# 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:

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

A previous Workgroup was:

- o 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.
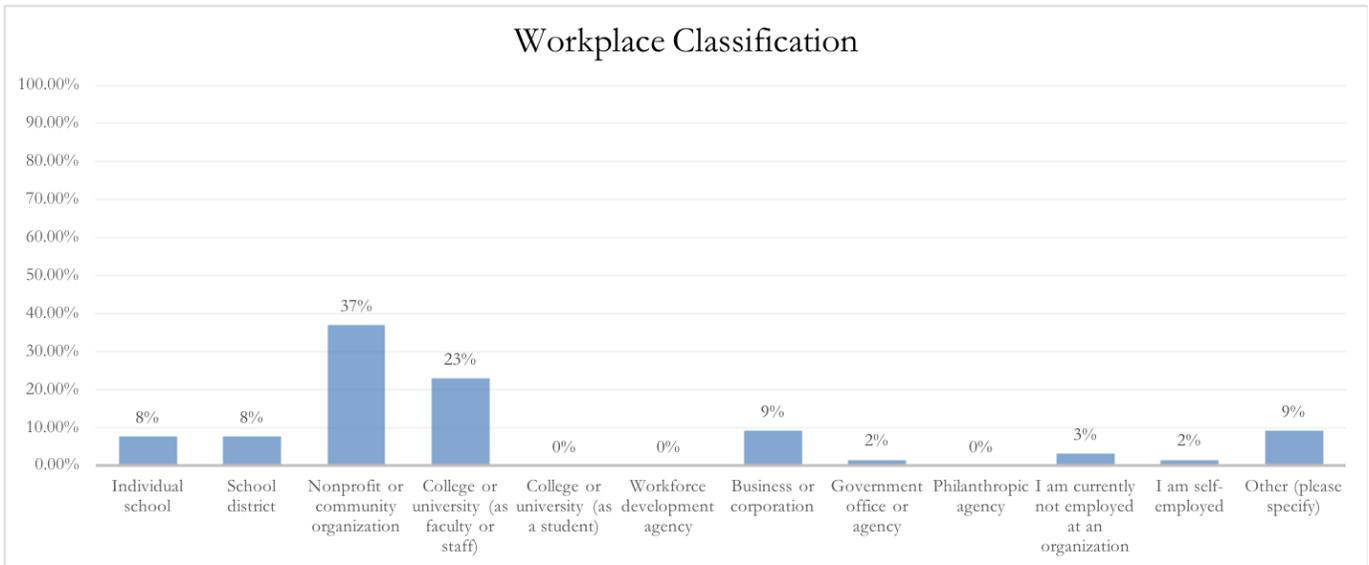
## Evaluation Methodology

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.
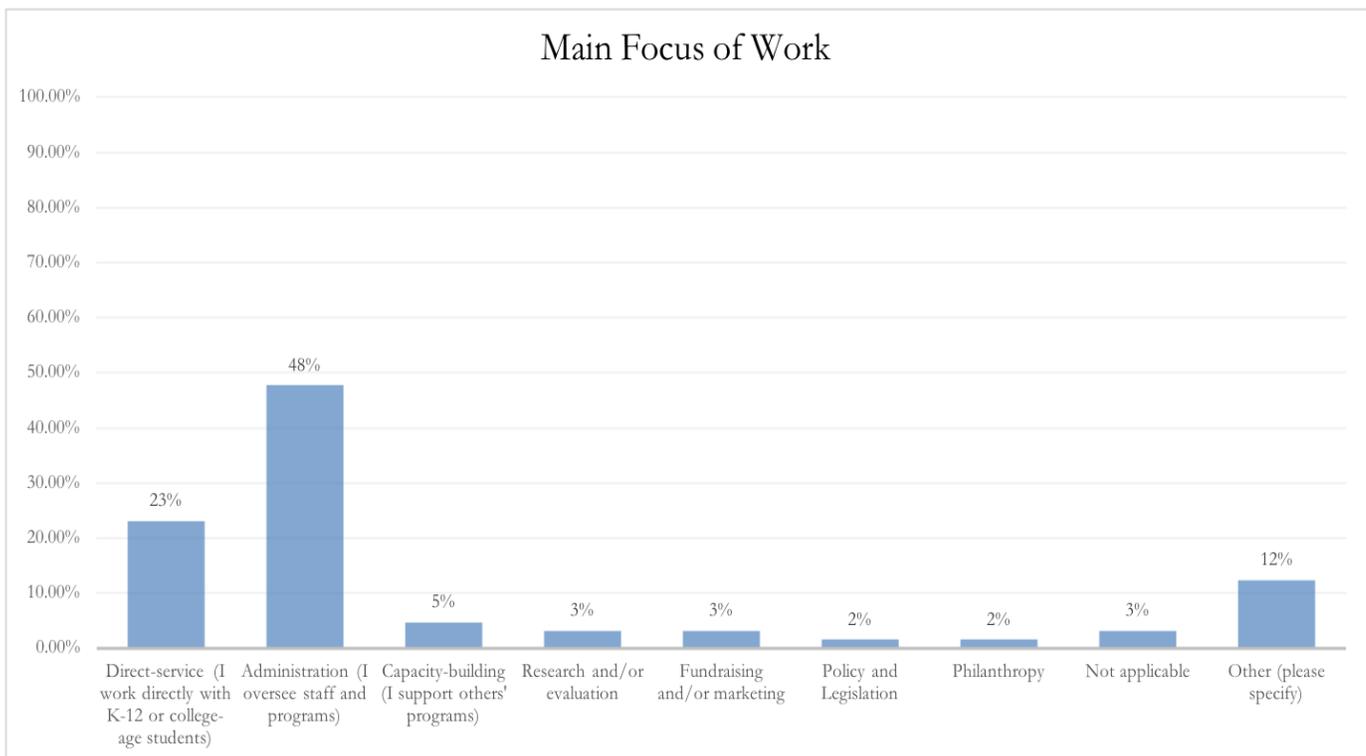
## Evaluation Results

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 **APPENDIX A**.

