partnerships are among the most prevalent benefits to emerge from Ecosystem participation.

Experiences and Assessment of Progress

The open-ended responses exhibit a diverse range of member experiences. Respondents reported professionally rewarding experiences as a result of the Ecosystem, mainly through partnerships with organizations and schools.

Regarding barriers to participation and shortcomings of the Ecosystem, respondents reported a lack of time and funding, difficulties in accessing Workgroups or the Steering Committee, and limited tangible benefit for their organizations. Progress toward goals is most likely to manifest through increased collaborations, but results are inconclusive in regard to the Ecosystem's progress in reducing duplication. Respondents reported a desire to have increased access to information regarding the occurrence of meetings and events.

Key Evaluation Results

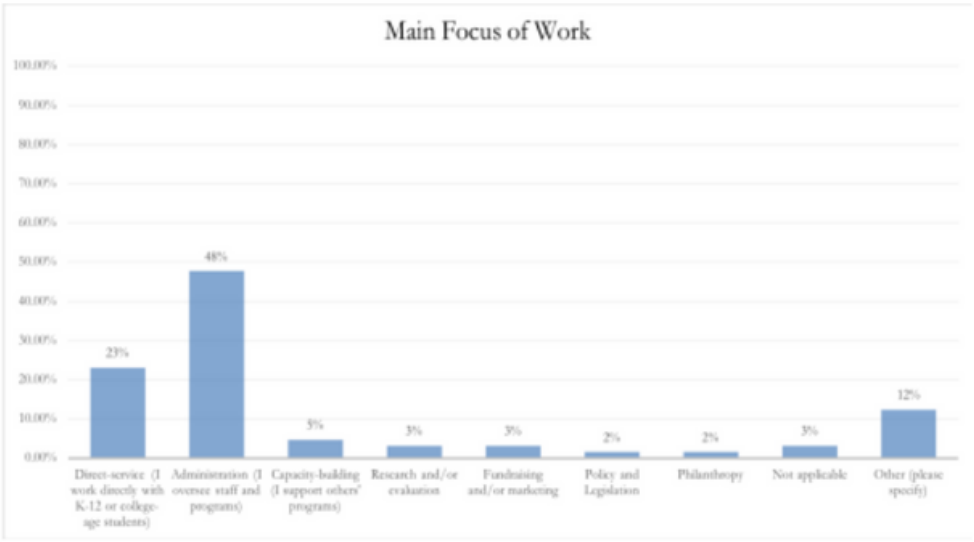
- Partnerships and participation in PD are the two most tangible benefits of membership. o Many survey respondents emphasize the collaborative nature of the Ecosystem and its network as a means of disseminating information.
- Criticisms of the Ecosystem include the lack of physical resources and funding, as well as the difficulty in getting involved with smaller groups such as the Steering Committee.. o Respondents' suggestions for improvement include:
  - More direct work with teachers, school districts, and community organizations • Increased access to material resources and funding opportunities
  - Better means of evaluating Ecosystem effectiveness and progress
  - More transparency and responsiveness from members, especially Workgroup leadership and Steering Committee members
- Ultimately, Ecosystem members who participated in the survey generally felt positively about their experience within the Philadelphia STEM Ecosystem, citing the Ecosystem's role in allowing members to foster collaborations, acquire information, and improve the visibility of their own organizations.

ATTACHMENT A: ANALYSIS OF QUESTIONS 1-10

1. What best describes the organization in which you work?

All 65 survey participants responded to the question. The most commonly represented organization type among Ecosystem members is the nonprofit or community organization at approximately 37%, or 24 out of 65 individuals. Faculty or staff at colleges and universities are the second most represented group, with 23% or 15 individuals. Individuals working in businesses and corporations make up 9% of the sample, or 6 individuals. Another 9% or 6 individuals indicated Other, with the written responses "museum", "non-profit healthcare institution", "union", "PEF board director", "school district teacher and also am the founder and director of a non-profit STEM education organization that I implement in the summers", and "informal education center". School districts and individual schools represented by 8% of the sample or 5 individuals each. Finally, 2 individuals are not employed by an organization, and 1 individual is working at a government office or agency and another person is self-employed. None of the respondents are college or university students or employees at workforce development or philanthropic agencies.

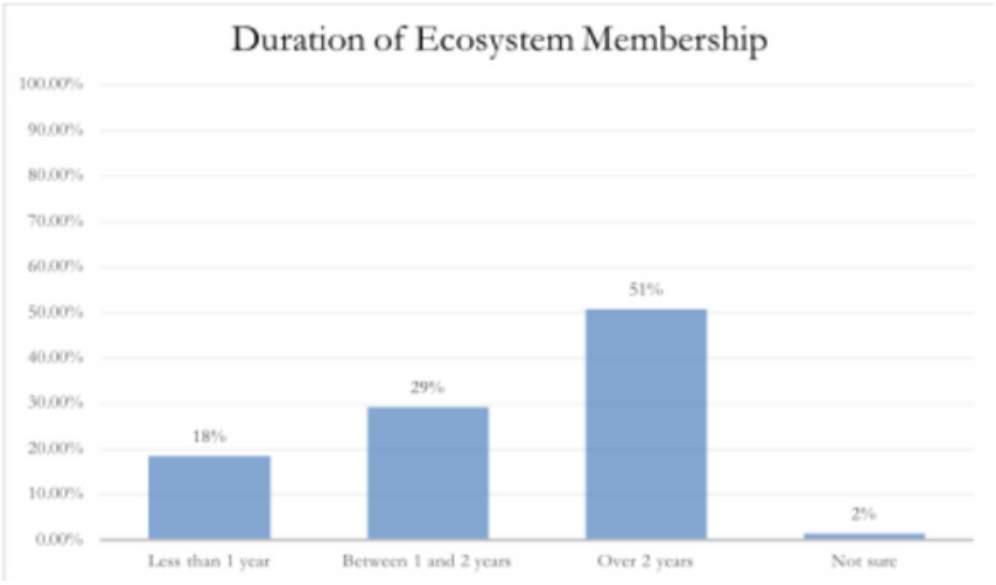
2. How do you spend MOST of your work hours?



