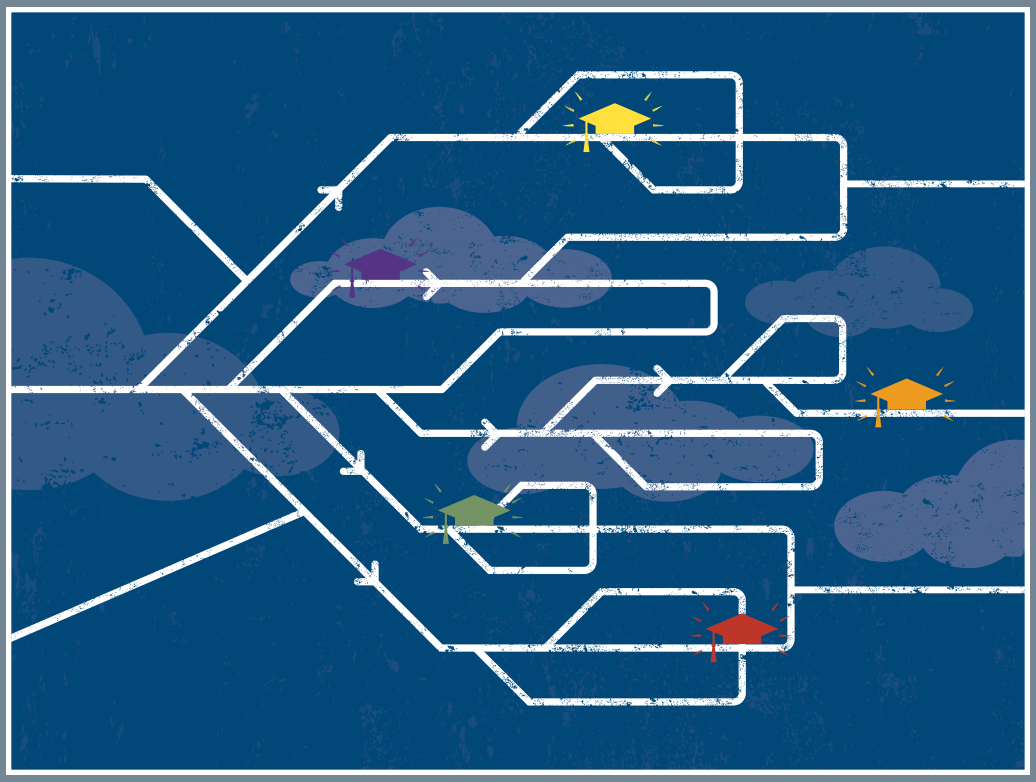
The Complex Universe of Alternative Postsecondary Credentials and Pathways



Jessie Brown and Martin Kurzweil,
Ithaka S+R

AMERICAN ACADEMY OF ARTS & SCIENCES

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Executive Summary

A program at a college leading to an academic degree is the archetype of postsecondary, undergraduate education in the United States. Yet a large and growing segment of the population engages in postsecondary learning outside these programs, seeking credentials other than a degree, and the number and types of alternatives have grown over the past decade.

This occasional paper provides an overview and analysis of *credentials* that serve as alternatives to bachelor's and associate's degrees and alternative *pathways* to achieving an academic degree. The paper groups these alternatives in five categories:

- Labor market training and credentialing, including:
  - certificate programs;
  - work-based training;
  - skills-based short courses;
- massive open online courses (MOOCs) and online micro-credentials; and
- competency-based education programs.

After defining and mapping the landscape of these alternatives and providing some historical context, the paper offers more detailed descriptions, illustrations, and analyses of typical programs in each category. For each category, it also reviews the growing number of intersections between alternatives and traditional degree-granting institutions, as well as potential future directions. The paper concludes with some overarching observations and recommendations.

Certificate Programs

Certificate programs typically last for less than two years and are primarily offered at for-profit two-year trade schools, for-profit degree-granting institutions, and community colleges. Popular programs include those in the health sciences and consumer services. Most individuals who participate do not hold an undergraduate degree and are from the lower end of the income distribution. The labor market returns for certificate programs vary: certificate holders in fields such as information technology and electronics can earn as much as the average bachelor's degree holder, while those who earn certificates in health care and cosmetology typically earn no more than the average high school graduate. The number of certificates awarded has grown rapidly over the past decade and, in 2013, nearly 1 million certificates were awarded by Title IV institutions. Most of this growth has occurred within the for-profit sector.

Work-Based Training

Work-based training includes apprenticeships, other forms of on-the-job training, or vestibule training. Participants are usually connected with these opportunities as employees at companies, through local community development initiatives, or through academic programs. Entry-level corporate training and workforce development programs usually lead to an industry-recognized certification, either associated with a specific employer or awarded by an industry association. Like certificate programs, these entry-level programs typically lead to careers in trades, and participants are often lower-income adults who do not have access to traditional degree programs.

Skills-Based Short Courses

Skills-based short courses can be part of short-term certificate programs or stand on their own as just-in-time opportunities for gaining skills for employment. These offerings have gained renewed attention with the emergence of coding bootcamps in 2012, which offer short-term, intensive opportunities for students to gain skills needed for high-demand jobs as developers, designers, or data scientists in the emerging technology world. Despite massive growth and the substantial hype surrounding these providers, bootcamps do not currently constitute a true alternative to a traditional undergraduate program for most students: in 2016, only about 18,000 students graduated from coding bootcamps, and nearly 80 percent had already earned a bachelor's degree or higher. However, because of their apparent cost-effectiveness, the relative diversity of their student bodies, and emerging partnerships with traditional institutions, bootcamps are worth monitoring as they continue to evolve.

MOOCs and Online Micro-Credentials

MOOCs, first offered in 2008, are free or low-cost online courses that accommodate high or unlimited enrollment. In March 2016, 35 million students were enrolled in MOOCs offered by at least 80 providers, in courses broadly distributed across disciplines. Though enrollments and offerings have expanded significantly, MOOCs have not, as some had predicted, revolutionized undergraduate education: about three out of every four MOOC enrollees already has a bachelor's degree, and only about 6 percent of those who start a course complete it. Some MOOC providers have diversified their offerings in ways that might increase their utility as alternatives to traditional undergraduate pathways and credentials. For example, some providers have bundled courses into specializations that lead to credentials and "nanodegrees"; others have partnered with colleges and universities to offer components of traditional academic degrees.

Competency-Based Education Programs

Competency-based programs provide alternative pathways to a degree or credential that are more personalized, flexible, and aligned with in-demand skills. To varying degrees, these programs recognize prior and extra-institutional learning and allow students to progress at a pace determined by the rate at which they demonstrate learning outcomes. Competency-based programs are offered by for-profit, not-for-profit, and public institutions, and by both two-year and four-year institutions. Participants tend to be older and have accumulated some educational credit or work experiences, and the pathway is most popular in business, health care, and engineering. Because of the centrality of the credit hour to federal financial aid eligibility, many self-paced competency-based programs are not eligible for federal financial aid. However, some recent federal rule changes and experiments have extended eligibility.

Common Themes

Our analysis surfaces several key findings that cut across all categories of providers:

- **Alternative credentials and pathways have proliferated over the past fifteen years, but many have deep historical roots.** Since 2000, participation in certificate programs, apprenticeships, and competency-based education programs has increased rapidly, and MOOCs and bootcamps have emerged and grown quickly in a short time. As one example, the number of certificates awarded by Title IV–eligible postsecondary institutions increased by 73 percent from 2000 to 2013, a period during which the number of bachelor's degrees awarded increased by 49 percent. While alternatives have grown in recent years, options like trade schools, distance education, work-based training, and assessment of prior learning have been around for decades or centuries, and their popularity has ebbed and flowed with contextual forces.
- **While there is a great deal of variation, alternative credentials and pathways typically take less time, have more flexible formats, and are more directly aligned with employer-defined skills than traditional degree programs.** Alternative programs can last from a few months to four years, can take place within or outside traditional academic institutions, and can deliver training via in-person instruction, online instruction, hands-on work, or a mixture of modalities. They typically focus more directly than bachelor's degrees do on skills for employment in specific fields. While alternatives have the potential to cost less than traditional degree programs, eligibility for financial aid varies: some certificate programs at Title IV institutions are eligible, but bootcamps, MOOCs, and competency-based degree programs have received federal financial aid only as part of Department of Education experiments. With increased regulation of for-profit schools and increased federal experimentation with alternative providers, the boundaries of aid eligibility are dynamic.

