STEM WORK-BASED LEARNING IN POSTSECONDARY SETTINGS:
A GUIDE FOR EMPLOYERS
STEM Work-Based Learning in Postsecondary Settings: A guide for employers

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This report provides information about five common work-based learning (WBL) programs utilized by industry, postsecondary institutions, and nonprofits to prepare students for future jobs and to provide employers with access to trained future talent pipelines. The five WBL opportunities the report discusses include:

- Internships
- Apprenticeships
- Cooperative education
- Externships
- Project-based learning

This white paper is written primarily to advise corporations about how they can make strategic decisions regarding which WBL programs they should, or should not, implement. We also believe postsecondary institutions can benefit from learning more about the choices facing employers around WBL programs. The report provides information about the five popular WBL programs listed above, including what makes each unique and detailed information about the characteristics of each opportunity (e.g., duration, target student demographic, paid/unpaid, etc.). It also offers considerations for employers determining which WBL programming makes most sense to implement.

As we stated in STEMconnector’s 2018 State of STEM report, we believe WBL is a best practice to address today’s STEM talent crisis and create greater alignment between education and industry. WBL also provides employers with the opportunity to amplify their brand awareness in the community, to hire diverse student employees and foster more equitable workplace environments, and to contribute to their social impact goals. Students of all ages – from K-12 to postsecondary – and employers across all industries can benefit from WBL. For the purpose of this report, we will be focusing on WBL during postsecondary years in STEM fields.

This report offers employers a description of common postsecondary STEM work-based learning opportunities and guidance about how to decide which type of WBL to use based on available resources, talent and brand strategies, and diversity, equity, and inclusion goals.

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Work-Based Learning vs. Experiential Learning

Work-based learning and experiential learning are often used interchangeably and are nearly synonymous.

**Work-based learning:** meaningful job tasks in a workplace that help students develop knowledge and skills that support entry or advancement in a career field.

**Experiential learning:** learning – obtaining knowledge, skills and attitudes – through doing and reflection.

We chose to use the term work-based learning in this report due to its more specific focus on employer involvement in the learning process.
What is work-based learning?

Work-based learning is defined as education that connects industry experience with classroom learning to provide students with knowledge and skills to support their entry or advancement in a particular field. While college and university classes are traditionally theory-based, WBL offers students the opportunity to connect theory to application either in the classroom or at a job site. WBL also enables students to gain real-world work experience and to develop both their technical skills (e.g., systems engineering, ideation, manufacturability) and their employability skills (e.g., project management, teamwork, problem solving). WBL can occur in the classroom, the workplace, or in a combination of settings.

Five of the most common WBL programs are:

- **Internships**: a form of work-based learning that integrates knowledge and theory learned in the classroom with practical application and skills development in a professional setting.
- **Apprenticeships**: an employer-driven model of on-the-job training during which apprentices receive increases in wages as they acquire new skills.
- **Cooperative education**: an employment opportunity during which students work on-site at the employer full-time for the span of a semester or full year.
- **Externships**: a work-based learning program that exposes students to the workplace through job shadowing or a project-based approach.
- **Project-based learning**: a method of teaching that involves hands-on applied learning in the classroom to prepare students for academic and career success.

Why is work-based learning important for strengthening STEM career pathways?

We are in a STEM talent crisis; more STEM jobs exist than there are STEM graduates and employees prepared with the skills needed to fill them. This crisis will only continue to worsen as STEM jobs grow faster than non-STEM jobs.
While this crisis hits at every age and stage of the STEM talent pipeline, the postsecondary years represent a significant part of the problem. Not enough students choose to pursue postsecondary STEM degree programs. As shown in Figure 1, only 8% of students earning an associate’s degree and 19% of students earning a bachelor’s degree graduate in a STEM field.⁹

*Figure 1. Bachelor’s and associate’s degrees awarded, by discipline, 2015-2016*

Many students who choose to start a STEM degree program switch to a non-STEM major (or drop out completely) before they obtain the degree.¹⁰,¹¹ As seen in Figure 2, this problem is particularly acute for African American and Hispanic students, who switch out of STEM majors at higher rates than their peers.¹²

*Figure 2. Percent of degree-earning students who drop out of STEM majors, by race (undergraduates, 1980 – 2002)*