All 65 survey respondents answered this question. Nearly half of the respondents are administrators, overseeing staff and programs as their primary task: 31 people or 48% of the sample. Less than a quarter of respondents work directly with students, either K-12 or college-age: 23% or 15 people. The remaining 6 categories are all represented to some degree: 5% or 3 people in capacity-building, 3% or 2 people in both research and fundraising categories, 2% or 1 person in both policy and philanthropy categories. 3% or 2 people selected "Not applicable".12% or 8 individuals wrote their own responses, including "data analytics",

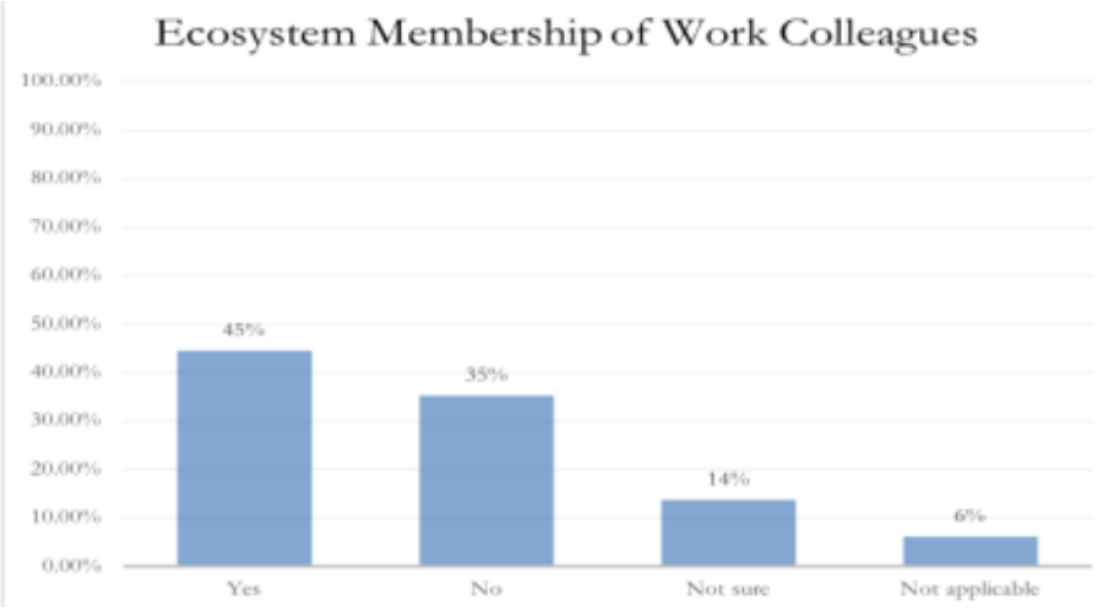
"writing", "secondary school services, programs, and partnerships", "50/50 direct service and admin", "representing union members", "retired, voluntary board membership", "educator/5th grade special ed friendly classroom", and "partnership & program development". From this distribution of work experiences and expertise, it can be seen that a majority of the sample occupy leadership and administrative positions. Individuals in leadership positions as well as those who work in the nonprofit sector overlap which may influence their motivation for voluntarily joining the Ecosystem, where they may meet fellow industry professionals, leaders, and individuals with influence and authority. Less than a quarter of the sample works directly with students as their predominant focus.

3. How long have you (personally) been a Philadelphia STEM Ecosystem member?



All 65 survey respondents answered this question. Over half of the respondents have been Ecosystem members for over two years: 51% or 33 individuals. The next populous category is between 1 and 2 years, with 29% or 19 individuals. 18% or 12 individuals have been members for less than 1 year, and 2% or 1 individual selected "Not sure". When these statistics are compared to responses to the open-ended questions at the end of the survey, it is apparent that Ecosystem members who have been members for shorter periods of time do not have as much experience as those who have been members for over 2 years—who are able to provide feedback with both more breadth and depth due to their higher levels of experience. Moreover, Ecosystem members with less experience may not be as willing to participate in the evaluation due to an awareness of their comparative lack of familiarity with the Ecosystem's structure, function, and features.

4. Are additional staff in your organization members of the Philadelphia STEM Ecosystem?



All 65 survey respondents answered this question. Less than half (45% or 29 individuals) are aware of fellow staff members at their respective organizations who are also members of the Philadelphia STEM Ecosystem, while 23 individuals or 35% do not know any colleagues who are also in the Ecosystem. 14% or 9 people are not sure, and for 4 people or 6% of the group, this is not applicable. These statistics suggest that individuals may learn about the Ecosystem through colleagues who are existing members and be influenced to join through this avenue, and that growing the Ecosystem is dependent on networking among professionals working in fields relevant to STEM education.

