Results from Spring 2015 Interviews with STEM Pathways Partners

STEM Pathways aims to increase youths' long-term interest, learning and achievement in STEM through a deliberate and interconnected system of STEM learning opportunities. STEM Pathways is a partnership of Minneapolis Public Schools (MPS), the Minnesota Department of Education (MDE), The Bakken, The Bell Museum of Natural History, Minnesota Zoo, STARBASE Minnesota, and The Works that tests a model for collaboration that could be expanded and replicated across more grade levels, schools, organizations, and communities. In 2014-2015, STEM Pathways serves fourth- and fifth-grade students at six elementary schools in MPS. This report presents findings from interviews with leaders of the STEM Pathways partner organizations.

The evaluation of STEM Pathways is guided by a set of 10 research questions. The interviews were designed to elicit information regarding seven of these research questions:

1. How successfully is the STEM Pathways model being implemented?
2. What partner and school characteristics are associated with strong implementation? In what ways can implementation be strengthened?
3. What are the core components of the program model and conditions for replication?
4. How well does the collaboration function, and how can it be strengthened?
5. How effective is professional development, and what are future needs?
6. What impacts does the model have on informal STEM education organizations?
7. What are the implications of the Pathways model for the field of informal science organizations?

STEM Pathways' goals for implementation include:

- Giving students access to multiple in and out of school STEM Pathways partner programs
- Offering connected experiences across partner programs
- Offering high quality, relevant STEM experiences for Pathways students

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Overall, the interviewees felt that STEM Pathways was successfully implemented, and that there were elements of the program still at the beginning stages, which was reasonable considering the project was in the first year of implementation. A major accomplishment was that STEM Pathways implemented each informal STEM education partner's programming for all the fourth- and fifth-grade classes at the six Pathways schools. The partners grew in their familiarity with and appreciation of what the other partner organizations do and it gave them new ideas to improve their own program curriculum and instruction. Additionally, interviewees felt that STEM Pathways programming at all partner sites was strongly aligned with the state standards and that they had increased knowledge of and alignment with MPS learning targets.

With regard to some specific programmatic elements, partner organizations were at different stages of implementation. Some partners made references to the others during programming, but this was not consistent across the organizations. Partners were beginning to use common vocabulary and incorporate crosscutting concepts, practices, and core ideas, but the understanding of these programmatic elements and expectations regarding implementation of them were not clear to all partners. Referencing to the STEM Pathways Portfolio and the Career Interactive website varied; some partners referenced them more often than others. The Career Interactive was launched near the end of the school year.

Partner representatives identified some challenges in the first year of implementation. While funding was provided for project coordination, research, and evaluation, some partners stated that additional funding to support their organization's participation in STEM Pathways would have allowed them to participate at a greater level. Scheduling and communications with MPS was also cited as a challenge by some. Interviewees also indicated that partners had varying levels of engagement in planning activities and developing programmatic tools.

The remainder of this report gives a brief review of the methodology, offers a discussion of how the partners describe STEM Pathways, provides additional detail about findings for each of the research questions including illustrative quotes,[1] and closes with findings regarding how STEM Pathways can have a bigger impact and thoughts about its potential for the future.

Methodology

Key informant interviews capture informed opinions and perceptions from individuals with special knowledge and expertise. This methodology was utilized in order to collect in-depth information from all the STEM Pathways partners regarding the goals, implementation, and accomplishments of STEM Pathways and also about suggestions for changes or improvements for STEM Pathways in the future. Interviews were conducted with members of the steering committee and members of the implementation team. Respondents included the project director for STEM Pathways as well as representatives from:

[1] Quotes included in this report may be edited for grammar, spelling, and clarity.

- STARBASE (3)
- The Bakken Museum (2)
- Minnesota Zoo (2)
- The Works Museum (1)
- Bell Museum (1)
- Minneapolis Public Schools (2)[2]

What is STEM Pathways?

STEM Pathways partners were asked how they would describe STEM Pathways to someone who has no knowledge of the project. Overall, STEM Pathways was described as a partnership between informal STEM education organizations, MPS, and the Minnesota Department of Education to provide opportunities for students with informal education organizations that will improve STEM learning and introduce students to careers in the field of STEM. Additionally, STEM Pathways was described as a project that strengthens the relationship between schools and informal education sites and improves the connection between STEM learning in the schools and programming at partner organizations.