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⁹ STEM Work-Based Learning in Postsecondary Settings: A Guide for Employers
Additionally, not enough STEM degree holders who enter the STEM workforce have the skills and mindsets employers require to succeed on the job. Only 11% of business leaders think recent grads are well prepared for on-the-job success, and only about one-third of current college students feel they themselves are prepared for the workplace.\textsuperscript{13}

*Figure 3. Confidence of business leaders and students in recent graduates’ preparedness for the workforce (2013)*

In light of these trends, it is more important than ever that both postsecondary institutions and industry engage students in STEM career pathways and invest in students’ career readiness. Work-based learning addresses challenges around STEM degree completion and student preparation for workplace success, benefiting students and their future employers.
What is the benefit of work-based learning?

Successful work-based learning does more than just engage and employ students; it equips students with the skills to thrive in STEM careers and provides businesses with future employees, leaders, and advocates. WBL benefits everyone involved – the student, the employer, and the postsecondary institution.

Below is a list of some of the benefits each participant receives from WBL:

**Students**
- Gain exposure to, and an understanding of, STEM jobs
- Form relationships with mentors, leaders, and role models in STEM fields
- Bolster their confidence in STEM and belief they can pursue a STEM career
- Grow and develop a professional network before working full-time
- Develop technical and employability skills to help them succeed in school and in the workplace

**Employers**
- Gain access to and vet future talent
- Equip future talent with the skills they want graduates to have, potentially reducing future training costs
- Diversify their future workforce by providing WBL opportunities to diverse student groups
- Improve brand positioning as an employer of choice and/or valued community partner

**Postsecondary institutions**
- Improve retention and graduation rates in STEM degree programs
- Improve job placement rates for graduates
- Prepare students for immediate workplace success
- Complement classroom teaching with real-world application
What is the role of work-based learning in increasing diversity, equity, and inclusion in STEM careers?

A diverse future workforce is a business imperative for all STEM companies – for economic need and for public good. Yet, women and people of color have historically been underrepresented in STEM and continue to enter the field at lower rates than their male, white, and Asian counterparts. This gap starts early and widens during the postsecondary years. Fewer students of color pursue and complete STEM degrees than their peers, despite sharing similar levels of interest in STEM as freshman. There are many reasons for this gap, including bias in STEM learning environments and lack of equitable access to advanced STEM classes, professors, tutoring, and other resources that support degree attainment.

Work-based learning provides employers with an opportunity to address these challenges in the postsecondary years and to diversify their future workforce. WBL allows employers to engage a more diverse group of students – many of whom may have never otherwise considered STEM careers – in STEM before they graduate and enter the workforce. A positive, equitable WBL experience can help equip students with the technical and soft skills needed to succeed across a lifetime of STEM careers, which can be life-changing for students who come from low-income communities and/or do not have any other access to STEM professionals.

Applying an equity lens to WBL means asking the question “what barriers do students face to successful participation based on their income, race, ethnicity, gender, or other characteristics?” The most critical practice to improving equitable access to STEM WBL programming is also one of the most overlooked - paying students for their time. We recommend employers pay student workers, especially during programming where students work on-site for a significant number of hours every week (e.g., internships). Paying students opens access to WBL programs, as many students cannot afford to take an unpaid WBL experience. Additionally, paying students in WBL programs can differentiate an employer among their peers in a competitive talent market.

Other employer best practices for increasing diversity and equity in WBL programming include:

- Focusing recruitment for these programs in low-income areas and of student demographics typically underrepresented at your organization
- Addressing challenges faced by students from low-income backgrounds by providing students with transportation stipends when travel is involved, with clothes to wear to the office for onsite work, and with housing and/or relocation assistance
- Providing students with mentors at your company from similar demographic groups and/or backgrounds to bolster students’ belief in their own potential to pursue a STEM career
This section provides an overview of the major characteristics of five popular work-based learning methods, including:

- Source of talent (i.e., students)
- Compensation for talent
- Duration of work-based learning experience
- Required employer staff resources
- Frequency/type of employer involvement

All of these characteristics are listed as the most “typical” approach, but naturally there is variation.

