PROOF POINT: PATHWAYS TO PROSPERITY NETWORK

INTRODUCTION

At the October 2014 Network convening, JFF asked the Pathways regions to consider whether they were far enough along in implementing the Pathways to Prosperity design to serve as a proof point for the Network. By proof point, we mean a region that has implemented at least 3 of the 4 levers in the Pathways design (career advising, 9-14 pathways, intermediary functions, and employer engagement) with sufficient depth to serve as a model for other Network member regions. In essence, these sites prove that they are well down the road to building out the pieces of a career pathways system. Eventually, these regions might serve as “clinical” or “demonstration” sites where other regions can get peer advice and support at early stages of implementation. Over the last year, JFF has worked with three proof point sites—Long Beach, Central Ohio, and Marlborough, MA—to strengthen their work on all four levers, but with special emphasis on areas meriting particular attention.

NOTE: While the Network is designed to show a positive impact on high school completion, degree or certificate attainment, and even labor market outcomes, such data is, unfortunately, a long way off. However, JFF and other organizations have been following cohorts of early college students for a sufficient number of years for Pathways to take that very impressive data as an indication of what strong 9-14 pathways can accomplish with regard to student outcomes.

Demonstrating outcomes metrics will be a challenge and require patience. Most 9-14 pathways begin with small cohorts of ninth graders and add students and grades each year, so initial cohorts are limited in size. It will take a sophisticated evaluator to determine which outcomes can be correlated with Pathways implementation. In addition, we do not at this stage
have the resources for comprehensive data collection, nor are most cohorts large enough to generate statistically significant results. There are, however, some exceptions: the three cases considered here all have substantial numbers of high school students in pathways—not attributable to Pathways to Prosperity alone, but also to prior work establishing career pathways that Pathways to Prosperity has enhanced and strengthened. They also collect and provide data on the progress of students in their districts.

THE PROBLEM: MARLBOROUGH

On May 23, 2015, Dan Riley, the director of STEM for the Marlborough, MA public schools, and Sylvia Beville, executive director of Partnership for a Skilled Workforce (PSW) and her team were thinking long and hard about the agenda for the last meeting of the school year with their leadership committee. The employers who had been so involved in the school—participating in science fairs, hosting student visits at their companies, running teacher workshops on design thinking—would now be asked to produce 100 paid internships over the next year. What would they say? Dedicated as they were to the school’s STEM early college program, this was a big ask. Dan, Laura and Kelley came into the meeting with an activity that would culminate with a plan.

Both the early career awareness and 9-14 pathway levers are well developed in Marlborough. Students identify a pathway at the beginning of junior year. Each pathway is aligned with a specific industry sector. Through the community college partner, students will accumulate 18 college credits at graduation. During the 2015-16 school year, Marlborough will pilot pathways in engineering, computer science, information technology, and biotechnology. The school has memoranda of agreement with two public higher education institutions. The Partnership for a Skilled Workforce carries out intermediary functions and helps create a system that integrates work-based-learning.

This case centers on a partially developed lever: Employer Engagement. Marlborough has integrated work-related exercises and applications throughout the curriculum, as well as a menu of visits and activities with employers and professional development programs that introduce teachers to business processes. The challenge addressed here is increasing the number of paid internships available to students, and, closely linked to that goal, developing the capacity to design workplace position descriptions suitable to the needs of specific companies or sectors and to the skills and capacities of high school students. (See proof point goals.) In the graphic below, the current challenge is under the mentor/supervise category.

