



PLTW



Increasing Student Access and Career Potential Through a STEM Ecosystem Model

Careers in science, technology, engineering, and math (STEM) are booming. Now, more than ever, it is imperative to get students interested in STEM and actively engaged in STEM opportunities to develop the skills necessary for success in the workforce. A 2022 report from the National Science Board states, “The U.S. STEM workforce, those who work in jobs that typically require science and engineering (S&E) knowledge and skills, is large: 16 million workers with at least a bachelor’s degree and nearly 20 million workers in the skilled technical workforce (STW) who do not have a bachelor’s degree.”¹ Additionally, a 2022 estimate from the U.S. Bureau of Labor Statistics shows STEM jobs increasing 10.8 percent between 2021 and 2031 – double the 5.3% average growth rate for all jobs.² Combine these statistics with the finding that approximately 80% of middle-skill jobs have a digital proficiency requirement and that the CHIPS and Science Act of 2022 aims to establish an inclusive STEM workforce, and it quickly

becomes apparent that PreK-12 students must be equipped with strong STEM skills to be successful in today’s and tomorrow’s workforce.^{3,4}

Developing partnerships through a STEM ecosystem is a key pathway to equipping all students with the skills and experiences necessary for success in STEM.^{5,6} According to STEM Learning Ecosystems, a community of practice focused on STEM learning, “A STEM Learning Ecosystem encompasses schools, community settings such as after-school and summer programs, science centers and museums, and informal experiences at home and in a variety of environments that together constitute a rich array of learning opportunities for young people.”⁷ By linking in- and out-of-school STEM learning, STEM ecosystems have the potential to: enable students to understand and connect concepts, increase interest and engagement in STEM, build transportable skills, support historically underrepresented students,

The CHIPS Act of 2022

President Biden signed into law the Creating Helpful Incentives to Produce Semiconductors for America Act (or CHIPS Act) on August 9th, 2022. The purpose of the CHIPS Act, through a massive investment of nearly \$280 billion, is to support the production of domestic semiconductors used in a wide range of technologies. The act primarily works toward this objective by providing funds to the existing domestic semiconductor manufacturing infrastructure to enhance its ability to meet demands for semiconductors and reduce reliance on foreign capacity. In addition, the act invests in K-12 education, higher education, workforce development, and diversity in STEM programs designed to improve the nation’s ability to sustain this capacity in the future and meet related STEM industry needs.⁴



Photo by Charles Maples

and increase capacity among caregivers to support students’ learning.⁸ Afterschool programs, for example, can impact student STEM interest and engagement, maintenance of STEM interest over time, career interest and knowledge, as well as transportable skills.⁹ ^{10, 11} Moreover, internships give students the opportunity to apply their classroom knowledge in the workplace, explore their career interests and build industry-relevant skills, as well as develop professional networks.^{12, 13, 14} Likewise, STEM learning in early childhood is most impactful when there are connections between STEM experiences at home, in school, and in informal learning environments like museums and libraries.¹⁵ The research is clear: exposure to STEM opportunities cannot take place at school alone.^{16, 17, 18} This is why STEM ecosystems are crucial to student success.

STEM ecosystems require a shared mission between schools, industry, community, parents and caregivers, and leaders to guide the way.¹⁹ These partnerships are critical to building a thriving ecosystem with the capacity to

support all students K-12 and beyond.²⁰ That’s why the KC STEM Alliance and Project Lead The Way (PLTW) are continuing to respond to students’ need for empowering, transformative learning experiences through a collaborative, community-focused approach that is producing remarkable results.

KC STEM Alliance

Founded in 2011, the KC STEM Alliance is a nonprofit collaborative network of educators, businesses, and related organizations working to inspire interest in STEM, with the mission of generating a robust workforce of related professionals for the greater Kansas City region. The Alliance connects the many STEM education and workforce initiatives in the area. It supports implementations of PLTW’s in-school curricular programming, as well as out-of-school STEM programs. The organization also increases access to STEM activities in underserved communities and invites community collaboration by leading regional STEM initiatives.