This section also details the major benefits to the employer and the student, shares program snapshots as examples, and highlights reasons why employers should consider pursuing each type of work-based learning program.

1. Internships
   a form of work-based learning that integrates knowledge and theory learned in the classroom with practical application and skills development in a professional setting

2. Apprenticeships
   an employer-driven model of on-the-job training during which apprentices receive increases in wages as they acquire new skills

3. Cooperative education
   an employment opportunity during which students work on-site at the employer full-time for the span of a semester or full year

4. Externships
   a work-based learning program that exposes students to the workplace through job shadowing or a project-based approach

5. Project-based learning
   a method of teaching that involves hands-on applied learning in the classroom to prepare students for academic and career success
Internships are the most popular type of work-based learning. The National Association of Colleges and Employers defines internships as a form of work-based learning that integrates knowledge and theory learned in the classroom with practical application and skills development in a professional setting.20

Most employers that utilize internship programs host student interns either full-time or part-time over summer, though it is also common to host interns year-round – with interns working part-time in fall and spring as they also attend classes at their postsecondary institutions. While all undergraduates can benefit from internships, postsecondary internships are most common for upper level (junior and senior year) college students in their final years before entering the workforce. The majority of undergraduate interns tend to be four-year degree earning students since they have more time to explore multiple internships before graduation, but two-year degree earning students can also gain valuable experience as interns before graduating.
A credit-bearing internship has formalized learning objectives and will provide the students with course credit towards their degree. This type of internship requires the employer, the student, and the postsecondary institution to establish and agree upon students’ goals and objectives from the start to ensure employer-academic alignment.

**Benefits for students**

| Experience in and exposure to STEM careers | Increased confidence in STEM career pathways | Enhanced technical and employability skills | Opportunity to build a professional network |

Internships provide students with the opportunity to gain relevant workplace experience and skills that will help them with the hiring process upon graduation. Internships also help students learn which types of jobs, careers, and industries will interest them, or not interest them, long-term. Students can work in several different types of internships at several different employers while they are attending college. A student’s internship does not have to relate to their coursework or academic major, allowing them to explore a greater array of options and develop professional networks in multiple industries of interest.

**Why should employers consider internships?**

*Tried and true approach:* Internships are the most popular form of work-based learning to provide employers with access to future talent, and thus companies have many examples to use when guiding their programming.

*Flexibility in structure:* Employers have many options in terms of shaping the internship experience. Employers can manage the duration of the internship, type of assignments given, type of skills involved, and more to align the internship to their overall goals and resources.

*Focus on vetting, not training:* As a result of the flexibility, an internship often serves more as a vetting process for employers to evaluate potential talent as an overall fit rather than a formalized training for a specific role at the company. Employers are able to offer students full-time positions upon successful completion of the internship program but are not required to – nor are the students required to accept.
The Missouri Innovation Campus Program at the University of Central Missouri (UCM) created partnerships with local high schools, community colleges, and regional employers to provide students with a pathway to an expedited bachelor’s degree, involving a three-year, paid year-round internship. Students begin the program their junior year of high school during which they take college level classes alongside their high school classes. For students’ last three years of the program – their senior year of high school and first two years at UCM – students work at internships at local employers where they work part-time and year-round. If students successfully complete the program, they receive free tuition for their first two years at Metropolitan Community College or UCM and graduate with a bachelor’s degree by the end of their second year. Students benefit from a cost-effective and efficient path to a degree along with extensive work experience and exposure to potential careers. Employers benefit because they are able to help develop the program curriculum and thus can train students with the skills they require of full-time employees while also gaining access to a consistent and diverse talent pool.

