



Results from Spring 2015 Interviews with Minneapolis Public Schools Leaders

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.

STEM Pathways serves fourth- and fifth-grade students at six elementary schools in MPS. This report presents findings from interviews with MPS leaders (district staff and school principals) involved with STEM Pathways and/or who work closely with STEM education in the district.

The evaluation of STEM Pathways is guided by a set of 10 research questions. The interviews were designed to elicit information regarding four 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. How well does the collaboration function, and how can it be strengthened?
4. How effective is professional development, and what are future needs?

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

Involvement in STEM Pathways among leaders from the district and school principals varied; however, all those interviewed agreed that STEM Pathways is of great value to the district, schools, teachers, and students. Some of the benefits of STEM Pathways include increased student engagement, increased ability within schools to integrate the sciences and literacy requirements, modeling and increased support for teachers, and alignment of informal education experiences to state standards. Identified successes of STEM Pathways in the first year include strengthened relationships between the MPS district and participating schools and STEM Pathways partner organizations, growing enthusiasm among students around STEM learning, and co-planning and communication between teachers and partner organizations.

Challenges were identified by both principals and district leaders. Principals identified lack of funding for buses and site visits as the primary struggle for participating schools this year. District leaders shared concerns about STEM Pathways' ability to meet the district's goal of serving all students and ensuring that each student receives similar educational opportunities. According to several principals, some partner organizations were more successful than others in communicating with teachers prior to STEM Pathways field trips and felt that these communications could be improved moving forward. Out of these challenges came several suggestions for improvement. Some of these suggestions included securing funding for buses for STEM Pathways schools, involving teachers in a kick-off meeting at the beginning of the year, and giving teachers an opportunity to give feedback on their experiences at the partner organizations. MPS leaders also suggested providing professional development opportunities for the teachers involved in STEM Pathways.

The remainder of this report gives a brief review of the methodology, offers a discussion of how the district leaders describe STEM Pathways, a description of the role these leaders have played with STEM Pathways, provides additional detail about findings for each of the research questions including illustrative quotes,¹ addresses the benefits of STEM Pathways to the MPS district, schools, teachers, and students, and closes with a discussion of the implications of STEM Pathways for STEM education broadly speaking.

Methodology

Key informant interviews capture opinions and perceptions from individuals with special knowledge and expertise. This methodology was utilized in order to collect in-depth information from district leaders regarding the implementation and accomplishments of STEM Pathways as well as suggestions for changes or improvements for STEM

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

Pathways in the future. Interviews were conducted with school principals from five of the six Pathways schools:²

- Keewaydin Elementary
- Jefferson Elementary
- Pillsbury Elementary
- Emerson Elementary
- Loring Elementary

Leaders from the MPS district included the:

- Coordinator of GEMS & GISE
- STEM Curriculum Integration Specialist
- Director of Elementary Education
- Director of Teaching and Learning

It should be noted that engagement with the implementation of STEM Pathways varied greatly across the principals and MPS district leaders. Some of the MPS leaders were involved at a very high level, while others were involved in many aspects of the programming. Principals often spoke on behalf of their teachers who were the ones that communicated with the partner sites and were more heavily involved in the STEM Pathways field trips and school visits.

What is STEM Pathways?

MPS leaders who work with STEM Pathways were asked how they would describe STEM Pathways to someone who has no knowledge of the project. Overall, STEM Pathways was described as an opportunity for students to connect classroom learning to experiences outside of the classroom through a set of field trips with informal education organizations who have expert staff in the field of STEM. According to MPS leaders, the goals of STEM Pathways are to improve STEM learning by taking students out of the classroom and engaging them in hands-on learning, to prepare students to be 21st century learners, and to expose students to STEM related careers. Some MPS leaders noted that another purpose

² The principal of Bryn Mawr Elementary was not able to be reached.

of STEM Pathways is to get informal education organizations to communicate and work together to better align their programming with the needs of Minneapolis Public Schools.

Role of MPS leaders

Interviewees were asked how they had encountered or been involved in STEM Pathways in the past year.