FIGURE 1. LEVER-EMPLOYER ENGAGEMENT

<table>
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<tr>
<th>MEET</th>
<th>ENGAGE</th>
<th>SUPERVISE/MENTOR</th>
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<tr>
<td>DEVELOP RELATIONSHIPS AND CAREER AWARENESS</td>
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<tr>
<td>Participate as judges in STEM events</td>
<td>Discuss career possibilities with students</td>
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<td>Present at panels and round-tables</td>
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<td>BUILD CAPACITY IN PBL AND WBL</td>
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<td>Consult with teachers on Project-based learning</td>
<td>Offer informational interviews</td>
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<td>Provide site tours to teachers and students</td>
<td>Be a resource about industry pathways</td>
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<td>DEVELOP INTERNSHIPS</td>
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<tr>
<td>25-50 Hours</td>
<td>Supervise intern</td>
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<tr>
<td>Interview screened intern</td>
<td>Debrief with school</td>
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<td>Develop WBL plan with school</td>
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BACKGROUND

In fall 2011, with funding from a Massachusetts Department of Elementary and Secondary Education’s Race to the Top grant and technical assistance from Jobs for the Future, Marlborough launched a STEM early college high school. In 2013, using the Pathways framework as the guiding rubric, JFF and partners applied for a U.S. Department of Labor Youth CareerConnect (YCC) grant and were awarded $4.9 million to scale up innovative high school models geared to regional labor market needs over 5 years. Marlborough became a Pathways demonstration site for YCC in Massachusetts. A distinction of the Massachusetts Pathways approach, which became part of the College and Career Ready unit of the Massachusetts Department of Elementary and Secondary Education in 2014, is that community colleges and WIBs—not school districts alone—serve as the organizing hubs.

The Marlborough STEM program immerses 600 young people, grades 6 through 12, in advanced, interdisciplinary collaborative projects and work-based learning (WBL). The Marlborough Proof Points region consists of MPS Middle School and MPS STEM Early College High School (M-STEM). M-STEM employs a non-tracking, non-leveling approach that begins in sixth grade, continues into secondary, and is entirely honors-based. Students receive instructional supports as they progress through the problem-based advanced curriculum. Both vertical and horizontal teaming, in the form of professional learning communities, are common in both the middle school and high school. The scope and quality of project-based learning has increased over time: currently, middle school students complete one project per semester and high school students complete four projects per year.

Starting in tenth grade, students earn college credits through partnerships with a community college and a four-year state university. In addition, they explore the world of work through internships. The program is not targeted to the highest performing students. Rather it serves average students who might not have postsecondary aspirations, English language learners (14 percent), Latino students (35 percent) and students with disabilities. Nearly half the participants are eligible for free or reduced-cost lunch.

DUAL ENROLLMENT/AP

M-STEM has MOUs with Framingham State University and Quinsigamond Community College (QCC) for dual enrollment courses that include expository writing (12 students), college writing (12 students), Intro to C++ (9 students) and Intro to Web Design (2 students). Due to distance from the colleges (25 miles), M-STEM employs a hybrid course delivery model; students participate in college coursework on site at MHS, take courses online, and participate in college visits to experience the campus environment.

M-STEM has also established a blended model of AP that includes articulated courses for skills areas (CAD for college credit), as well as online college courses. This allows students to have at least semester worth of postsecondary study prior to high school graduation.

THE EMPLOYER ENGAGEMENT CHALLENGE: BEYOND SCHOOL-BASED LEARNING

PATHWAYS

M-STEM has identified 16 different pathways matched to four major Pilot Pathway Clusters (Engineering, Computer Science, Biotechnology, and Information Technology). Fifty percent of current eleventh grade students elected to enroll in the Pilot Pathways model for the 2015-16 school year. These include Computer Science, Engineering, and Biotechnology. These pathways are coupled with individualized learning/development plans (IDPs). Naviance Family Connection will be used beginning in fall 2015 with all students starting their freshman year as a college/career-planning tool that houses the IDP.