How successfully is the STEM Pathways model being implemented?

Interviewees were asked several questions about the implementation of STEM Pathways. Interviewees felt that implementing each partner's programming with fourth- and fifth- graders at the six Pathways schools was a major success, with some elements still at early stage of implementation. Many lessons were learned during the first year of implementation and will influence implementation planning moving forward.

Finding: A major accomplishment was that STEM Pathways implemented each informal STEM education partner's programming for all the fourth- and fifth- grade classes at the six Pathways schools.

- Despite some challenges many partners felt it was an accomplishment that they were able to get the fourth- and fifth-grade classes from the six Minneapolis schools to each site.

[2] These two respondents were only asked a subset of the questions from the STEM Pathways Partners interview. These questions were asked in addition to the full set of questions from the MPS Leaders interview. These two respondents are included in the summaries of results from both sets of interviews.

> *Truthfully, just having everything happen with the first year of a big project, especially with so many moving parts with all these different partners and different scheduling issues and all sorts of different funding barriers or lack thereof for the different organizations, the communication with teachers, getting everybody on board, every single school to attend the right field trips. I think in a lot of ways it's just the fact that we made it all happen and I think everyone got through everything they were supposed to do. I kind of feel like that's a pretty big accomplishment in the first year. – Implementation team member*
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> *Just that fact that, in its first year of trying to provide that 30 hours of programming in 4th and 5th grade at six schools, that to a large degree that happened, I think is a big success. – Steering committee member*

Finding: Most partner organizations refer to other partner organizations when working with students; however, this was not done consistently or strategically across all the organizations.

- Discussion of other organizations were often specifically in reference to the scientific process in an attempt to address what will be similar across organizations for student visits. Efforts to reference programs at other organizations were more successful in the fifth-grade cohort.

> *I very intentionally will reference STARBASE and the MN Zoo and what their programs are about and the scientific process that they have participated in and how that flows through all three of our programs. – Implementation team member*

- Over the course of the year, partners discovered a natural sequence that made sense for student learning. Having a sequence will allow partners to reference each other more systematically. This sequence should be considered when scheduling field trips in the future.

  Suggested sequence:

  Fourth grade—The Bakken Museum, The Works Museum, STARBASE

  Fifth grade—Minnesota Zoo, STARBASE, Bell Museum

> *Next year, because we kind of experienced this this year and have much more understanding about the importance of the sequencing, we already have made plans for how we will make sure all schools come to the zoo in either October or November, and then they do STARBASE in January and February, and then they do the Bell in March, April, and May. – Implementation team member*

Finding: Partners are making progress in using common vocabulary, crosscutting concepts, practices, and core ideas.

> *I feel like we talked about it a lot, but I don't know that we ever came to any consensus about what that shared vocabulary was going to be. So I don't feel like that's done. It's sort of a work in progress, but I do feel like it's important. – Steering committee member*

> *The idea of systems and interdependence in systems, as well as impact of change on systems, is sort of our big crosscutting concept that we're trying to have woven through this whole 5th grade experience. A lot of that is introduced by us. I don't know that we did a super good job this year, but I think next year, now that we've been through this once, my instructors will be able to, when they introduce this kind of stuff say, you're going to see more systems or think about when you encounter systems and what you already know [to] talk about them moving forward. We've talked a lot about it and are working on how to really do a good job of pulling that stuff through.*
> *– Implementation team member*

- The understanding of what crosscutting concepts are varied across organizations.

> *I'm still a little vague on what that means… We've got core ideas that we're trying to emphasize. Whether they're crosscutting concepts I'm not exactly sure. – Steering committee member*

- Partners felt that the fifth-grade cohort was making a good progress in incorporating crosscutting concepts and fourth-grade cohort was at an early stage in doing so.

> *I think the 5th grade cohort has done it a little better than we have, because they're a little more closely related. – Implementation team member*
>
> *I think that the crosscutting concept, practices and core ideas, I think in particular the 5th grade cohort has really stepped up and gotten to that level where we now have connections among MN Zoo, the Bell Museum, and STARBASE for crosscutting concepts, practices, and core ideas. For 4th grade I'm hoping that for next year we can build on what we started and go deeper there. We have some basics, but I would like to see us go deeper. – Implementation team member.*

Finding: Discussion of careers or promoting the Career Interactive website varied across partner organizations.

