



Time-Based, Competency-Based, or Hybrid Programs?

Considerations for Selecting an Approach to Registered Apprenticeship

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Registered apprenticeship programs result in positive outcomes for employers and apprentices. Traditionally used as a training model in the building trades, the US Department of Labor (DOL) aims to expand registered apprenticeship as a workforce training model, including to nontraditional industries such as health care and information technology. Although registered apprenticeship programs share key elements, they vary in terms of occupational focus, length, registration agency, and approach (time based, competency based, or hybrid). This brief focuses on the three approaches to registered apprenticeship programs, considerations in selecting an approach, and insights from program sponsors using each approach.

Background

Apprenticeship is an “earn-and-learn” model that combines classroom instruction (“related technical instruction,” or RTI) with on-the-job learning (OJL) provided by a mentor at the employer’s worksite. It provides training in a specific occupation and delivers occupational skills that are recognized and transferable across employers. Apprentices are employed and earn progressively higher wages as they master skills.

Apprenticeships in the US have traditionally focused on training for occupations in the building trades (e.g., electrician, carpenter). However, apprenticeships are growing in nontraditional occupations, such as health care, advanced manufacturing, and information technology, in part because of DOL initiatives and funding available since 2016. Box 1 summarizes elements of registered

apprenticeships. These programs must be approved by a registration agency—either the DOL Office of Apprenticeship (OA) or a federally recognized State Apprenticeship Agency (SAA). An apprenticeship sponsor oversees the program; among its many roles is maintaining the Standards of Apprenticeship, which documents the OJL and RTI (known as the work process schedule, or WPS), wage increases, and other program elements. Completers receive an industry-recognized credential. An evaluation of a DOL initiative that aimed to expand registered apprenticeship to nontraditional industries and underrepresented populations found positive earnings outcomes for apprentices and a positive return-on-investment for employers (Walton, Gardiner, and Barnow 2022; Kuehn et al. 2022).

BOX 1

Elements of Registered Apprenticeship

- **approval** by the DOL's Office of Apprenticeship (OA), a State Apprenticeship Agency (SAA), or sometimes both
- **related technical instruction** (RTI) of 144 hours or more recommended per year in a physical or virtual classroom
- **on-the-job learning** (OJL) of at least 2,000 hours overseen by a mentor at the employer's job site
- **wage increases** over the course of the apprenticeship (wage progression), which can be tied to time in the program or to demonstration of skill competency
- **work process schedule** (WPS) that outlines the major job functions, competencies, and/or hours an apprentice completes in a registered apprenticeship program
- an **Apprenticeship Completion Certificate** issued by the DOL or SAA upon completing the apprenticeship
- a **Standards of Apprenticeship** document that describes the WPS and specifies the RTI, OJL, and wage progression, among other processes, for the registered apprenticeship program
- a **sponsor** to oversee the program and maintain fidelity to the Standards of Apprenticeship and collect basic data on apprentices (sponsors can be employers, consortia of employers, joint-labor management organizations, community colleges, state or local workforce agencies, or nonprofits)
- a **written apprenticeship agreement** between an apprentice and either the program sponsor or an apprenticeship committee acting as an agent for the sponsor

Source: Karen Gardiner, Daniel Kuehn, Elizabeth Copson, and Andrew Clarkwest, *Expanding Registered Apprenticeship in the United States: Description of American Apprenticeship Initiative Grantees and Their Programs*, report prepared for the US Department of Labor, Employment and Training Administration (Rockville, MD: Abt Associates; Washington, DC: Urban Institute, 2021).