5. Over the past 3 years, have you personally participated in:

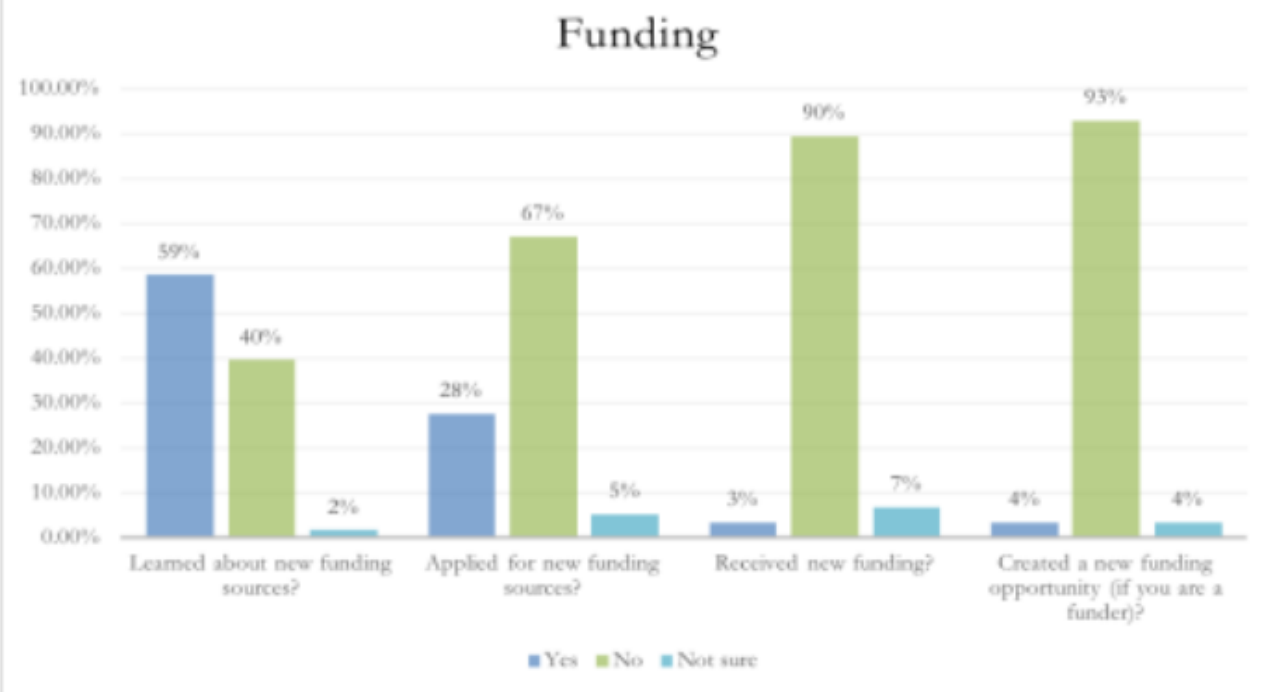
All 65 survey respondents answered this question. An overwhelming majority of Ecosystem members have participated in the collective through in-person Ecosystem meetings (84% or 53 people have), a majority of members have attended an Ecosystem-sponsored event (63% or 40 people have), and a majority of members have participated in an Ecosystem workgroup (61% or 37 people).

In terms of more uncommon avenues of participation, however, Ecosystem members are the least likely to participate in the Ecosystem Steering Committee—with 68% or 41 people never having participated. The second most unpopular method of participation is through Ecosystem conference calls, with 60% or 36 people never having participated. In terms of Steering Committee participation, the small size of the Committee and its designation as a group of stakeholders may create a sense of exclusivity and be less accessible as means of participation for members. Additionally, along with Ecosystem conference calls, Steering Committee activities may be difficult for individuals with competing time commitments and responsibilities to access, which may explain the lower level of member involvement.

6. As a result of participating in the Philadelphia STEM Ecosystem, have you or your organization recruited:

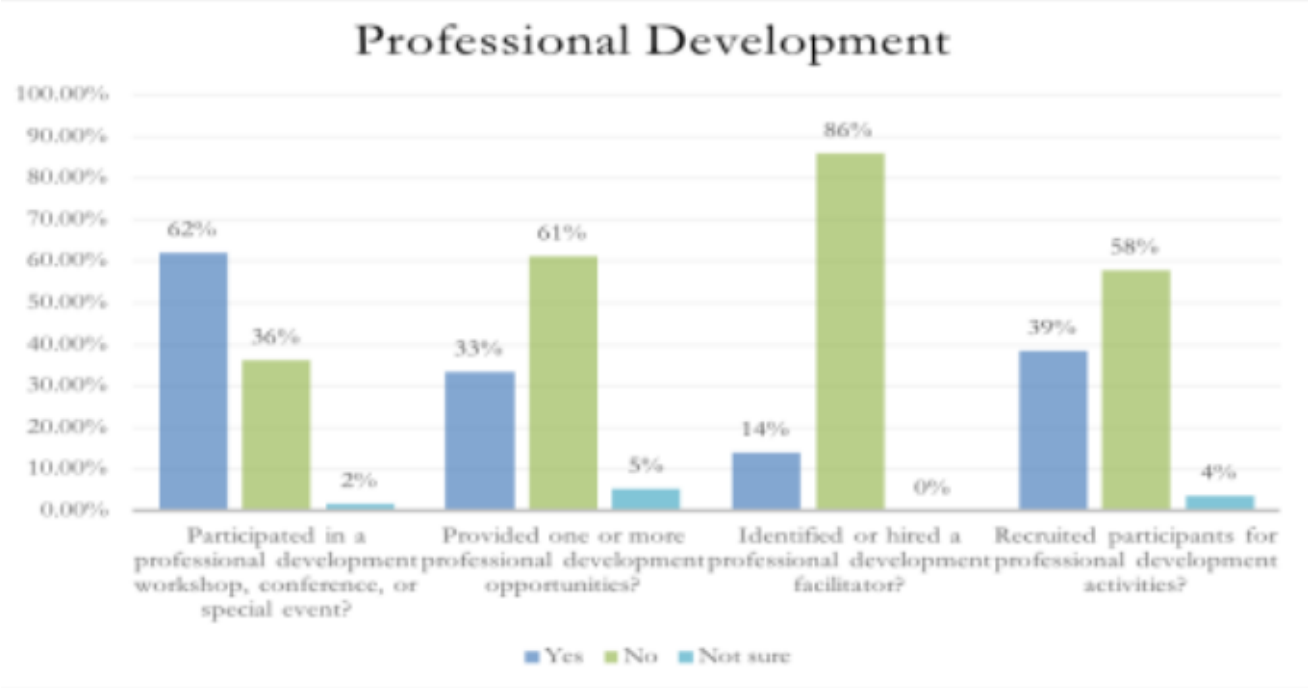
Fifty-eight out of 65 survey respondents answered this question. From the responses to this question, it is evident that recruitment for members' organizations is not a dominating feature or function of the STEM Ecosystem. Across all 5 positions, 73% or more respondents indicated that they had never recruited individuals into their organizations for a certain position. Additionally, among the members who have recruited individuals into their organizations, it is evident that people are much more likely to be recruited into non-paying positions (adult volunteers, K-12 or college-level student volunteers or interns, and K-12 or college-level student participants). This may be due to the comparatively lower commitment required for many volunteer, participant, and intern positions as opposed to the much more complex processes of hiring full-time staff, part-time staff, and consultants.