- **Although alternative pathways and credentials have conceptual and practical appeal, evidence of their efficacy is thin and quality assurance is weak.** For many programs, robust data on features, costs, enrollment, and outcomes are not available. Few programs for which there are data have been rigorously assessed, and some of the evidence that does exist is not promising. Furthermore, many alternatives function outside any system of quality assurance, and even some of those that are subject to oversight—particularly for-profit institutions—have a history of taking advantage of students. Without better quality assurance and more comprehensive, nuanced, longitudinal data on these programs, questions about their returns to students and taxpayers will remain unanswered.
- **Degrees and degree programs are likely to retain their value, but are already evolving to incorporate features of alternatives and integrate academic with nonacademic experiences.** Specific vocational skills have a shelf life, and employers routinely report that advancement in management, creative, and professional roles requires not only ongoing skill development but also critical thinking, communication, and adaptability. These more general competencies are the domain of degree programs, and we anticipate a future in which traditional institutions and degree programs take a substantial role in validating varied learning experiences and linking them with academic coursework and degree pathways. There is already evidence of this in many of the partnerships, programs, and federal initiatives reviewed throughout the paper.

Policy Recommendations

In light of these themes, the paper offers three, high-level policy recommendations for policy-makers, funders, and the higher education community:

- Adjust quality assurance processes to allow for accurate and comparable evaluation of alternative programs, robustly enforce quality standards for all providers, and accelerate the process of integrating quality alternative pathways and credentials into the federal financial aid system.
- Invest in a more comprehensive data system that captures longitudinal, student-record data on students' experiences across the full array of postsecondary pathways, as well as information about providers and their programs and credentials.
- Support rigorous research on the efficacy and return on investment of existing and emerging alternative pathways and the value of alternative credentials.

Introduction

A program at a college leading to an academic degree is the archetype of postsecondary, undergraduate education in the United States. Yet a large and growing segment of the population engages in postsecondary learning outside these programs, and the number and types of alternatives have grown over the past decade.

Indeed, the expanding array of options can appear overwhelmingly complex—to policy-makers as much as to prospective students and their families. The federal government tracks many of these options—specifically those that have sought eligibility to accept federal financial aid from students—but many others exist without federal oversight. The only source of information is often the providers themselves, and what they share is piecemeal and often unreliable. Because these alternatives seem poised to play an important role in the future of postsecondary education, it is critical that policy-makers and the public have a comprehensive portrait of the landscape.

This occasional paper is an initial effort to meet that need. It provides an overview and analysis of alternative postsecondary credentials and pathways, focusing on five categories of programs: certificate programs; work-based training; skills-based short courses such as coding bootcamps (all of which fall into a broader category of labor market training and credentialing); massive open online courses (MOOCs) and online micro-credentials; and competency-based education programs.

We begin with some orientation: the first section defines what we mean by alternative credentials and pathways, provides a summary of the landscape of options, and offers a brief history to contextualize the present situation. The second section provides more detailed descriptions and analyses of the types of programs in each of the five categories, including how they have developed over time, whom they serve, and how well they have served them. For each category, we also discuss the growing number of intersections between these alternatives and traditional degree-granting institutions, as well as potential future directions.

The final section offers overarching observations about the trajectory of alternative credentials and pathways, the risks and potential benefits inherent in those trends, and critical policy considerations. The alternatives we discuss are hardly new—many have existed in some form since early in the twentieth century. Yet changes in technology, employer needs, and demographics; the rising cost of degree programs; and federal policy have made these alternatives more attractive, accelerating their growth over the past two decades. Since the Great Recession, demand for employees with "some college" has largely rebounded, while employees with a high school diploma or less are still struggling to find

work.[1] For students for whom direct entry into a bachelor's degree program after high school remains inaccessible, many of the options we discuss offer the promise of shorter-term, lower-cost ways to increase their earning potential and career prospects.

There remain several hurdles and cautions to continued expansion, however. One is the lack of reliable information on the value of these alternatives to students and society. Without more comprehensive, nuanced, longitudinal data on these programs and the characteristics, experiences, and outcomes of those who participate in them—which can be joined with comparable data for more traditional programs—questions about how much students and taxpayers *should* invest in the alternatives described here will remain unanswered. This lack of transparency is particularly problematic in light of a history of bad actors in the for-profit postsecondary education sector taking advantage of students with misleading claims and programs of limited value.

One trend that presents perhaps the best opportunity to answer questions about quality and value is that colleges and universities—conferrers of academic degrees—are increasingly partnering with alternative providers and adopting their methods and credentials. Additionally, the U.S. Department of Education has begun to experiment with funding nontraditional programs or partnerships between alternative and traditional providers. This expansion signals a recognition that the alternatives are growing but also indicates the continued relevance of traditional institutions, degree programs, and funding structures in postsecondary education and credentialing.

In line with this analysis, we conclude with three high-level recommendations for policy-makers, funders, and the higher education community. First, adjust quality assurance processes to allow for accurate and comparable evaluation of alternative programs, robustly enforce quality standards for all providers, and accelerate the process of integrating quality alternative pathways and credentials into the federal financial aid system. Second, invest in a more comprehensive data system that captures longitudinal, student-record data on students' experiences across the full array of postsecondary pathways, as well as information about providers and their programs and credentials. Finally, support rigorous research on the efficacy and return on investment of existing and emerging alternative pathways, and the value of alternative credentials.

1. See Matthew Meyer and Anne Bacon, "The Need for a National Certification Ecosystem," *The EvoLLLution* (September 12, 2016), http://evolllution.com/programming/credentials/the-need-for-a-national-certification-ecosystem/.

Defining Alternatives

This occasional paper covers both *credentials* that serve as alternatives to bachelor's and associate's degrees and alternative *pathways* to achieving an academic degree. *Alternative credentials* include certificates, industry-recognized certifications, licenses, badges, and nanodegrees. Many students obtain these alternative credentials through an institution of higher education that also offers associate's degrees and sometimes bachelor's degrees. There are also many organizations that offer these alternative credentials but do not offer academic degrees, including trade schools, coding bootcamps, MOOCs, and employer-provided training opportunities.

Students pursuing *alternative pathways* to academic degrees can earn academic credit for experiences outside an academic environment or for demonstrating competencies. Institutions have awarded credit for nonacademic experiences (such as military service) since World War I, but in the past decade, a growing number of institutions have established their own self-paced or competency-based pathways to a degree. Many more institutions recognize MOOC completion for credit, and a handful have begun to accept completion of a defined sequence of MOOCs in lieu of a portion of the degree program.

MAPPING THE LANDSCAPE

Title IV Eligibility

As with traditional degree programs, federal financial aid is the lifeblood of many alternatives. But because federal financial aid has so deeply internalized the degree and the time-based Carnegie unit upon which it is based, a large share of alternatives operates outside the federal financial aid system. Reliable, systematic information about such programs is difficult to acquire, so for purposes of this occasional paper, financial aid eligibility also means that data about the program are more readily available.