Three Approaches to Apprenticeship

Apprenticeship sponsors can use any of three approaches to structuring their programs:

- **Time-based.** This approach measures skill acquisition through the individual apprentice's completion of a minimum of 2,000 hours of OJL, as described in a WPS.
- **Competency-based.** This approach measures skill acquisition through the individual apprentice's successful demonstration of acquired skills and knowledge, as verified by the sponsor. The Standards of Apprenticeship must address how OJL will be integrated in the program, describe competencies the apprentice will master, and identify an appropriate means of testing and evaluating them. Current OA policy requires that competency programs last at least 12 months.
- **Hybrid.** This approach measures the individual apprentice's skill acquisition through a combination of a specified minimum number of hours of OJL and the successful demonstration of competencies as described in a WPS. Hybrid programs generally provide a range of OJL hours, which an apprentice may expect to complete the program (e.g., 2,000–2,700 hours).

Regardless of approach, registered programs must include RTI that complements the apprentice's OJL, delivering the technical concepts and workforce and academic competencies needed to succeed on the job. The DOL recommends a minimum of 144 hours per year. A community college, a technical school, an apprenticeship training school, an online education provider, or the employer itself (or a combination of the above) can provide the instruction.¹ Programs can deliver RTI and OJL concurrently, deliver RTI before OJL, or alternate RTI and OJL. Most RTI is time based—that is, measured in classroom hours. RTI can be competency based; for example, if apprentices complete online training at their own pace.²

The traditional approach to apprenticeship is time based, as articulated in the National Apprenticeship Act of 1937.³ (Box 2 explains the history of time-based apprenticeship.) The minimum hours of work experience were consistent with industry-established training requirements—that is, requirements in the construction industry, which hired most apprentices.⁴ In 2008, the DOL authorized competency-based and hybrid approaches in recognition that—for some nonconstruction occupations—demonstration of a skill, such as taking a patient's blood pressure, is a better measure of mastery than time spent on a skill.⁵ Table 1 (on page 10 of this brief) shows three approaches to the first learning objective of a nontraditional occupation (Commercial Drone Software Developer). As shown, the outline for the learning objective is the same, but how skills are assessed for OJL purposes differs by approach.

BOX 2

Why Have Registered Apprenticeships Historically Been Time Based?

The foundation for time-based programs goes back far earlier than the National Apprenticeship Act of 1937. In early colonial America, settlers imported apprenticeship systems from English guilds to meet labor training needs. From the 12th to 14th century, English guilds used age as a proxy for experience; young men would begin serving a master craftsman in their teenage years, and it was presumed that by age 21 they had achieved proficiency as a journeyman, as widespread certification of skills was not feasible. This was formalized in the United Kingdom in 1563; the Statute of Artificers and Apprentices was passed, mandating a minimum of seven years of apprenticeship before an apprentice could practice freely as a tradesman independent from their master.

Because of this requirement, apprenticeships became standardized in the UK to last from ages 14 to 21. Records of apprenticeships in colonial Philadelphia indicate that when the training system was imported to the US, this time requirement standard was imported as well: the average colonial tradesman served as an apprentice from ages 14–17 to 21. This template for apprenticeship persisted, despite a reduction in apprenticeship during the industrial revolution, and remains in place today as the basis for time-based apprenticeships.

Sources: S. R. Epstein, “Craft Guilds, Apprenticeship, and Technological Change in Preindustrial Europe,” *The Journal of Economic History* 58, no. 3 (1998): 684–713, <http://www.jstor.org/stable/2566620>; S. R. Epstein, “Craft Guilds in the Pre-Modern Economy: A Discussion,” *The Economic History Review* 61, no. 1 (2008): 155–74, <https://www.jstor.org/stable/40057560>; Sheilagh Ogilvie, “The Economics of Guilds,” *The Journal of Economic Perspectives* 28, no. 4 (2014): 169–92, <http://www.jstor.org/stable/23973563>.

A Closer Look at Each Approach

Each approach has benefits and drawbacks, as detailed below.

