

The Intern Professional Development Center: A Model for Improving Student Engagement Within Industry – 20006

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ABSTRACT

Many innovations and technical improvements have been made over the last half-century regarding our understanding of nuclear materials, with some of the brightest minds in the world collectively working towards a cleaner, brighter, healthier future. However, there is a demographical oddity with the enormous technical workforce that helped shape this new world: they are aging, collectively. Known as the “silver tsunami,” mass retirements are in the near future for many technical industries, something that the industrial community is not entirely prepared to accommodate. There is an urgent need for a tech-savvy generation to replace the baby boomers, and there must be an uninterrupted hand-off from one generation to the next of institutional knowledge and best practices. Further, it is not enough to simply replace every retiring engineer with a younger one in a “cold hand-off” – this information transfer takes time.

Many educational communities, such as those in the Tri-Cities, Washington, are rising to the challenge, with STEM-focused programs, introducing students to technical concepts and potential career opportunities at an early age. However, while individually, academic institutions search for internships and industry has open positions for interested students, no single clearinghouse exists in the Mid-Columbia region to match talent with opportunities, regardless of the sending or receiving organizations. To fill this void, AYB Drafting (AYB) has established a career development and personal growth center, the Intern Professional Development Center (IPDC). The IPDC, located in Richland, Washington, addresses the problem of what has been referred to as the “Graying of America,” as it bridges the gap between education and career for the up and coming workforce, creating valuable efficiencies for the young workforce and the industry alike. The operating principles and details of the initial IPDC launch are discussed in the following text, as well as the apparent success and overwhelming positive feedback received in just the first year of operation.

INTRODUCTION

“In less than two decades, the graying of America will be inescapable: Older adults are projected to outnumber kids for the first time in U.S. history.” - Jonathan Vespa [1]

“There simply aren’t enough younger workers to make up for the huge (skill) gap the baby boomers will leave behind.” - Neelie Verlinden [2]

The “Graying of America” is felt all over the United States, but nowhere as starkly evident as in the Tri-Cities, Washington. Home to the Pacific Northwest National Laboratory and the Hanford Site, the Mid-Columbia has some of the brightest minds in the world, collectively working for a cleaner, brighter, healthier future. However, there is a demographical issue with the enormous technical workforce that helped shape this industry decades ago: collectively they are aging, and rapidly. Known as the “silver tsunami,” mass retirements are in the near future for the Hanford Site, something that the industrial community is not entirely prepared to accommodate. *“Nearly 60 percent of those in jobs connected to Hanford are older than age 50, and more than a third are eligible for workforce retirement within the next five years.”* - Robin Wojtanik [3]

Not only does there need to be a tech-savvy generation to replace the baby boomers, but there needs to be an uninterrupted hand-off of institutional knowledge and best practices, from one generation to the next. It is not enough to simply replace every retiring engineer with a younger one in a “cold hand-off” – this information transfer takes time.

Local education districts in the Mid-Columbia are rising to the challenge, with the introduction of STEM-focused schools, such as Delta High School and Marie Curie Elementary. The Tri-Cities Washington State University campus and Columbia Basin College have also increased their emphasis on their STEM programs, supplying the industry with engineers, scientists, technicians, and other much-needed individuals.

However, even with their best efforts, there is often a divide between the worlds of academia and industry, which can leave students stranded in the middle. Unfortunately, there is currently no single resource for students that are looking for internships, or for companies that are looking for interns, or young talent in general. Therefore, the need for the Intern Professional Development Center (IPDC) becomes apparent.

The IPDC is a career development and personal growth center developed by a technical services firm, AYB Drafting LLC, hereafter referred to as “AYB.” In March 2019, AYB established an initial prototype of the IPDC in Washington State’s Columbia Basin – home to the Tri-Cities, the Hanford Site, the Pacific Northwest National Lab, and more than 50 engineering firms, spanning across many industries. The operating principles and details of the initial IPDC launch are discussed in the following text, as well as the apparent success and overwhelming positive feedback received in just the first year of operation.

IPDC BREAKDOWN – TRI-STAGE APPROACH

AYB has developed the IPDC into three distinct and separate stages that naturally accompany students as they complete their undergraduate degree and prepare for their entry into the industrial complex.

Stage E1: Engagement

This stage introduces students to the program with a goal that the students become motivated and engaged early on, utilizing the benefits throughout their undergraduate career. The recruitment process and strategy used by AYB is critical for the success of the IPDC. AYB seeks to attract passionate, motivated technical students interested in STEM fields, even those students who had not originally considered a STEM career, or never thought it possible for them to attend post-secondary education. The IPDC is designed to open doors for students that show initiative. AYB’s first job is to focus on finding those students and encouraging them to pursue their dreams.