Finding: Involvement in STEM Pathways varied greatly for MPS district leaders. Some were directly connected to day-to-day implementation and others were indirectly connected to the project.

Finding: MPS school principals primarily played the role of assisting the teachers in preparing for the STEM Pathways field trips. A few principals also attended planning meetings at the beginning of the year and were able to attend the field trip to STARBASE.

The largest piece is supporting the teachers, making sure they get everything organized and getting the kids ready to go on the field trips.

...in my role, I do check-ins with the teachers and talk about the connections with the learning and how they're bringing it back into the classroom. But also, I see it as my role to make it a priority. So when we're scheduling, to make sure that's a priority for our 4th and 5th grade students.

...just kind of talking to teachers about how all those field trips and experiences have gone.

I worked a little bit with teachers on selecting a contact person and monitoring the logistics of it as we went through the year.

How successfully is the STEM Pathways model being implemented?

Successes

Interviewees were asked about what they thought were the biggest successes of STEM Pathways.

Finding: Relationships between the MPS district, including individual Pathways schools, and STEM Pathways partner organizations have been strengthened resulting in better alignment of programming.

That it's not just a separate field trip that comes and goes away and then we come back and have some cute pictures. It's really the standards that students are expected to learn about are embedded in the field trip experience and then are brought back to school and vice versa.

I definitely think that the organizations working together and with the district is a huge, huge success. I think communication and the sharing of goals and ideas and education is a huge success. I think having common language, vocabulary and having those connections between organizations so that students can pick up on that is a really big deal.

Finding: There is growing enthusiasm and engagement in STEM learning from students as a result of STEM Pathways field trips. Students are making connections between their STEM Pathways experiences and what they are learning in school.

What our students have shared is that they think being a scientist is cool, being a scientist is fun, and building stuff is fun. I remember distinctly sitting with a few students saying 'I need to learn this, I need to learn this because this is what we practiced when we were at STARBASE. We practiced this in math, so I need to figure this out.' So they're making these connections and to me that's what it is. If a student walks away learning something and seeing that value and its purpose and how it connects to potentially their future, for me, it was a successful day.

Finding: Co-planning and communication with teachers prior to the field trips from some organizations was helpful for teachers.

The Bakken is helpful because they co-plan with the teachers. Staff reached out to teachers.

In what ways can implementation be strengthened?

Challenges

Interviewees were asked about what they thought were the biggest challenges of STEM Pathways.

Finding: Schools faced significant challenges with finding funding to be a part of the project—most challenging was the cost of buses and site visits.

Getting a list of the costs earlier would be nice. To have information in March would be nice for principals to make a budget.

Finding: District-wide expansion would be important for long-term sustainability of STEM Pathways in the district. If STEM Pathways were to remain at the same scale as it is during this pilot phase, MPS district leaders felt that STEM Pathways would not align with the district's goal of serving all students because it only provides the experience for a fraction of the district's fourth- and fifth-graders.

One of my biggest concerns about STEM Pathways is that it's a limited subset of our students, which doesn't seem to fit with our goals related to equity. So one of the things I've wondered about is what might it look like to think about a consistent STEM opportunity across all of our sites as opposed to a number of partner opportunities within a chosen number of sites.

I would prefer to look at and evaluate a model that would provide access for all of our 45 elementary sites as opposed to just the chosen few that we have right now.

Finding: Communication between teachers and informal education sites prior to the field trip visits varied for each partner organizations. Often teachers didn't know what they were going into when they went on a STEM Pathways field trip. However, several principals felt that, after this year, teachers will be able to plan better to fit the learning from each site into their curriculum and learning sequence.

The first year was a little tricky with teachers for navigating. Now they can see how they will connect it next year. Connecting has happened after, next year [it] could happen more before.

Teachers weren't sure about what would be happening at the Bell Museum coming up.

Suggestions for addressing the challenges and improving the program

Interviewees gave several suggestions for improving STEM Pathways moving forward including:

- Develop concrete goals to accomplish and utilize project management strategies to document progress.