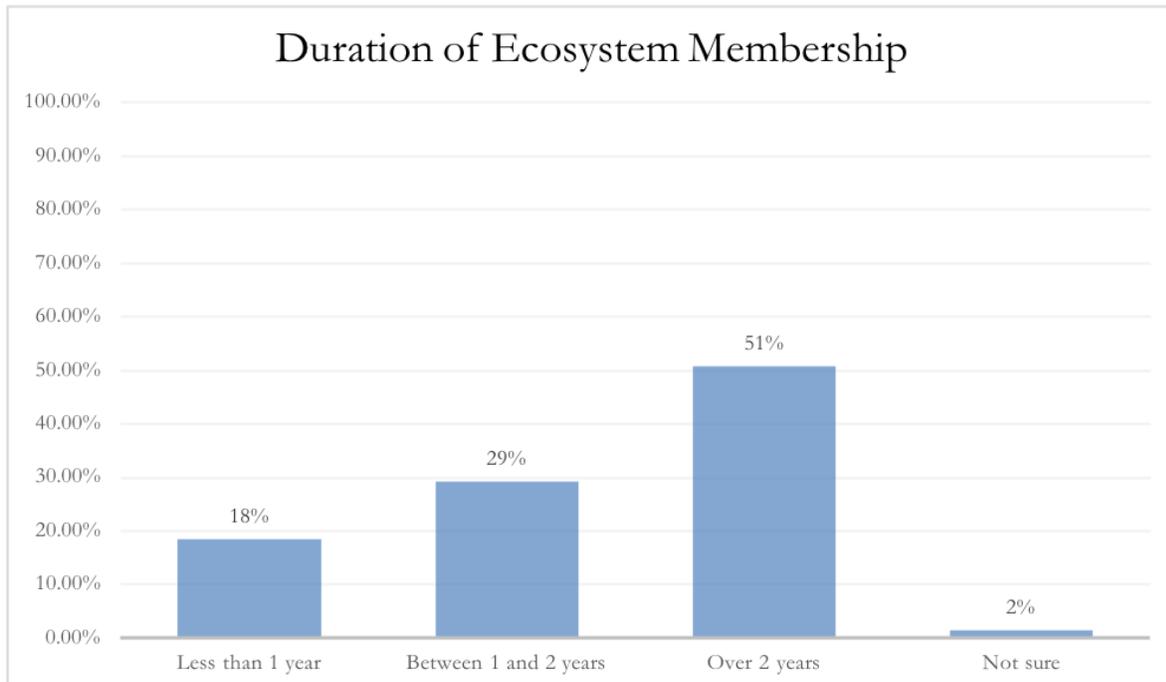**1. What best describes the organization in which you work?**



**Workplace Classification**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8% | 8% | 37% | 23% | 0% | 0% | 9% | 2% | 0% | 3% | 2% | 9% |

*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?**



**Main Focus of Work**

| 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) |
|---|---|---|---|---|---|---|---|---|
| 23% | 48% | 5% | 3% | 3% | 2% | 2% | 3% | 12% |

*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?**

## Duration of Ecosystem Membership

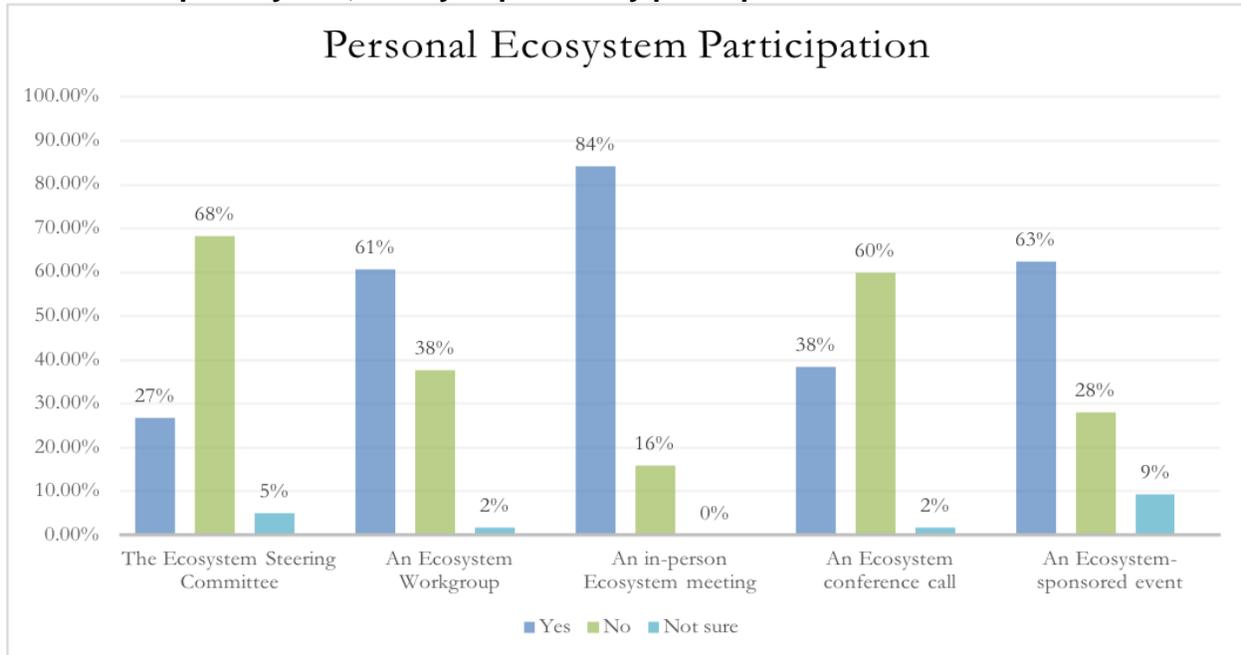| | |
|---|---|
| Less than 1 year | 18% |
| Between 1 and 2 years | 29% |
| Over 2 years | 51% |
| Not sure | 2% |

*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?**

## Ecosystem Membership of Work Colleagues

| | |
|---|---|
| Yes | 45% |
| No | 35% |
| Not sure | 14% |
| Not applicable | 6% |
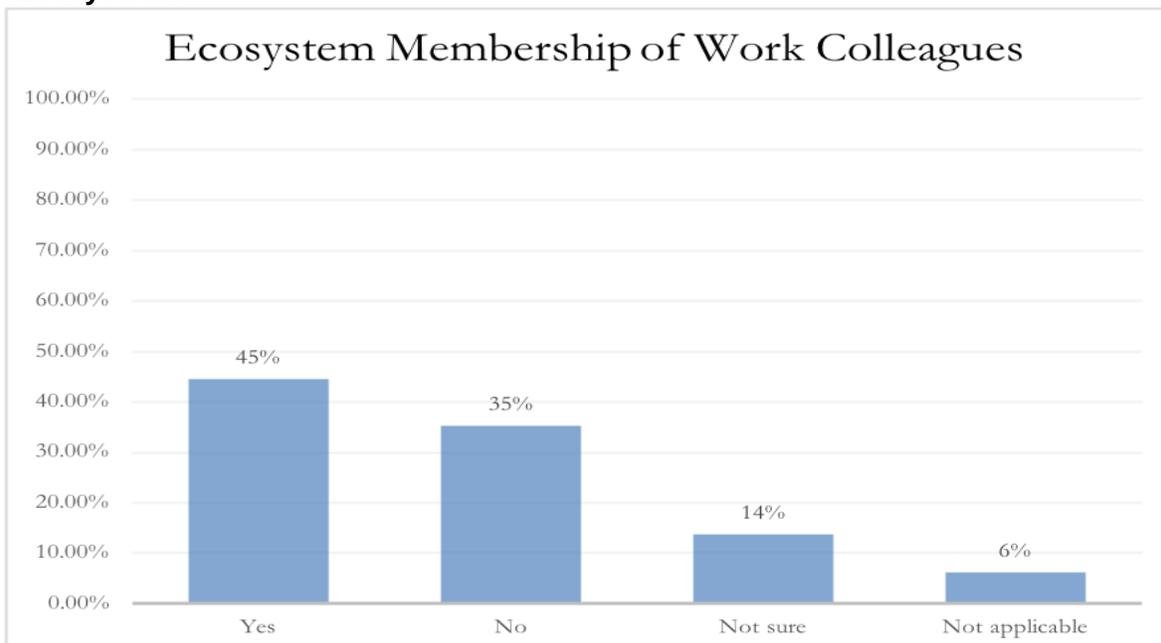
*Less than half are aware of fellow staff members at their respective organizations who are also members of the Philadelphia STEM Ecosystem.*