Time-based approaches can be quicker to develop because the WPS *requires less detail* relative to competency-based and hybrid approaches. The sponsor determines the number of hours for the apprenticeship (a minimum of 2,000 per year) and then allocates hours to each learning objective. As shown in table 1, the sponsor allocates hours overall to the first learning objective in the WPS and to each task. Also, because the time-based approach was the exclusive approach for decades, many registered apprenticeship programs continue to use it. Thus, *sponsors likely can find and modify, if needed, an “off-the-shelf” WPS*, which can be customized to meet specific local needs.⁶ Additionally, *tracking apprentices’ progress is relatively easy* in time-based programs; commercially available software facilitates tracking apprentices’ time in their respective programs. The downside of this approach is that it equates time with skills mastery, which might be appropriate for construction trades but potentially not for other occupations, such as tech occupations in which the competencies change increasingly over time.

Competency-based approaches provide *more flexibility for the apprentice*. This approach acknowledges that apprentices start with varying skill levels and is common in other countries.⁷ Per federal guidance, competency-based programs “have an open entry and exit design, which enables apprentices to accelerate the rate of competency achievement or extend the term of training in order to meet performance-based completion requirements.”⁸ As table 1 shows, no hours are assigned to the objective; instead, a mentor or supervisor determines that the apprentice achieved the task and assesses the apprentice’s performance on a scale of 1 to 4. To be deemed competent, an apprentice must be able to perform the task multiple times without supervision.

Because competency-based programs include a detailed evaluation of apprentice performance, it is *clear to both the apprentice and the employer exactly what competencies the apprentice has demonstrated* and where additional learning is required (Auer Jones and Lerman 2017). Thus, employers know that completers have mastered specific competencies. Apprentices can move at different paces through the program depending on their own learning style and previous experience. Finally, if an apprentice enters the program with relevant skills, the *apprentice could reduce the time it takes to complete the program*

through mastering learning objectives more quickly. And employers may provide credit for previous experience if apprentices can complete the competency.

A potential downside of the competency-based approach is that *developing the WPS is more time consuming* because it involves compiling a detailed list of competencies and how the employer or sponsor will assess them for proficiency. Depending on where the program is registered, not all registered occupations have a competency-based option, so it might be more difficult to adapt an existing program. Additionally, competency-based programs *might not align with time-based systems*, such as community colleges, which are common RTI providers, because colleges measure progress in credit hours as opposed to demonstrated competencies. The sponsor and college would need to determine how to translate credits into skills mastery (e.g., using report cards and performance reports). Finally, *some programs cannot use a competency-based approach*, namely occupations in the building trades, because eligibility to sit for a licensing exam is based on proof of a set number of hours of experience. For example, electricians generally need proof of 8,000 hours of experience, although requirements vary according to state statute.⁹

Hybrid approaches combine aspects of time-based and competency-based programs. Apprentices must demonstrate competencies but within a specific time frame. By determining a range of hours for each learning objective, hybrid programs acknowledge that apprentices start with varying skill levels and learning capabilities, while also preventing them from spending excessive time in any learning objective. As shown in table 1, a hybrid program combines the competency assessments with hour ranges. An apprentice may need only 15 hours to be competent in one task but 45 hours for another.

Hybrid programs are flexible. Sponsors can use competencies and time to assess progress. For example, a program with competency-based OJL could make wage increases contingent upon time in the program (e.g., annual). Or an occupation in which licensing is contingent upon completing a degree or certification, such as a Licensed Vocational Nurse, RTI can be counted in hours, while OJL can be competency based.

One downside is *the WPS is the most detailed* and can take more time to develop. Additionally, *tracking must involve both documenting the apprentices' time spent in each learning objective as well as demonstrated competencies*. Finally, because each learning objective has a time range, *hybrid programs could be longer* than either time- or competency-based programs if the apprentice uses the maximum amount of time to complete a learning objective.

Selecting an Approach: Considerations

Considerations in selecting an approach include the apprenticeship occupation, employer organizational culture, and apprenticeship system in the state where the occupation will be registered.