- Overall, partners feel that connections to STEM careers are a valuable aspect of the program and should be given more attention. This is an opportunity for students to see 'normal people,' who are not in white lab coats, working in STEM careers.

> *I think that careers can serve as a great connecting piece between the experiences. So I think that we could do more [and] really make sure that the teachers are providing the opportunities for students to use the career interactive … I think careers can really serve as a strong link between everything. – Implementation team member*

- Some partner organizations reference connections to careers in STEM more than others. Variations may be attributed to differences in the amount of time with students allotted for each program.

> *…but we don't have a ton of time to focus on career stuff. As I mentioned before we only have 45 minutes of hands-on time with the kids. – Implementation team member*

- The Career Interactive (a website that offers many short videos about careers with connections to each of the partner organizations) was developed late in the year and was not available for all partner organizations to promote to teachers and students.

> *We contributed to the career interactive. I haven't seen it in its final form yet. I think it's a great idea, but it didn't get finished until pretty much long after we had completed all of our interactions with the students so it wasn't necessarily available. I do have every intention of referring to it more when we kick off for the next year. – Implementation team member*

Finding: The STEM Pathways Portfolio was developed for classroom teachers to use in the classroom to support student STEM learning. Some partners said that teachers have given positive feedback on the Portfolio as a useful tool. Referencing to the STEM Pathways Portfolio varied across organizations, with some organizations referencing it more regularly than others.

> *I have absolutely no idea how it worked. It's one of those things that's so on the teachers and I mean I've heard just through meetings, talking with [STARBASE instructor] who's the main liaison between the teachers and the [informal educators], that they liked it and it was useful, but I really haven't spent much time thinking about it. – Implementation team member*
>
> *I think it would probably be a great idea if before the next school year kicks off, the implementation staff at the very least, the people associated at the different organizations with STEM Pathways get together and go through and kind of break down that document. Again, the portfolio was something that was kind of put together on the fly. – Implementation team member*

Finding: Partners agree that the use of the logo is valuable as a visual cue for students and teachers to make connections between the partner organizations and is important in representing a unified initiative.

> *I think it looks good. I think it's nice to have visual cues for students and teachers to help them relate experiences to each other and sort of recognize, oh yeah, we're here on this field trip and I see this familiar symbol, this must be STEM Pathways. I think that's a useful tool for sure and I don't have any recommendations for change on that. – Implementation team member*
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> *I'm kind of indifferent to the design. It's not my favorite, it's a little busy and hard to figure out what's going on with it, but I think it's good to have one. – Implementation team member*
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> *…it has a tree with a door in it and there's these different spots in the tree where you could put the participating organization logos in it. And I've used it both ways. Just without the organizations' logos and then with them. And I think it looks better as a stand-alone logo. – Implementation team member*
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> *I think that to change the logo at this point in time is probably not a good idea and that we need to stick with this. Then as this become replicated across more years, hopefully, then maybe we could get that logo more solidified. – Steering committee member*

Successes

Interviewees share many insights about the key successes of STEM Pathways during its first year of implementation.

Finding: A major accomplishment was that STEM Pathways implemented each partner's programming for all the 4th and 5th grade classes at the six Pathways schools.

- Despite some challenges many partners felt it was an accomplishment that they were able to get the fourth- and fifth-grade classes from the six Minneapolis schools to each site.

> *Just that fact that, in its first year of trying to provide that 30 hours of programming in 4th and 5th grade at six schools, that to a large degree that happened, I think is a big success. – Steering committee member*

Finding: Enthusiasm and commitment on the part of all the individuals from the partner organizations greatly contributed to the success of the project.

- The passion and the talent of staff from each partner organization were an asset to the program and critical to its success.

> *And I do think that just the empowering of the people who work directly with teachers and students to make some decisions about this and kind of take some things and run with it, figure out what works, has been very exciting to watch. – Steering committee member*

Finding: Leadership and teachers at MPS see the value in STEM Pathways and have rallied around the concept.

- Teachers from other Minneapolis schools want to participate in the program and some leaders at the district level are advocating for the continuation and expansion of the program.

> *Other Minneapolis schools would also like to participate in STEM Pathways. So I think that's a huge accomplishment. – Steering committee member*

Finding: The partners felt that STEM Pathways programming from each site is strongly aligned with state standards and expressed improved knowledge of and alignment with MPS learning targets.