7. As a result of participating in the Philadelphia STEM Ecosystem, have you or your organization:



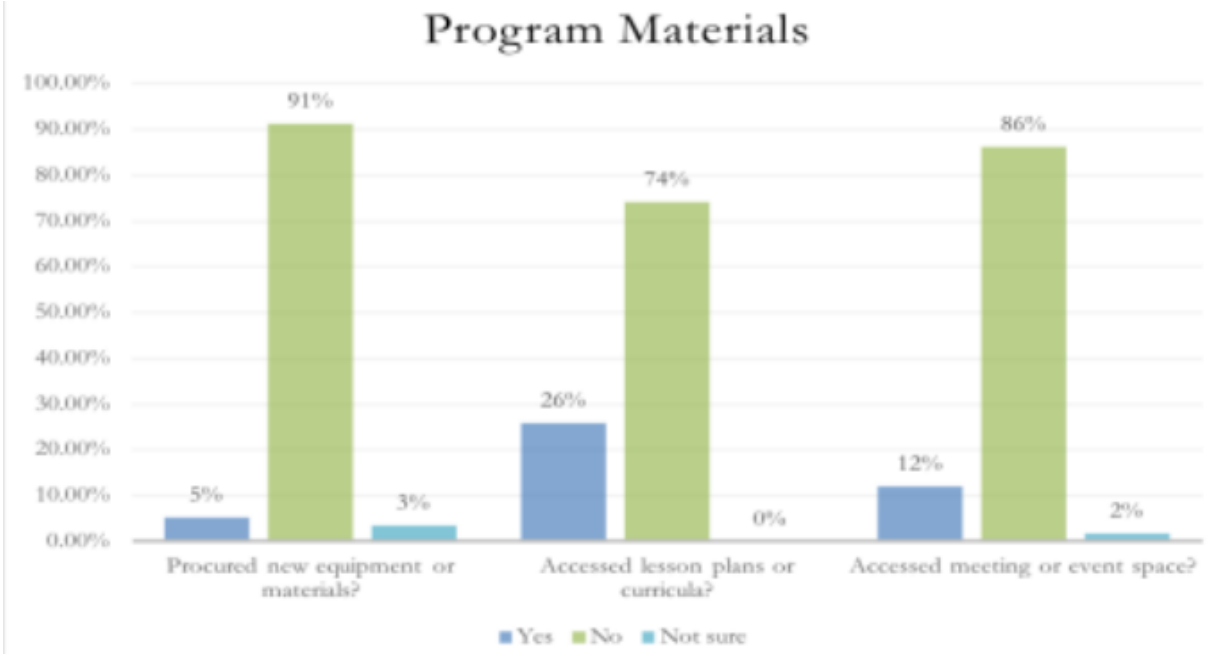
Fifty-eight out of 65 survey respondents answered this question. While Ecosystem members are likely to learn about new funding opportunities, with 59% or 34 people having done so, members are extremely unlikely to create new funding opportunities or receive new funding. That said, 2 individuals indicated that they have received new funding and 2 individuals indicated that they had created a new funding opportunity. While a sizable number of respondents have applied for new funding sources (16 people), it is still unlikely to occur.