University of California Davis (UC Davis) and Chevron partner to offer STEM career opportunities to students through UC Davis’s program AvenueE. Through AvenueE, students at partner community colleges apply to the program and transfer to UC Davis, where they commit to completing an engineering degree. As a part of the program, students have the opportunity to apply to intern at Chevron and other companies. Chevron and UC Davis have maintained a successful partnership for many years due to their open dialogue and focus on holistic student supports. Chevron and UC Davis meet bi-monthly in formal advisory board meetings where they exchange ideas and feedback and ensure they are aligned in their programming.
The apprenticeship model is often considered the “gold standard” of work-based learning as it is a proven way of efficiently preparing workers for employment while addressing employers’ needs for a highly-skilled and adequately trained workforce. Apprenticeship is defined by the Department of Labor as an employer-driven model of on-the-job training that involves “progressive increases in an apprentice’s skills and wages” and can last anywhere between one and six years. During an apprenticeship program, an apprentice works for an employer as a full-time, paid employee and receives wage increases as they master new skills. Alongside their on-the-job training, apprentices also attend related classes from a partner community college, technical school, apprenticeship training school, or at the employer itself. After apprentices successfully complete their program, they receive a nationally-recognized credential for the industry in which they were working along with a full-time employment offer from their employer.26
Why should employers consider apprenticeships?

Responsiveness to business demands: Apprenticeships are unique among traditional WBL programs because employers determine the training and education the apprentices receive, thus providing employers with the agility to make changes to the curriculum each year as skills and role needs change.

Employee retention: Due to the large investment employers make in apprentices, apprentices are often quite loyal to the company following the apprenticeship program and are therefore more likely to remain at the company long-term.

Diversity: An apprenticeship program can diversify a company’s talent pipeline much faster than any other WBL program. Apprenticeships allow the employer to draw directly from the community or technical schools where there is often a wide range of potential diverse talent who may not be enrolled in traditional postsecondary programs.

Benefits for students

| Training and experience that leads to a full-time job | Debt-free postsecondary degree | Specific skills that build to a nationally-recognized credential |

Historically, apprenticeship models in the United States have focused on building trades and the age of apprentices in the United States remains 28 – compared to an average age of 17 in many European countries. Due to increased national support in recent years, however, the United States apprenticeship model is expanding across a vast number of industries, offering ample opportunity to workers of all backgrounds.

Apprenticeship programs provide apprentices with market rate wages, the opportunity to earn wage increases, and full-time employment upon successful completion. Their structure is particularly beneficial to adults from lower socioeconomic classes because apprenticeships do not require enrollment in a traditional two- or four-year postsecondary degree program, providing workers with a debt-free pathway to a nationally-recognized credential and a high wage job.
IBM launched its registered apprenticeship program in 2017 as part of its new collar programs. IBM coined the term new collar to describe in-demand careers that require specific skills but not necessarily a traditional bachelor’s degree. The apprenticeship program provides on-the-job training in fast-growing IT areas like data science, software engineering, cloud computing, mainframe system administration, and cybersecurity. IBM sees these new apprenticeships as the first step in bringing the tradition of apprenticeships into the digital age by promoting 21st century skill building, facilitating access to fast-growing jobs and economic opportunity for more Americans, and expanding the number of candidates with the skills that companies like IBM need.
In the U.S., employers utilize either Registered Apprenticeship or “recognized” apprenticeship programs. Registered Apprenticeship programs are registered with and approved by the U.S. Department of Labor or with state apprenticeship agencies and award apprentices with a nationally-recognized credential upon completion. "Recognized" apprenticeships are apprenticeship programs employers run that are not registered and, therefore, do not provide industry-recognized credentials or have a third-party evaluator to ensure quality.\(^{30}\)

**The Department of Labor’s five components of Registered Apprenticeship programs:**

1. **Business involvement:** Employers serve as the foundation for apprenticeships. They build the program and are involved in every step of the apprenticeship program.

2. **Structured on-the-job training:** Registered Apprenticeships always include on-the-job training during which apprentices receive training from a mentor at their job site. The training is based on national industry standards and customized to fit the needs of the employer.

3. **Related instruction:** Along with on-the-job training, apprenticeships also include related instruction about the technical and academic competencies of the job. The instruction can be provided by community colleges, technical schools, apprenticeship training schools, or the business itself. It can be delivered at school, online, or at the employer site.

4. **Rewards for skill gains:** Apprentices are paid for their work and receive wage increases as they meet their benchmarks.

5. **Nationally-recognized credential:** Every apprentice who completes a Registered Apprenticeship program earns a nationally-recognized credential.