To recruit students from Washington State University (WSU) into the program, AYB works directly with the Director of Engineering, as well as the engineering faculty to attract potential students, preferably as they first enter the institution. There are several ways to reach out to the students: first, AYB participates in the freshman orientation to inform incoming students of the internship and development opportunities that the IPDC offers, available for interested engineering students. The IPDC is also registered with WSU’s Handshake portal, where students are encouraged to create a profile for potential employers to review. From within the Handshake portal, AYB has access to nearly all the students at WSU – branching across all campuses and programs.

Next, AYB actively recruits with the help of WSU’s engineering advisors. With their support, AYB sends out emails to specific categories of engineering students – freshman civil engineering students, for example. Although AYB does not have access to the roster and email list, the IPDC email content is distributed through the advisor to the proper audience. Finally, AYB recruits students by giving presentations about the benefits of the IPDC in engineering classrooms. Without exception, professors have been very accommodating to such presentations and are usually more than happy to allow a 10-minute discussion at the end of class.

Recruitment of students from Columbia Basin College (CBC) and local high schools takes a very similar form: a combination of e-mail communication, in-person presentations, and attendance at career fairs. AYB continues to build relationships with individual teachers and professors at CBC and the high schools to garner their feedback and recommendations as to which students should be encouraged to enroll and participate in the IPDC.

Once a student is interested in the IPDC and would like to enroll, they can do so by applying to one of the internship postings that are hosted on AYB's website. Once a student applies, they are added to the active candidate pool, and then transition into Stage E2: Education.

Stage E2: Education

The purpose of this stage is to educate the students that are participating in the program, and better prepare them for Stage E3: Employment. As an example, below we describe a civil engineering student's path through the IPDC.

Software Training

First, the student goes through the software training section. Here, the student is exposed to software that may be relevant to them throughout their career. In the case of the civil engineering student, they take structured online training courses covering AutoCAD Civil 3D, Revit Architecture, and Bluebeam. This training gives the student a strong understanding of what the software is capable of, and why it is used for specific purposes. However, this is just the beginning of the software training.

As important as online training is, there is no disputing the importance of hands-on learning. Therefore, the online training is followed by in-class instruction, starting with basic 2D drafting, and leading up to complex concepts and shapes. There is usually approximately 60 hours of project-based learning, with the students following along as the instructor completes an actual industrial project. In the case of the civil engineering student, an example project would be to extend a water main and add a fire hydrant at the end. More complex topics such as 3D pipe networks and grading are also covered.

Drafting Experience

Once a student understands the fundamentals of software use, they are ready to put those skills to use and begin drafting. Unlike the examples that the students worked on during their training, which were purely for educational purposes, these projects support an actual client, whether a municipality, a commercial entity, or a federal contractor. For example, a local civil engineering firm gives AYB a drafting order for its developer client: to design a parking lot for a new office building. AYB then collects a team of civil engineering students and assigns them a mentor for the project.

A mentor is someone who has been working within the industry for a significant amount of time and is passionate about sharing that knowledge. In this case, the mentor is a local civil engineer acting as a consultant for AYB. The engineer works with the group of students during a short session (two-four hours or more, depending on the task) to complete the work at hand. The students learn what it takes to design the parking lot, including studying materials, slopes, and grading, and considering special circumstances. The team then completes the draft, which is reviewed by AYB's engineers and revised as needed and sent back to the client, the local civil engineering firm, for review. AYB uses real-life work from its wide range of clients - from commercial HVAC firms, to local engineering firms, to Federal Hanford contractors, to local cities and other government agencies, to train the students in short, scheduled sessions. Once the student has the necessary skill, they transition from a training-heavy structure to a practice-heavy structure, performing the work solo, with oversight from AYB's engineers.

Over time, the students themselves gain a considerable amount of practical experience working with the experienced engineers, as well as through feedback from the mentor and from the client. This kind of experience cannot be taught in a classroom or learned from a textbook — it can only be transferred through experience and practice. The same concept applies to municipal and local government agency projects and commercial projects alike. In another example, a commercial HVAC provider could request a complex air-handling unit or duct system to be laid out within a building. In this case, the mechanical engineering students perform this work, learning about the industry as they tackle the project.