8. As a result of participating in the Philadelphia STEM Ecosystem, have you or your organization:



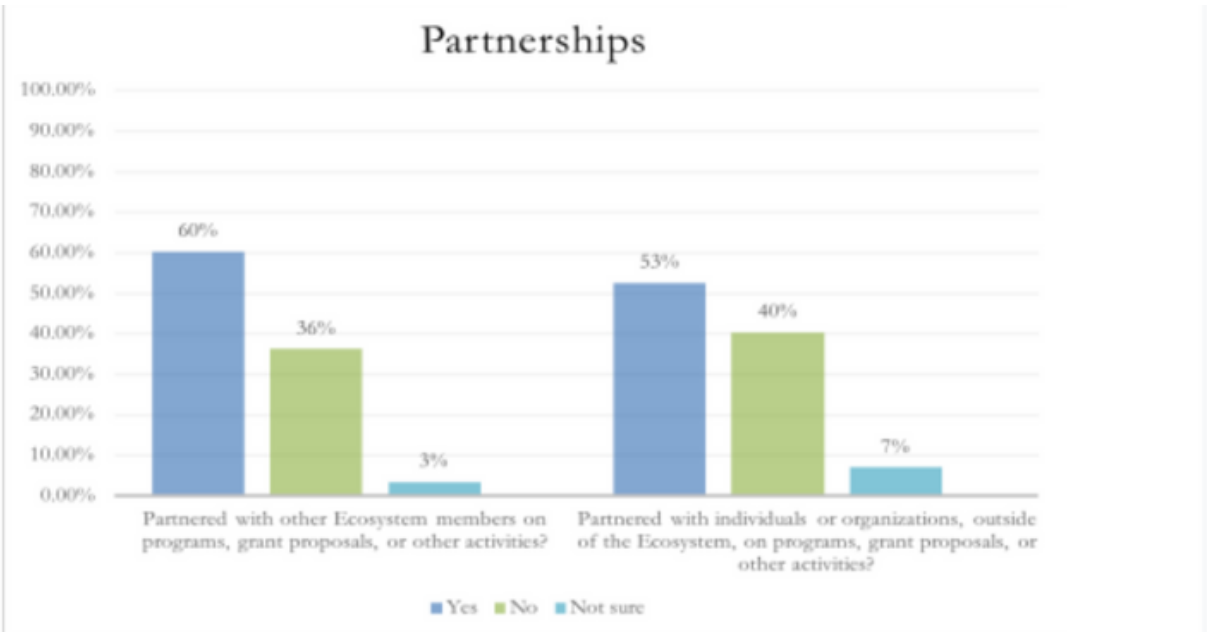
Fifty-eight out of 65 survey respondents answered this question. Members are very unlikely to use the Ecosystem to identify or hire a professional development facilitator and are unlikely to provide professional development opportunities through the Ecosystem. However, the fact that 62% of respondents have participated in some form of professional development through the Ecosystem demonstrates that the STEM Ecosystem is utilized more as a direct provider of professional development to its members rather than a platform for members to create their own professional development events. As a result, this may indicate that PD offerings through the STEM Ecosystem are more likely to impact Ecosystem members but are self-contained and less likely to directly benefit those outside of the Ecosystem.

9. As a result of participating in the Philadelphia STEM Ecosystem, have you, your organization, or your program:



Fifty-eight out of 65 survey respondents answered this question. A majority of respondents have not accessed new equipment or materials, lesson plans or curricula, or event and meeting spaces. Members are most likely to access lesson plans, followed by meeting space, with new equipment and materials the least likely to be attained. This may be interpreted in the context of the Ecosystem being an entity and network that does a significant amount of its correspondence, organization, and networking online. Through the web, lesson plans can be more efficiently spread, compared to materials and equipment which is not only costly, but also more difficult to arrange.

10. As a result of participating in the Philadelphia STEM Ecosystem, have you or your organization:



Fifty-eight out of 65 survey respondents answered this question. A majority of respondents indicated that they have partnered with other Ecosystem members or outside individuals or organizations. However, partnerships with Ecosystem members are more common. This demonstrates that the Ecosystem is most effective as an avenue to foster networking and collaboration among different sectors, professionals, and backgrounds. The Ecosystem is more effective in fostering partnerships than in recruiting, funding, or program materials.

ATTACHMENT B: COMPLETE LIST OF RESPONSES TO QUESTION 11

How Ecosystem participation has benefitted respondents and their organizations' recruitment efforts:

- "Information about our activities were shared and promoted to the larger ecosystem, which attracted new members and awareness."
- "We were able to recruit participants for a STEM based PD opportunity for teachers last summer."
- "By being a member of the Ecosystem in general, I have been able to share info about my STEM teacher prep program; I don't have direct evidence of whether or not this has helped us with STEM teacher recruitment though."
- "We learned about the UPenn education graduate student program and got a volunteer from that. Also attended the PSD Workshops on Professional Development."
- "The subgroup Stem Through Sport has gathered staff from Sports Based Youth Development programs to explore how to incorporate STEM education into sports education."

How Ecosystem participation has helped respondents access funding:

- "The Ecosystem has introduced us to other professionals in the STEM field. It has helped us build relationships and we have submitted grants together through these new relationships."

How Ecosystem participation has helped respondents enhance professional development activities:

- "I have taken the topics discussed at the PD events back to my team. For example, cultural sensitivity and curriculum alignment."
- "By participating in the PD working group my organization was able to design a PD for science teachers last summer. This resulted in the training of 12 local science teachers and hiring of PT instructors for informal science learning environments."
- "By co-chairing the PD workgroup, I have been able to gain a better sense of what STEM PD opportunities are available in the Philly area and then convene PD providers to share ideas and best practices. By having knowledge of the local STEM PD network and opportunities, I am better informed to support STEM teachers who graduate from the STEM teacher prep program that I direct. Also, by working with STEM PD providers in the region to improve alignment of their teacher PD, I aim to enhance ongoing learning opportunities for STEM teachers so that the PD translates into classroom practice that affects student learning. The STEM Ecosystem provides me with a forum to volunteer to improve STEM PD in ways that are related to but not explicitly part of my full-time job..."
- "The Ecosystem has provided STEM certification information and Makerspace development supports."
- "We were able to create an opportunity for external PD providers to learn about SDP's needs and best practices for working with the District."

How Ecosystem participation has helped respondents procure physical resources:

- "We've benefited from our Ecosystem partnership by having access to research and resources that we use as guidelines for our internal program development."
- "...I have not accessed any sort of funding or physical resources through the Ecosystem; my co-chairs and I provided refreshments for events out of our own pockets."
- "Having the opportunity to meet outside of program activities to catch up and know more about each other's work is what we gain. Material benefits of these experiences are negligible yet doesn't negate the time invested for the possibility of future impacts..."
- "*Limited: I have used the lesson plans and curricula in my classroom."