The vision of the KC STEM Alliance is to:

- Create a shared services model for two nationally acclaimed STEM programs – PLTW and FIRST robotics – by assisting with data collection and program evaluation, as well as facilitating school and industry partnerships.
- Support a solid foundation of STEM education for all students, regardless of race, gender, or economic status.
- Increase the quality, quantity, and diversity of job-ready candidates for local STEM employers.
- Advance economic development and progress in the community.

A key milestone in the KC STEM Alliance’s effort to increase community collaboration came in 2015, when the STEM Funders Network recognized the organization and its partners as a STEM Learning Ecosystem. The initiative is part of a national effort to engage young people in STEM by creating collaborative learning ecosystems consisting of schools, out-of-school programs, museums, science centers, higher education institutions, community-based groups, businesses, and STEM professional organizations. The KC STEM Alliance – part of the nationwide initiative’s very first cohort – helped blaze the trail for those that have followed; across the country, these STEM Learning Ecosystems have only continued to multiply.

Engaging in this national initiative provided the Alliance with momentum and recognition that enabled the organization to deepen existing relationships, formalize key partnerships, and initiate collaborations with brand-new partners, says Martha McCabe, executive director at the KC STEM Alliance.

The development of a formal STEM Learning Ecosystem in Kansas City represents a natural progression for the KC STEM Alliance, which from its inception has believed it could perform at its peak by “engaging all relevant partners to create systems and infrastructure to reach as many children as possible, providing access and equity to STEM learning,” says KC STEM Alliance’s Strategic Planner and Ecosystem Coordinator Ann Zimmerman.



Today, the KC STEM Alliance drives forward the ecosystem initiative by convening work groups around key issues and by connecting the greater KC STEM community to its program work. That work includes continued support for PLTW’s in-school learning experiences, annual STEM planning for schools/districts, teacher professional development, events and workshops focused on inspiring more young women to pursue STEM, work-based learning and summer employment opportunities targeting at-risk youth, and out-of-school student experiences such as robotics and after-school PLTW programming for PreK-5 students.

66 A thriving STEM learning ecosystem enhances the experiences for all students. Here in Kansas City, PLTW teachers in biomedical sciences, engineering and computer science gather at an industry site at least once a year to explore current industry trends, learn about career paths and ask questions of STEM professionals. High school students make direct connections with industry professionals through capstone project workshops and career days, opening the door for mentoring and feedback. STEM learning ecosystems also can help address issues that can only be solved collectively, such as closing the gender and racial gaps within STEM”

Martha McCabe, Executive Director, KC STEM Alliance



Photo by Charles Maples

This many-pronged approach is integral to providing students with relevant, hands-on opportunities to develop both technical STEM skills as well as in-demand, transportable skills and knowledge, such as critical and creative thinking, communication, collaboration, and problem solving. Building these competencies – all highly sought after across career paths – empowers students to thrive at a time when both the career landscape and the world are quickly evolving.

What’s more, the impact of the Alliance’s work is radiating outward from each individual student and, in turn, playing a crucial role in supporting the region’s economic development goals. Both Missouri and Kansas focus heavily on strengthening key target industries – most of which fall squarely into the world of STEM. These industries include health science and services, advanced manufacturing, energy solutions, biosciences, financial services, information technology, and transportation and logistics, according to the Missouri Department of Economic Development and the Kansas Department of Commerce.

The Approach

The KC STEM Alliance employs a regional approach to convening, connecting, and communicating with partners to incubate and nurture innovative education strategies. Moreover, in partnership with institutions of higher education, the Alliance tracks student access and is committed to evaluating students outcomes.

“When you can leverage a national best-practice opportunity for students, teachers, and administrators, you are able to scale across your city and create synergy among teachers and administrators,” McCabe says.

What’s required to create this meaningful, impactful community experience is a deliberative approach helmed by purpose-driven leaders dedicated to the cause.

“If you don’t have somebody whose job it is to convene, communicate, and facilitate the collaboration, it just doesn’t happen,” Zimmerman says.

Intentionality matters when it comes to getting work done, and it also speaks volumes to students in the community.

“The opportunity for students to see that their work is not just in isolation at their school, that they’re part of this larger strategy, really resonates with students,” McCabe says.

The Alliance considers the following three pillars to be the foundation of its concerted, intentional approach:

1 Secure committed support of the cause.

The KC STEM Alliance came into existence in 2011 through a generous \$3.2 million gift from the Ewing Marion Kauffman Foundation.