Eligibility to receive federal financial aid, including Pell Grants, Direct Loans, and Perkins Loans, is determined by Title IV of the Higher Education Act and its related regulations. To be eligible, an undergraduate program must meet certain time requirements (600 hours of instructional time over 15 weeks for Pell Grants; 300 hours over 10 weeks for Direct Loans), must be offered by an institution accredited by a recognized accreditor, must be authorized by a state, and must admit only students who have earned at least a high school diploma. Since 2014, when the Department of Education promulgated the "gainful employment" rule, nearly all programs at proprietary

(for-profit) and vocational institutions, as well as nondegree programs at public and not-for-profit institutions, are also required to show that graduates achieve gainful employment in a recognized occupation, or risk temporary restrictions on eligibility to receive aid.[2] Because eligibility is determined at the program level, it is not uncommon for institutions, particularly for-profit institutions and community colleges, to offer some programs that are eligible for aid and others that are not.

Counting Providers, Programs, and Credentials

Although data are more readily available for Title IV–eligible providers, different ways of disaggregating the data and nuances in reporting complicate the picture even for this relatively visible group. In 2013, 7,236 institutions were eligible for aid under Title IV (data by program are not generally available). Just under half of those institutions—3,422—were for-profit. Of those Title IV–eligible for-profit institutions, 1,642 were "less-than-two-year," meaning they offered only certificates, not degrees. By contrast, only 3.6 percent of public Title IV institutions and 1 percent of not-for-profit Title IV institutions were "less-than-two-year."[3]

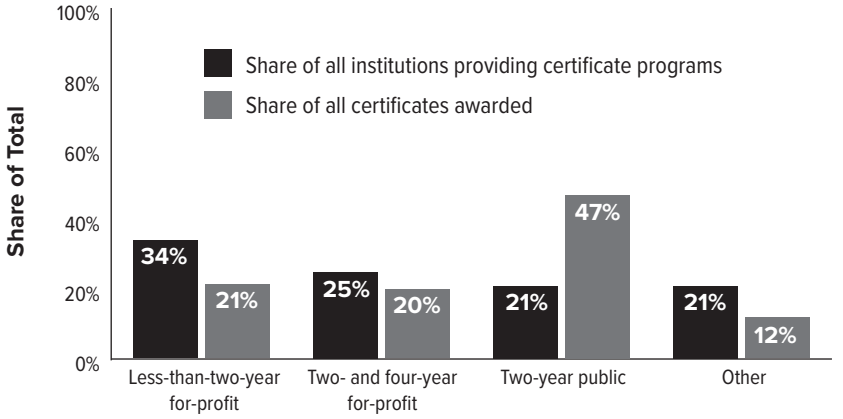
The majority of institutions offering certificate programs are thus for-profit institutions—including four-year institutions, two-year institutions, and less-than-two-year nondegree-granting institutions (see Figure 1). Yet for-profit institutions, especially less-than-two-year for-profits, award a disproportionately small share of all certificates.[4] Instead, public community colleges award the bulk of certificates: 47 percent of the approximately one million awarded by Title IV institutions in 2013.

2. See "Institutional Eligibility," Federal Student Aid, http://ifap.ed.gov/qahome/qaassessments/institutionalelig.html, and https://cew.georgetown.edu/wp-content/uploads/2014/11/Certificates.FullReport.061812.pdf; "Certificates Count: An Analysis of Sub-Baccalaureate Certificates," Complete College America (December 2010), http://www.completecollege.org/docs/Certificates%20Count%20FINAL%2012-05.pdf. Gainful employment is based on two proxy measures: debt-to-earnings ratio and repayment rate.

3. See U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Institutional Characteristics (IC) and Completions Components, 2013, "Table P143. Number and percentage distribution of Title IV postsecondary institutions that offer programs at each undergraduate credential level, overall and in occupational education programs, by level and control of institution: United States, 2013," https://nces.ed.gov/surveys/ctes/tables/P143.asp.

4. Of the 966,084 occupational certificates awarded by Title IV postsecondary institutions in 2013, only 160,028 were from less-than-two-year for-profit institutions. U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Institutional Characteristics (IC) and Completions Components, 2013, "Table P152. Total number of credentials awarded by Title IV postsecondary institutions, overall and in occupational education, by credential level, control, and level of institution," https://nces.ed.gov/surveys/ctes/tables/P152.asp.

Figure 1: Share of Institutional Providers of Certificate Programs and Share of Certificates Awarded, by Institution Type, 2013



Note: "Other" includes public and private nonprofit four-year schools and public and private nonprofit less-than-two-year schools.

Source: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Institutional Characteristics (IC) and Completions Components, 2013, "Table P143. Number and percentage distribution of Title IV postsecondary institutions that offer programs at each undergraduate credential level, overall and for occupational education programs, by level and control of institution: United States, 2013," https://nces.ed.gov/surveys/ctes/tables/P143.asp; "Table P152. Total number of credentials awarded by Title IV postsecondary institutions, overall and in occupational education, by credential level, control, and level of institution," https://nces.ed.gov/surveys/ctes/tables/P152.asp.

Pinpointing the number and characteristics of non-Title IV providers of alternative credentials is substantially more difficult. The most robust analysis of this sector estimates that more than 3,000 for-profit postsecondary institutions are not eligible to receive federal aid and serve about 670,000 students each year, almost entirely in short-term certificate programs.[5]

This estimate of non-Title IV providers excludes offerings that do not lead to a certificate, such as MOOCs and coding bootcamps. In March 2016, 35 million students were enrolled in more than 4,000 MOOCs, and 18,000 students were projected to graduate from coding bootcamps in 2016. On their own, neither MOOCs nor coding bootcamps serve as true alternatives to undergraduate programs: at least 70 percent of MOOC enrollees have a bachelor's degree

5. Average program length at non-Title IV–eligible institutions was half a year. Stephanie Reigg Cellini and Claudia Goldin, "Does Federal Student Aid Raise Tuition? New Evidence on For-Profit Colleges," NBER Working Paper No. 17827 (February 2012), http://www.nber.org/papers/w17827.pdf.

or higher and are not seeking a credential, and 79 percent of coding bootcamp participants have a bachelor's degree.[6]

Scoping the landscape of work-based training is also a challenge, as the approach spans the public and private sector, as well as multiple partnerships. In the public sector, at least 30 states have invested in "sectoral" training programs that partner educational organizations, local industry, and other local organizations to train local workers to fill regional skills gaps. Within these states, dozens of cities and regions have also built sectoral programs, supported by public and private funding.[7] For example, the National Fund for Workforce Solutions funds 32 regional collaboratives in 25 states.[8] Additionally, in fiscal year 2015, the Department of Labor counted nearly 500,000 active registered apprenticeships, an increase of roughly 75,000 since 2013.[9]

Data on private sector work-based training is harder to come by—partially because the federal government stopped collecting information from employers on their training activities in the 1990s, and partially because the information available is not often parsed according to entry-level and incumbent employees. While national sample surveys from the 1990s found that the incidence of employer-provided training increased with education, they also revealed that intensity of employer training (the number of hours of participation) was greatest for workers with some college. These results suggest that those with some college were using employer training or assistance to help them finish a degree or certificate.[10]

Finally, because they deviate from minimum-hour and accredited-provider requirements, many alternative pathways to academic degrees are ineligible for financial aid, and getting a sense of their scale is also a challenge. Although the

6. "By the Numbers: MOOCs in 2015," Class Central, https://www.class-central.com/report/moocs-2015-stats/; Jeff Haywood, *Learning from MOOCs: Lessons for the Future* (London: Portland Press Publishing, 2016), 69–79, http://www.portlandpresspublishing.com/sites/default/files/Editorial/Wenner/PPL_Wenner_Ch06.pdf; A. D. Ho, I. Chuang, J. Reich, C. Coleman, J. Whitehill, C. Northcutt, J. Williams, J. Hansen, G. Lopez, and R. Petersen, "HarvardX and MITx: Two Years of Open Online Courses," HarvardX Working Paper No. 10 (2015), http://dspace.mit.edu/bitstream/handle/1721.1/96825/SSRN-id2586847.pdf?sequence=1.