IN-SCHOOL CAREER PREPARATION

Marlborough has put in place extensive school-based activities preparatory to a work-based experience in a company, the goal for all rising seniors. Not only is the curriculum sequenced in such a way that in sixth through tenth grades students gain the foundational skills and knowledge required for advanced work in eleventh and twelfth grades, but industry perspective and participation is woven into students’ daily activities at school. The following companies have a role in the school.
M-STEM has a three-tiered approach that allows industry partners to engage in a variety of activities that range from career awareness to training, including STEM fairs, career panels, roundtables, and project-based learning, as well as a limited number of internships. One particularly interesting feature of in-school work occurred last year with STEM Office Interns. Working for the high school, students organized technology user agreements, created FAQs, repaired broken Chrome Book screens, took inventory of classroom projectors, and set up study guides and project resources for students new to STEM. In FY16, M-STEM plans to expand in-school internships throughout the high school.

In addition, students are using robotics technology, 3D printers, and CAD programming. Plans are in place to train students in computer numerical control, mostly in woodworking, as well as simulation software geared toward milling. PTC, a global company that produces technology-enabled solutions to help manufacturers “transform the way they create, operate and service products” provides particularly generative school-based activity. Working with teachers and students, STEM expert Ayora Berry, an employee of PTC in their Global Education Program, provides teachers with the knowledge about and experience with design thinking that results in product development curriculum. Below is a snap shot of the PTC-sponsored Product Development Work Day at the high school.

**COMPANY REPRESENTATIVES: A SAMPLE**

**PTC.** Ayora Berry, an experienced education manager, instructional designer, and teacher trainer, works in the K-12 education division of PTC Inc. The company’s goal is to foster innovation in product development and the Internet of Things through software and service partnerships with 27,000+ manufacturing companies across the globe. Berry’s contributions to and activities with Marlborough’s school community include supporting the district’s PBL and STEM/STEAM education strategy, supporting teachers’ curriculum innovation, providing students with industry design challenges and mentoring, and connecting the school with PTC’s worldwide education and industry community. PTC has a K-12 team of 6 to 8, as well as a postsecondary team of 25.

**Dow.** Research Scientist Phillip Hustad is an award-winning chemist in the R&D unit of Dow. Dow’s Core R&D division, where he is responsible for development of advanced block copolymer systems for electronic applications, and invention...
and development of advanced polymeric materials for lithographic patterning. Associate Research Scientist Paul LeBeaume (interviewed above) has a background in bioorganic and medicinal chemistry. Dow is deeply involved in education under the banner of STEMtheGAP™, a series of initiatives to support and advance STEM education, including a teacher challenge, robotics competitions, curriculum dissemination and the like. However, Dow’s role in Marlborough is unique. Phil and Paul organized colleagues to judge science fairs, to install a booth and judge the STEM EXPO, and this year piloted a half-day field trip to the company with a future goal of providing such an experience to 50 percent of ninth graders. The carefully planned event was structured around the invention, scale up, and quality control processes in the company. Dow first brought in teachers, and then hosted six students selected by the school. Each student prepared a slide about him/herself and why he/she wanted to be here. In groups they delved into the company’s processes. The company also hosted two weeklong internships for Marlborough students, one resulting in research that the company is using. “Now have broken the ice have a narrative we can use to expand,” observed Phil.

JFF Question: The Marlborough team has a challenge. YCC requires that 100 students have internships next year. What should they do to make this happen?

Ayora: The traditional approach, internships, would be hard for us—we only hire BAs and although we have a rich history of internships, there’s not much a high school student could do, and we’d have to pay them. PTC is not in shape to do that now, and as a pipeline investment—which we need—we’d have to wait too long for them to be done with college. But we could do what Olin College does: Students are given a challenge a company faces, they go through an invention process with virtual and face to face mentoring. They present their results to the company. It’s much less costly especially if the school partner handles logistics.

JFF Question: How did you get involved?