McCabe and Zimmerman point to this type of commitment – whether from a foundation, government entity, or other source – as a requisite component of the establishment and long-term sustainability of a strong collaborative, community-focused approach to STEM.

2 Create strong connections to industry.

The KC STEM Alliance’s business and industry partners have a strong symbiotic relationship with the organization, and the Alliance’s collaborations with these entities provide a myriad of benefits to all stakeholders:



Photos by Charles Maples

- Industry partners have opportunities to nurture and connect with the talent of tomorrow.
- The Kansas City community’s students have access to meaningful, work-based learning opportunities.
- Industry professionals bolster the ecosystem through their engagement in volunteerism, mentorship, and financial support.

3 Implement best-practice curricular programs.

The KC STEM Alliance has always been extremely intentional about leveraging the Ewing Marion Kauffman Foundation’s investment through best-practice curricula used consistently across the region, Zimmerman says.

“This enables you to convene and collaborate around a common curriculum, and it helps you learn from universal experiences and then share best practices,” Zimmerman continues. “We have less overlap, less duplication in our community, and we better collaborate and coordinate our efforts in a shared vision.”

The KC STEM Alliance has partnered with PLTW to provide students and teachers with transformative learning experiences through PLTW’s comprehensive curricular programs and teacher professional development.

Advantages to the Model

While there are innumerable benefits to the KC STEM Alliance’s comprehensive, integrated approach to STEM, the organization cites three key advantages to its model:

1. Increased communication, collaboration, and coordination
2. Expanded access to information and resources
3. Decreased duplication of efforts

The KC STEM Alliance and PLTW provide access to many students in the Greater Kansas City Region.

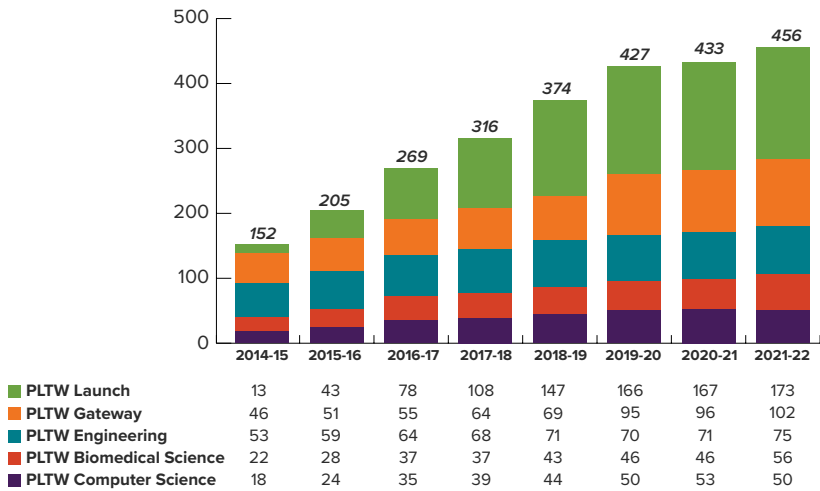
Just look at the numbers.



STEM ecosystems connect classroom learning with great experiences in business, industry, and higher education. They are not only critical to fostering innovation and driving economic growth, but also to solving some of the world’s most pressing challenges, from climate change to healthcare. By nurturing collaboration and creativity, these ecosystems provide a fertile ground for STEM education, research, and entrepreneurship to thrive.”

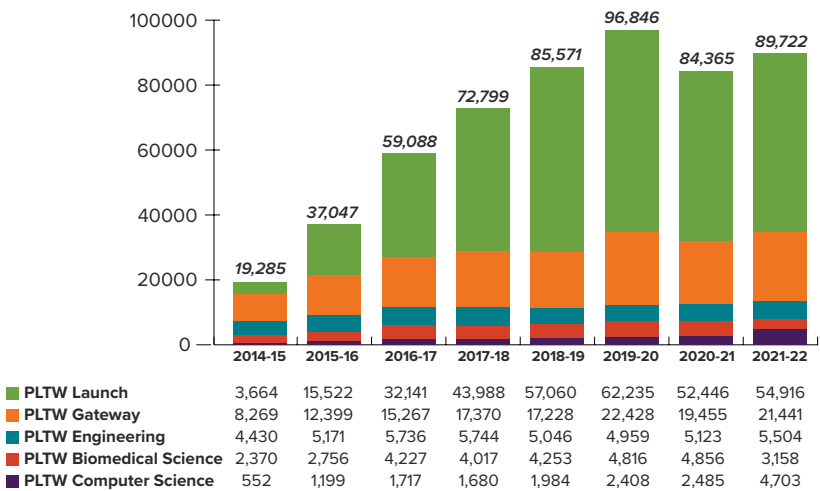
Dr. David Dimmett, President and CEO of PLTW