7. Harry J. Holzer, "Going, Going . . . Gone? The Evolution of Workforce Development Programs for the Poor since the War on Poverty," Georgetown and AIR (June 2012), http://npc.umich.edu/news/events/war-on-poverty-june-conference/holzer.pdf.

8. "Regional Collaboratives," National Fund for Workforce Solutions, http://www.nfwsolutions.org/regional-collaboratives.

9. "Data and Statistics," Apprenticeship USA, United States Department of Labor Employment and Training Administration, https://www.doleta.gov/oa/data_statistics.cfm.

10. Workers with a high school diploma or less were least likely to receive formal training, with only 14.5–22 percent take-up. Workers with a bachelor's degree or higher were most likely to receive formal training, with 33.9–50 percent take-up. Based on analyses of the 1997 National Employer Survey, the 1995 Survey of Employer-Provided Training, and the 1995 National Household Education Survey. See Robert I. Lerman, Signe-Mary McKernan, and Stephanie Riegg, "The Scope of Employer-Provided Training in the United States: Who, What, Where, and How Much?" W.E. Upjohn Institute for Employment Research (2004), http://research.upjohn.org/cgi/viewcontent.cgi?article=1175&context=up_bookchapters.

category is still flexible, some estimate that as of 2016, 150 programs offered competency-based pathways to academic degrees, serving about 200,000 students.[11]

An Expanding Sector

Despite difficulties in quantifying the scope of offerings, there is evidence that alternatives are growing in popularity. For example, the number of certificates awarded by Title IV institutions increased by 73 percent from 2000 to 2013 (with the highest rate of growth after 2008), while the number of bachelor's degrees awarded increased by 49 percent during that period. (The number of associate's degrees awarded increased at a slightly faster rate than the number of certificates awarded; see Figure 2.) Similarly, the number of individuals entering apprenticeship programs increased by 50 percent from 2008 to 2015.[12] MOOCs and coding bootcamps emerged within the past decade and have grown rapidly and, by some estimates, the number of competency-based programs increased from 50 programs serving approximately 50,000 students in 1990 to 150 programs serving about 200,000 students in 2016.[13]

Perhaps in recognition of this expansion, the boundaries of financial aid eligibility for alternatives are also slowly shifting. For example, in 2011, the U.S. Department of Education piloted a program enabling students in short-term vocational programs to receive Pell Grants.[14] A 2005 amendment to the Higher Education Act made programs that used direct assessment eligible for student financial aid, but only if learning was translated into credit hours on a student's transcript; and in 2014 the Department of Education began piloting federal financial aid disbursement to competency-based providers.[15] In 2016, the Department of Education selected eight partnerships between alternative providers and traditional postsecondary institutions to participate in the Educational Quality through Innovative Partnerships (EQUIP) program. Among the eight selected alternative providers were four coding bootcamps, two competency-based online course providers, a workforce development provider, and General Electric. EQUIP both allows students of the providers to use financial aid for the programs and subjects the providers to additional oversight by their partner institutions and third-party quality assurance entities.[16]

11. Bryan Fleming, "Mapping the Competency-Based Education Universe," Eduventures (February 17, 2015), http://www.eduventures.com/2015/02/mapping-the-competency-based-education-universe/.

12. "Data and Statistics," Apprenticeship USA.

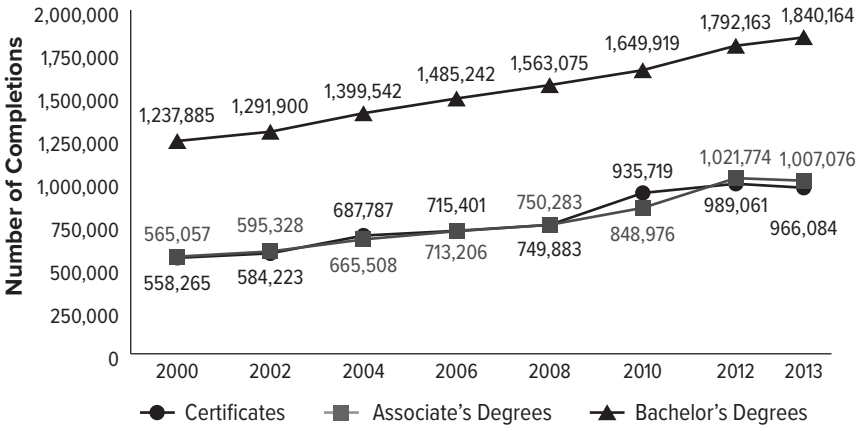
13. Fleming, "Mapping the Competency-Based Education Universe."

14. "Experimental Sites," Federal Student Aid, https://experimentalsites.ed.gov/exp/approved.html.

15. Ibid.

16. See "FACT SHEET: ED Launches Initiative for Low-Income Students to Access New Generation of Higher Education Providers," U.S. Department of Education (August 16, 2016), http://www.ed.gov/news/press-releases/fact-sheet-ed-launches-initiative-low-income-students-access-new-generation-higher-education-providers.

Figure 2: Credentials Awarded by Title IV Postsecondary Institutions, 2000–2013



Source: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Institutional Characteristics (IC) and Completions Components, "Table P160: Number of undergraduate credentials awarded by Title IV postsecondary institutions, by control and level of institution and credential level," https://nces.ed.gov/surveys/ctes/tables/P160.asp; "Table 152. Total Number of credentials awarded by Title IV postsecondary institutions, overall and in occupational education, by credential level, control, and level of institution, United States, 2013," https://nces.ed.gov/surveys/ctes/tables/P152.asp.

HISTORICAL ANTECEDENTS

Each of the alternatives we discuss have existed, in some form, for decades if not longer. In the second half of the nineteenth century, as the industrial revolution created the need for practical, technical skills and the apprenticeship system declined, independent trade schools and company-operated factory schools emerged as vocational alternatives to academic postsecondary institutions.[17] Companies also created their own materials to train employees and offer direction to others in the field, and the federal government began offering funding for schools to provide vocational and agricultural programs. Correspondence courses, from which MOOCs draw many features, emerged in the nineteenth century as well, and became more ubiquitous and accessible with the development of radio, television, and video cassettes in the middle of the

17. Ernest W. Brewer, "The History of Career and Technical Education," in *Definitive Readings in the History, Philosophy, Practice, and Theories of Career and Technical Education*, ed. Victor C. X. Wang (Hangzhou, China: Zhejiang University Press, 2009), 6–10.

twentieth century.[18] MOOCs are also an extension of a long-standing tradition of continuing education in the United States, expressed in undertakings like the lyceum system and the Chautauqua movement and institutionalized at colleges and universities around the turn of the twentieth century.[19]

Finally, competency-based education programs emerged out of "nontraditional" and external degree programs that became popular at traditional institutions in the 1970s. A response to the increasing share of adult students pursuing postsecondary degrees, these programs delivered instruction remotely, emphasized personalization, and "de-emphasized time, space, and even course requirements in favor of competence and, where applicable, performance."[20] They also magnified the need, first surfaced among returning World War I veterans, for institutions to recognize and award credit for academic experiences accumulated outside postsecondary academic institutions, and established multiple coordinating systems for doing so.[21]

These historical alternatives emerged from and have been sustained by the same factors that shape the sector today. Technological change and shifting employer needs have long created demand for vocational training options, and traditional postsecondary institutions and the infrastructure in which they operate have struggled to keep pace. Technological developments have also enabled new forms of instructional delivery, which have increased access and flexibility as postsecondary demographics and ideas about who should have access have expanded. Concerns about costs and the value of a bachelor's degree have also been a crucial factor, especially since the 1970s, when tuition began to increase at a rate much faster than other goods and services. And, since the late nineteenth century, government policy-makers have responded pointedly to workforce, technological, demographic, and financial changes, shaping both the traditional and nontraditional landscape of providers in the process.