I think that one of the things that makes it hard to speak authoritatively about whether or not we're fulfilling goals, whether or not work is being successful, is that it's not always clear throughout the process, what precisely the STEM Pathways are delivering or committing to deliver and on what time line. So, I gave the group some feedback, specifically around the need for a more robust planning process and then some really consistent project management to back up whatever commitments are being made to make sure they're actually getting built and implemented.

- Communicate costs related to program participation to principals earlier in the year so they can plan for STEM Pathways in their budget.
- Secure funding for buses and site visits.
- Hold an initial kick-off meeting that includes not only the partner organizations, but teachers as well.

- Increase communication between teachers and informal education sites earlier in the year and prior to the field trip visits for a more coordinated effort to improve student learning.
- Offer training for the teachers before the school year starts and have a time for them to learn from each other about how they incorporate aspects of the field trips into their classroom.

One idea I have is to have all the teachers of STEM Pathways schools talk about ways that they incorporate these things in their classroom so that we're not all trying to do separate things. Sharing some of those ideas.

- Provide an opportunity for teachers to give feedback on the experiences at each organization.

Teachers could give some feedback if there was an exit slip to give feedback on what went really well this year, what would be another opportunity for learning or what might be some ways to make those connections for growth. They could provide more on that.

- Involve/provide opportunities for parents. Provide a list of possible STEM activities for parents to do with their children in the community.

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

Relationships and collaboration with partner organizations

Interviewees were asked how their relationships with the STEM Pathways partner organizations had changed as a result of being involved in STEM Pathways and about how the partner organizations worked to collaborate with schools and the district to improve STEM education.

Finding: Some MPS leaders felt that participating in STEM Pathways strengthened their relationships with the partner organizations and made them more meaningful.

Now that we have this STEM Pathways thing, I think it feels supported in that we don't have to kind of beg and hope that we get to keep going [to STARBASE].

STEM Pathways allows for a clear balance between the 4th and 5th grade of who's going where and then making it more meaningful... It's connected to what they're doing and [it's] connected to [what they're doing] during different times of the year.

There's a smarter use of those trips.

I think the work we do with them is more coordinated and aligned.

Finding: MPS leaders appreciated how STEM Pathways and some individual partner organizations supported teachers and communicated with them before and after the field trips or visits. However, this did not happen consistently across all the partner organizations.

There was some pre-learning that the teachers did with the students. Bakken reached out and there's been strong support there... The organizations have been very specific at reaching out to our teachers. The [STEM Integrationist] will follow up if something's not quite right or we need more information.

The Bakken is helpful because they co-plan with the teachers. [The] staff reached out to teachers. A lot of connecting and planning [happened] leading up to the future...The Bakken and STARBASE staff have really reached out and have worked a lot with the science department. So much work happened behind the scenes.

STEM Pathways support of MPS curriculum

Interviewees were asked whether, and in what ways, STEM Pathways supports the MPS curriculum.

Finding: Each partner organization supports some aspect of the MPS curriculum.

They know what those standards are for the 5th grade, and when our students go on a field trip there they will highlight those things or they'll make sure they're using some of the same vocabulary the teacher might be using in labs or lessons here.

Talking with the teachers, they feel it really supports the MPS curriculum 100%.

Our curriculum, of course, is aligned to the state standards that teachers are charged with teaching each year. Insofar as the things I've looked at, some of the written materials and what I saw at STARBASE, there's also an alignment with those same standards.

Other relationships that support STEM learning

Interviewees were asked whether they have relationships with other organizations that support STEM learning besides STEM Pathways organizations.

Finding: When asked whether they have relationships with other organizations that support STEM learning responses differed for principals and MPS district leaders. Most principals do not feel that they have other relationships with STEM organizations and most district leaders feel they have several other relationships.