Drafting - Logistics of Obtaining the Work

To obtain the drafting work for the students to work on, AYB aggressively markets its capabilities to potential clients. To secure the municipal work across the entirety of Washington state, AYB is enrolled in the MRSC Small Business Roster and personally meets with various city and county public works management staff to establish relationships with the various entities. The kind of work municipalities and local government offer to AYB consists primarily of smaller public works projects, such as the replacement of a water main and the addition of a manhole. This smaller scale work is often too small to send to a full-scale engineering firm, due to their high overhead costs. Alternatively, performing this work in-house often takes resources away from other crucial areas within the local government's staff.

To secure drafting work from consulting and engineering firms, AYB has established relationships with engineers and managers at many firms and demonstrates to those individuals the fiscal advantage of having AYB perform their drafting work. If a firm sends its drafting work to AYB instead of hiring a drafter as an employee themselves, they do not need to worry about the logistics of payroll, taxes, insurance, and other legal details that occur as an employer. Instead, AYB simply charges the engineering firm an hourly rate for the work that is completed for them. An additional benefit is that students have the option to be assigned primarily to specific engineering firms and can begin forming a relationship with that organization as they begin their career at AYB and the IPDC. After 12 – 24 months of performing drafting work for a specific company, the student is an asset for that firm, having knowledge of the firm's work and clients, which nearly guarantees an internship or permanent position in the future.

Professional Growth and Development

Aside from learning technical skills, students at the IPDC are also exposed to a very professional working environment and are expected to be comfortable working in it. Today, social skills are just as important as technical ones – if not more so. Therefore, students are mentored on professionalism, ranging from proper dress code to professional etiquette. Although these may seem like trivial and unnecessary topics for some, there are many students who have not had a chance to be properly exposed to professional environments and may unintentionally limit themselves because of it.

Student Work “Gallery Nights”

Every six months, AYB hosts an open-door gallery night for students, family, and potential employers to review the work that students have been doing at the IPDC, and to mingle with the students. At this event, students can display the work (upon approval and release of the client) that they are most proud of – non-proprietary projects they have done in the past, to demonstrate their technical skills. This allows the students to practice their professional skills, since the mingling employers ask the students questions regarding the work they have done; in essence, these can be considered as practice interviews. During the 12 – 24 months years that a student is performing drafting work for AYB at the IPDC, they are exposed to several such Gallery Nights, allowing them to work on their social skills, as well as the art of presenting oneself to a potential employer. This leads directly into the third core value of the IPDC, E3: Employment.

Stage E3: Employment

This stage places students with local engineering firms for internships, allowing them to begin working directly on-location at a specific company and begin building that personal relationship. The final goal of the IPDC is to connect students to potential employers, creating a bridge for the students to cross once they graduate and are ready to begin their careers. The placement stage is separated into 2 parts: augmentation, and independent.

Placement: Augmentation

Once a student completes their sophomore year, they are placed at a local firm for an internship, working exclusively for that company at their location. The student remains as an employee of AYB until the middle of their senior year, and the company is simply billed for the hours that the student works. There are several benefits to this staff augmentation arrangement.

First, the company's risk and up-front cost in hiring the student is minimal. They do not need to submit new-hire paperwork, they do not need to worry about benefits, taxes, insurance, payroll, and other legal details. They simply sign a Staffing Agreement and pay the hourly wage that the student is billed at, for every hour that the student works. This also reduces nearly all risk for the company, since they can opt out of the agreement at any time – if they are not satisfied with the student that is placed with them.

This arrangement also allows AYB to ensure the quality of the student's work by having regular performance reviews involving the student, AYB, and their immediate manager. During these meetings, the group discusses the work the student is doing, their performance, and any additional training that may be necessary for the student's success with the company. This allows for a process of constant improvement on the student's side, with relevant feedback and training opportunities at regular intervals.

Placement: Independent

At the conclusion of a student's fall semester during their senior year, they are given the option to transition out of AYB and the IPDC to be placed directly with the firm they have been an intern for. If the student and company are satisfied with their relationship and would like to continue, this is often a seamless transition, with the student beginning their independent career. However, if the student has decided that they would like to try something new, they still have approximately six months before graduation to find a new company and begin establishing other relationships, and the IPDC can help them through this process as well. Once a student leaves AYB, they are considered a graduate from the IPDC and should be well on their way to a successful career within the technical sector.

A graphical representation of the IPDC, tri-stage approach is shown.

