

# Paving Pathways to Postsecondary Success



How a Boston STEM school has revamped its curriculum to better prepare students for the future.

**Edward Liu, Jacqueline DeLisi, Erica Fields, and Kristen Almquist-Cevallos**

**T**here are many important questions teachers and administrators need to ask as they grapple with how to ensure high school graduates are college and career ready. What does it mean to prepare students for a world that is rapidly changing—a world in which science and technology are altering how we

live, work, play, and interact? If we focus on preparing students for specific jobs or careers, what happens to them if technological or economic forces eliminate those jobs or change the skills required to be successful? How can career and college preparation coexist, so that we don't end up forestalling options and locking in or tracking students? And how can

**Above: High school students at Dearborn Stem Academy in Boston take an intro to programming computer science class, learning coding and problem solving.**

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we ensure that all students, especially those who have limited economic resources or access to professional networks, are well positioned for success in the future and have multiple options to pursue?

At the Dearborn STEM Academy in Boston, some of the answers to those questions have involved thoughtfully designed and implemented STEM college and career pathways. Dearborn is a non-selective, open-enrollment public school serving more than 600 students in grades 6–12 who are mostly low-income students of color. Teachers and administrators at Dearborn, whose work we are documenting and studying through a National Science Foundation grant, have spent the past three years creating and refining three career pathways: computer science, engineering and advanced manufacturing, and health and life sciences.

These college and career pathways are not vocational programs aimed at preparing individuals to immediately enter the workforce in highly specific jobs. Rather, they seek to expand students' options and prepare them for success in a variety of postsecondary settings while exposing them to a new way of learning STEM. Across the United States, college and career pathways provide a structure and context for making learning engaging and relevant, connecting the high school experience to postsecondary life, exposing students to the worlds of work and higher education, and building important skills that are relevant to careers, college, and citizenship (such as teamwork, project management, communication, and presentation skills).

At Dearborn, these pathways also equip students from marginalized and underrepresented

communities to access opportunities in STEM. Every student at the school participates in a STEM pathway that connects their experiences across grades 10–12. Each 10th grader makes a tentative commitment to a pathway by enrolling in a year-long elective to build prerequisite skills and knowledge and exposure to the discipline to see if it is a good fit. In their junior and senior years, students immerse themselves in their pathway through enrollment in a STEM core course and aligned English and social studies courses, as well as projects and experiences tied to coursework. In the health and life sciences pathway, for example, they may participate in authentic activities such as emergency room triage simulations in which trained actors present symptoms and students must apply their specialized health knowledge to diagnose the problem. In the engineering pathway, students might study various sustainable energy sources and work in teams to develop a plan for a clean energy source and accompanying power grid that could be used for their community.

Students also take early college courses at partner institutions, participate in internships, and interact with industry professionals via workplace site visits, panel discussions, and presentations of their pathway projects.

### **Blending Academics and Real-World Experience**

The STEM career pathways at Dearborn were designed with four main components that work together to give students real-life work experience, increase their knowledge of STEM and industry-related skills, build confidence navigating new settings, and develop industry relationships.

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# 1

## Industry-Informed High School Coursework

The curriculum for each pathway was developed with input from industry professionals and blends the learning of conventional academic skills with industry-relevant skills and knowledge. Students frequently work in teams and take on roles mirroring those in a real work environment. In the computer science pathway, for example, teams design and build video games, with each student working as either a programmer, artist, producer, or designer, similar to the work of industry

game-design teams. They begin their learning by playing and studying existing games and discussing what makes them engaging. They then learn how to identify the mechanics of a game, how to use the industry-standard Unreal Engine game-building software, and how to use project management processes and industry tools.

Aligning the coursework with industry roles and expectations helps prepare students better for life after high school. One Dearborn teacher, who previously worked in the game design industry, says, “A lot of the feedback that I’m getting from industry is that the kids coming out of college don’t know how to collaborate. Getting into teaching allowed me to think about this differently—how would we create the type of person that we would want to hire?”

This understanding of what employers are looking for has helped teachers design and implement curricula that not only builds students’ STEM knowledge, but also supports the development of their teamwork, communication, and problem-solving skills.



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# 2

## Cross-Disciplinary Project-Based Learning

At Dearborn, teams of science, English language arts, and social studies teachers collaborate to design project-based curricula for the three pathways that intentionally incorporate literacy and connections to ethics and social issues. The cross-disciplinary nature of this curriculum helps break down knowledge silos that are more common in schools than in industry and helps students see the relevance of what they are learning.

In the ELA class in the computer science pathway, for example, students learn the essential elements of story and develop a narrative for their game, which they convert into the format of a game script. They also learn and practice persuasive writing, which is then applied to the creation of a “game pitch” that a team might put together to gain approval for the development of a game. In their social studies

**Technology software industry professionals work with Dearborn STEM Academy students and demonstrate the tools they use during a STEM pathways experience.**

class, students learn about the demographics of the gaming industry and consider gender and racial stereotypes and issues of representation. They also learn how to market a product so it appeals to their audience, while considering the ethics of making games that might be addictive and identifying what impact they want their creative work to have. In computer science class, they learn the game design process, how game engines work, and how to use key software.

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Students appreciate the project-based structure of the program as compared with traditional classes and find the STEM learning more relevant. They also become more engaged in other subject areas because the courses are interconnected with the pathway content students have chosen.

“I didn’t realize how good at writing I was until I joined the computer science pathway,” said one student. “I like writing stories. . . . I added all these different elements in the story, and it eventually became what I believe is one of, if not my best, piece of work I’ve ever done.”