**Funding opportunities for Registered Apprenticeship programs**

Although registering an apprenticeship program does not immediately qualify an employer to receive federal funding to help run the program, a Registered Apprenticeship program can help an employer qualify for education and workforce program funding that can support apprenticeship programs. Employers with apprenticeship programs – and students taking part in apprenticeship programs – can be eligible to receive funding from the Workforce Innovation and Opportunity Act, the GI Bill for eligible apprentices, and federal student aid that may help offset some of the costs of an apprenticeship program.\(^{31}\)
Partnering with postsecondary institutions through cooperative education is the best way to expose students to real-world experience while ensuring you attract the best and brightest talent coming out of universities.”
- Ian Sladen, VP of Cooperative Education and Career Development at Drexel & Talent Evolving Workforce

## 3. Postsecondary cooperative education programs

### Overview

<table>
<thead>
<tr>
<th>Source of talent</th>
<th>Four-year postsecondary institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical compensation</td>
<td>Usually paid and offers school credit</td>
</tr>
<tr>
<td>Duration</td>
<td>Between 3-12 months – students usually work full-time for an employer during a school semester</td>
</tr>
<tr>
<td>Required employer resources</td>
<td>HR for hiring</td>
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<td></td>
<td>Technical employees to train</td>
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<tr>
<td></td>
<td>Managers to oversee co-op students</td>
</tr>
<tr>
<td></td>
<td>Liaison with postsecondary partners to shape program</td>
</tr>
<tr>
<td>Frequency/type of employer involvement</td>
<td>Daily – manage students on-site</td>
</tr>
</tbody>
</table>

Cooperative education (co-op) programs are employment opportunities for students lasting anywhere between three and 12 months. During a co-op program, students work on-site at the employer full-time for the span of a semester or full year, rather than taking classes. Upon completion of the co-op program, students resume a regular class schedule. Postsecondary institutions that utilize co-op programs often either require it of all students or have specific academic departments that require students to complete at least one co-op experience before earning a degree. Co-op programs operate similarly to internship programs, but co-op programs are imbedded into a student’s curriculum and occur in place of one semester of classes. Because of their place in the curriculum, co-op programs are designed for four-year degree earning students who have the flexibility of a four- to five- year college schedule.
Benefits for students

| Immersion in a STEM career | Increased confidence in STEM career pathways | Enhanced technical and employability skills | Opportunity to build a deep understanding of a company that may be his/her future employer |

Co-op programs seamlessly blend college coursework and work experience for students. Because they are very closely related with a student’s course of study and academic interests, co-op programs are part of students’ official transcripts. Co-ops allow students to work at their job sites full-time – rather than also attending classes – for at least one semester, providing them the chance to earn money while more deeply contributing to their employer.

Why should employers consider co-op programs?

*Dependable source of full-time student workers:* Co-op programs are often grounded in deep and multi-year partnerships between employers and postsecondary institutions and provide employers with new cohorts of student participants on a regular basis. This allows the employer to “count on” a certain number of student workers as part of its ongoing workflow.

*More significant contribution from student workers:* Because co-op programs are imbedded in a student’s course of study, students often bring highly specific technical skills to their co-op role alongside their interest in the industry. This blend of aligned skills and interest allows students to contribute more fully to their co-op employer.
Drexel University created its co-op program in 1919 and has successfully run it ever since, with 92 percent of its full-time undergraduate population participating in a co-op experience before graduating. Many of Drexel’s academic majors require students to complete at least one co-op before graduating, and all students are encouraged to complete a co-op whether or not they are required. Drexel operates on a quarter system and offers students the option to complete either one co-op during the fall/winter or spring/summer of their junior year (rather than take classes) and graduate in four years or the option to complete three co-ops (one during their second, third, and fourth year) and graduate in five years. Students can apply to work for one of Drexel’s nearly 1,600 employer partners across 31 states and 38 countries.
4. Postsecondary externship programs

An externship is a work-based learning opportunity that provides students with exposure to the workplace without requiring a significant time commitment from students or employers. Externships are often a form of job shadowing but can also involve students completing a research project for an employer. An externship is typically completed during the school year and involves a partnership between an employer and a postsecondary institution.