- The partner organizations were working to align their programming with the state standards before their involvement with STEM Pathways and have now become more familiar with how the district defines them and how they are implemented by teachers within the district. Working with each other, with the district, and with teachers helped the informal education organizations to make even greater connections to the standards.

> *… right now at [Partner Organization] all of our programs are aligned to the state standards, but we hadn't done any work to specifically align them to the learning targets in Minneapolis and so that was something that we started to look at this year. – Steering committee member*

- The partners have kept in mind the Next Generation Science Standards (NGSS) as they have been developing their programming. It is understood that these standards are important and may be adopted by Minnesota in the near future.

  Overall, partners felt that STEM Pathways supports the NGSS, especially with their use of crosscutting concepts.

> *I do, I'm not sure that it was super intentional. It think it's actually kind of organic that it supports NGSS because, at least, again for the 5th grade cohort, the crosscutting concept of systems is a pretty big deal and that's what we're really able to pull from our various programs that we have in common. So I think we kind of accidentally support NGSS pretty well.*
> *– Implementation team member*
>
> *Definitely, we immediately, as soon as we started going down the road in developing the curriculum and talking about how we were going to present the material, we were already looking at the NGSS at the same time. – Implementation team member*
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> *And then in terms of the NGSS, all the STEM Pathways partners have spent a decent amount of time exploring and trying to understand and thinking about incorporating [it] into what they do… especially the science and engineering practices. But the 5th grade group has also spent a lot of time identifying how a particular crosscutting concept weaves its way through all of the 5th grade programming well. – Steering committee member*
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> *As far as all those crosscutting concepts and things like that, I'm not quite as sure because I think the organizations are at different points as far as incorporating the NGSS into their work.*
> *– Steering committee member*

Finding: Familiarity with, knowledge, and appreciation of what other partner organizations do and how their work complements the work of other informal STEM education organizations has increased substantially.

- Organizations have become more familiar with what other partner organizations do and can appreciate their similarities and differences. Many interviewees commented on having the realization that there is a rich STEM community in the Twin Cities and that this has helped them feel supported in what they do. Leaders at the partner organizations felt impassioned by the staff at the other organizations and enjoyed getting to know them, particularly through presentations from participating organizations on their programming. Many organizations said they realized that they are not a stand-alone organization, but rather, what they have to offer complements the work of the other partners.

> *I've gotten to know these other informal educators and I've enjoyed working with them. I've gotten to know them better. It's a nice thing. I know the roles of the different informal education programs better, what their focuses are. – Implementation team member*

> *This past year working with these other institutions and realizing that it is genuinely trying to be cooperative. It's really helped me to realize what our place in the whole Twin Cities/Minnesota region is, what our niche is, what our role is in the community, and how these other organizations are different. So that if a school came to me or a teacher came to me and said, 'oh, we'd really like to do a program on the human body and electricity' or something, I could say, we could do something like that, but you should really go to the Bakken. Or, in another case, you might want to go to the Minnesota Zoo. I have a better idea of how we're cooperative and can be cooperative rather than being in direct competition– Steering committee member*

- Partners have gained knowledge of the different organizational models and how they operate from a structural and fiscal standpoint.

> *…had a lot of insight in to the different kinds of organizations. We're a state agency, the Bell is under the University, STARBASE is federal, and then we've got smaller private groups too, the Bakken and the Works, and so just it's been interesting to learn a little bit about the different kinds of organizations and their abilities to tweak programing really easily to accommodate this project or not. Different funding streams, different sort of approaches. – Implementation team member*

- Connections were made across partner organizations despite significant differences in programming.

> *Especially on the implementation team we work really hard to think about ways that our programs are connected to each other, and so in order to do that we have to go kind of in depth with each other about what the objectives of our programs are and really think about how we can draw the conceptual connections. …How can we work with our different structures and systems to be kind of good and supportive partners and make sure all these experiences are really meaningful for the students? – Implementation team member*

Challenges

Interviewees highlighted several barriers and challenges faced during the first year of STEM Pathways. These are described below.

- One of the partners felt that STEM Pathways had gone beyond the scope of the project as planned for the first year.

> *…I think [it] developed too much in year one where we should have, truly, been asking for funding to develop these things…But as far as the portfolio and the videos, it just went beyond what I understood to be the scope of the project this first year. – Steering committee member*

- Additionally, some partners felt that the role of the MPS district was very small in regards to the implementation of the project.

