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Portfolio Review of DoD's Work Experience Programs: Developing a STEM Workforce

Summary Report

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About This Publication

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Developing a STEM Workforce: Portfolio of DoD STEM Work Experience Programs

The Department of Defense (DoD) has an imperative to inspire, cultivate, and develop current and future science, technology, engineering, and mathematics (STEM) talent to meet workforce needs in the near-, mid-, and long-term. With nearly 300,000 DoD civilian STEM professionals,¹ there is a continual need to fill positions for those who have left or retired, or to gain new capabilities as the DoD strives to maintain technological superiority. An important step for developing STEM professionals is participation in *work experience programs* (WEPs): internships, apprenticeships, post-doctoral positions, and early career programs.²

In 2020–21, the Institute for Defense Analyses (IDA) conducted a portfolio assessment of the wide variety of WEPs across DoD science and engineering (S&E) organizations and facilities. The DoD has many of these programs that reach across the Services and Fourth Estate agencies (Figure 1). They allow participants to enhance their STEM skills and abilities, gain valuable experience, and learn how to effectively contribute to an organization or team. However, there was no prior assessment to describe the extensive scope of the DoD’s WEP portfolio. This summary report provides highlights of IDA’s portfolio evaluation and an assessment of the scope of opportunities available through the STEM WEPs.³

The IDA study examined 54 programs across the DoD through the analysis of publicly available program information, interviews with some key stakeholders, and

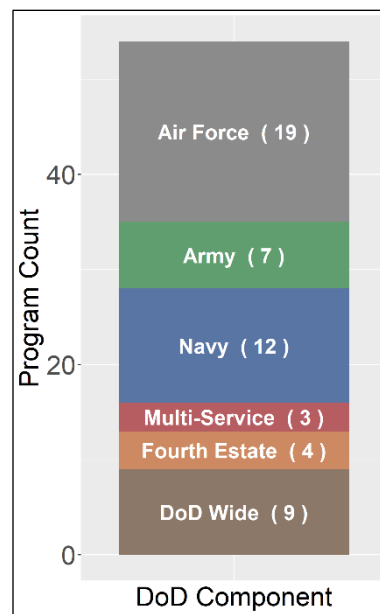


Figure 1. Number of WEPs identified across the Services and DoD agencies.

¹ <https://dodstem.us/about/>

² For the purposes of this evaluation, IDA defined WEPs as having two required components: (1) an experiential component where participants engage in meaningful work and (2) an educational component where they acquire skills or knowledge.

³ Kolodrubetz, Daniel, Alexis A. Pang, Christian Dobbins, Franklin L. Moses, Emily A. Fedele, and James Belanich. 2022. *Portfolio Review of DoD's Work Experience Programs: Developing a STEM Workforce*. IDA Document D-22721. Alexandria, VA: Institute for Defense Analyses.

analysis of program-generated data. Across the portfolio, there were a variety of program goals to include increasing interest in STEM, reaching underserved populations, increasing domain interest, identifying people to hire, early career growth, and creating a geographic or regional community. DoD STEM WEPs reach an enormous number of participants with an estimated 5,000 or more participants per year engaged in these programs.

Broad Access

Collectively, DoD STEM WEPs draw participants from across the United States, maintaining a large geographical reach. Approximately 75% of the programs recruit from a national pool while the remaining focus on a particular state or local community for participants. There is also geographic distribution of where the programs are conducted, with DoD WEPs taking place at many DoD labs and research facilities as well as other settings that conduct technical work. Additionally, a few programs are conducted at DoD-funded university labs, providing participants with exposure to an academic research environment. There is also a range of program sizes by the number of sites where the WEPs are implemented, with several smaller ones in a single location and some larger programs spanning 30+ locations (Figure 2).

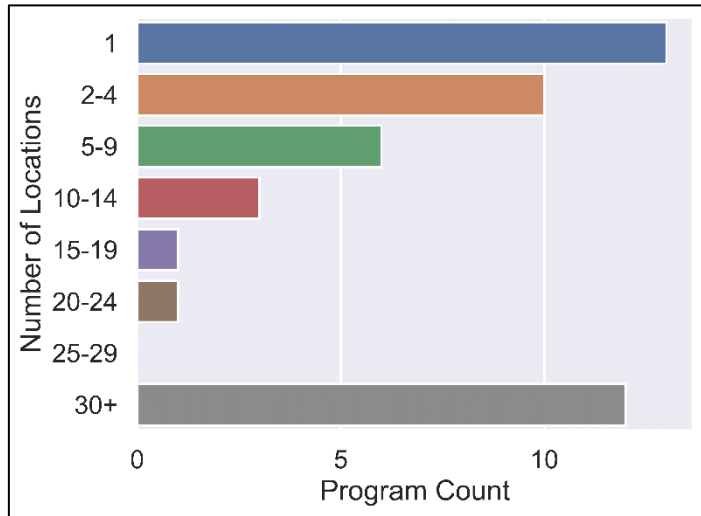


Figure 2. Distribution of program size based on number of locations where WEPs are conducted.