For externships that serve as job shadowing, students visit an employer on-site for anywhere from a day to a few weeks. This form of externship enables students to learn more about the day-to-day responsibilities of certain careers and industries. Externships can also involve research projects during which college students – usually organized through a class or an extracurricular club or activity – complete a project for an employer over the course of a semester or quarter. The students work as a group during the school year to address a long-term challenge the employer is facing and usually conclude the externship by presenting the employer with their recommendations. The employer and students often communicate via weekly call or in-person meeting. Any type of degree earning students, whether at a four-year institution or a two-year institution, can partake in an externship.
Why should employers consider externships?

**Minimal time commitment:** When externships act as job shadowing experiences, they can last for as short a time as one day.

**Minimal resource commitment:** During project-based externships, students do not work on site at an employer, eliminating the need for dedicated space and daily supervision. Externships rarely require the employer to pay the student since the students do not work on site and are not required to commit a certain number of hours to the employer each week.

**Opportunity to combine with other work-based learning programming:** Due to the minimal time and resource commitment externships require, employers can host externships and other work-based learning programming simultaneously.

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Benefits for students

<table>
<thead>
<tr>
<th>Exposure to STEM careers</th>
<th>Less time commitment than an internship</th>
<th>Chance to develop technical and employability skills</th>
<th>Opportunity to build a professional network</th>
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</thead>
</table>

Externship programs can provide students with the chance to shadow a STEM professional to gain a better understanding of what the job entails and if it is something that would interest them. When externships are project-based, they offer students the opportunity to gain employability skills such as problem solving and teamwork and also enable them to build relationships with STEM professionals.
Dallas County Community College District (DCCCD) and Hunt Consolidated, Inc. (Hunt) created a partnership to develop the “mINiTERN,” a district wide externship program, that provides WBL opportunities to DCCCD students. The program lasts 10 weeks—throughout the course of a semester—during which students work in consulting teams, led by a DCCCD faculty member, to evaluate and make recommendations for a business opportunity proposed by Hunt. At the end of the externship, students present their final project to company leadership. The externship provides students with the opportunity to gain workforce experience, exposure to a potential future employer, and practice presenting in front of executives, without requiring students to commute into the office or serve as active employees. The flexibility of the program—students work an average of four to six hours a week at their own convenience—attracts a wide range of diverse and high-performing students every semester, including students who already have internships or part-time jobs. By participating in the externship, Hunt receives valuable insight and new perspectives for long-term company problems and exposure to potential future employees or interns.
5. Postsecondary project-based learning

<table>
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<tr>
<th>Overview</th>
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<tbody>
<tr>
<td>Source of talent</td>
</tr>
<tr>
<td>● Students in four-year degree institutions</td>
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<tr>
<td>● Students in two-year degree institutions</td>
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<tr>
<td>Typical compensation</td>
</tr>
<tr>
<td>● Unpaid</td>
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<tr>
<td>Duration</td>
</tr>
<tr>
<td>● Usually between 2-3 months (over the course of a semester) or 8-9 months (over the course of a year)</td>
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<tr>
<td>Required employer resources</td>
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<tr>
<td>● Employee(s) to oversee student project</td>
</tr>
<tr>
<td>Frequency/type of employer involvement</td>
</tr>
<tr>
<td>● Weekly calls or in-person meetings</td>
</tr>
</tbody>
</table>

Project-based learning (PBL) is a method of teaching that involves hands-on applied learning in the classroom in two- or four-year institution settings to prepare students for academic and career success. PBL encourages students to play a more active role in their learning and provides them the opportunity to engage with real-world challenges by combining theory and application. During PBL, students work with other students on a project over an extended period of time to solve a complex, real-world problem. PBL can involve employer partnerships – where a local employer provides the “real-world” challenge on which students work – but does not require it. When an employer is involved, students typically meet with a representative from the employer once a week in person or over the phone and present their findings to the employer at the end of the semester or quarter.

Benefits for Students

- Deeper understanding of STEM careers
- Less time commitment than a traditional internship
- Chance to develop technical and employability skills
- Opportunity to build a professional network

"Traditional STEM classes can feel abstract and boring. Project-based and experiential learning allows students to apply the material and makes STEM much more interesting for students."

- Alisha Sarang-Sieminski, Director of SCOPE, Olin College
Project-based learning helps students connect STEM theory to practice, exposing them to the type of work they would complete in a STEM career and sparking greater interest in STEM fields. When PBL involves a local employer, students also have the opportunity to build a professional network and learn directly from STEM professionals.