> *I think another barrier and challenge is that for MPS their role was extremely small, I thought, in the implementation of this project over the year. And for this being [a] brand new project, being tried out in MPS, it would be great if, whether it's more time or more personnel devoted to such a large project in the future, that would be incredible. – Implementation team member*

Finding: Partner organizations struggled with the lack of funding to participate in STEM Pathways.

- For some organizations, other responsibilities besides STEM Pathways had to take precedence due to tight budgets and budgetary priorities.

> *It would be fabulous if we could get some sort of funding that helps the individual institutions. – Implementation team member*
>
> *The MN Zoo and the STARBASE are very well financially supported, the Bell, the Bakken, the Works, it's more of a challenge for us. And I would also say the Bakken is somewhere in the middle. For the Bell and for the Works, it's a pretty significant challenge from a financial perspective. – Implementation team member*
>
> *This project has big goals and ideas about what it should be and needs to be, but only a couple of the institutions actually get outside funding to implement it. The rest of us are just kind of doing it because we want to be part of the project and we recognize the value in it, but without additional funding to pay for additional people or anything the amount of time required to really do it right is just something that we can't give up. Or it's very difficult, so we've navigated that by trying to get a couple more people involved and just spread out the work load. And when someone can be involved they are and when they can't somebody else tries to step in. But that becomes a challenge in and of itself. Keeping everybody properly in the loop. – Steering committee member*

Finding: Scheduling between the schools and the partner organizations presented logistical challenges for some organizations.

- One partner said that the district had provided tremendous support in the past for scheduling the field trips with schools, but that this year a lot of the logistics were left to the teachers and partner organizations to manage. Another partner said that scheduling in coordination with the other partner organizations for sequencing the lessons was 'tricky'; however, they were able to accomplish what they set out to do.

> *Some of this is just logistics. From our perspective at [partner organization], we offer this program and have for many years for all 5th graders, but we have not required schools, because it's not our job to require the schools to sign up for it, but with the STEM Pathways, not only did we have to require them, we had to make sure that they got in and they were coming at a time that made sense with the other partners. So some of just the scheduling logistics were a little bit tricky… – Implementation team member*
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> *That can be pretty tricky because we weren't able to schedule until later in our scheduling process, picking dates that are available for teachers and their classes was a big challenge, but we were able definitely to do that. – Implementation team member*

> *But scheduling early is a big recommendation, making the path very clear so that they're not necessarily bouncing around from place to place. I think there should be communication as we schedule schools. – Implementation team member*

In what ways can implementation be strengthened?

- Interviewees recommended agreeing on shared vocabulary, crosscutting concepts, practices, and core ideas to strategically implement across organizations. They also recommended agreeing on the development and use of new programmatic tools. They specifically mentioned: scheduling a meeting to go over the STEM Pathways Portfolio with representatives from each partner organization, developing shared goals as informal educators, and providing more opportunities for informal educators to meet.

> *Having more time to get to know the other organizations and to talk about what we were trying to accomplish and how we were going to assist each other would probably be the best thing that we could do. – Steering committee member*

- Interviewees recommended increasing the capacity, empowerment, accountability, and engagement of the steering committee to match that of the implementation team.

> *Everyone is trying really hard to provide input when it is asked for. But it's still kind of something that they're only involved when they're asked to be involved as opposed to taking initiative. – Steering committee member*

- Interviewees recommended addressing scheduling challenges. They recommended doing so by scheduling visits to partner organizations far in advance, developing and adhering to an appropriate sequence for visits to partner organizations for students, and identifying one person to coordinate scheduling logistics with the partner organizations and schools.[3]

> *The suggestions I have… the further out we can plan these things…often these things are a month, month and a half in advance, but I would love to know now about next year's schedule. I've got programs and my staff have got programs scheduled throughout June already. And sort of arbitrarily dropping in or doing a number of Doodle polls to try and find something…it's all just kind of ineffective and right now we should be looking at our schedules for next year and trying to get people to either commit to times and holding those times so we can get more people participating or something like that. – Steering committee member*
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> *For the 4th grade cohort I definitely think that summer planning and cohort meetings are absolutely necessary because the program takes off so quickly in the fall…I think teachers report back to Minneapolis schools on August 17th and I feel like we need to have our plan in place, what we're going to do, by the end of August. And then for 5th grade, again, early fall planning would be fine, but just kicking things off earlier as a cohort. – Implementation team member*
>
> *And so we'll be more intentional about just reaching out to them and getting them on the schedule right way. – Implementation team member*

[3] The last recommendation (identifying one person to coordinate scheduling) was only offered by one partner.