As these changes have taken place, the line between what are considered "traditional" and "nontraditional" students and programs has continually shifted. Traditional institutions, funding structures, and accreditation requirements have expanded, under constraints, to accommodate an increasingly diverse set of students, new delivery methods, and changing employer needs.

18. See K. Patricia Cross, "The External Degree: Introduction," *Journal of Higher Education* 44 (1973): 6, http://www.jstor.org/stable/1980906; Cyril Houle, *The External Degree* (San Francisco: Jossey-Bass, 1973).

19. Daniel W. Shannon, "A Selective Look at the History and Practice of Continuing Education," in *Centennial Conversations: Essential Essays in Professional, Continuing, and Online Education*, ed. Daniel W. Shannon and Robert Wiltenburg (Washington, D.C.: University Professional and Continuing Education Association, 2015).

20. Patricia Cross, "An Introduction to Non-Traditional Education in the United States" (October 1976), https://diva.sfsu.edu/collections/kpcross/bundles/210857.

21. This included the National College Credit Recommendation Service, the College Level Examination Program, and the American Council on Education's Office of Educational Credit, which established standardized ways of awarding credit for postsecondary learning that took place outside of degree-granting institutions. See Patricia Cross and Ethan Hutt, "The Least They Can Do: A History of Minimum Standards in American Education," book manuscript, 62–106.

Our current moment—characterized in part by decreased state funding, mounting college costs, and rapid technological changes in instructional delivery and employer needs—presents challenges that may be unique in magnitude but not necessarily type. A review of the landscape suggests that, as they have in the past, postsecondary alternatives and the factors that sustain them are exerting increasing pressure on traditional degree programs, funding policies, and accreditation structures to innovate and expand. Our discussion of the intersections between alternative and traditional options emphasizes this point and illustrates that traditional providers and degrees have already begun to accommodate a shifting landscape of students and credentialing needs.[22]

22. For a more sustained conversation about these changes, see Goldie Blumenstyk, *American Higher Education in Crisis? What Everyone Needs to Know* (New York: Oxford University Press, 2014); Jeff Selingo, *College (Un)bound: The Future of Higher Education and What It Means for Students* (New York: Houghton Mifflin, 2013).

The Current Landscape of Alternatives

In this section, we provide more detail and examples for five categories of alternative providers. The first three providers—certificate programs, work-based training programs, and skills-based short courses—fall into the broader category of labor market training and credentialing but are distinct enough for separate discussions. The final two are MOOC providers and competency-based degree programs. For each category, we describe the common features and major variations of credentials and training, provide a brief historical background, offer illustrative examples, and analyze available data on enrollments, cost, and outcomes. We then discuss ways in which alternative providers have challenged or exerted pressure on traditional funding and accreditation requirements and other ways in which they intersect with traditional academic degrees and degree programs.

LABOR MARKET TRAINING AND CREDENTIALING

The first three programs we review—certificate programs, work-based training, and coding bootcamps—can all be categorized as labor market training and credentialing. What brings these programs together is a common end: a credential certifying that the completer possesses basic skills to enter an occupation. While these credentials can take the form of associate's and bachelor's degrees, we focus on nondegree credentials, including certificates, industry-recognized certifications, and licenses, and the pathways to achieving them.

Certificates, a growing category of labor market credential, are provided by public, private, and for-profit institutions that also award degrees, as well as by nondegree-granting institutions. They require classroom time, in-person or online, at an educational institution, and often cover both technical and academic content. Such programs also typically require on-the-job training or fieldwork in the form of apprenticeships or internships. Nearly 967,000 certifi-

cates were awarded at Title IV institutions alone in 2013—a steep increase from approximately 558,000 in 2000 (see Figure 2).[23]

Industry-recognized certifications differ from certificates in that they are validated by a corporation or industry organization rather than a postsecondary institution. Though requirements vary by industry and state, programs leading to industry credentials almost always include a written, oral, or performance-based assessment of industry-defined competencies. Some also require that individuals earn an academic degree before certification.

Certificates and industry-recognized credentials tend to be optional, unlike licenses, which are necessary to practice in some industries. Licenses are awarded by licensing agencies, which are often public entities. Criteria for licensure vary by industry but usually include a mix of education, work experience, the attainment of other credentials, and an assessment.

A 2012 analysis estimated that 19.3 percent of adults who reported that they had attended some college held a professional certification or license, and 13.9 percent of adults with only a high school diploma held such a credential.[24] The ARMY COOL database lists 1,566 types of certification. These certifications are awarded by industry associations, but only 443 are validated by a third-party accrediting body. The largest independent validators of industry-recognized certifications are the International Certification Accreditation Council, the American National Standards Institute, and the Institute for Credentialing Excellence.[25]

Because of the varied and usually multiple criteria for attaining labor market credentials, pathways to earning them are diverse and can include academic programs (including certificate programs), workforce development programs, corporate training programs, or self-study (or a combination of these). Certificate programs and corporate training often incorporate curriculum to prepare students for industry certification and licensure assessments. In turn, industry organizations provide resources or engage in partnerships with certificate programs to create pathways to professional certification. In recent years, federal legislation and funding have incentivized such partnerships. For example, the

23. Anthony Carnevale and colleagues at the Georgetown Center for Education and the Workforce estimate the total number of certificates awarded from Title IV and non-Title IV institutions as roughly 1 million in 2010. The authors estimate that only 300,000 certificates were awarded in 1994. See Anthony P. Carnevale, Stephen J. Rose, and Andrew R. Hanson, "Certificates: Gateway to Gainful Employment and College Degrees," Center on Education and the Workforce (June 2012), https://cew.georgetown.edu/wp-content/uploads/2014/11/Certificates.FullReport.061812.pdf. Estimates are based on the Survey of Income Program Participation and the National Longitudinal Survey of Youth. See also, Anthony Carnevale and Jamie Merisotis, "An Important Measure of Education," *Politico* (July 31, 2012), http://www.politico.com/story/2012/07/the-importance-of-post-secondary-certificates-079223.

24. Stephanie Ewert and Robert Kominski, "Measuring Alternative Credentials: 2012," Household Economic Studies, United States Census Bureau (January 2014), https://www.census.gov/prod/2014pubs/p70-138.pdf.

25. "Army COOL: Credentialing Opportunities Online," https://www.cool.army.mil/search/CredSearchAlpha.htm.

U.S. Department of Labor's Trade Adjustment Assistance Community College and Career Training Grant Program includes requirements that recipients incorporate industry-based credentials into their programs. Similarly, the Carl D. Perkins Career and Technical Education Act of 2006 and Workforce Innovation and Opportunity Act of 2014 incentivized the creation of pathways in secondary and postsecondary programs that are aligned with industry standards.[26]

To account for the overlapping nature of these credentials, we organize our discussion of them around pathways and providers: institutional providers of certificate programs, which can lead to industry certification; entry-level corporate training and workforce development programs, which usually lead to industry certification (or even licensure); and coding bootcamps, which borrow elements from both of these pathways to provide labor market training and credentialing for the technology industry.

CERTIFICATE PROGRAMS

Certificate programs are offered mainly by community colleges and for-profit schools, although some four-year public and private not-for-profit institutions offer them as well. These programs emphasize skills-based and demand-driven training in fields such as health care (the most popular option), business, information technology, manufacturing, agriculture, and consumer services.[27] Most schools offer programs of varying lengths, including short-term certificate programs that last for less than a year, medium-term certificate programs that last from one to two years, and longer-term programs that take from two to four years to complete. Certificate programs enroll larger shares of women, African Americans, and students from families with lower incomes and less educational attainment than academic associate's or bachelor's degree programs. A little more than half of completers in these programs are between the ages of 18 and 29.[28]

26. See Cassandria Dortch, "Carl D. Perkins Career and Technical Education Act of 2006: Background and Performance," Congressional Research Service, https://fas.org/sgp/crs/misc/R42863.pdf; "Carl D. Perkins Career and Technical Education Act of 2006," Advance CTE, https://www.careertech.org/perkins.