How Ecosystem participation has resulted in new partnerships for respondents:

- “We were able to partner with the school district on programs through participation on a workgroup.”
- “We partnered with the School District of Philadelphia on a PA smart grant proposal.”
- “The ecosystem has kept me informed of what is happening in Philadelphia and how we can work within the city. We are an organization with a strong focus on partnerships and thus sometimes it is hard to point to one particular activity that resulted in partnership or funding. Certainly, there are ways I feel the ecosystem has contributed to our name recognition and willingness of other organizations to support or partner with us...”
- “Participation has helped us sustain partnerships, which are crucial to the work we do connecting STEM researchers with the public.”
- “While presenting at CS4Philly 2017, many presenters were interested to learn more and support our effort in promoting CS.”
- “We will use the ecosystem to raise awareness about partnership opportunities.”
- “Strengthen professional network. Partnerships are relationship based and take time. Knowing who and what people do is essential to be responsive to funding and programmatic needs.”
- “It was great to have the opportunity for the work of the Partnership working group to share on the STEM partnership tool kit to our university network.”
- “The Ecosystem has been a resource in identifying potential partners and strategies for partnering and marketing.”
- “SciStarter, Science Cheerleaders, and the STEM Ecosystem through the Philadelphia Education Fund, collaborated on Science at the Sixers with a citizen science expo, in game activities and more.”
- “Resulted in new partnerships by identifying organizations that I did not know were active in providing PD for teachers.”
- “Co-authored poster presentation From Math to Martial Arts through PE American Mathematical Society and Mathematical Association of America.”
- “Networking with peer organizations.”
- “By attending the Ecosystem meetings and activities, I've been able to expand PSBR's partnerships throughout the region.”

Other comments:

- “Information dissemination.”
- “Other science teachers in my department have benefited from this program.”
- “Unclear, some of these relationships were pre-existing.”
- “It helps significantly to know what is happening around Philadelphia on STEM Education.”
- “Provides information on upcoming opportunities that I can share with the teachers I coach.”
- “STEM Ecosystem provides access to people with answers to the important questions we have, and to resources to build our capacity.”
- “Learning and acquiring new knowledge about the Philadelphia workforce and educational institutions that reflect STEM initiatives.”
- “I've just joined. Looking forward to participating in upcoming events.”
- “I only joined the Ecosystem a few weeks ago, as a consequence, I do not have any examples.”
- “Being connected to a larger community of people with similar goals and missions is empowering in itself. I wish we could easily respond to each other about our challenges and questions.”
- “I have met new organizations and people who have enhance my offering to my students. I haven't procured anything at this time, but I am considering it.”
- “Has helped others learn about some of our STEM and Technology programs at our university.”

Analysis

The respondents provided 38 comments, spanning across all 5 categories. Two comments (5%) were from participants who had recently joined the Ecosystem and stated that they were not able to produce any examples. One individual may have misunderstood the question; they responded with "unclear, some of these relationships were pre-existing" rather than their experiences in the Ecosystem.

Five comments (13%) described successful recruitment efforts for Ecosystem members and their organizations as a result of utilizing the Ecosystem; for example, one organization was able to get "a volunteer" from the "UPenn education graduate student program" they had learned about through the Ecosystem. Other comments described successes with subgroups who were able to gather staff from "Sports Based Youth Development", colleagues being able to also benefit from Ecosystem programs and resources, and the recruitment of both "participants" and paid "PT instructors" for STEM-based professional development events through the Ecosystem. Moreover, 7 comments (18%) discussed members' experiences with professional development or PD. Participants appreciated the Ecosystem as a source of development through entities like "STEM certification information and Makerspace development supports," PD for science teachers, and "PSD Workshops on Professional Development".

The most numerous comments were those relating to partnerships and, with 13 comments (34%) addressing this aspect of the Ecosystem. Examples of partnerships that members formed including relationships that "submitted grants together", "co-authored [a] poster presentation" on math and martial arts and worked with the Partnerships working group on a "STEM partnership tool kit". The areas least addressed were funding and physical resources, with 3 mentions each; while individuals were able to submit grants, often through partnerships with school districts and other organizations, members had difficulty obtaining "material benefits"; one participant mentioned that she and her co-chair had to "provide refreshments for events out of their own pockets" due to an inability to access "funding or physical resources through the Ecosystem."

ATTACHMENT C: COMPLETE LIST OF RESPONSES TO QUESTION 12

Regarding the Ecosystem's progress towards its goals:

- "I think the ecosystem has increased collaboration through relationships and information sharing, but I don't know that it has achieved other goals."
- "I believe it inspires more collaboration. From the vantage of a longstanding science educational institute we've worked with many partners over the years. It has not opened new partnerships but strengthen previous ones as we have this common time to consider our impact from a larger context through the STEM ecosystem. As for decreasing duplication, identifying gaps and increasing access I can't speak to those directly but will say all the folks I know doing this work could do more with more funding. We are collaborating and have been but we are only so many people and people power is expensive. Hands-on science education is also expensive; materials and busing for experiences. We collaborate out of necessity to run our programs with bare essential funds."
- "Increase collaboration? Yes. STEM Ecosystem events that also provide space for networking allows members (including me) to share information and consider ways to collaborate. The PD workgroup is a good example of increased collaboration between PD providers, individuals involved STEM teacher prep, school district officials, and others to improve STEM PD. I don't have a good example as to how the Ecosystem has decreased duplication. By creating a database of PD providers, the PD workgroup was able to identify local assets and gaps for STEM teacher learning. I don't have empirical evidence that directly shows that the Ecosystem is increasing student access to STEM education."
- "Increasing collaboration—Yes, see above. Decreasing duplication—Not sure; however, it definitely creates opportunity for folks to learn from each other and avoid duplication of mistakes! Identifying gaps and increasing access—to really achieve this I think we need to take some steps toward getting teachers and school leaders more directly involved.
- I'm not sure how to best do this but it's something I'd like to work on in the future!"
- "Yes, creating structured opportunities to learn about other local organizations and events."
- "Yes, as mentioned in #11, PSBR's collaborations have increased."
- "Yes. I'm in the Computer Science workgroup, and it is definitely making progress on all of those fronts."
- "Yes, through professional development for STEM teachers."
- "I think there is certainly increased collaboration, but I'm not sure about progress on the other goals."
- "Yes, the networking events have allowed me to meet people and learn about other programs across the city. I have now collaborated with more offices within SDP."
- "Yes. These frequent communications and events provide opportunities for meeting and connecting with new people and organizations."
- "I think the Ecosystem is doing an excellent job in providing a great platform. I would like to see (including myself) more interaction and collaboration between the members."
- "Yes. Continued and focused work with the School District of Philadelphia is especially appreciated."
- "Yes, the STEM Ecosystem Education is making progress toward addressing key identified goals."
- "Yes. Most Workgroups have central information point where services and resources are listed."
- "Yes, but I think it needs to be more well known. There are so many educators who do not know about it."
- "Yes, the in-person events I have attended have been very helpful."
- Yes, I am definitely much more aware of programs that are going on across the city."
- "Yes, I believe so."

- “Yes, it's great! I love the community it is building and the ideas that are brought forward.”
- “Yes, the inventory or organizations and programs is a great resource for this. I personally appreciate being connected to local STEM leaders.”
- “Yes, the Philadelphia Ecosystem is meeting its mission objectives for the most part as it boils down the universe of sustainable communities into one hub (one stop and shop) where the Philadelphia Community can come for Ecosystem information.”
- “Yes, and slowly. Grass roots level collaboration such as work group organizing is slow to develop. It would be a faster and more viral process with funding behind it.”
- “I hear you are from colleagues.”
- “I believe it is a good start with more iteration necessary to improve in accomplishing the overarching goals.”
- “Definitely on the collaboration area we the Ecosystem is making progress. As for duplication, I'm not sure how this is being measured so I don't know.”
- “I think so. I see a real increase in STEM programming specifically for girls which is needed to invite girls further in to the world of math and science.”
- “Progress is being made.”

Regarding the Ecosystem's shortcomings and potential areas of improvement:

- “The ecosystem has shared goals with the Philadelphia Science Festival network. It would be interesting to see how the two groups might better coordinate, as there are so many shared members and participants, to meet some of the goals. The overall purpose of the ecosystem isn't always clear--being open and communicative about the opportunities presented through the ecosystem would be helpful.”
- “I am unclear as to whether any progress is being made towards these overarching goals as there are no simple measures in place to track progress towards these goals. In addition, there is very little qualitative or quantitative feedback from members on progress they feel they are making towards these goals as a result of being an Ecosystem member. I am hoping that the responses to this questionnaire will help address this gap. I would like to consider whether having a closer link with the district's STEM goals might help the Ecosystem deliver a greater impact.”
- “Philadelphia is a huge complex system and I think that the ecosystem has established a framework to achieve these goals. We still feel that there is significant competition for resources (financial) and audience (recruiting and retaining teachers for programs). It is still challenging for us to collaborate with other organizations in Philadelphia, I would say mostly because organizations as a whole are working from a scarcity mindset and true collaboration will require some significant cultural shifts.”
- “Not for my org.”
- “Not sure. Likely due to lack of funds/time.”
- “Not really, I think there a greater need to engage the private sector business community to create a true collective impact for the region.”
- “Regarding increasing access to STEM education, I have not seen the progress I hope to see because I have not seen the connections to teachers and practitioners.”
- “There are a gazillion gaps in a K-5 setting mainly the access to materials without buying them.”

Other comments:

- “School based Stem Team and activities Curriculum development and co-planning opportunities.”
- “The structure of Dr. Peter's flow chart helps others understand the cycle of continuous improvement. the workgroups should mirror that structure.”
- “Through the larger Ecosystem meetings, it is wonderful to learn of the wide-spread options for the city. Initiatives like the toolkit are helpful, as are the STEMcityPHL assessment map, but it is a lingering challenge to get program content to the public. Could a 'fair' of some sort be held for the teachers/students?”
- “From what I do as part of the Ecosystem, it is hard to know whether or not most of these things are happening on a wide scale, but I believe that collaboration is increasing.” ○ “I think it does very well making connections and helping to inform different groups so that we know what is happening in Philadelphia. I'm not sure how useful it has been in helping to decrease duplication.”
- “As a new member of the Ecosystem I cannot accurately answer this question.”

Analysis

Out of 42 comments, 34 (80%) expressed agreement that the Ecosystem is making progress towards its goals to various degrees, while 1 comment stated a lack of knowledge due to their new membership, and 7 comments expressed the viewpoint that the Ecosystem is not fulfilling its mission. Most who agreed that the Ecosystem is making progress referenced the increasing collaboration, but others disagreed on the success of the Ecosystem in other ways, such as the lack of engagement with "the private sector business community" or a difficulty in qualitatively or quantitatively measuring progress.