- Interviewees recommended addressing funding challenges. Their specific recommendations included increasing funding to facilitate greater participation from partners who do not have capacity, having each organization commit monetarily to the project, and providing transparency regarding what each organization is willing and able to do for the project.

> *I think in order to make something like this result in more meaningful change and benefit, all the partners and Minneapolis schools need to inform us of and commit to what they are willing and not willing to do. So we know what we're dealing with. So we know what we're working with and can be more planful around that. Who are the decision-makers, who are the developers, who are the implementers, and what is each and every person willing and able to do and how often.*
> *– Steering committee member*

What are the core components of the program model and conditions for replication?

The discussion that follows addresses a portion of this research question regarding the conditions necessary or desirable for successful implementation or replication, but does not identify the core components of the program's model. Interviewees identified the following key conditions for successful implementation of STEM Pathways:

- Total buy-in from all partners, the school district, and teachers.

> *…buy-in by everybody, but I think teachers are really important. – Implementation team member*
>
> *Without someone like [MPS STEM Integrationist] committed to the project it would be really hard to make this happen, so that's really critical. – Steering committee member*
>
> *I would also say that it's equally incredible that the partner organizations, most of whom have never worked together before or have needed to work together before, have come together on this collective work toward this common purpose and all have done so without any monetary benefit. So that's been pretty amazing because it's no small amount of work and no small investment.*
> *– Steering committee member*
>
> *I think the biggest condition is the good will of all the partners. I've said it a few times. People are doing this kind of on their own dime. They believe in the concept. And so the flip side of that then means the condition to make this possible is that people need to stay engaged. If people say it's just not worth my time, it's too expensive, I can't explain to my administrative staff why in the world we're doing this anymore, if we start losing the buy-in then it would all fall apart.*
> *– Steering committee member*

- Understanding from teachers about what STEM Pathways is and what the field trips involve.

> *One of the things that went well, and maybe there was some hesitation at first about how it's all going to work, but really having the classroom teachers understand what the project is… just connecting with them and helping them understand what STEM Pathways is really early on in the year. – Implementation team member*

- Strong leadership and direction from the steering committee.

> *I would say commitment of participating partners, maintaining the focus of the goals and the deliverables of the Pathways project and having a funding stream that enabled someone to spearhead this as part of a main priority or to facilitate the process.*
> *– Steering committee member*

- Endorsement and advocacy on the part of the district to principals and teachers at participating schools.

> *There has to be a strong connection with the expectations of Minneapolis Public Schools and this project. If a teacher in the classroom has just received a portfolio, for example, from the STEM Pathways liaison and they're left to wonder if this is supported by Minneapolis schools, does this count towards anything, does this align or is this an extra add-on. That's not good. That needs to be clearer and that needs to be more transparent and promoted. So there has to be advocacy there on the part of Minneapolis schools for any parts of these pieces that we're trying to accomplish. – Steering committee member*

- Small group work (e.g., fourth- and fifth-grade cohorts, implementation team, steering committee) was described as one of the ways the project was able to get things accomplished despite challenges with time and capacity.

> *I kind of outlined it in the previous question, just the work of the cohorts, bringing the cohorts together earlier. Getting the different pieces in place earlier, like the portfolio and the game of STEM… – Implementation team member*
>
> *I thought our groups getting together, our small work groups, was very useful. Getting to know the other participants was very helpful… Having more time to get to know the other organizations and to talk about what we were trying to accomplish and how we were going to assist each other would probably be the best thing that we could do. – Steering committee member*

- Collaboration—meaningful input from every partner involved.

> *I think that it will be important that there will be equal representation from all of the organizations in decision-making. – Steering committee member*

- Consistency of activities—ensuring that each partner consistently implements agreed upon programmatic components (e.g., STEM Pathways Portfolio).

> *I think greater consistency of activities, stronger leadership [or] direction on the part of the steering committee…We couldn't rely on just shared messages from the partners because we knew that wasn't happening consistently. And the portfolios weren't being implemented consistently.*
> *– Steering committee member*
>
> *…there's a lot of variation in how much time each different institution has to put into this specific project. And that shows in implementation. So I think that some of the institutions and the field trips that get done at those institutions and the level of knowledge of the staff at those institutions is just much stronger than others and I think that's a barrier or a challenge for future success in that it's not consistent. – Steering committee member*

- Providing compelling evidence-based research and evaluation to funders in order to secure funding.