27. The National Center for Education Statistics breaks these programs down into ten broad categories: agriculture and natural resources; business and marketing; communications and design; computer and information sciences; consumer services education; engineering and architecture; health sciences; manufacturing, construction, repair, and transportation; protective services; and public, legal, and social services. In 2013, more than one third of certificates awarded were in the health sciences.

28. See Carnevale, Rose, and Hanson, "Certificates: Gateway to Gainful Employment and College Degrees"; U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Institutional Characteristics (IC) and Completions Components, 2013, "Table P130: Percentage distribution of credential-seeking undergraduates within each credential goal and curriculum area, by sex and age: 2011–12," https://nces.ed.gov/surveys/ctes/tables/p130.asp.

History

The development of certificate programs is part of the larger history of industrialization and vocational education in America. Trade schools and mechanics institutes first emerged outside the existing college and university system in the mid-nineteenth century. Around the turn of the century, Congress passed several pieces of legislation that expanded funding for vocational training at public secondary and postsecondary schools.[29]

World War II and its aftermath were turning points in the growth of the higher education sector, both academic and vocational. The influx of returning veterans with funding from the G.I. Bill put pressure on existing colleges to expand their capacity and prompted the creation of hundreds of new institutions that focused specifically on preparing adult learners for employment.[30] The number of for-profit schools, which had existed in some form since the colonial era, tripled in the five years following passage of the G.I. Bill. Community colleges grew from 238 colleges in 1941 to 330 in 1950, with a newly defined focus on terminal vocational degrees and serving the employment and educational needs of their communities.[31] The Higher Education Act of 1965, which established Title IV eligibility, also increased access and diversity in the sector, and a crucial amendment in the 1972 authorization extended aid to "proprietary colleges."[32] Since the 1980s, both the number of students who seek out and attain certificates and the number of institutions that award them have increased dramatically, especially in the for-profit sector.[33]

29. Congress passed the Morrill Acts in 1862 and 1890, establishing land-grant support for colleges with a focus on vocational fields. In 1917, the Smith-Hughes Act set the foundation for a modern vocational education system in public secondary and postsecondary schools, with curriculum and funding that were separate from academic programs. See Brewer, "The History of Career and Technical Education."

30. See Suzanne Mettler, *Soldiers to Citizens: The G.I. Bill and the Making of the Greatest Generation* (New York: Oxford University Press, 2005).

31. A. J. Angulo, *Diploma Mills: How For-Profit Colleges Stiffed Students, Taxpayers, and the American Dream* (Baltimore: John Hopkins University Press, 2016); "CC Growth Over Past 100 Years," American Association of Community Colleges, http://www.aacc.nche.edu/AboutCC/history/Pages/ccgrowth.aspx. See also "Higher Education for American Democracy, Volume 1: Establishing the Goals," A Report of the President's Commission on Higher Education (December 1, 1947), 67–70, https://babel.hathitrust.org/cgi/pt?id=uc1.31158001076040;view=1up;seq=5; Philo A. Hutchenson, "The Truman Commission's Vision of the Future," *Thought and Action* (2007), http://www.nea.org/assets/img/PubThoughtAndAction/TAA_07_11.pdf.

32. Angulo, *Diploma Mills: How For-Profit Colleges Stiffed Students, Taxpayers, and the American Dream*; Doug Lederman and Paul Fain, "Boom, Regulate, Cleanse, Repeat: For-Profit Colleges: Slow but Inevitable Drive toward Acceptability," in *Remaking College: The Changing Ecology of Higher Education*, ed. Michael W. Kirst and Mitchell L. Stevens (Stanford, Calif.: Stanford University Press, 2015), 61–83.

33. Carnevale, Rose, and Hanson, "Certificates: Gateway to Gainful Employment and College Degrees"; Complete College America, "Certificates Count: An Analysis of Sub-Baccalaureate Certificates"; Ewert and Kominski, "Measuring Alternative Credentials: 2012."

Overview of Current Providers

Estimating the number and characteristics of certificate programs and students is challenging, especially for the approximately 3,000 for-profit institutions that are not eligible to receive financial aid under Title IV.[34] Even certificate program data that Title IV–eligible institutions provide to the National Center for Education Statistics (NCES) is suspect: some institutions report only on their Title IV–eligible certificate programs, while others report on all of their certificate programs, even those that are not Title IV–eligible.

Despite these limitations, available data on Title IV institutions provide a sense of the scale and distribution of these programs. In 2013, 4,845 Title IV institutions offered certificate programs. Less-than-two-year for-profit schools, commonly known as trade schools, make up the largest share of Title IV institutions that offer certificate programs (see Figure 2). The average enrollment in a trade school is fewer than 100 students, and most programs these institutions offer are in consumer services and cosmetology. Most degree-granting two-year and four-year for-profit schools also offer certificate programs, focused heavily on consumer services and health services.[35]

Both trade schools and degree-granting for-profits have come under increased scrutiny in the past decade. In 2014, the Department of Education promulgated the so-called gainful employment rule, which conditions Title IV eligibility on the ratio of the average graduate's loan payment to his or her total earnings.[36] Several for-profit colleges have also been targeted for enforcement actions by the Department of Education. In August 2016, ITT Tech, a national technical institute with more than 100 campuses across the country, was disqualified from financial aid and barred from enrolling new students because of

34. These schools educated roughly 670,000 students each year. Cellini and Goldin found that for-profit schools that are not Title IV eligible charge tuition rates that are significantly lower than those charged by Title IV–eligible schools. They also found that students in programs in those schools have completion rates and certification exam performance that are similar to students at analogous programs at Title IV–eligible institutions. See Cellini and Goldin, "Does Federal Student Aid Raise Tuition? New Evidence on For-Profit Colleges."

35. U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Institutional Characteristics (IC) and Completions Components, 2013, "Table P150. Number of Title IV postsecondary institutions that offer sub-baccalaureate occupational education certificate programs, by control and level of institution and detailed field of study: United States, 2013," https://nces.ed.gov/surveys/ctes/tables/P150.asp.

36. For eligibility, loan payment of a typical graduate must not exceed 20 percent of his or her discretionary income, or 8 percent of his or her total earnings. U.S. Department of Education, "Fact Sheet: Obama Administration Increases Accountability for Low-Performing For-Profit Institutions," July 1, 2015, http://www.ed.gov/news/press-releases/fact-sheet-obama-administration-increases-accountability-low-performing-profit-institutions. The Department of Education estimates that as many as 1,400 programs serving 840,000 students would not meet the gainful employment standard.

multiple investigations into its management of federal aid.[37] In September 2016, ITT announced that it would close its doors.[38]

While fewer public two-year colleges than for-profit schools offer certificate programs, community college programs tend to be larger and therefore award the plurality of certificates.[39] Average net cost for these programs is often significantly lower than that of for-profit institutions, and public two-year schools tend to have more diverse offerings than for-profit schools (and especially trade schools).[40] As with two-year and four-year for-profit schools, the most commonly awarded certificates at these institutions are in the health sciences. However, community colleges also offer programs and award many certificates in business management; consumer services; engineering, architecture, and science technologies; manufacturing; and protective services.[41]

Figure 3 shows the change over time in certificates awarded by trade schools, for-profit two- and four-year institutions, and community colleges. While all three institutional types have awarded more certificates over time, for-profit colleges have increased the number of certificates that they award most dramatically, from 76,220 in 2000 to 190,466 in 2013, with a particularly sharp

37. Ashley A. Smith, "U.S. Cuts Off ITT Tech," *Inside Higher Ed* (August 26, 2016), https://www.insidehighered.com/news/2016/08/26/education-department-bars-itt-tech-enrolling-new-students-federal-aid.