Many DoD WEPs strive to broaden participation in STEM through efforts to address diversity, equity, and inclusion. In our analysis, we identified 16 programs that explicitly emphasized this as a primary goal. To reach underrepresented and underserved populations, DoD WEPs approached the concept of diversity in a few ways including: racial and ethnic minorities, residents of rural areas, low-income students, first-generation college students, people whose second language is English, people with disabilities, and gender in certain STEM fields. Thus, WEP programs help explore ways to reimagine and transform STEM opportunities to meet the STEM educational needs of all.

Varied Opportunities

The DoD offers a wide-ranging portfolio of programs that provide a broad set of opportunities to participants (Figure 3). These programs cover a variety of STEM fields, engage participants at most stages of educational development, and offer participants programs of varying duration.

DoD STEM WEPs are available across the full range of STEM fields and disciplines. Of the WEPs in the sample, 11% specialized in one specific area of STEM, while the remaining 89% supported multiple areas. Some of the most common disciplines identified include computer science, engineering (e.g., electrical, mechanical, and civil), mathematics, physics, and chemistry.

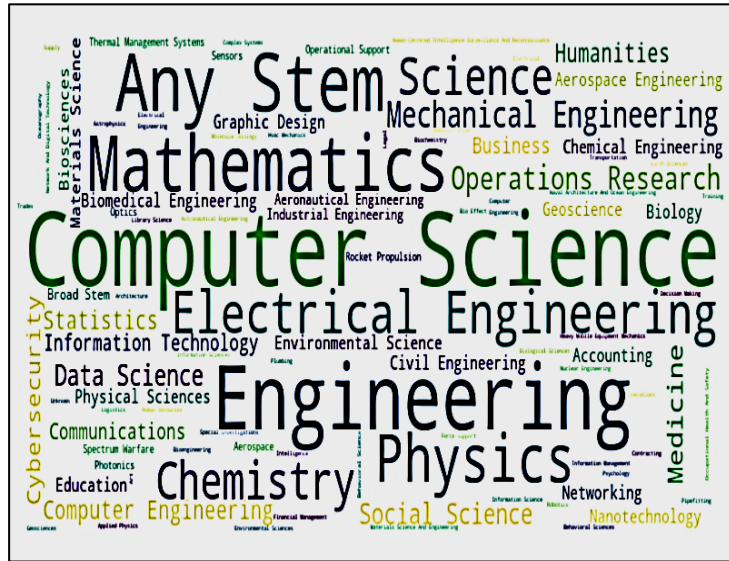


Figure 3. Word cloud showing disciplines identified in program recruitment literature, with word size indicating prevalence of use in program recruitment literature.

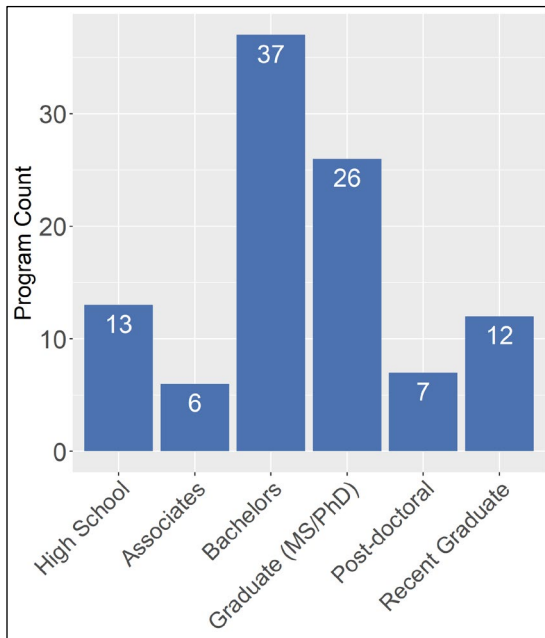


Figure 4. Number of programs that offer opportunities to students at particular education levels.

DoD WEPs provide participants with developmental opportunities at multiple education levels (Figure 4). There are WEPs available to students in high school, community colleges, undergraduate and graduate programs, as well as programs for students who have recently graduated. A few WEPs provide support to participants as they prepare for the next level of education, such as helping those working towards an associate's degree apply for bachelor's programs or those in undergraduate programs to pursue graduate degrees. Most programs are open to students at multiple education levels, which is why the values for bars in Figure 4 sum to greater than 54.