I know that we do, I don't know who they're with. – MPS District leader

Yes we do. We work really closely with the Science Museum of Minnesota. We have Engineering is Elementary, workshops for our teachers and residencies from the Science Museum. – MPS District leader

I'm sure we probably do, just off the top of my head I can't name any at the moment.
– MPS District leader

We do not. That's an area we're looking at. ... I would say any contributors that we have seem to be more around the arts. – MPS Principal

Nothing comes to mind right now. I think they've gone on other trips, but I just can't recall. They go on so many trips that I can't say with any certainty, but I would say this is our main partnership. – MPS Principal

We do not, not with other organizations. We do offer our ALC (alternative learning center)—we have an academic part of ALC and then we do our STEM ALC with the GEMS & GISE program. – MPS Principal

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

Finding: Some MPS leaders would like to have professional development offerings for teachers who have classrooms involved in STEM Pathways (3 interviewees, including 1 MPS district leader and 2 MPS principals). Others referred to the teachers' involvement in STEM Pathways as a form of professional development and felt that teachers were able to benefit from attending STEM Pathways field trips with their students (3 interviewees, including 2 MPS district leaders and 1 MPS principal).

I definitely want PD [Professional Development] for our teachers that are implementing... So understanding the programming and how to then integrate that into your lessons in your classroom. – MPS District leader

If we had maybe one or two teachers get some more intensive professional development that they could bring back to their colleagues or some kind of model where teachers could develop their craft a little more with the subject matter. That could follow-up with collaboration they're already doing and build capacity for them to do some of this learning throughout the day. – MPS Principal

Wonder if there's an opportunity for schools and partners to get together for a half day of learning or planning around the experiences they're going to have. Set aside some planning time. Teachers are always asking for that. – MPS Principal

I know that the teachers who have gone on these experiences have learned a lot more about science, technology, engineering, and math. Their own content knowledge is much stronger and that always helps when they're teaching. – MPS Principal

Interviewees recommended creating a Professional Learning Community (PLC) around STEM.

What is the benefit of STEM Pathways to the district, schools, teachers, and students?

Perceived benefit to the district

Interviewees were asked about what they thought the benefit of STEM Pathways was to the MPS district.

Finding: MPS leaders feel that STEM Pathways is a great opportunity to connect and align informal education opportunities to state standards and MPS learning targets.

So I believe, from that stand point it's a good support to the curriculum. I think it's a support from that view point, but I'd look at it as more of an enhancement where we're able to teach some of those standards, reinforce some of those standards in ways that might be more hands-on, more experiential or project based. And so having a variety of ways to teach those things both supports and enhances the curriculum.

Finding: STEM Pathways contributes to a continuum of education so that students are set up for success as they enter into the later grades.

If we can get all our kids on the same level of knowledge, then our teachers that are teaching those grade levels, they're not going to have to step back, they're going to be able to continue and push the kids even further. Perhaps they'll go in and stay in those classes longer instead of saying, 'gosh I'm done with science. I only have to take my one year requirement.' Kids may say, 'gosh I really like that, I want to continue that.'

Finding: MPS district leaders identified the value of relationship building with community partners, including the sharing of ideas for how to approach teaching and learning.

I think any time you have community partners that are working together for the benefit of your students, the staff, and just making the Minneapolis Public Schools a richer place to be and grow, there's endless benefits.

Finding: District leaders see the potential to understand the impacts of coordination and alignment of informal education programs on student learning and achievement.

...we're able to provide a coherent and aligned sequence of experiences for students in certain grades, in certain schools. And then we're able to compare that with the achievement of students who are not having those experiences to kind of isolate the impact those STEM experiences might have on student learning, which might have implications for us down the road. If this really does make a meaningful difference either in terms of achievement or students' interests or long-term commitments to STEM disciplines, then what can we do to get these experiences to more kids? It's giving us a useful test case for thinking about what non-classroom educational experiences we can coordinate that are still to the benefit of our students.

Perceived benefit to schools

Interviewees were asked about what they thought the benefit of STEM Pathways was to their school or schools within the district.

Finding: Connecting with informal education organizations increases the resources available to schools and to the district and helps to use these resources in a more strategic way.