Paul: I wanted to give back, and thought about it a long time, until I had a light bulb moment. I’m a chemist, so why not give back with chemistry. Then I realized there was a growing interest across the company in STEM for the community. I reached out to the MSTEM team and said, we’ve got people who want to volunteer. How can we help? We met and created an exciting vision together. I brought it up to the president and VP level and got 110% support. But scaling paid internships is not going to be easy. Even taking in two students, I talked to a lot of people who said, “this is impossible.” And it took a lot of effort to find projects valuable to Dow and right for a high school student, but once a young person is up to speed, perhaps they could come for a month or six weeks.

Paul’s question: What’s the amount of time really needed to impact students?

Boston Scientific is one of the world’s largest medical device makers. Their support for the STEM program is two-fold: The eighth grade STEM cohort does a day of work-based learning experience at the company. More than just a “walk around,” structured on-site activities teach students—for example—why statistics are important and how to learn from mistakes. The company has also provided resources at critical junctures, such as printing 30 students’ large-scale models on their 3D printers for the STEM EXPO.

Marlborough Hospital. The team of Marlborough Hospital interns developed a plan for the orthopedic service line to raise awareness about sports injury prevention. Interns went one step further and developed a class for their peers at Marlborough High School to help prevent sports injuries.

Raytheon. Jim McGrath retired as an Engineering Fellow at Raytheon Network Centric Systems. With a long history of work with area schools, Jim and a Raytheon team created project based learning opportunities in Marlborough classrooms. One project involved Raytheon engineers helping students create
an energy efficient roofing system to store water. LEED certified engineers reviewed student designs. However, high school internships are not usual at Raytheon—for security reasons as well as others.

**INTERNSHIPS**

The Marlborough site has committed leadership; a tight-knit, diligent planning team that meets regularly; ample financial resources to support the work; strong and varied partnerships with external stakeholders; a culture of collaboration; and internal district authorization committed to scaling pathways. The curriculum for each of the pathways is in place and the scope and sequence is clearly delineated. Opportunities to receive college credit are heavily concentrated in AP coursework. The team is working currently to expand dual enrollment offerings and to embed additional dual enrollment courses in the senior year. Grant funds have enabled the district to put teachers through training, to integrate new content into the curriculum. Teachers receive stipends for training their peers.

**Status of Student Internships**

In summer 2015, 10 students had internships across different companies, three were paid: Marlborough Hospital (6), Dow Chemical (2), Hologic (1), and the Engineering Pipeline Program at National Grid (1). Because Marlborough is operating within the YCC guidelines, companies were required to provide 25-40 hours of work total during the summer.

**NETWORK LEADERSHIP TEAM**

External partnerships are developed by a network leadership team comprised of one representative from each of the companies that works with the high school. Up until now, the group has met quarterly; it may meet semi-annually moving forward. The group includes representatives from 10 companies, among them senior scientists from Dow Chemical and the research and development director of Boston Scientific, as well as two health care executives, the mayor of Marlborough, and three staff from Partnership for a Skilled Workforce, including the Executive Director,

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**LEADERSHIP TEAMWORK PLAN**

1. Continue to develop and support comprehensive WBL structure for fall Institute presentation.
   a. Complete Action Plan with specific, measurable, and detailed deliverables and timelines
   b. Develop a model to further integrate employers in WBL (e.g. co-designing curriculum and co-teaching)
   c. Establish early connections in middle school for WBL (Possible Futures, Possible Selves)
   d. Build and extend mentorships
   e. Continue to build teacher externships
      i. Framework, model, protocols for teacher/employer visits
2. Support the identification of metrics and methods for data analysis.
   a. Accountability measures that determine student learning outcomes
   b. Facilitate peer collaboration with other proof points sites/members of the Network
3. Assist with the development of Marlborough’s presentation for the Fall Institute
   a. Provide guidance and feedback around focus, content, and delivery
   b. Help identify and polish any artifacts that may be of interest to other members of the Network
the Youth Director and the MAPP-funded STEM career specialist. Attendance of this group is consistent and regular. The group, chaired by PSW Executive Director Sylvia Beville, has been meeting for 9 months. In each meeting, the leadership team plans the implementation of specific metrics in the Employer Engagement Lever. On page 7 is a document from the leadership on work-based learning (see Table 1).