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



**Personal Ecosystem Participation**

| | Yes | No | Not sure |
|---|---|---|---|
| The Ecosystem Steering Committee | 27% | 68% | 5% |
| An Ecosystem Workgroup | 61% | 38% | 2% |
| An in-person Ecosystem meeting | 84% | 16% | 0% |
| An Ecosystem conference call | 38% | 60% | 2% |
| An Ecosystem-sponsored event | 63% | 28% | 9% |

*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**

| | Yes | No | Not sure |
|---|---|---|---|
| Full-time or part-time staff? | 7% | 80% | 13% |
| Consultants? | 11% | 80% | 9% |
| Adult volunteers? | 21% | 74% | 5% |
| K-12 or college-level student volunteers or interns? | 18% | 75% | 7% |
| K-12 or college-level student participants? | 18% | 73% | 9% |

*Recruitment for members' organizations is not a 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:**
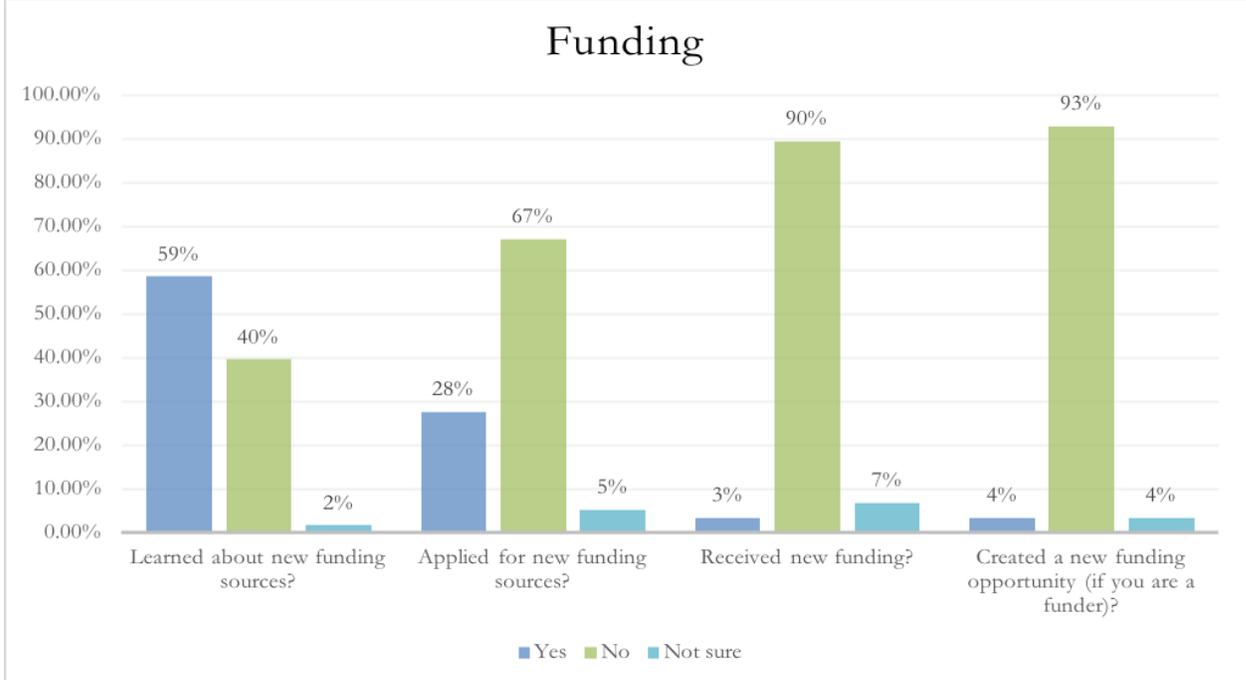


*While Ecosystem members are likely to learn about new funding opportunities, they are less likely to create new funding opportunities or receive new funding.*

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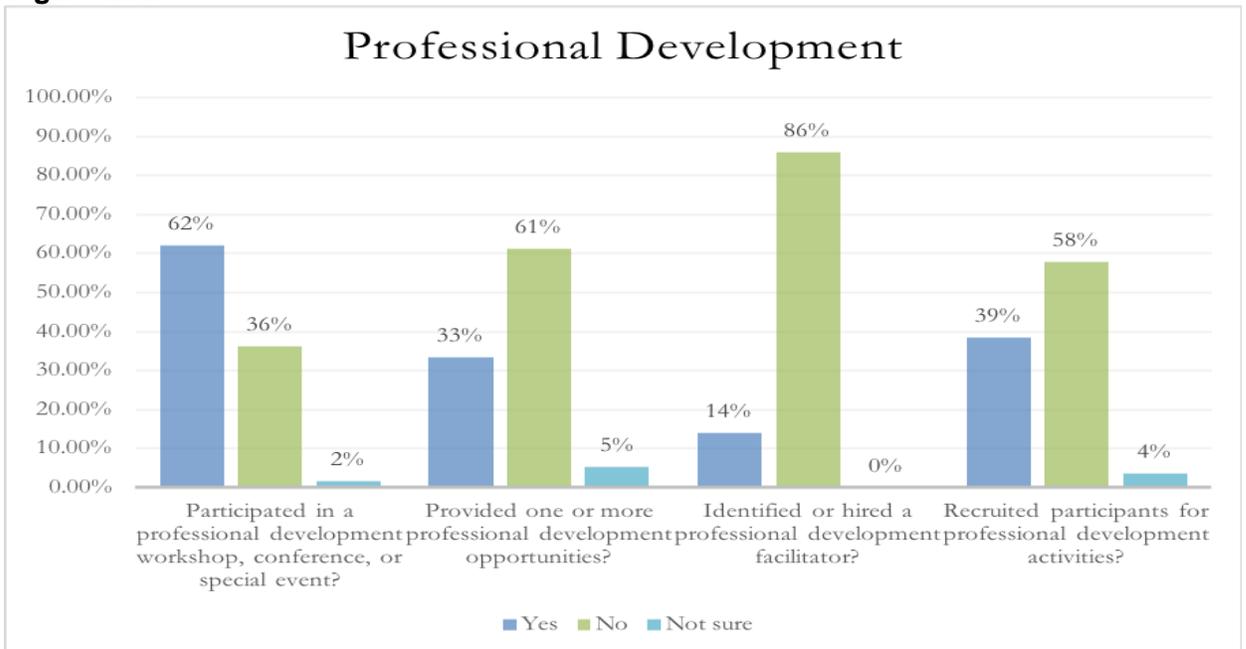


*The Ecosystem is utilized primarily as a direct provider of professional development to its members, rather than a platform for members to create their own professional development events.*