Why should employers consider project-based learning programs?

**Minimal time and resource commitment:** In general, project-based learning is focused on time spent in the classroom. Successful project-based learning experiences are led by academic staff and students, with input and support from employers. Employers have the option of being heavily involved through mentoring and coaching, or lightly involved by providing project ideas.

**Reach more students with your brand:** Because of the low resource commitment required, employers can offer multiple academic institutions the chance to participate in the same project-based learning experience. This allows employers to get their brand in front of a range of students across institutions, geographies, and disciplines.

Externship Program Snapshot

Olin College of Engineering (Olin) integrates project-based learning throughout its four-year curriculum for all students, believing students learn best through “immersion in real-world applications.” During their senior year, most Olin students partake in an externally-sponsored, real-world project called the Senior Capstone Program in Engineering (SCOPE). SCOPE is a year-long, eight-credit class for Olin seniors where students meet one day a week to work in multi-disciplinary teams to provide innovative solutions to sponsor problems. The teams meet weekly with their sponsors – companies and organizations across the country, and sometimes the world, with which Olin partners. Sponsor liaisons also serve as mentors to the students. At the end of the year, the student teams present their final projects to sponsors. SCOPE enables students to apply what they have learned in their classes the previous three years and also gain experience working with and presenting to stakeholders within sponsor organizations. The sponsors are able to have a presence on campus for recruitment purposes and gain exposure to potential future talent and to the value of the work Olin students produce.
Work-based learning in the postsecondary years is a best practice to address today’s STEM talent crisis. It helps meet employer needs for qualified talent with postsecondary credentials and equips students for success in the STEM workforce. Yet, choosing among the work-based learning options can be difficult given the many variables at play and making the wrong choice can lead to wasted resources and unmet goals.

Employers should consider two key questions when considering which work-based learning program to implement:

1. What are my STEM talent acquisition goals over multiple time horizons?
2. What resources, including staff, funding, time, and partnerships, do I have available to execute this program?

Determining goals

All work-based learning opportunities can meet short-term talent acquisition goals, but some types have a more immediate and direct impact on talent acquisition than others.

All work-based learning programs expose students to a company, amplify its brand as a STEM employer of choice among a pool of potential future talent, and build STEM and/or employability skills. However, only internships, co-op programs, and apprenticeships offer employers the chance to vet potential talent and prepare students to work in specific types of jobs at their company.

The type of work-based learning most directly linked to hiring is the apprenticeship. While internships and co-ops offer employers the chance to make an offer at the end of the program, only apprenticeships provide a nearly guaranteed talent pipeline.

Figure 3 provides information about which STEM work-based learning program(s) aligns with specific employer goals and priorities.
Any type of work-based learning program can help meet employer talent goals around diversity, equity, and inclusion, but only with intentionality in program design. Elements outlined earlier in this paper that can help meet such goals include partnering with diverse institutions to source student participants and removing barriers to access for all students.
Assessing the “lift”

Required resources, or “lift,” varies considerably among work-based learning programs. Apprenticeships, co-ops, and internships typically require a significant investment of time and resources to be successful for both the employer and the student participants. Externships and project-based learning typically require less time and resource.

Common resource considerations include:

- Staff available to dedicate to the program
- Partnerships that exist (or can be created) with postsecondary education institutions and/or nonprofits to provide access to student talent
- Available work assignments for students
- Additional financial resources that can be dedicated for equitable access/opportunities

Figure 5 provides a summary of the employer resources required for each type of work-based learning program.
### SUMMARY OF WORK-BASED LEARNING PROGRAM QUICK FACTS