#of Programs



The number of PLTW programs has grown by 200% since 2014-15.

#of Students



Student enrollment has grown too, by 365%.

PLTW’s Transformative Programs

PLTW is a nonprofit organization that inspires and empowers PreK-12 students to build and demonstrate in-demand transportable skills by applying problem-solving strategies to complex, real-world challenges. The organization offers cohesive PreK-12 curricular pathways in computer science, engineering, and biomedical science. PLTW serves students across the country and can be found in all types of schools – public, private, charter, and specialized academies – in urban, rural, and suburban settings.

The cornerstone of PLTW programs is the organization’s activity-, project-, and problem-based (APB) instructional design, which centers on hands-on, real-world activities, projects, and problems that help students understand how the knowledge and skills they develop in the classroom may be applied in everyday life. The APB approach scaffolds student learning through structured activities and projects that empower students to become independent in the classroom and help them build skill sets to apply to an open-ended design problem. This approach also provides students with opportunities to work collaboratively, identify problems, persevere through challenges, lead their own learning, and find unique solutions to real-world challenges.

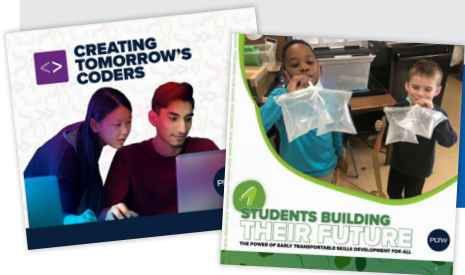
In addition, PLTW students use professional equipment, technology, and supplies in the classroom, providing them with hands-on experiences and opportunities to apply what they learn in a meaningful way. As students use equipment and software employed by industry, they can see the real-world implications of what they learn.

To ensure PLTW students are on track for post-secondary success, PLTW’s curriculum developers align the organization’s multidisciplinary programs to a variety of standards, which provides districts and schools with the flexibility to tailor programs to meet their specific state or local requirements. PLTW also partners with universities and corporations to verify that activities, projects, and problems represent relevant, real-world challenges and allow students to practice the skills that employers seek.

PLTW provides teachers with the training, resources, and support they need to engage students in relevant, true-to-life learning. PLTW professional development helps teachers build skills and confidence around APB learning; prepares educators to become facilitators and coaches; and empowers them to bring learning to life through their PLTW programs. In fact, a recent survey of PLTW teachers indicates 90 percent of respondents report confidence in teaching the subject matter content for PLTW courses, units, and modules.

PLTW professional development empowers teachers to gain the ongoing pedagogical and content knowledge necessary to be expert facilitators of student learning, rather than lecturers at the front of the classroom. PLTW professional development also provides training that empowers teachers to blend STEM topics into their current curriculum.

The KC STEM Alliance supports PLTW programs in the Kansas City community by providing professional development, connecting industry mentors with students and teachers, and organizing student competitions and scholarships.



Learn more about PLTW in the Kansas City Area in our recent Impact Reports at pltw.org/impact!

About KC STEM Alliance

KC STEM Alliance was founded in 2011 to connect the many STEM education and workforce initiatives in its community. The Alliance supports leading in-school and out-of-school STEM programs, increases access to STEM activities in underserved communities, and invites community collaboration by leading regional STEM initiatives.

About Project Lead The Way

Project Lead The Way (PLTW) is a nonprofit organization that provides a transformative learning experience for PreK-12 students and teachers across the U.S. PLTW empowers students to develop in-demand, transportable knowledge and skills through pathways in computer science, engineering, and biomedical science. PLTW's teacher training and resources support teachers as they engage their students in real-world learning. Learn more at pltw.org.

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