The DoD STEM WEP portfolio offers programs of varying duration, both in time of year and the potential to participate for multiple years (Figure 5). The most common WEP duration is for 8–12 weeks over the summer months (76% of the programs identified). In addition, some programs offer WEP opportunities on a year-round basis and some have both options.

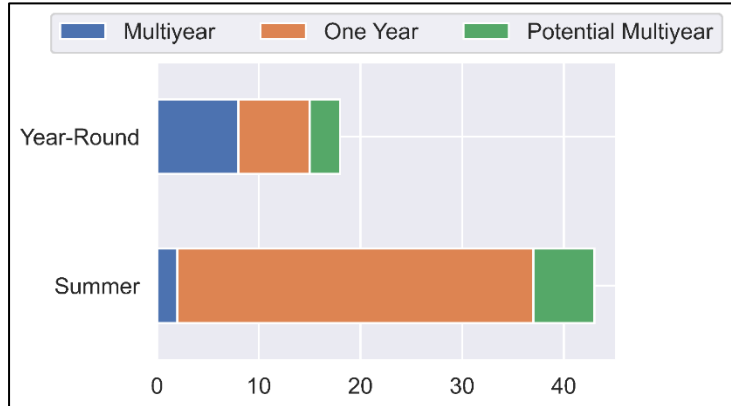


Figure 5. Number of programs that offer WEPs of varying duration.

The variety of education levels and duration of WEPs provide participants with ample opportunities to stay in the STEM developmental pipeline over multiple years. The opportunities use three primary strategies: a) formal organizational networks where there is an explicit link from one program to another program, b) informal program connections where participants in one program may learn about other DoD opportunities, and c) programs that explicitly promote student participation in continued education.

Building Workforce

DoD WEPs aim to enhance the future STEM workforce in ways that benefit both participants and DoD host agencies. Participants gain valuable STEM work skills and experiences while the DoD benefits by getting work done and assessing talent that may be hired in the near-future.

Programs create opportunities for students to grow their abilities as STEM scientists and junior professionals using several types of activities. Participants join or lead STEM projects that support the hosting agency’s mission, working closely alongside government employees and staff. Through this experience, they are able to contribute their ideas and perspectives to some of the most pressing challenges in national security. Most programs in the sample culminate by having participants present their respective projects to the host agency and affiliates.

Beyond projects, all programs in the sample offered one or more growth-oriented activities to deepen participants’ learning. There was often some type of mentoring, though programs varied with respect to its degree of structure. Many programs also held at least one professional networking event to help participants connect with established STEM professionals, industry partners, and other participants. Combined with their work on projects, such activities help students grow their abilities in STEM, increase their awareness of STEM efforts and opportunities throughout the DoD, and gain the knowledge

and experiences they will need to turn their educational and professional aspirations into realities.

WEPs create a strategic opportunity for host agencies by facilitating access to the upcoming talent pool. Several programs in the sample used WEP activities as a way to assess participants for permanent positions immediately after graduation or at a later time after further education. Some of these programs have formal hiring mechanisms and designated hiring authorities through which successful participants are placed into permanent, full-time positions within the Department. This hiring incentive approach lines up closely with how private industry often uses internships. Thus, WEPs provide a means for successful participants to transition into DoD jobs and build the workforce.

In various ways, WEPs have been designed to build a workforce community either in a particular STEM domain or a particular geographic location. The programs that focus on particular domains (e.g., autonomy, high-performance computing, cybersecurity, naval engineering) have the intent to build communities of interest and talent in areas that are important to the DoD. The programs with a geographic focus have the intent to develop that location as a STEM hub, leveraging cross-sector partnerships with city or state agencies, educational institutions, and employers to build a STEM capacity that contributes to the region's economic development. STEM communities, centered on a particular domain or geography, can strengthen both the supply and demand of STEM professionals, drawing in students, recent graduates, private employers, and government agencies.

Conclusion

This summary report provides highlights of IDA's portfolio assessment of the DoD's STEM WEPs. Filling the many varied DoD STEM needs of tomorrow requires programs that facilitate the development of STEM students and early-career professionals of today. The DoD's approach offers a broad range of WEP opportunities to develop a diversity of STEM professionals because one size does not fit all. The programs address a varied set of goals that are important to the organizations running them but also to the broader goal of developing essential STEM talent for the future. We conclude that participation in DoD WEPs helps to bridge the gap between sitting in the classroom and completing meaningful STEM work to make real-world contributions. By connecting students and junior professionals with DoD STEM opportunities, WEPs position themselves to address the perennial need to recruit and develop the next generation of the DoD STEM workforce.

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