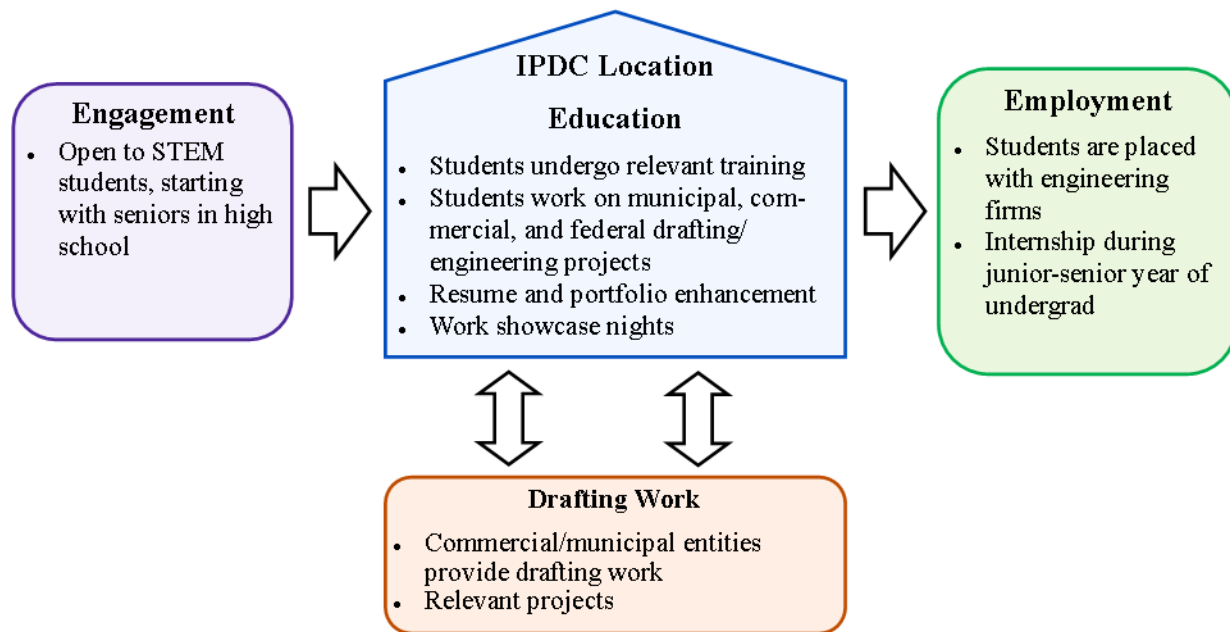


Fig. 1. IPDC Structure

COMMUNITY BENEFITS

A successful implementation of the IPDC brings a suite of benefits to the community that it has been incorporated into – in this case, the Tri-Cities, in Washington State.

Local Talent Retention

As students complete their high school and undergraduate degrees, they are not always able to find accommodating employment locally, forcing them to search elsewhere – outside of the Tri-Cities, often causing a loss to our local economy. However, the IPDC adds value to the student, and helps them build those connections with local employers, encouraging them to keep their talents within the Columbia Basin. This leads to an increase in younger talent locally, an injection of a fresh wave of technical skills and energy that is crucial for the sustainability of the Tri-Cities economy.

Increased Attendance to Local Institutions

If students can begin their career as early as their senior year in high school, and have a prospective job for the upcoming years, they are less likely to leave the local area for their undergraduate degrees. This could lead to increased enrollment numbers for both Columbia Basin College (CBC) and Washington State University (WSU), since students are more hesitant to leave behind an opportunity like the one offered by the IPDC.

Improved Graduation and Educational Performance Statistics

Students with direct ties to industry and employers during their educational career are much more likely to complete their high school and undergraduate degrees, as opposed to students that do not have a relevant internship during the same period of time. A 2011 study from the Iowa State University found that students participating in an internship during their undergraduate degree had a significantly higher GPA per semester and have vastly improved graduation statistics relative to non-participating students. [4]

RESULTS

In March 2019, AYB launched the initial prototype of the IPDC, and set in motion aggressive recruitment

and marketing strategies, targeting all areas of involvement. Over the course of several months, AYB representatives visited classrooms, businesses, and social gatherings, collecting commitments and support, while distributing information regarding this novel opportunity. On the student side, the candidate pool of students increased drastically, with over 100 undergraduate students applying through AYB's website portal within just a few weeks. This candidate pool continues to grow as more students find out about the IPDC and express interest. On the business side, many companies expressed an interest in supporting the IPDC, but 2 local engineering firms were chosen to participate in the prototype program, and they each requested AYB to subcontract one of the program's late-stage participants as an intern. This is a direct implementation of the IPDC's third stage: placement at a local firm via staff augmentation. For the sake of conciseness, only one such placement is discussed in detail.