THE BIG ASK: SCALABILITY OF INTERNSHIPS

As the steering committee gathered at Boston Scientific on May 23, Sylvia Beville introduced the agenda, the small group work assignments, and the goal. After the group engaged in a facilitated discussion of their vision and goals, they would come up with the parameters for a quality internship. The puzzle on the team’s mind was what could an internship look like across such different companies? Raytheon had work with data analysis and modeling, while Marlborough Hospital had an entirely different set of needs.

When the team visited High Tech High in San Diego, they observed that every junior completed an internship, which gave them an edge up as college applicants. The team wanted to provide Marlborough students with that advantage, but how could it happen for all 100 rising juniors? Finally, they worried about sustainability. Because of the team’s passion and strong leadership and organizational skills, they had a committed set of company representatives, but could they together build the kind of sustainable internships that would be available year after year—even through personnel changes in the company?

The crowd broke into designated groups, each led by a facilitator. Their assignment was to create a student intern job description that included:

› Unique requirements of company, if any
› Integration into the work of the company
› Hours per week and number of weeks
› Number of interns
› Paid or unpaid

The group began discussing the types of internships they have now, and how they could scale those back for high school students. Most of the companies said they hire grad students working on degrees in biotech, big data, or biochemistry for their summer jobs. Other insightful questions arose: do you recruit

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<th>HOW COMPANIES CAN SUPPORT LEARNING:</th>
<th>HOW STUDENTS CAN ADD VALUE</th>
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<tr>
<td>Meet and become familiar with students at STEM events.</td>
<td>Research company and understand what they do.</td>
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<tr>
<td>Orient students to the workplace and introduce them to co-workers.</td>
<td>Be honest and dependable. Arrive on time and appropriately dressed.</td>
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<tr>
<td>Review the WBL plan in writing with the student and walk through a typical schedule and possible scenarios.</td>
<td>Review the WBL plan together. Ask questions. Take notes. Use the plan as a guide.</td>
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<tr>
<td>Model the skills, habits, and knowledge you want to develop.</td>
<td>Follow directions carefully. Concentrate on the work at hand.</td>
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<tr>
<td>Allow students chances to overcome obstacles and model how to learn from failure.</td>
<td>Read, write, and calculate well.</td>
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<tr>
<td>Offer opportunities to practice communication skills through presentations, teamwork, and reports.</td>
<td>Recognize problems and find creative solutions.</td>
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<td>Determine how you would like the school coordinator to intervene if problems arise.</td>
<td>Manage time. Finish jobs without sacrificing quality.</td>
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interns for their leadership qualities as well as for their content knowledge? Could the grad student interns take responsibility for high school interns? Dow and Marlborough Hospital volunteered to pilot internship programs for the summer of 2015, while the rest made promises for the following year. The team agreed to emphasize quality over quantity for the first try, so this was a reasonable outcome.

Question: How would M-STEM get from this summer to 100 internships for the following one?

The leadership teamwork plan outlines the activities and timeline for establishing an internship curriculum and experiences for students, work-based learning outcomes, and data collection procedures to track and measure progress across WBL activities. The site is continuing to develop a comprehensive and tiered WBL structure and to expand industry partnerships. They have a designated staff person primarily responsible for securing additional employer partnerships. The completion of a data plan that includes student-level metrics will provide a guidepost for continuous improvement and accountability.

**ENDNOTES**

1. Alternatively, “career exploration activities and project-based learning experiences are embedded within each pathway. Individualized learning/development plans map academic plans, personal/social growth, and career development activities, helping students see the connections between the core curriculum and the skills they need to develop for college and career.”

2. See YCC grant proposal for data concerning alignment of pathways to postsecondary credentials aligned with needs of the labor market.

3. Including social/emotional, non-cognitive factors