> *Going back to the funding piece, I do think the research and the evaluation component and doing that well is really important, because that's how funders are deciding whether or not the project is worth supporting. – Steering committee member*
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> *…if I had dollars to support my staff to spend time in development and implementation meetings, spend time training staff to implement these components into STEM, that changes the ball game because then I can reallocate current staff time or go find a 0.25 or 0.5 staff person that can actually do this, but this can't happen if I don't have the dollars to put toward the program. – Steering committee member*
>
> *So I think the biggest gap is funding to the participating organizations. Support funding. – Implementation team member*

How well does the collaboration function, and how can it be strengthened?

Finding: Overall, STEM Pathways was successful in coordinating, collaborating, and fundraising to make sure the schools visited each of the partner sites.

- A positive outcome of the collaboration is that the partner organizations feel like colleagues rather than competitors competing for field trip dollars. Partners shared that they have come to understand that each organization has a different niche and serves a unique purpose towards accomplishing the shared goal of improving STEM education.

> *And I think having this shared belief and common understanding and goals and this collective brain power is just really critical to our work and success. – Steering committee member*
>
> *Strengths of the collaboration are all of us getting together and talking and developing these consistent themes and simplifying our messages and getting down to some core messages that we're trying to get across. I think that's valuable. – Steering committee member*

Finding: There are varying levels of involvement from partner organizations which can present a challenge for the collaboration.

- Some partner organizations were more able than others to contribute time and resources to STEM Pathways. This resulted in varying levels of engagement in planning activities and the development of programmatic tools (i.e. the STEM Pathways Portfolio and Career Interactive).

> *…everyone is excited about it and has bought in but there's not a super good balance of how much work different organizations put in toward making stuff happen. And so that then can create a strange dynamic. And I can imagine down the line, if other organizations aren't able to feel sort of like as big of a player that things could start to fall apart. – Implementation team member*

> *There's a bit of a conflict there because clearly when you have the resources, the people, and the time, someone to get things done, you really want to allocate that, but when it keeps getting allocated from the same place I think other organizations have come to depend on that and so I think that can get in the way of it being as complete [a] collaboration as perhaps everybody wants it to be. But related to all of that, some of that's going to be hard to do until we have a more substantial funding base that does allow for organizations, all of them, … to have some funding allocated to the staff time that goes into working on STEM Pathways.*
> *– Steering committee member*
>
> *The organizations that don't have any funding currently, it's hard for us to fully commit and do what we want to do to make this a really great collaboration without having any resources behind it."*
> *– Steering committee member*

- In order to serve the six STEM Pathways schools, other schools that regularly visit these organizations and qualify for scholarships were denied visits this year. Additionally, one of the organizations lost a funder to STEM Pathways.

> *I'm pretty sure we actually lost a donor at our institution because we were part of this collaboration and they chose to fund the collaboration and not our individual request, but we were not receiving any funding from the collaboration. So it was sort of a disconnect. – Steering committee member*

How effective is professional development, and what are future needs?

Interviewees were asked to describe the professional development that was provided for organizations, and their staff members, that are part of STEM Pathways. They described training about MPS learning targets, state standards and curriculum, a writing in science session about science notebooks, and presentations from each partner organization about their programming.

Finding: Sharing knowledge and identifying commonalities between, as well as unique talents of, each organization was a beneficial component of the collaboration.

> *We get to know more about each other, but we also get to observe and experience other teaching styles – other methods of delivering science and engineering concepts. So it's always good to see other people in action. Good educators doing their thing in their environment, because it always challenges you. Everybody can get complacent in their teaching style and their delivery methods. It's inspiring to see other people and it kind of kicks you in the butt and gets you thinking about different ways to present. – Implementation team member*

In regard to professional development, interviewees gave the following recommendations:

- Provide professional development for MPS teachers regarding content knowledge and ideas for implementation.
- Provide training for informal educators on how to work with English language learners (ELL). Provide an opportunity to learn from other informal educators' techniques when working with ELL students.

- Focus and target the professional development offered so that it is relevant to those who attend. Have more single purpose meetings—make sure there are clear goals for what needs to be achieved and then follow-up.