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



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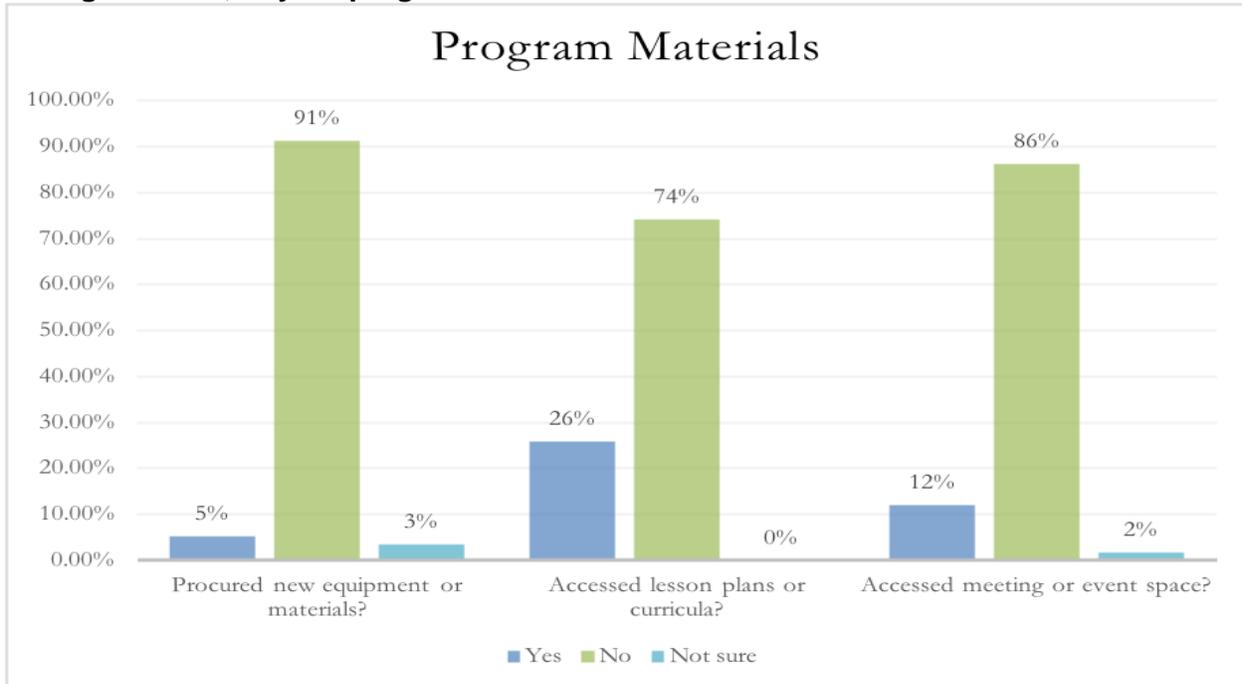
*Most members have not accessed equipment, materials, lesson plans, curricula, or event/meeting spaces.*

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



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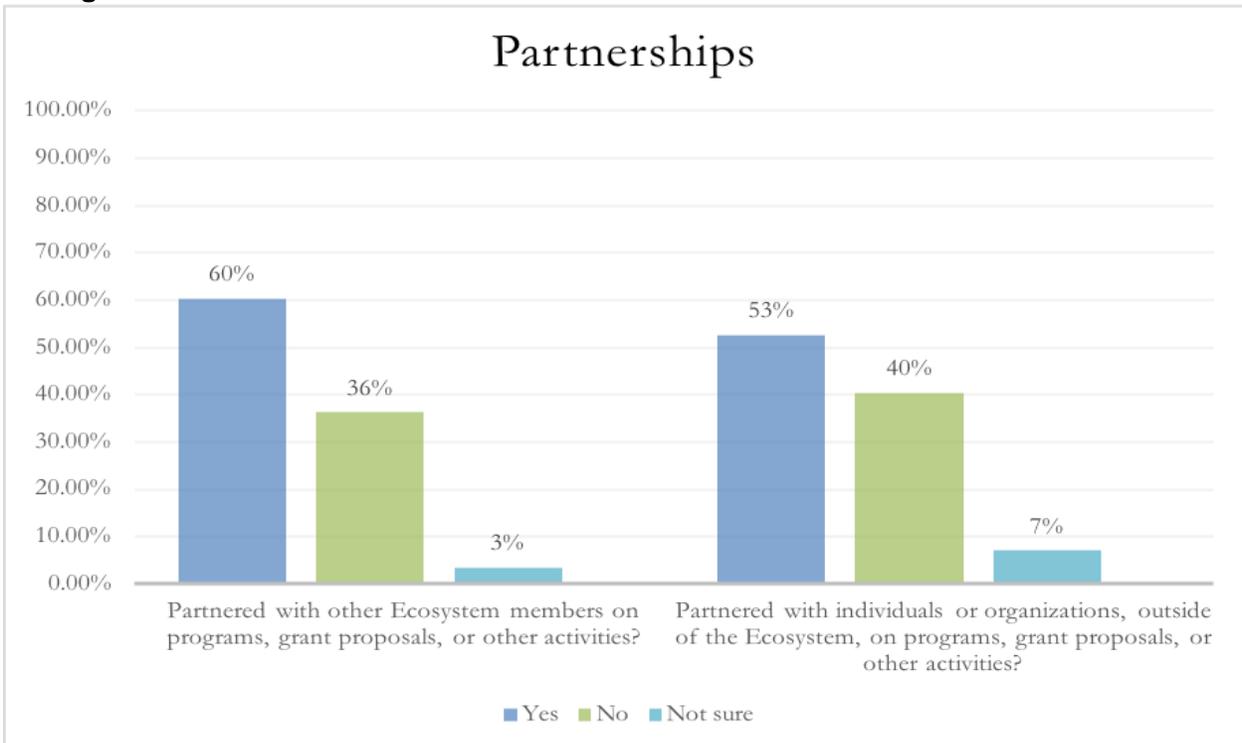
*Most respondents indicated that they have partnered with other Ecosystem members or outside individuals or organizations.*

**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 **APPENDIX B** for a complete list and analysis of responses to this question.

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*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..."

*How Ecosystem participation has resulted in new partnerships for respondents:*
○ "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..."

**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 **APPENDIX C** for a complete list and analysis of responses to this question.

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*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 **APPENDIX D** for a complete list of responses.

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*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.
- ○ 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..
- ○ 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.