Apprenticeship Occupation

The first consideration is the apprenticeship program's occupational focus. *Construction-related occupations*, as noted above, historically have been time based.¹⁰ However, OA approved a hybrid approach for some programs (e.g., Cement Mason).¹¹

If the apprenticeship program occupation is *nontraditional*—that is, not associated with the building trades—sponsors generally do not need to use a time-based option, although some occupations, such as cosmetologist, might also require a certain number of hours of practice before sitting for a licensing test, depending on the state. For professions that require mastery of a specific skill set, such as those in health care, sponsors are apt to select an approach that requires skills demonstrations, thus either a competency-based or hybrid approach. For example, a sponsor of a Licensed Practical Nurse¹² program might find the demonstrated ability to complete learning objectives, such as recording medical histories, monitoring patient conditions during treatments and procedures, and administering basic health care or medical treatments, a better indicator of skill attainment than the number of hours completed for each competency. Similarly, an advanced manufacturing apprenticeship program, such as CNC Operator and Programmer,¹³ might use a competency-based or hybrid approach to assess competencies for learning objectives, such as programming equipment and creating blueprints for workpieces or products rather than using time spent in each learning objective. OA approved all three approaches for both programs. Thus, ultimately it is the preference of the sponsor or employer that determines the approach.¹⁴

Competency-based programs also provide flexibility for occupations where apprentices often start with relevant skills, such as tech occupations. A former program director at a Workforce Development Board (WDB) in Virginia who helped employers develop apprenticeships noted, “[Apprentices] grow up with computer skills—they can pick up cyber in a boot camp. When they come to the apprenticeship, they learn quickly. It would be foolish to put them in a time-based program.”

Employers

Several factors can influence an employer’s approach to apprenticeship. First is program length. A DOL Apprenticeship Training Representative (ATR)¹⁵ noted that when talking with employers about developing programs, she presents all three approaches. She finds that employers often are not familiar with the different approaches and “generally want the shortest,” which she noted is often competency based.

Another aspect is the employer’s experience with apprenticeship programs. The WDB program director gave the example of two companies designing a four-year, 8,000-hour mechatronics apprenticeship program. One employer is a pharmaceutical company that operates a program with a union organization. The union has established training models and a state-of-the-art training facility. Time-based programs are its tradition. Another employer designed a program for incumbent workers. This employer does not have a connection to a union. The employer, she noted, wanted a competency-based or hybrid program so that the apprentices could potentially progress more quickly. She added, “When an employer decides to move someone internally, someone who excels, they want the flexibility to fast-track, to accelerate skill development, and not wait four years. They want to train and retain.”

Finally, the type of employer can influence the approach. A consultant who helps sponsors and employers develop apprenticeship programs noted, “When the employer is a government entity, the approach needs to be time-based or hybrid. Government is traditionally a merit-based system. Annual reviews occur at the same time each year. They are not set up for interim wage increases.”

Apprenticeship System

A final consideration is whether the program is registered in an “OA state” or “SAA state.”¹⁶ Currently, 26 states and territories register their programs through the DOL Office of Apprenticeship (OA states) and 30 through a federally recognized State Apprenticeship Agency (SAA states). Key differences include the following:

- **OA states** use standard documentation to register programs and use the Registered Apprenticeship Partners Information Data System (RAPIDS) system for registration, oversight, and tracking apprentices’ progress and apprenticeship compliance. Sponsors can find approved occupations online;¹⁷ depending on the occupation, there may be one to three types of approaches approved. Sponsors can customize their programs using the OA standards builder.
- **SAA states** generally use their own paperwork to register programs and have the option to use RAPIDS or their own state system for registration and oversight. A key difference between OA and SAA states is that SAA states have State Apprenticeship Councils, which operate under the direction of the State Apprenticeship Agency and are either advisory or regulatory.