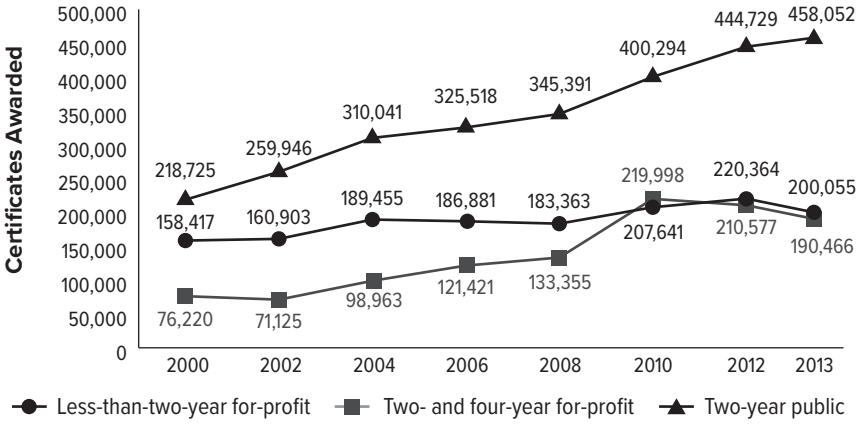
38. Andy Thomason, "After Losing Aid for New Students, Giant For-Profit ITT Will Close All Its Campuses," Chronicle.com (September 6, 2016), http://www.chronicle.com/blogs/ticker/after-losing-aid-for-new-students-giant-for-profit-itt-will-close-all-its-campuses/114025. In 2015, another large for-profit chain, Corinthian Colleges, shut down and filed for bankruptcy because of federal fines for misleading employment claims, and in 2016 a federal panel recommended the termination of the Accrediting Council for Independent Colleges and Schools, an accreditor of many for-profit institutions. See Kirk Carapezza, "The Days May Be Numbered for Corinthian Colleges Accreditor," NPR ED (June 15, 2016), http://www.npr.org/sections/ed/2016/06/15/482181707/the-days-may-be-numbered-for-corinthian-colleges-accreditor.

39. Of 1,028 public two-year institutions, 1,003 offer occupational certificates. U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Institutional Characteristics (IC) and Completions Components, 2013, "Table P143. Number and percentage distribution of Title IV postsecondary institutions that offer programs at each undergraduate credential level, overall and for occupational education programs, by level and control of institution: United States, 2013," https://nces.ed.gov/surveys/ctes/tables/P143.asp.

40. For a comparison of costs, see "Figure 18: Public two-year institutions net costs are lower than private institutions," in Carnevale, Rose, and Hanson, "Certificates: Gateway to Gainful Employment and College Degrees." For a comparison of program offerings, see U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Institutional Characteristics (IC) and Completions Components, 2013, "Table P150. Number of Title IV postsecondary institutions that offer sub-baccalaureate occupational education certificate programs, by control and level of institution and detailed field of study: United States, 2013," https://nces.ed.gov/surveys/ctes/tables/P150.asp.

41. U.S. Department of Education, National Center for Education Statistics, IPEDS IC and Completions Components, 2013, "Table P150. Number of Title IV postsecondary institutions that offer sub-baccalaureate occupational education certificate programs, by control and level of institution and detailed field of study: United States, 2013," https://nces.ed.gov/surveys/ctes/tables/P150.asp.

Figure 3: Certificates Awarded by Institutional Type, 2000–2013



Source: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Institutional Characteristics (IC) and Completions Components, "Table P160. Number of undergraduate credentials awarded by Title IV postsecondary institutions, by control and level of institution and credential level: United States, selected years 2000–2012, https://nces.ed.gov/surveys/ctes/tables/P160.asp; "Table P152. Total number of credentials awarded by Title IV postsecondary institutions, overall and in occupational education, by control and level of institution and detailed field of study, United States, 2013," https://nces.ed.gov/surveys/ctes/tables/P152.asp.

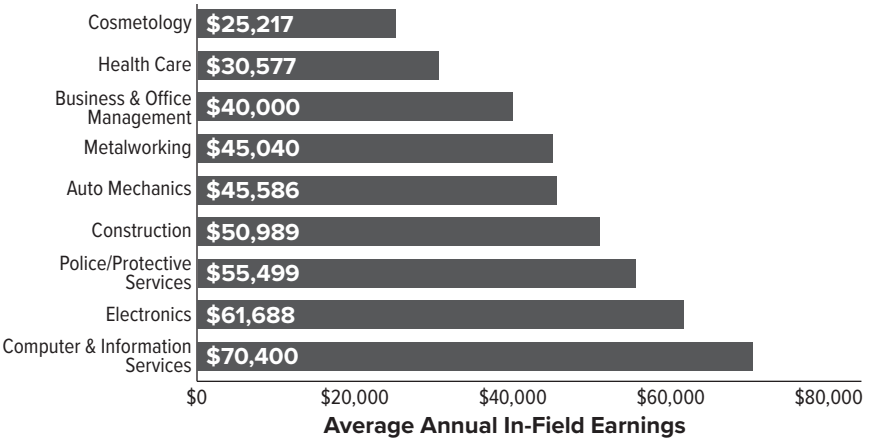
increase in the first years of the Great Recession. However, for-profits awarded fewer total credentials in 2013 than in 2012, and growth at community colleges slowed. These results likely reflect increased regulation of the for-profit sector, as well as a countercyclical decrease in enrollment due to an improving economy.[42]

More than half of certificates earned at all institutions are short-term certificates, though labor market returns are greater for longer programs.[43] Labor market returns also vary by field, which tends to be correlated with provider type: individuals who hold certificates in computer and information services, electronics, and business and office management (usually from community colleges) and who work in those fields make more than at least half of associate's and bachelor's degree holders; they also have at least a 50 percent earnings

42. "For-Profit College Sector Continues to Shrink," *Inside Higher Ed* (July 15, 2016), https://www.insidehighered.com/quicktakes/2016/07/15/profit-college-sector-continues-shrink.

43. One analysis of labor outcomes in Kentucky found that completers of one-year certificate programs earned nearly as much as associate's degree completers, and that men increased their earnings by 40 percent and women increased their earnings by 20 percent. The same study found that men who completed programs that lasted for less than one year increased earnings by only 10 percent, and women in shorter-term programs increased earnings by only 3 percent. Ewert and Kominski, "Measuring Alternative Credentials: 2012," https://www.census.gov/prod/2014pubs/p70-138.pdf.

Figure 4: Average Annual In-Field Earnings for Certificate Holders by Field



Source: Anthony Carnevale, Stephen J. Rose, and Andrew R. Hanson, "Certificates: Gateway to Gainful Employment and College Degrees," Georgetown University Center on Education and the Workforce (June 2012), https://cew.georgetown.edu/wp-content/uploads/2014/11/Certificates.FullReport.061812.pdf. Certificates in cosmetology, health care, and auto mechanics tend to be short-term certificates; health care, business management, and cosmetology are majority-women fields.

premium over those with only a high school diploma (who earn, on average, about $30,000 per year). Certificate holders in the health sciences and cosmetology (fields in which a large majority of employees are women, and most certificates awarded are short-term certificates from for-profit schools) make, on average, between $20,000 and $25,000 per year (see Figure 4).

Intersections and Future Directions

Policy-makers, researchers, and advocacy groups have promoted certificate programs as promising pathways to degrees and employment, especially for typically disadvantaged groups.[44] Proponents view the responsiveness of the programs to economic conditions as a strength and have promoted partnerships among employers, educational institutions, and other nonprofits to create short-term certificate programs in high-demand fields.[45] In 2011, a Department of Education experimental sites initiative allowed students in 46 short-term vocational

44. Complete College America, "Certificates Count: An Analysis of Sub-Baccalaureate Certificates." See Meyer and Bacon, "The Need for a National Certification Ecosystem."