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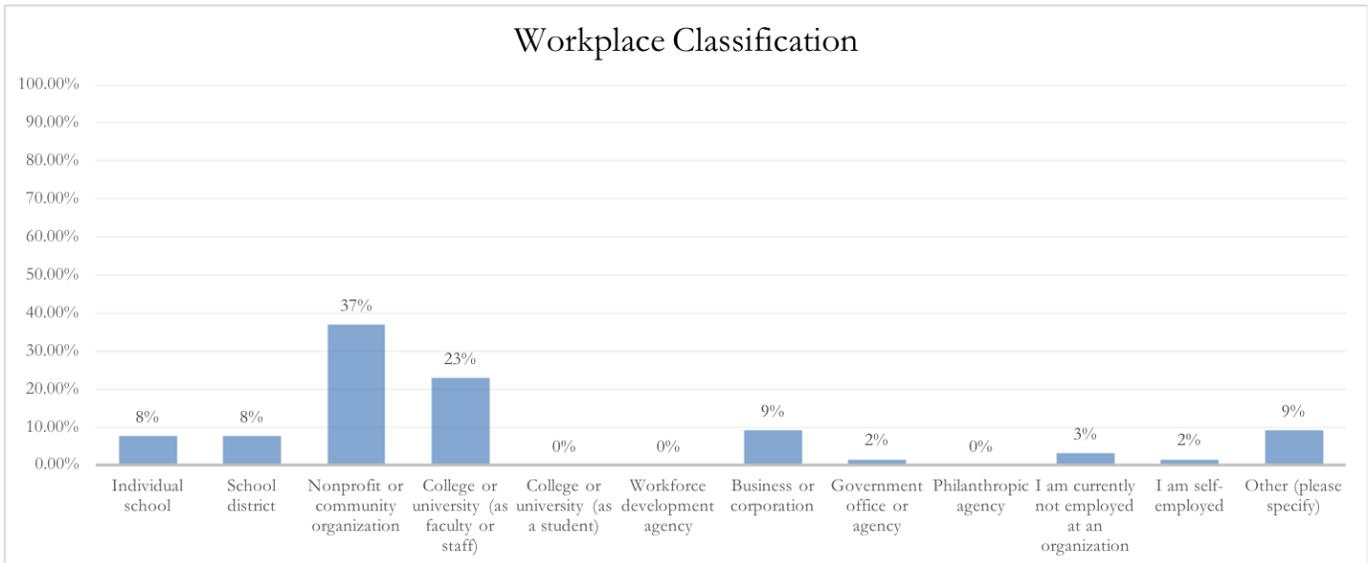


All 65 survey participants responded to the question. The most commonly represented organization type among Ecosystem members is the nonprofit or community organization at approximately 37%, or 24 out of 65 individuals. Faculty or staff at colleges and universities are the second most represented group, 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?
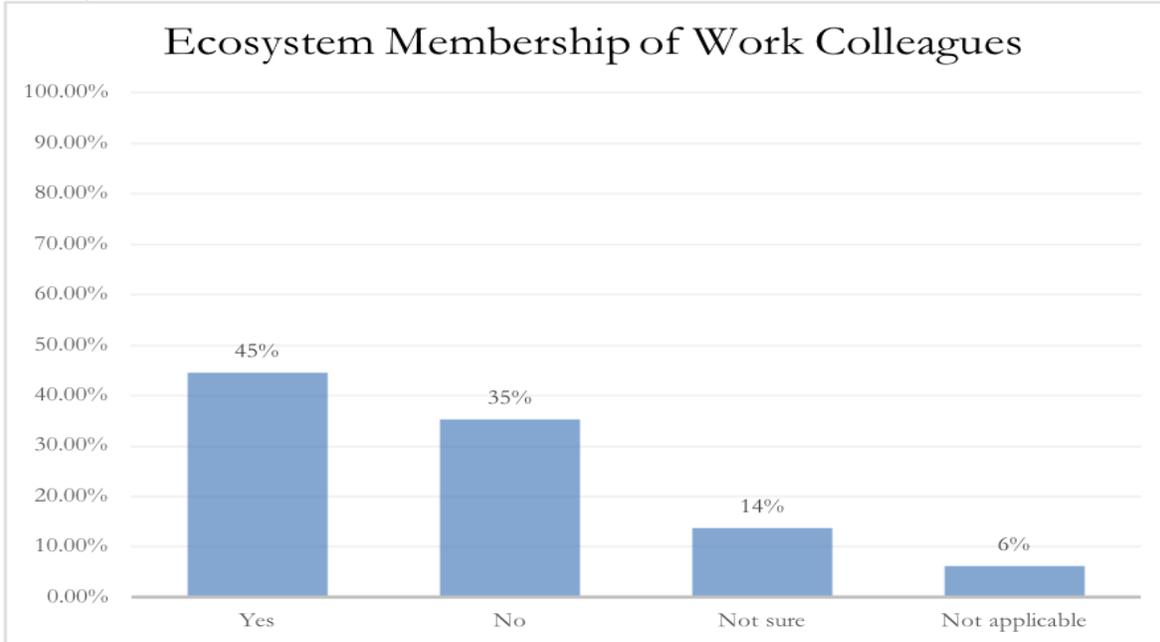
### Main Focus of Work
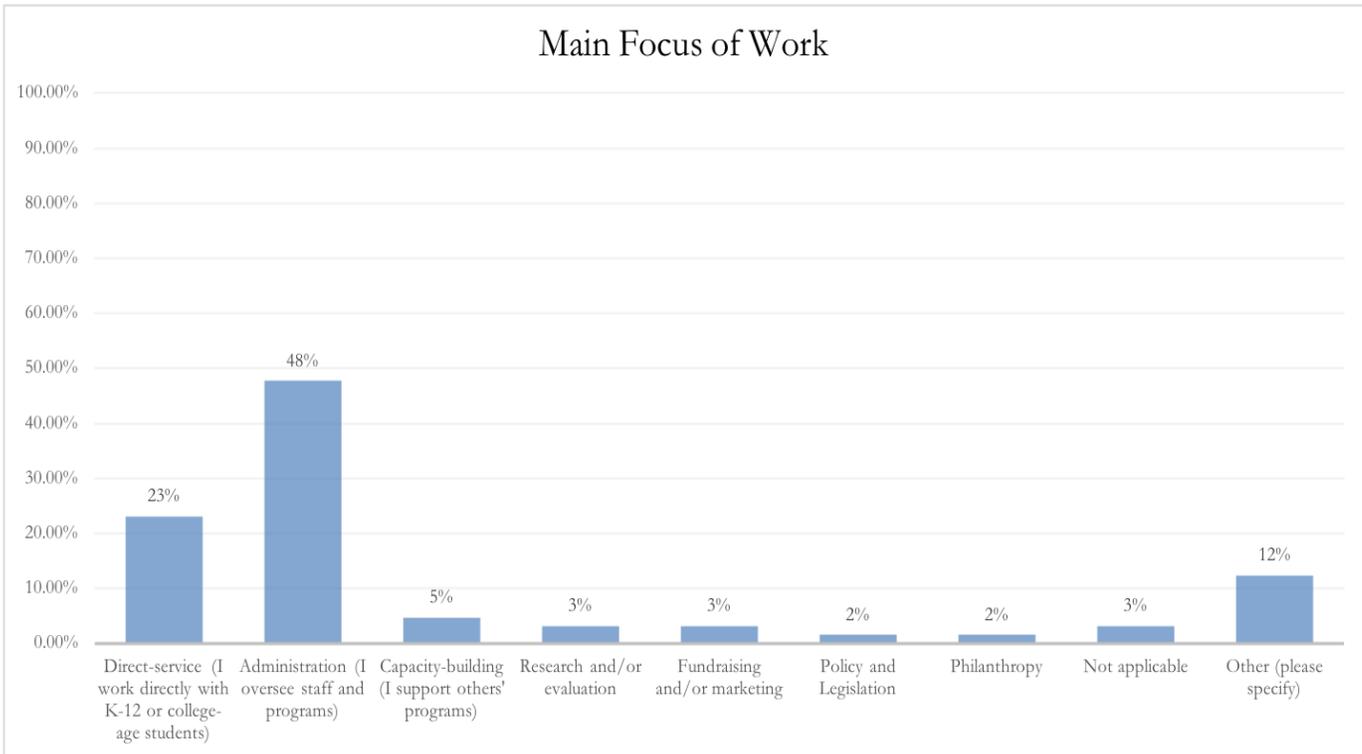