- Provide professional development for the partner organizations to learn about STEM integration and how MPS defines it.

What impacts does the model have on informal STEM education organizations?

Finding: STEM Pathways did not significantly affect programming offered by partner organizations, but it did impact the partner organizations in other ways.

- Most partners felt that, although they learned a lot from collaborating with other informal educators, their programming did not significantly change as a result. Some organizations did, however, incorporate new ideas to improve their curriculum and felt that the collaboration improved instruction.

> *I don't actually think it's affected us hugely because we were already seeing all the 5th graders. It's been a really kind of cool way to partner with other organizations and learn about each other…It's helped me look harder and make sure that my staff is aware of who they're teaching on any given day and thinking about how they're delivering the content on that. We don't offer anything different because of it or anything like that. We haven't changed our programming in any way. – Implementation team member*
>
> *It's improved our instruction because we've gotten amazing ideas from our STEM partners. How to hit messages in new and creative ways. – Implementation team member*

What are the implications of the Pathways model for the field of informal science organizations?

Finding: STEM Pathways can serve as an example and model for other informal organizations and other communities.

> *I would say we're setting ourselves up as a model for other communities throughout the country. Hopefully it will have the results that we hope will come out of it. We've kind of become the icon, the hallmark, the leader of the pack and could maybe get programs like this started in other locations. – Implementation team member*
>
> *If we can show that we can have a great impact on student learning by combining our efforts and helping students see the connections between these different experiences, I think that has a tremendous impact on other institutions in different communities who are looking to broaden their impact as well. – Steering committee member*
>
> *I also think every community and every school district is different so it needs to be a model that can be tweaked to meet the specific needs of the community where it's being implemented. – Steering committee member*

Finding: STEM Pathways provides a strong example for how informal science education can support and improve classroom learning.

> *As part of the informal education system, it can be these partnerships where we [informal educators] can provide really valuable experiences that are really supportive and really help solidify and bring energy to classroom learning. – Implementation team member*
>
> *…potentially creating a model for how informal science and informal STEM can work with schools that's different than what's happened in the past. – Steering committee member*
>
> *The potential for this type of work is to show that there are actual ways to collaborate and to do integrated science education that brings in the humanities, the reading, the social studies that schools say that they want, what education says is needed. This is something that can do that in a small way, but as a much better example of how it could be done than what currently exists. So an implication could be if it worked it could have broad impact on what we do and could be a case example for what other people do in the future. – Steering committee member*

How STEM Pathways can have a greater impact

Interviewee's ideas

- Provide more learning and programming between field trips to keep motivation and momentum for STEM learning.
- Increase engagement from higher levels within MPS.
- Engage more informal education partners.
- Involve families in STEM learning activities and opportunities in the community.
- Find funding for MPS teachers to be involved as true partners in the collaboration.

> *So it would be great if there was a way for us to be able to compensate teachers for time [so] that they would then play a more significant role in the development, oversight, implementation. – Steering committee member*

> *It would be really good if the Minneapolis School district provided some support for this program so that they could release teachers for a day, like in August to actually meet, so we could all have a professional development day. So we could go over and plan with the teachers and come up with really concrete outcomes for the program, and this is how the year is going to flow and these are the parts that you're going to be doing and what you're expected to do. – Steering committee member*

- Develop a relationship between each individual school and a STEM partner to create more of a customized relationship with each school.
- Engage MPS in the promotion of elements of STEM Pathways. For example, endorse the use of the STEM Pathways Portfolio among teachers.

Potential for the future

Although partners felt that STEM Pathways, in its current form, should not and could not be expanded due to organizational capacity and funding, it is worth exploring possibilities for the future.

> *…whether it's bringing on more partners or changing the way that we're doing our programming or creating a model that others can implement, there are just lots of different approaches to take and at some point we're going to have to hone in on what the one we want to embrace is.*
> *– Steering committee member*

Interviewee's recommendations

- Expand to other grade levels, other schools, and include more partners.
- Utilize STEM Pathways as a model for other communities who are looking to develop collaborations in support of STEM learning. Those who have participated in the planning and implementation could serve as consultants to other communities.
- Involve other organizations throughout the Twin Cities to fill possible gaps or increase capacity.
- STEM Pathways may take a leadership role in the STEM learning ecosystem.
- If STEM Pathways' evaluation results are positive, these findings could be used to encourage receipt of additional funding for STEM education more broadly.

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