Councils must include equal numbers of representatives of employer and employee organizations and include members of the public. Persons must be familiar with apprenticeable occupations.¹⁸ The composition of council members varies but often includes representation from the construction industry, which aligns with the historical role of the building trades in apprenticeships. A former staffer in a midwestern SAA state noted that 70 percent of apprenticeships in the state are construction related, so the industry has a “huge voice” on the apprenticeship council. She added that all programs in the state have a time element (thus are time based or hybrid) because that is the tradition of the council. The apprenticeship director in another SAA state described how council members associated with traditional industries expressed concerns about the quality and rigor of competency-based programs because they had no experience with such programs. A former WDB official in Virginia, an SAA state, echoed this sentiment: “It is hard to get competency-based [programs] through an SAA...States will say we’ve already been doing it this other way and it works.” She added that hybrid approaches can be good options in states that do not have a history with competency-based programs because “the system is satisfied with the time-based element. The business can see clear competencies gained.”

Perspective from a Program Sponsor: Why Select a Specific Approach?

Hawkeye Community College (HCC) sponsors apprenticeship programs that use each of the approaches. The director of community education and workforce solutions discussed each approach.

Workforce Development Specialist. For four years, HCC operated this program as part of its contract to administer Workforce Innovation and Opportunity Act Title 1 Adult and Dislocated Worker programs, which address the employment-related needs of adults, dislocated workers, and young people. The program was time based, with two years and 4,000 hours of OJL. HCC opted for a *time-*

based approach because “there are so many elements of the job, so many things to experience.” An apprentice “needed a good two years in the job to be exposed to the range of skills and tools needed,” such as how to interact with a customer or a program and how to participate in an audit. He added, “it would have been extremely difficult to detail the competencies needed to do the job.” However, within two years, the apprentice would be exposed to a range of tasks and could master them.

Combination Welding. This is a *competency-based* program. Per the director, “You either know how to weld or you don’t. It isn’t like passing with a C or D. It is the perfect example of competency-based—pass or fail.” A welder must have a firm grasp of specific competencies (e.g., inspect, measure, or test completed metal workpieces to ensure conformance to specifications, using measuring and testing devices). Apprentices must perform each competency on their own repeatedly without prompts before a mentor can sign off on the competency.

Certified Nursing Aid. This is a *hybrid* program. The RTI is competency based; apprentices spend differing amounts of time in the classroom depending on how quickly they grasp concepts. During the 2,000 hours of OJL, apprentices experience the range of tasks associated with being a skilled nursing aid. Knowledge and skills experience are necessary to pass the registration exam.

CNC Operator. This is multiple formats: *time-based, competency-based, or hybrid*. In selecting the approach, a key question is whether the employer has the “right mentor”—that is, someone who will be meaningfully involved, have the right skill set (including communication and training skills), and can train on all competencies. If the employer does have such a mentor, competency-based makes sense. With a strong mentor relationship, the apprentice could master some or all competencies quickly, thus reducing the length of the three-year, 6,000-hour program.

If the employer does not have the right mentor, time-based could be a better option. The director notes, “the mentor might be a master of the craft but does not have the capacity to teach. A time-based program will ensure that the apprentice will be on the job for a given number of hours and in this time frame will likely be exposed to all necessary competencies.” An employer in this situation could also adopt a hybrid program because the OJT also has a time component. Apprentices who master the competencies more quickly can spend more time on the production floor but, unlike a competency-based program, would remain with the employer for a set amount of time.

Ultimately, the decision often comes down to an employer’s preference.

Some employers want to keep folks as long as possible. Registered apprenticeship results in a national, portable credential. The employer might not want to issue the credential as fast as possible, if, for example, it is not the highest-paying employer in the area and risks the apprentice being poached. A hybrid program combines the possibility of an apprentice mastering RTI content quickly, but that [they] will be on the floor for three years.

—HCC director of community education and workforce solutions

Conclusion

Registered apprenticeship program sponsors have flexibility in how they structure programs: time based, competency based, or hybrid. As this brief describes, there are benefits and drawbacks to each approach. Considerations in selecting an approach include the apprenticeship occupation (traditional or nontraditional), the employer (type of organization, experience with registered apprenticeship), and the apprenticeship system (an SAA state or OA state).

Where to Find More information

[Apprenticeship.gov](https://www.apprenticeship.gov) is a “one-stop source” to connect career seekers, employers, and education partners with apprenticeship resources.