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## **3**

### **Early College Coursework**

Ultimately, pathways at Dearborn are about exposing all students to a range of post-secondary opportunities while they still have support from their high school community. Students are encouraged to take early college courses at one of three partner colleges and are supported in their work. There is no minimum GPA requirement to enroll in a college class, although students may need to undergo a transcript review to access more

advanced courses or complete a self-guided survey to ensure they are ready for a class that requires college-level English. A combination of (a) in-kind support from partner colleges and (b) state and federal dual-enrollment grants covers the cost of the courses.

Some students take an early college course to dive more deeply into STEM topics of interest, such as coding languages, game design, or psychology. Others take courses that allow them to fulfill potential first-year college or major prerequisites, such as pre-calculus or college writing. Regardless of which college courses they take, students start to develop a college-going identity and earn college credit. In the 2020–21 school year, 34 pathway students, representing approximately 30 percent of the students enrolled in pathways, earned passing grades in a total of 61 college classes. The school’s goal is to reach 100 percent in the next few years.

For college to be one real option for students, they not only have to have the requisite skills to succeed academically in higher education, but they also have to see themselves belonging and thriving there. As one Dearborn student said, “It’s always fun to say, ‘I’m in 11th grade, and I’m taking college classes.’ It makes me sound smart.”

Early college coursework can also help with college affordability by allowing students to accumulate college credits during high school as well as earn “stackable credentials,” which are a sequence of industry-aligned certifications that can help students access higher paying jobs, whether they work part-time while attending college or enter the workforce full-time right after high school. For instance, a student pursuing computer science might earn a Google IT Support Professional Certificate while taking early college coursework at a partner institution. Then, if they enroll in that college after high school, they can earn a software development certificate after successfully completing one year of coursework, followed by an associate degree in computer information technology after a second year.

However, taking college-level courses while

still in high school is not without its challenges for students, especially at a school with many English learners and students who started high school academically below grade level. The goal of taking early college courses is to introduce students to the structures and expectations of college work while still receiving support from their high school teachers and staff. For example, students often experience instruction in their college courses that is more traditional than in their project-based pathways courses at Dearborn, with material delivered through lectures and more demanding homework. At Dearborn, school staff monitor students' progress while they're enrolled in early college courses to advise them and connect them to academic support as needed. The school also partners with an AmeriCorps program, Dudley Promise Corps, to provide early college mentors who help students build time management, organization, and communication skills required to navigate college coursework.

## 4

### Internships and Workplace Visits

Coursework is important, but there is nothing quite like real-life workplace experience to gain an understanding of the career a student is interested in pursuing. For this reason, Dearborn offers several opportunities for internships and workplace visits. In 9th and 10th grade, students participate in company visits and career talks with industry professionals, and in 11th and 12th grade, they are given opportunities to intern at companies within their career pathway field during the

school year or in the summer. One student discussed how his internship at a local design and consulting firm taught him new skills and new ways of communicating information.

They really helped me learn design and different ways to communicate with people visually instead of just writing out instructions. I could draw something out kind of like a storyboard and show it off to people, so that was pretty cool.

Other students have interned at an environmental engineering firm, a multinational consumer products company, local hospitals, and a number of financial services companies.

### A Model for Creating Pathways

Interdisciplinary, relevant, and industry-aligned experiences can support students, especially those from traditionally underserved communities, as they develop skills needed for the future of the workplace and higher education. But how can schools achieve this vision? Based on the development and refinement of the three pathways at Dearborn, we have learned a lot about necessary structures, expertise, and other resources—many of which emerged from our partnerships with industry, local colleges, and community organizations—that can better enable the alignment of students' experiences in

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## To create a successful pathways program, schools must build a knowledgeable and collaborative team of high school teachers who share the vision of industry-aligned experiences for their students.

high school with real industry work.

To create a successful pathways program, schools must build a knowledgeable and collaborative team of high school teachers who share the vision of industry-aligned experiences for their students. At Dearborn, teachers' commitment and skills are essential for forging deep partnerships and meaningful opportunities for students. They collaborate on the design of cross-disciplinary experiences, participate in meetings with industry professionals, and carefully consider the ways in which students' experiences reflect those in the workforce. Their own knowledge of the industry is important, as are their connections to professionals outside of the school walls. Building such a team does not happen overnight. Indeed, several years prior to the official launch of STEM pathways at Dearborn, the school hired two teachers with prior industry experience to teach a mix of conventional science courses, such as physics, and newer courses in computer science and robotics. In this way, the pathways at Dearborn built upon teachers' knowledge, interests, and commitment.

Industry and early-college partnerships are essential elements of STEM pathways. Dearborn's partnerships began with a vision and specific goals for the program, which included the types of postsecondary opportunities students should be ready to access after graduation; the skills, knowledge, and dispositions students would need to seize these opportunities; and the role that early college would play in the pathways. These served as the basis for preliminary conversations with potential partners in industry and higher education.

Managing partnerships takes considerable

time and energy from school staff and program leadership. Thus, it is in the interest of schools that wish to offer STEM pathway programs to have deeper collaborations with a small number of committed companies, colleges, and non-profits rather than many one-off interactions with an ever-changing group of organizations. These deeper partnerships can be forged by creating multiple opportunities for individual partner organizations to engage with the pathways, such as asking industry partners to help write curriculum or provide input on student activities; structuring student project work so that industry representatives can attend student presentations and provide feedback; or having partners provide work-based learning opportunities such as job shadows, mini internships, or full-time paid summer internships. Finally, it is important to routinely elicit feedback from all partners to ensure that the program and its stakeholders are meeting their joint goals, communicating well, and continuing to have strong relationships.

School leaders need to cultivate intentional partnerships with both higher education and industry to prepare young people for their futures. By building pathways to the real world that begin in high school, we can empower students to envision their futures in college and careers through opportunities to experience both in a supportive high school environment. 

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