I think the real value now, and the potential greater value, is being able to coordinate partnerships with a lot of the premier organizations that do this work outside of the school system. To be able to tap into those things, into those partnerships in a way so that we can be more strategic as a school district and a school rather than each school kind of reaching out based on the interest of the people at the school or who they know or what they happen to care to do that year. This allows us, as a school, as a district, to plug in to a lot of resources beyond what we're able to provide and to also make sure it's aligned to standards, make sure the quality is there, and that we're being very intentional about how we partner with people and what we put in front of students as far as content goes. So I think that strategic piece is really important for the district and for the individual schools.

Finding: According to several school principals, participating in STEM Pathways has increased the marketability of their school.

I think the other positive thing has been our parent community. They are really excited and happy that their children go to what they would consider a STEM Pathways school. It brings a strong marketing part to the school.

Finding: The ability to integrate the sciences and literacy requirements is easier with STEM Pathways experiences to reference.

I think where science comes, in particular, is you can use science or any of these other content areas to teach the skill of reading. So it's a way to not say, okay we're just doing reading now or doing math or doing science. You can integrate them easier, better, especially with some of these outside experiences.

Perceived benefit to teachers

Interviewees were asked about what they thought the benefit of STEM Pathways was to teachers in their school or district.

Finding: STEM Pathways provides modeling for teachers, inspires them, and increases their interest in STEM topics. It gives them new ideas for ways to incorporate STEM education into their classroom.

I think it's helped them...I'm thinking mostly about our science teachers. Science is often times a subject in elementary grades that you do when you have time to do it, because there's so much you have to do in terms of literacy and math. This has been a chance for teachers to really dig into science and feel the importance of that content and have the tools and resources to really teach it in depth. And I think this has really helped that. I'm thinking, specifically about some of the vocabulary that is used in all of these experiences and then also back in the classroom. I think that's been really great. I've seen teachers talk about those field trip experiences in the lessons that they're doing in the labs that they're doing back here. So that's been very helpful. ...Last year we departmentalized so there was just one 4th grade teacher who taught all the science, and I think she got very good at this. She knew exactly what she needed to teach them, and I think that was very helpful with all those experiences.

And I think that that's been a big piece... just being able to go to these various opportunities. The teachers probably sit there and go, 'well I can't necessarily lead the kids through this activity to build a 3-D rocket, however, what they are noticing is that the people who are leading those are elementary classroom teachers that have a passion in science, have a passion in technology, have all those passions and through proper learning and all of that, get to that point.

Finding: Being involved in STEM Pathways makes STEM less scary and more approachable to teach for teachers who are not trained science or math teachers.

Looking at it in a way that it's not scary. That STEM is not a scary thing. It's really applicable and there are so many different ways you can teach it.

Finding: Principals feel that teachers felt supported by STEM Pathways and that it helped alleviate some of the pressure around planning and organizing meaningful experiences for students.

Just understanding what standards are being addressed by each partner helps us to coordinate student learning, but also helps teachers as they're doing their planning to be very purposeful ... there's an opportunity for these preliminary and post-activities and tying it in a meaningful way.

I think having that support. It's not a 'here, do this' program, but the teachers are getting the support. There's follow-up, they're meeting and having check-ins with the coordinators. I think that's important and a positive thing that gives them the support they need and also keeps them on the right track.

Finding: STEM Pathways assists and empowers teachers to make connections to the MPS curriculum and broadens their ability to present STEM curriculum, including providing stronger foundations for students in math and science to support their knowledge in engineering, and present STEM career options to students.

I think the professional development they get by going [on the field trips] with their students, but also the ones who participate in the planning group around the STEM Pathways, I think will feel more connected to the work at MPS and will help us build our institutional knowledge around what quality STEM instruction looks like for elementary age students.

I think it also gives teachers a sense of empowerment, to the extent that they are planning and leading around STEM Pathways programming, not just experiencing something that's been designed by other people for their benefit without any of their input.