The Urban Institute Registered Apprenticeship Occupations and Standards Center of Excellence¹⁹ develops Registered Apprenticeship Program frameworks (including competency-based and hybrid approaches) and has released the Registered Apprenticeship Standards Library²⁰ that houses examples of registered apprenticeship programs registered federally and in SAA states.

Apprenticeship legislation, policy, and other guidance²¹ are available from the DOL.

TABLE 1

Three Approaches to the Commercial Drone Software Designer Registered Apprenticeship Program Initial OJL Objective

Commercial Drone Software Developer OJL						
Job description: Research, design, and develop computer and network software or specialized utility programs. Analyze user needs and develop software solutions, applying principles and techniques of computer science, engineering, and mathematical analysis. Update software or enhance existing software capabilities. May work with computer hardware engineers to integrate hardware and software systems and develop specifications and performance requirements. May maintain databases within an application area, working individually or coordinating database development as part of a team.						
Estimated program length: One year (2,000 hours OJL)						
Work process	Time-based	Competency-based		Hybrid		
<i>Learning objective: Analyze project data to determine specifications or requirements.</i>	Approximate hours^a	Task standard^b Y, N, N/A	Performance level^c 1–4	Approximate hours^a	Task standard^b Y, N, N/A	Performance level^c 1–4
A. Analyze information to determine, recommend, and plan installation of a new system or modification of an existing system.	20			15–25		
B. Analyze user needs and software requirements to determine feasibility of design within time and cost constraints.	20			15–25		
C. Obtain and evaluate information on factors such as reporting formats required, costs, or security needs to determine hardware configuration.	60			35–45		
Total hours	80			65–90		

Source: “Software Developers,” Apprenticeship.gov, accessed July 19, 2023, <https://www.apprenticeship.gov/apprenticeship-occupations/listings?occupationCode=15-1252.00>.

Notes: The table shows the OJL only. The suggested RTI is the same for each approach and includes the RTI provider’s name, address, email, phone number; suggested RTI hours total; Classification of Instructional Programs code for each course title, and contact hours for each course title.

^a Approximate hours for demonstration purposes only.

^b Indicate “yes,” “no,” or “N/A.” For acceptable achievement, all individual tasks should receive a “Yes” or “N/A” response. The mentor will initial and date the standards achieved.

^c Measures or tests of competency attainment and demonstrated skills performance are the responsibility of the sponsor and should be observable, repeatable, and agreed to in advance, and defined in the standards of apprenticeship. There are four ratings:

4 = can perform this skill without supervision and with initiative and adaptability to problem situations

3 = can perform this skill satisfactorily without assistance or supervision

2 = can perform this skill satisfactorily but requires some assistance and/or supervision

1 = can perform parts of this skill satisfactorily but requires considerable assistance and/or supervision