AYB sat down with the client, a prominent architecture and engineering firm. Their electrical engineering team needed an undergraduate intern and had specific requests for the topics they needed the student to be familiar with. The list spanned subjects that are often not properly covered during a student's undergraduate degree. In this particular case, the knowledge gap consisted primarily of familiarity with drafting and visualization software, as well as a working knowledge of various codes and standards. After a careful selection process, a student was chosen, and began their involvement with the IPDC, starting with basic online training. The student was trained on several suites of software, including AutoCAD and Bluebeam. After several certification-level courses were completed, the student spent several weeks working with AYB's engineers at the IPDC, receiving classroom training in the topics requested. The software section included training with EasyPower, AGI32, AutoCAD, AutoCAD Electrical, and Revit MEP, while the codes and standards section focused on Washington's energy code and the National Electrical Code (NEC). At the conclusion of the training period, the student began working at the client's location, as a sub-contracted employee of AYB. After three months, AYB met with the client to conduct a performance review. When the primary mentor and engineer working with our student was asked for feedback regarding their intern, the manager asked, "How soon can we get another one?" This was the direct proof that AYB needed to validate the concept of the IPDC. The client was thrilled with the chosen student and began considering implementing students from the IPDC into other parts of their firm.

The value has been demonstrated: hiring a student that has been thoroughly vetted and trained is a much more lucrative option for employers who might be hesitant to hire and train junior-level staff. By picking out a student from IPDC's candidate pool, engineering firms drastically minimize their human-resource-related legwork and risk, while having the option to fully customize what their chosen employee will know before their first day at work. This is much more than a marginal increase in convenience – the amount of money and time a company can save by going through an intern clearinghouse like the IPDC is quantifiable. A benchmark report from the Society for Human Resource Management (SHRM) found that the average on-boarding cost-per-hire is \$4,125 – and that's before the employee begins working. [5] Once hired, a company spends an average of \$1,296 for employee training, all within the first 3 months [6]. This onboarding cost is nearly entirely offset by the IPDC, allowing the student to begin contributing productively at a much sooner stage.

Moving forward, AYB continues to actively grow the IPDC and its reach, hoping to engage with as many students and employers as possible – initially focusing exclusively on the local community. Now that an expansive candidate pool of students has been accumulated, growth will depend on further involvement from local employers – from small consulting firms, to international corporations, to government agencies. By the end of 2020, AYB has a goal of actively engaging with 10 - 20 students in stages E2 and E3 – as drafters at the IPDC location, or as sub-contracted employees working at a client's location. Given the variety of engineering companies located in the Tri-Cities and the wide scope of their collective work, this goal is realistic, and realizable with further networking and marketing on AYB's part. After this goal has

been met, further scaling is only natural – until every student and company wanting to participate in the IPDC can be accommodated.

As the dust settles from the first year of operation, a long-term goal for the IPDC begins to emerge: to have a single location “clearinghouse” where every local engineering student will have the opportunity for personal and career-focused development. Meanwhile, companies will now have a single point of contact for their junior staffing and intern needs – minimizing the risk and costs associated with on-boarding. Finally, after sufficient scaling and proof-of-concept has been completed, AYB strongly believes that the tri-stage approach of the IPDC can be replicated in other cities; anywhere that students and undergraduates need to rapidly fill the shoes of a retiring workforce.

CONCLUSION

Although there may be large waves of retirements upcoming in the technical community, the forecast for our workforce is far from grim. There is truly no shortage of young engineers, scientists, mathematicians, and technicians waiting to take their place, full of energy, new ideas, and a passion for solving problems. However, even the most talented and ambitious youth will require varying levels of additional support to reach their goals. Specifically, navigating the unclear waters of initial employment, as well as transitioning from the perspective of a college student to that of a young professional. Unfortunately, there are many gaps in the education that most students receive – gaps that industry expects to be filled. Therefore, the Intern Professional Development Center (IPDC) was designed to begin filling these gaps, creating a metaphorical bridge between students and employers, educational institutions and industry.

This paper illustrates the effective application and implementation of the tri-stage approach in the Tri-Cities, Washington, where AYB Drafting LLC launched an initial prototype of the IPDC in 2019. Although this prototype continually evolves and shifts to accommodate to an ever-changing landscape, the value has been clearly demonstrated. Employers value the unconventional tacit knowledge that students receive through the IPDC, while students appreciate the opportunity to learn and to get involved with the industry at such an early stage in their careers.

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