It's an opportunity for our students and our teachers and our 4th and 5th grade to have beginning exposure to STEM and to build that catalyst that will get them even more interested to seek further information, seek further in professional development and being able to integrate it into classroom. So I think the largest piece is making those connections across the standards and bringing them in for STEM for what we know about our 21st century learners. The importance of having a strong science foundation, a strong math foundation, so that all of those come together and continue to support that engineering piece. And what we know is that anything that's hands-on for our students, such as STARBASE and really hits that engineering goal, our kids did exceptionally well in terms of their participation and their behavior. It showed the gaps in what they may or may not know overall in those areas, but it was a piece that when the kids come back they were like, 'can we have our classroom like this?' It's beginning to contribute to building that, so that is one of the kind of overall goals. ... Building a knowledge base around those key disciplines, looking at how you integrate/make those connections so that our kids are ready to be 21st century learners.

Perceived benefit to students

Interviewees were asked about what they thought the benefit of STEM Pathways was to students in their school or district.

Finding: STEM Pathways expands student access to STEM learning activities and promotes career exploration.

Yeah, I think motivation in middle school especially. I guess even in the upper elementary grades. Sometimes kids will say, 'Why do I need to learn this?' And now there are very practical and obvious things we can point to. Well, if you want to have a job in technology, make a video game, or do any of those things you need those skills. And I know a lot of the field trip experiences show those career pathways.

Finding: STEM Pathways sets up students for success by strengthening skills around science, technology, engineering, and math. It also helps students make connections between STEM and everyday things.

Being able to say, 'building a bridge is really cool' or 'building a skyscraper' or 'being a scientist that is able to help with finding a cure for something.' Or, as a mathematician, I know all these pieces, but if I want to expand it I can become an architect or if I want to become a chemist or any of those things. So it's really about the kids starting to have these connections made for them. It's not just in a white lab coat wearing goggles or a mathematician writing problems. It's really showing the kids, by learning this, this is the bridge that helps you get to that next point.

....I know that they use those [referring to a 3D printer mentioned earlier in the interview] at STARBASE and I was very impressed with how they were having the students engineer some things and produce them on the printer and so I do think here and there I've noticed teachers seeing things that are going on in these programs and trying to adapt them in their classrooms as best they can.

Finding: MPS leaders feel that STEM Pathways will increase the likelihood that students will take more STEM classes in later grades and will pursue careers in STEM.

So I believe when we get students excited about science, technology, engineering, and math we're going to be, in the early years, a lot more likely to see them pursuing that rigorous coursework down the road. And maybe eventually careers in those fields. And so I think we're doing them a great service in terms of sparking their interest. Helping them compete down the road in the job market and globally. So I think that's probably the bigger value of it.

Finding: MPS partners feel that STEM Pathways provides students with good experiences in science and math.

It's just a really positive experience for kids. I'm hoping that it will have an impact on students' achievement. We are just kind of getting scores in and it's always hard to figure out, kind of, what is it that helped our test scores, was it a field trip, was it a project that they did? It's hard to say, but I think having positive experiences in science and math is always a good thing and will help student learning.

Finding: STEM Pathways provides experiences for students who may not be exposed to STEM related activities outside of school.

Bottom line they get the experience and the exposure that as a school with students that are 95% in poverty, 20% in shelters, they're not getting the opportunities to go to places like this and this may be one of their only opportunities.

Implications of STEM Pathways for STEM education

Interviewees had varying perspectives on the implications that STEM Pathways might have for STEM education, broadly speaking.

It's really the catalyst to get our students to think about what it means to be a 21st century learner and a citizen of the 21st century.

I think it's a model that other organizations in different areas of Minnesota or across the nation could really adopt and look at. I think it has a lot of potential in [conveying] what we want STEM education to look like.

Especially with MCAs, a lot of the focus is on reading and math, and science kind of gets put to the side. So I think something like this, the STEM Pathways program, keeps the sciences, especially the sciences, alive—doing it in the classroom and beyond. Earlier I said I've seen a lot more science going on in 4th and 5th classrooms this year than I have in the past.

Wilder Research

Information. Insight. Impact.

451 Lexington Parkway North
Saint Paul, Minnesota 55104
651-280-2700
www.wilderresearch.org



AMHERST H.
WILDER
FOUNDATION
ESTABLISHED 1906

Here for good.

For more information

For more information about this report, contact Francie Streich at Wilder Research, 651-280-2680.

Authors: Francie Streich and Anna Bartholomay

AUGUST 2015