**Figure 5. Summary of Work-Based Learning Program Quick Facts**

<table>
<thead>
<tr>
<th>Source of Talent</th>
<th>Compensation</th>
<th>Duration</th>
<th>Required Employer Staff Resources</th>
<th>Frequency/Type of Employer Involvement</th>
</tr>
</thead>
</table>
| **Internships**  | - 4-year institutions  
- 2-year institutions  
- Nonprofits working with students | Usually paid | Usually between 2-3 months, but may be longer |  
- HR for hiring  
- Technical employees to train  
- Managers to oversee | Daily - manage interns |
| **Apprenticeships** | - 2-year institutions  
- Technical schools  
- Nonprofits working with adults, whether they are students or not | Always paid | Between 1-6 years, depending on occupation and model |  
- HR for hiring  
- Technical employees to train  
- Managers to oversee  
- Liaisons with relevant government entities | Daily - manage apprentices |
| **Co-op Programs** | - 4-year institutions | Usually paid | Between 3-12 months |  
- HR for hiring  
- Technical employees to train  
- Managers to oversee  
- Liaisons with postsecondary institutions | Daily - manage student workers |
| **Externships** | - 4-year institutions  
- 2-year institutions | Usually unpaid | Between 1 day to a few months, depending on type |  
- Employee(s) to oversee student job shadowing and/or project | Weekly - check in by phone or in person |
| **Project-Based Learning** | - 4-year institutions  
- 2-year institutions | Always unpaid | Usually between 2-3 months, but may be longer |  
- Employee(s) to oversee student project | Weekly - check in by phone or in person |
Balancing goals and lift

Choosing among work-based learning programs is a decision unique to each employer in light of their talent goals and available resources. Here are three examples of employers deciding which type of WBL to implement based on their goals, available resources, and existing or future partnerships:

1. If an employer’s main goal is to hire trained workers over the next several years and the company has existing partnerships with local community colleges – or is prepared to create partnerships – the employer should consider implementing an apprenticeship program.

2. If an employer’s priority is amplifying its brand as a STEM employer of choice among local college students but does not currently have the capacity to implement an internship program – or already has an internship program and is interested in further amplifying its brand – it should consider partnering with a local college or university to create an externship program.

3. If an employer is interested in establishing a long-term partnership with a postsecondary institution and having four-year degree earning students work for them full-time throughout the year, they should consider creating a co-op program. While a co-op program would require more resources from the employer – including managing student workers daily – it would also provide the employer with a consistent influx of student employees every few months.

Research has shown that companies are more likely to choose internships over other work-based learning experience for postsecondary students. This is likely because internships are the most well-known WBL program and often assumed to be the easiest to implement. When they are equipped with appropriate resources, internships can provide an effective workforce development opportunity for students and provide employers with access to potential future talent and increased brand awareness. A poorly run internship, however, can detract from a student’s educational experience and cost a company time and money. An internship should be an informed choice for an employer seeking a work-based learning program, not the default.
FIVE KEY TAKEAWAYS FROM THIS PAPER FOR EMPLOYERS

1. STEM work-based learning is education that connects industry experience with classroom learning to provide students with knowledge and skills to support their entry or advancement in a particular field.

2. Work-based learning benefits employers by exposing students to their employment brand, enhancing student awareness of STEM jobs, and equipping students with the skills they need for success in STEM careers.

3. Work-based learning benefits students and postsecondary institutions by providing opportunities for practical application of academic concepts, increasing the chances students pursue and persist in STEM degree programs.

4. To choose a work-based learning program, employers should balance their STEM talent goals, including brand positioning as a STEM employer of choice and short-term hiring needs, against their resources available to dedicate to the program.

5. Any work-based learning program can achieve employer goals around diversity, equity, and inclusion, but only through intentional program design that removes barriers to access and fosters inclusive environments for traditionally underrepresented student demographics.
Appreciation

Special thanks to Abbott for sponsoring the Postsecondary Pathways Innovation Lab in February 2019 and for providing foundational input to this paper. Also, to Lois Joy, Associate Research Director, Jobs For The Future for her review and guidance.

Methodology

We consulted nearly 80 leading researchers, employers, higher education leaders, nonprofit service providers, and others to inform this report. They are listed alphabetically by organization. We also consulted a range of literature from postsecondary institutions, government entities, employer collaboratives, and others to supplement the knowledge gained in interviews and workshops.

Postsecondary Pathways Innovation Lab perspective

Participants in the Postsecondary Pathways STEMconnector Innovation Lab (February 2019) gave valuable input reflected in this final product through a day-long interactive workshop.

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*Industry, postsecondary, and nonprofit leaders shared their insight via interviews.*

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REFERENCES