Notes

- ¹ “Requirements for Apprenticeship Sponsors Reference Guide,” US Department of Labor (DOL), accessed July 19, 2023, <https://www.apprenticeship.gov/sites/default/files/apprenticeship-requirements-reference-guide.pdf>.
- ² Greer Sisson, supervisor, program analysis, US Department of Labor, Office of Apprenticeship, telephone interview with author, February 17, 2023.
- ³ National Apprenticeship Act of 1937, Pub. L. No. 193-98, 50 Stat. 664 (Aug. 16, 1937), <https://www.govinfo.gov/content/pkg/COMPS-3091/pdf/COMPS-3091.pdf>; “Legislation, Regulations, and Guidance,” DOL, accessed July 19, 2023, <https://www.apprenticeship.gov/about-us/legislation-regulations-guidance>.
- ⁴ “At-a-Glance: Three Approaches to Apprenticeship Program Completion Apprenticeship Final Rule, 29 CFR Part 29,” DOL, July 19, 2023, <https://www.apprenticeship.gov/sites/default/files/three-approaches-apprenticeship-program-completion.pdf>.
- ⁵ Part 29—Labor Standards for the Registration of Apprenticeship Programs, 73 FR 64425 (Oct. 29, 2008), <https://www.ecfr.gov/current/title-29/subtitle-A/part-29>.
- ⁶ See “Explore Approved Occupations for Registered Apprenticeship,” DOL, accessed July 19, 2023, <https://www.apprenticeship.gov/apprenticeship-occupations>.
- ⁷ Competency-based apprenticeships are common in other countries, including the United Kingdom, in which occupational standards describe the “knowledge, skills and behaviours” (KSBs) needed for someone to be competent in the occupation’s duties. See the Institute for Apprenticeships and Technical Education for examples of programs: “Welcome to the Institute for Apprenticeships and Technical Education (IFATE),” IFATE, accessed July 19, 2023, <https://www.instituteforapprenticeships.org/about/what-we-do>.
- ⁸ “Circular, Guidelines for Competency-based, Hybrid and Time-based Apprenticeship Training Approaches, 2016-01,” DOL, accessed July 19, 2023, <https://www.apprenticeship.gov/about-us/legislation-regulations-guidance/circulars>.
- ⁹ Matt Crawford, “Electrician Licensing Requirements by State: A Comprehensive Guide,” NEXT, January 31, 2023, <https://www.nextinsurance.com/blog/electrician-licensing-requirements/>.
- ¹⁰ Examples of occupations are Construction Laborers, Operating Engineers and Equipment Operators, Plumbers, Bricklayers, Cement Masons, Painters, Sheet Metal Workers, Roofers, Insulators, Ironworkers, and Boilermakers.
- ¹¹ “Cement Masons and Concrete Finishers,” DOL, July 19, 2023, <https://www.apprenticeship.gov/apprenticeship-occupations/listings?occupationCode=47-2051.00>.
- ¹² “Licensed Practical and Licensed Vocational Nurses,” DOL, accessed July 19, 2023, <https://www.apprenticeship.gov/apprenticeship-occupations/listings?occupationCode=29-2061.00>.
- ¹³ “Computer Numerically Controlled Tool Programmers,” DOL, accessed July 19, 2023, <https://www.apprenticeship.gov/apprenticeship-occupations/listings?occupationCode=51-9162.00>.
- ¹⁴ “Licensed Practical and Licensed Vocational Nurses,” DOL, accessed July 19, 2023, <https://www.apprenticeship.gov/apprenticeship-occupations/listings?occupationCode=29-2061.00>; “Computer Numerically Controlled Tool Programmers,” DOL, accessed July 19, 2023, <https://www.apprenticeship.gov/apprenticeship-occupations/listings?occupationCode=51-9162.00>.
- ¹⁵ An ATR is a DOL staff member chiefly concerned with promoting, advising, and ensuring regulatory compliance of sponsors on registered apprenticeship training.
- ¹⁶ “Apprenticeship System,” DOL, accessed July 19, 2023, <https://www.apprenticeship.gov/about-us/apprenticeship-system>.
- ¹⁷ “Explore Approved Occupations for Registered Apprenticeship,” DOL, accessed July 19, 2023, <https://www.apprenticeship.gov/apprenticeship-occupations>.

- ¹⁸ Recognition of State Apprenticeship Agencies, 29 CFR 29.13 (Oct. 29, 2008), <https://www.law.cornell.edu/cfr/text/29/29.13>.
- ¹⁹ “The Registered Apprenticeship Occupations and Standards Center of Excellence,” Urban Institute, accessed July 19, 2023, <https://www.urban.org/policy-centers/center-labor-human-services-and-population/projects/registered-apprenticeship-occupations-and-standards-center-excellence>.
- ²⁰ “Registered Apprenticeship Standards Library,” Urban Institute, last updated May 22, 2023, <http://www.urban.org/apprenticeshiplibrary>.
- ²¹ “Legislation, Regulations, and Guidance,” DOL, accessed July 19, 2023, <https://www.apprenticeship.gov/about-us/legislation-regulations-guidance>.

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