ATTACHMENT C: COMPLETE LIST OF RESPONSES TO QUESTION 13

Selected comments:

- "Having a formal organization that brings together individuals invested in STEM learning enables Philly to have a forum to share info, generate new ideas, and consider what people across different sectors can do to improve STEM learning. The STEM Ecosystem as an organization helps people who may not normally cross paths or reach out to each other, to do so in the interest of student STEM learning."
- "The ecosystem does not provide any staff support, meeting space, materials, or other resources to the working groups, which would all be very helpful."
- "I would not say that my participation has impacted my school or program directly, but rather, given me the opportunity to work with others, and apply my knowledge and skills to solve problems in the community."
- "I serve as an 'at large' member of the STEM Ecosystem SC and provide input to discussions/decisions that the SC make. I believe the SC plays an important bridging role between the 'backbone organization' and the ~250 members of the Ecosystem. It can work with the backbone organization to develop the Ecosystem's agenda and annual plans and continue to increase the impact it delivers. The SC can also ensure that the 'backbone organization' is transparent in its use of any funding it receives and that it remains 'independent' of the organization of which is it a member."
- "I would like to have increased access to groups working on the writing of collaborative grants and/or publications. By moving our programs into the public eye, we can gain momentum for the students and teachers of Philly."

Other comments:

- "Other members of our staff (including a grad student) have contributed to teacher PD and other work. I have been participating from the sidelines for about a year due to professional responsibilities and personal circumstances. I greatly appreciate the effort that is being made by several long-term colleagues."
- "Not sure about this but has this program interacted with Drexel's SIM program?"
- "We advertised our summer research experiences for teachers program, and our robotics camp for middle school girls through the Ecosystem mailing list. We also recruited a keynote speaker, and had another listed as a backup, for our robotics camp through the Ecosystem."
- "A good network has emerged where other ecosystem members share their experience."
- "Networking is essential to solving the problems we face. I feel like I'm just getting started."
- "Makespace PD"
- "The interns are excellent. Thank you!"
- "We have had very good response to our PD Providers Convenings which tells me that we are meeting a need that was not being met before."
- "It has helped us be better informed of what is happening in Philadelphia and introduced us to different types of STEM organizations as well as representatives from different governmental and for-profit institutions."
- "I am encouraged by the cross-section of organizations and individuals. I am discouraged by the lack of teacher voice and connections to teachers."
- "I'm proud of the Ecosystem's growth and development. We've come a long way and we're moving toward large growth branding as the premier location for all that is ECO."
- "I wish there were more informal online collaboration and advice given and received. (modeled more like the way the NSTA operates in that capacity)."
- "Thank you."

- “Thank you for doing this great work! As I said before, there is a lot of work to do and the nature of this work is slow progress. I am feeling that the ecosystem allows for better information sharing than existed before and it would be great to see funding come through for ecosystem projects that would support programs and organizations in Philadelphia.”
- “The Ecosystem has provided me with many opportunities to develop myself professionally.”

Analysis

Fourteen out of the 20 comments (70%) expressed exclusively positive attitudes regarding aspects of the Ecosystem. "Network" and/or "networking" was explicitly referenced in 2 of these positive comments, which highlighted the Ecosystem as "essential to solving the problems we face" and a space where "other ecosystems members [can] share their experience." "Professional development" and/or "PD" was praised in 3 individuals' comments; these individuals commented on the Ecosystem's effectiveness in "provid[ing] many opportunities to develop...professionally" and meeting the needs of educators that were "not being met before". Specific PD events such as "Makespace PD" and "PD Providers Convenings" were highlighted as particularly positive experiences. Multiple comments referenced the presence of "collaboration" and "information sharing" that were positive attributes of the Ecosystem. The Ecosystem mailing list was praised by one respondent as an effective way to share information and "advertise programs", allowing their organization to "recruit [a] keynote speaker" for a robotics camp and effectively "advertise summer research experiments for teachers" to a diverse and extensive network. Similarly, 2 comments both lauded the Ecosystem's ability to bring together "diff[erent] types of STEM orgs, diff[erent] people and sectors" in the spread of information, and help "people who may not normally cross paths" to collectively organize for STEM education. Two comments praised the "staff" and "interns", expressing appreciation for "the effort that is being made by several long-term colleagues" and describing staff members as "excellent". One respondent referenced their position as an "'at large' member of the STEM Ecosystem SC" to highlight the strength of the Steering Committee and its ability to ensure the backbone organization's transparency "in its use of any funding". Two other comments both reflected on the temporal aspects of the Ecosystem's operation. While one person praised the "growth and development" over time, stating that the Ecosystem has "come a long way", the other person mentioned the challenges of both "having a lot of work to do" and that "the nature of this work is slow progress". However, the latter person praised the Ecosystem for doing "this great work" and allowing "for better information sharing than existed before" despite these challenges.

On the other hand, 3 of the comments (15%) reflected either an exclusively negative criticism or mixed attitudes. The most negative comment criticized the Ecosystem for not providing "any staff support, meeting space, materials, or other resources to the working groups", pointing out that these entities would be "very helpful". Out of the two comments that reflected mixed attitudes, one individual praised the "cross-section of organizations and individuals" but criticized the "lack of teacher voice and connections to teachers." The second individual commented that "their participation has not impacted their school or program directly", but they were able to "work with others".

The remaining 3 comments (15%) consisted of neutral suggestions that were neither explicitly positive nor negative. One individual suggested interacting with “Drexel's SIM program”, while the 2 others expressed the desire for the Ecosystem to "increase access to groups working of collaborative grants and/or publications" and forms of "informal online collaboration" to give and receive advice in a way modeled "like the way NSTA operates in that capacity".

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