All 65 survey respondents answered this question. Nearly half of the respondents are administrators, overseeing staff and programs as their primary task: 31 people or 48% of the sample. Less than a quarter of respondents work directly with students, either K-12 or college-age: 23% or 15 people. The remaining 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?**
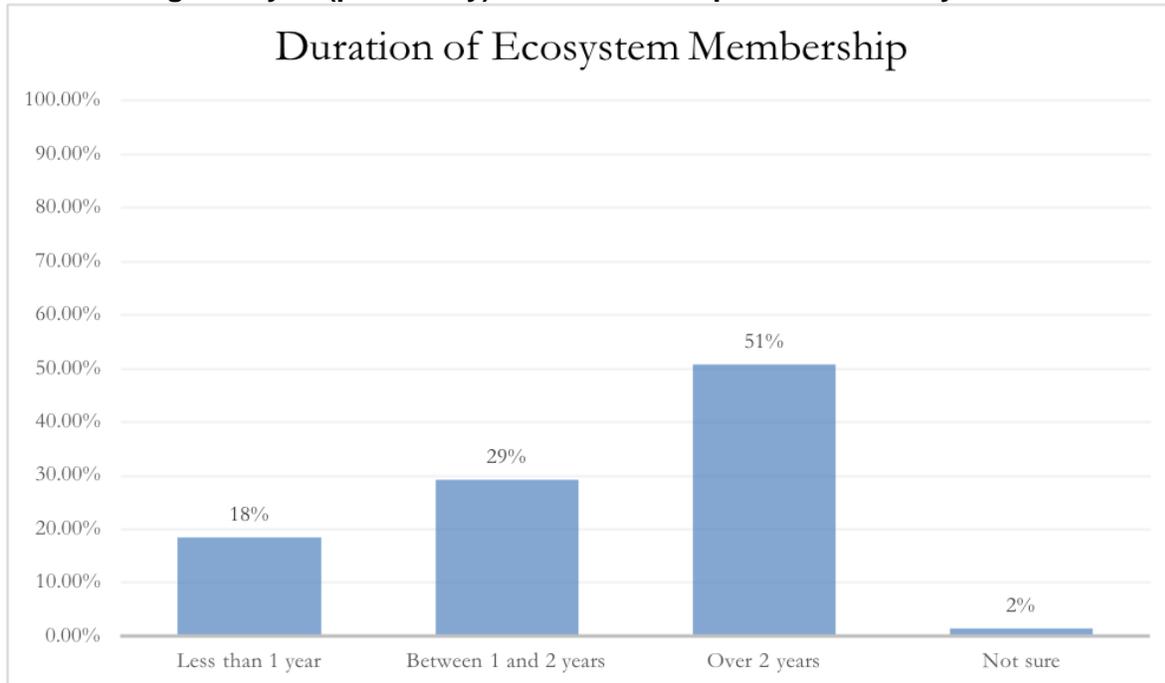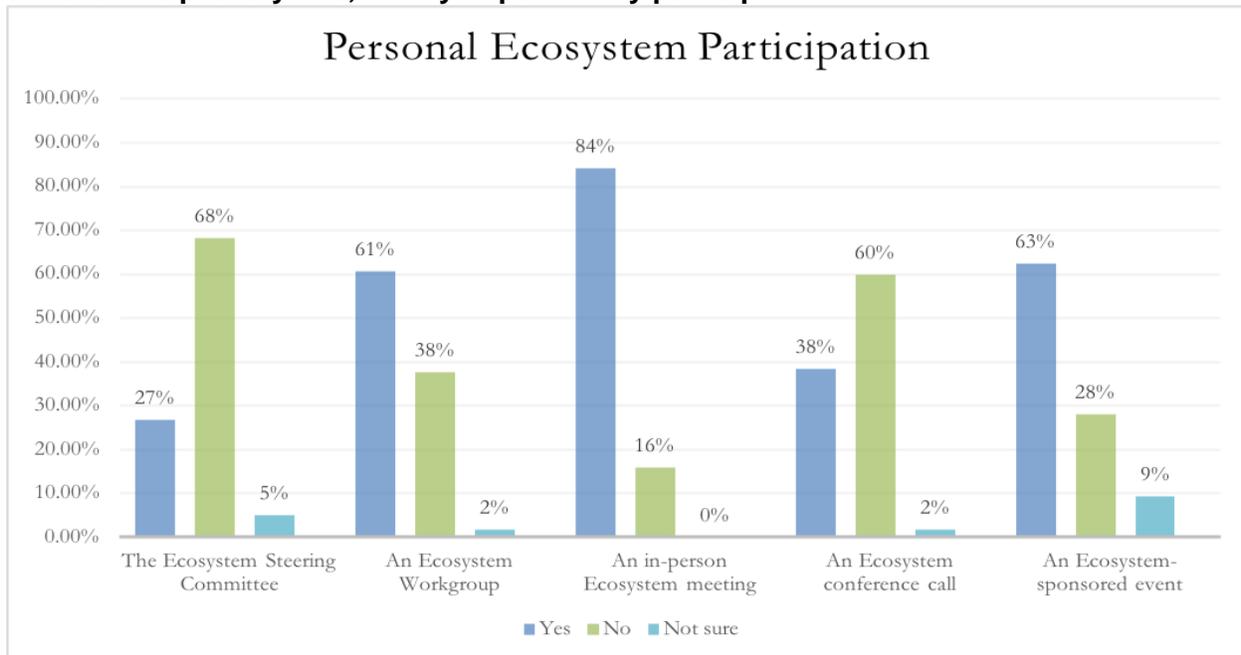


All 65 survey respondents answered this question. Over half of the respondents have been Ecosystem members for over two years: 51% or 33 individuals. The next populous category is between 1 and 2 years, with 29% or 19 individuals. 18% or 12 individuals have been members for less than 1 year, and 2% or 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?**

**Ecosystem Membership of Work Colleagues**

A bar chart showing: Yes 45%, No 35%, Not sure 14%, Not applicable 6%. The vertical axis ranges from 0.00% to 100.00% in 10% increments.
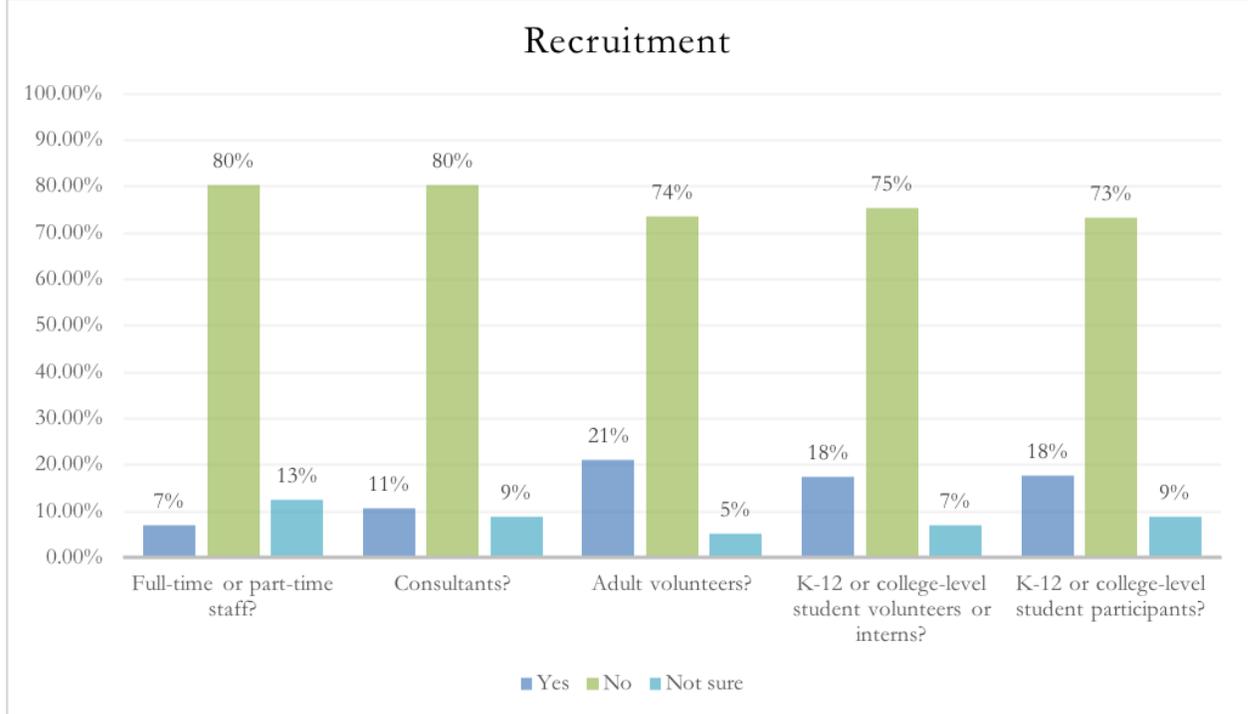
All 65 survey respondents answered this question. Less than half (45% or 29 individuals) are aware of fellow staff members at their respective organizations who are also members of the Philadelphia STEM Ecosystem, while 23 individuals or 35% do not know any colleagues who are also in the Ecosystem. 14% 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:**

## Personal Ecosystem Participation



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:**
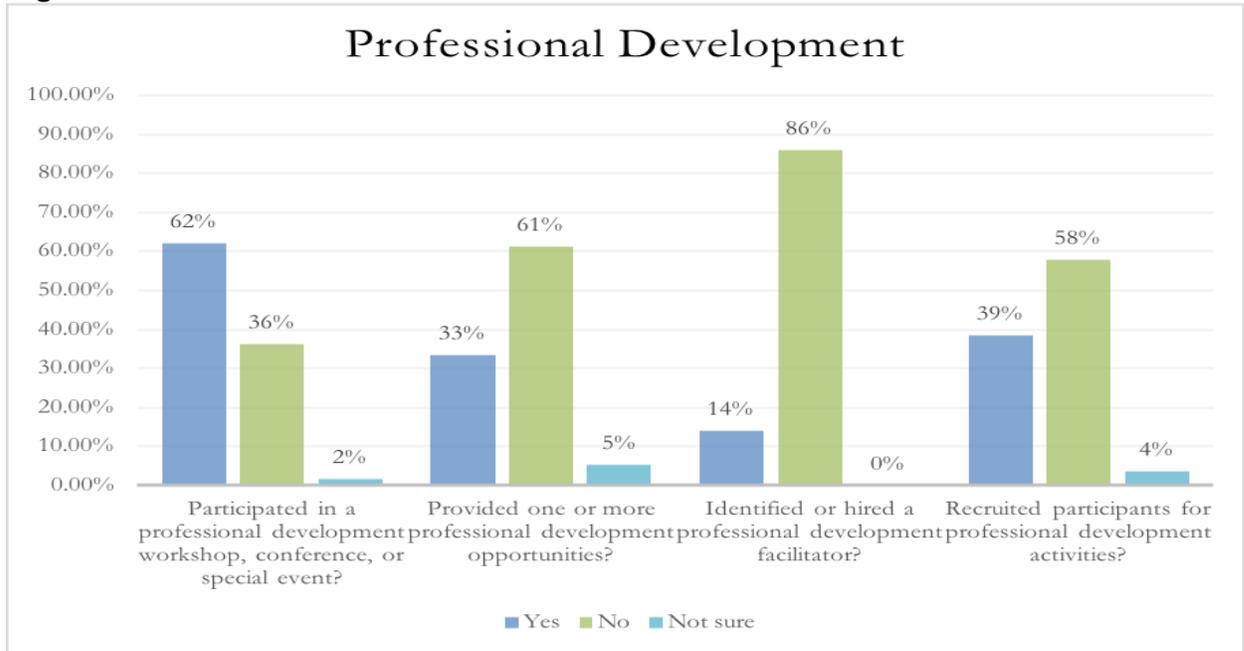


Fifty-eight out of 65 survey respondents answered this question. From the responses to this question, it is evident that recruitment for members' organizations is not a dominating feature or function of the STEM Ecosystem. Across all 5 positions, 73% or more respondents indicated that they had never 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:**
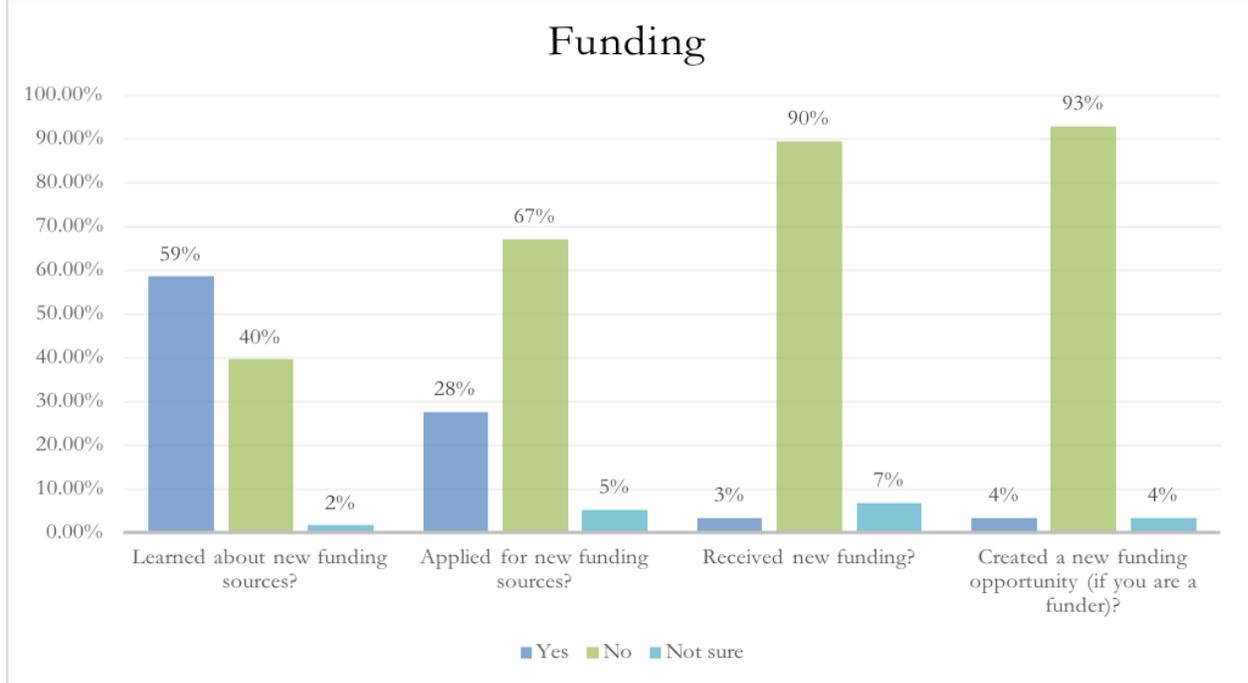
## Funding



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:**



**Professional Development**

| | 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? |
|---|---|---|---|---|
| Yes | 62% | 33% | 14% | 39% |
| No | 36% | 61% | 86% | 58% |
| Not sure | 2% | 5% | 0% | 4% |

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:**



Program Materials
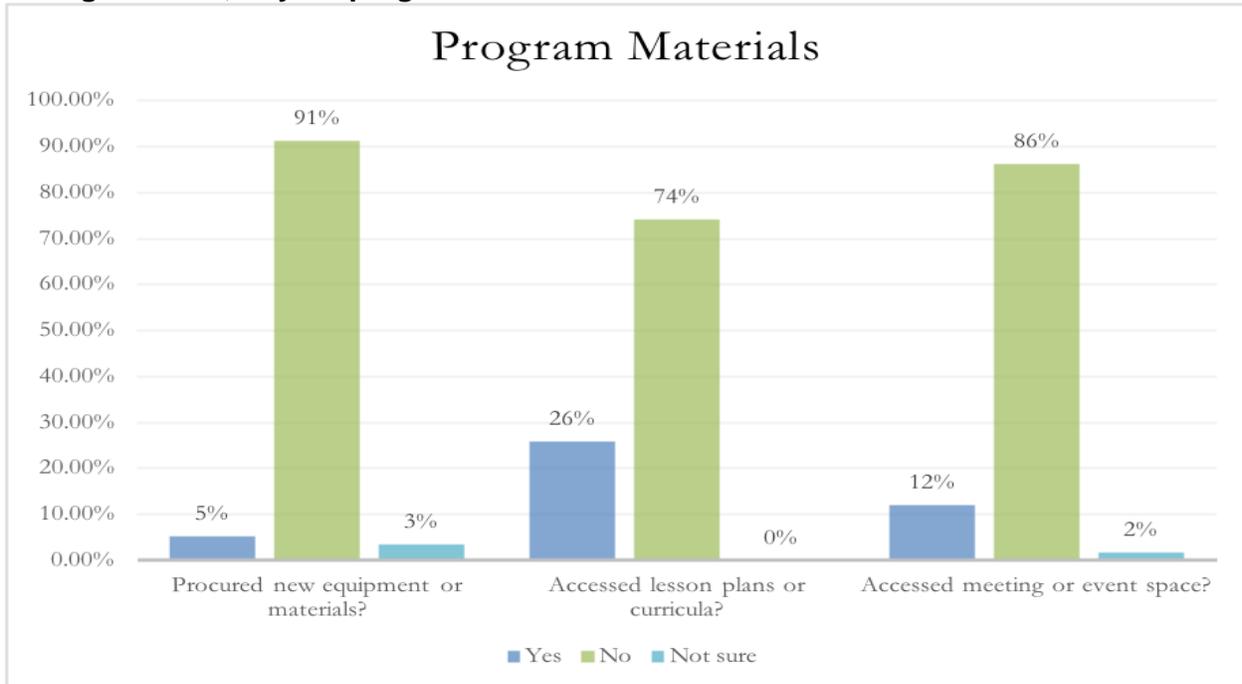
Fifty-eight out of 65 survey respondents answered this question. A majority of respondents have not accessed new equipment or materials, lesson plans or curricula, or event and meeting spaces. Members are most likely to access lesson plans, followed by meeting space, with new equipment and materials 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:**
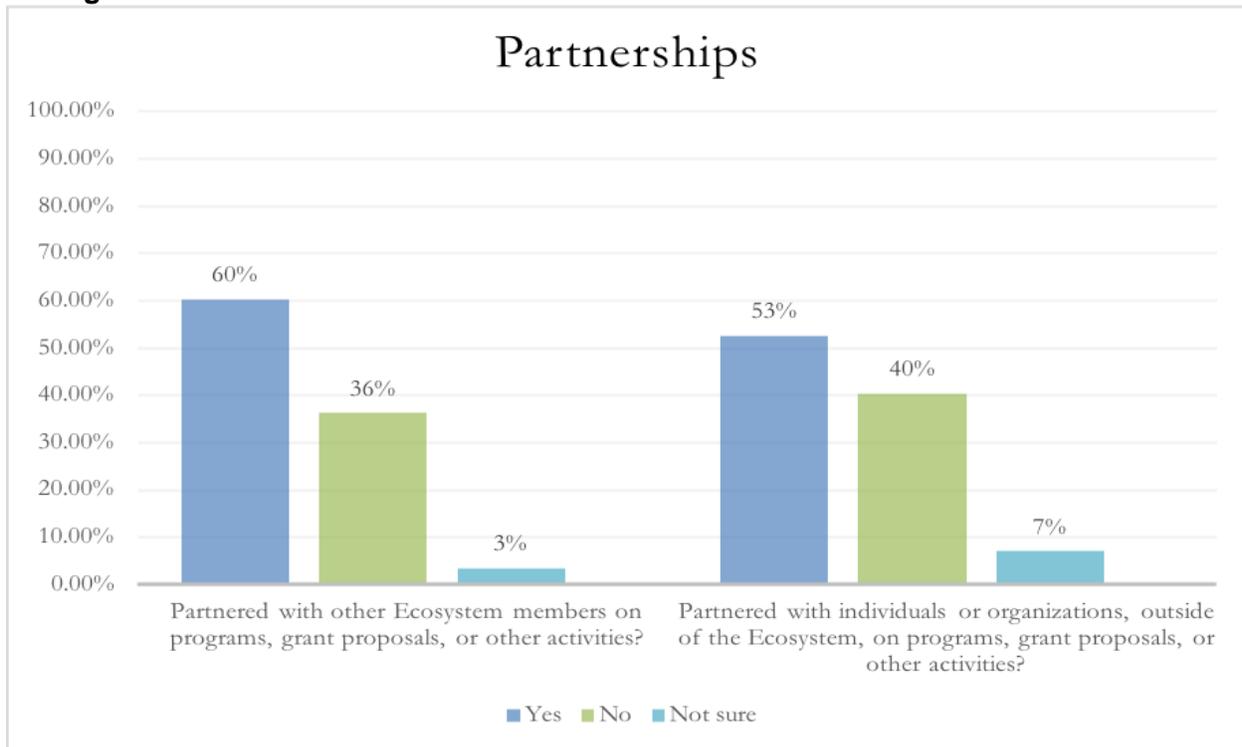


Fifty-eight out of 65 survey respondents answered this question. A majority of respondents indicated that they have partnered with other Ecosystem members or outside individuals or organizations. However, partnerships with Ecosystem members are more common. This demonstrates that the Ecosystem is most 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.

***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."

***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.

# APPENDIX D: 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".