45. Angela Hanks, "Making Pell Work: How America's $30 Billion in Need-Based College Aid Can Be More Job-Driven," National Skills Coalition (July 2015), http://www.nationalskillscoalition.org/resources/publications/file/2015-07-Making-Pell-Work-How-Americas-30-Billion-Investment-in-Need-Based-College-Aid-Can-Be-More-Job-Driven.pdf.

programs that exceeded 150 clock hours and met local workforce needs to use Pell Grants toward those programs.[46]

States and institutions are also involved in efforts to incorporate shorter-term certificates into stackable or latticed credentials, so that curricula across certificate and degree programs are clearly aligned and students can transfer credits easily.[47] Oregon's community college system and Wisconsin's technical college system have created modularized, credit-bearing, specialized credentials that can be combined for the receipt of a more general degree in the field. For example, a student could obtain an accounting clerk certificate, a payroll clerk certificate, and a business assistant certificate to earn an associate's degree in accounting.[48] Additionally, Lumina Foundation is coordinating a Connecting Credentials initiative that uses competencies as a framework for stacking credentials, including certificates, from a diverse set of providers.[49]

While many policy-makers and institutions have recognized the potential of short-term certificate programs, the potential for fraud or abuse in the sector has also been widely acknowledged, and the evidence base for the public and private returns from certificate programs is thin. To address these concerns, groups like the Certification Data Exchange Project and the Workforce Credentials Coalition are working to improve data collection and exchange on certificates and other workforce credentials.[50]

46. "Experimental Sites," Federal Student Aid, https://experimentalsites.ed.gov/exp/approved.html.

47. Students may already be "stacking" credentials, with and without coordinated efforts to ease the process. For example, in one analysis, 4.8 percent of students who initially earned a less-than-one-year certificate went on to earn a longer-term certificate within six years; 35.7 percent went on to earn an associate's degree; and 9.5 percent transferred to a four-year institution. Only 2.4 earned a bachelor's degree within six years of earning an initial short-term certificate. Degree attainment for long-term certificate holders is less, suggesting that short-term certificates, which tend to have lower earning outcomes when they are an individual's highest level of educational attainment, may have more potential as stackable credentials. See "Loss/Momentum Framework (LMF) Completion State: Model Analysis-Stacking Credentials," Completion by Design, http://www.completionbydesign.org/our-approach/step-3-diagnose-the-issues/pathway-analyses-toolkit/pinpointing-where-improvements-are-needed/lmf-completion-stage/model-analysis-%E2%80%93-stacking-credentials.

48. See James T. Austin, Gail O. Mellow, Mitch Rosin, and Marlene Seltzer, "Portable, Stackable Credentials: A New Education Model for Industry-Specific Career Pathways," McGraw Hill Research Foundation (November 28, 2012), http://www.jff.org/sites/default/files/publications/materials/Portable%20Stackable%20Credentials.pdf; Evelyn Ganzglass, "Scaling 'Stackable Credentials:' Implications for Implementation and Policy," Center for Postsecondary and Economic Success (March 2014), http://www.clasp.org/resources-and-publications/files/2014-03-21-Stackable-Credentials-Paper-FINAL.pdf.

49. "Connecting Credentials: A Beta Credentials Framework," Lumina Foundation (June 11, 2015), https://www.luminafoundation.org/resources/connecting-credentials.

50. Meyer and Bacon, "The Need for a National Certification Ecosystem," http://evolllution.com/programming/credentials/the-need-for-a-national-certification-ecosystem/.

WORK-BASED TRAINING

Employers have a long tradition of providing training for their employees to prepare for and advance in their careers, often at no or little direct cost to the employee. Entry-level corporate training and workforce development programs usually lead to an industry-recognized certification, either associated with a specific employer (such as a Cisco certification) or awarded by an industry association. Like certificate programs, these programs lead to careers in trades and usually cater to lower-income adults who do not have access to or preparation for traditional degree programs. Programs reviewed here are structured as apprenticeships and other forms of on-the-job training. Participants are usually connected with these opportunities as employees at companies, through local community development initiatives, or through academic programs.

History

On-the-job training has its roots in the preindustrial apprenticeship system, a practice that persists, in a modern form, to this day. Industrialization introduced new forms of work-based training in the late nineteenth century: with accelerated demand for workers skilled at operating new machinery, companies began creating their own factory schools to train their workers and started to experiment with "hybrid" and simulated training as well. Around the turn of the twentieth century, companies also began to understand the importance of corporate training as a tool to build a unified organizational culture and approach, and began to create materials, sites, and proprietary techniques for training.[51]

Throughout the twentieth century, developments in on-the-job training have often been at the vanguard of more-general advancements in instructional delivery: in the 1950s, companies began to experiment with individualized and modularized instruction; and in the 1950s and 1960s, companies began to utilize instructional design and computer-assisted pedagogy. These efforts were bolstered by the emergence of networked technology in the 1980s and 1990s, and corporate training programs were some of the first educational programs to rely heavily on computer-based training and blended-learning approaches to supplement on-the-job skill development. In 2015, companies delivered, on average, 53.8 hours of training per learner, marking a slight increase from previous years in the use of technological tools and techniques such as blended instruction, online instruction, and learning management systems.[52] While current sources of data are limited, several studies from the 1990s indicate that

51. In 1982, John H. Patterson created the National Cash Register Primer and other rigorous management techniques to train company salesmen, and Taylorism and Fordism gained popularity as forms of training and management in the early decades of the twentieth century. For a timeline with more details, see Di Lewis, "The History of Training and Development" [Infographic], AllenComm, http://www.allencomm.com/blog/2016/04/history-training-development-infographic/.

52. "2015 Training Industry Report," *Training Magazine* (2015), https://trainingmag.com/trgmag-article/2015-training-industry-report.

employer-provided training is more likely to target employees with higher levels of formal education than entry-level or less-educated employees.[53]

Overview of Current Providers

For many employees, employer-provided, on-the-job training offers an alternative pathway to a degree. For example, Jiffy Lube University combines competency-based computer-mediated instruction with hands-on training and proficiency assessments for its new auto technicians, who tend to be between the ages of 18 and 25, in their first job, and do not possess a bachelor's degree. Participants receive Jiffy Lube auto technician certificates upon completing the program and can also receive college credit through the American Council on Education (ACE) and the American Society for Training and Development.[54] Onshore Outsourcing, a Missouri-based company that is committed to keeping IT jobs domestic, has a rigorous, bootcamp-style training program for developing IT professionals. Eighty percent of the company's 150 employees did not attend college, and the organization specifically targets underemployed individuals in rural areas to help them develop their skills and obtain jobs.[55]

In addition to employer-provided and employer-sponsored training, entry-level employees access training through workforce development partnerships among employers, educational institutions, nonprofit organizations, industry groups, and federal programs. For example, subsidized on-the-job training programs have been sustained by federal workforce development legislation for more than 40 years. In these programs, workforce development agencies or other organizations provide firms with subsidies that cover 50 to 60 percent of trainees' wages, thus offsetting the firms' training costs. The subsidized firms provide training to employees in programs that usually last three to nine months, and in most cases trainees are expected to continue as full-time employees after the training period.[56] Individuals served by these programs are usually underemployed, lack postsecondary education, or face other disad-

53. See Lerman, McKernan, and Riegg, "The Scope of Employer-Provided Training in the United States: Who, What, Where, and How Much?"

54. Jennifer Friendmann, "Jiffy Lube Recognized for Superior Training Program, Dedication to Employee Development," Jiffy Lube News & Press (February 7, 2012), https://www.jiffylube.com/news-and-press/jiffy-lube174-recognized-for-superior-training-program-dedication-to-employee-development; "Jiffy Lube Technicians," Jiffy Lube, https://www.jiffylube.com/about/technicians.

55. Onshore Outsourcing, http://onshoreoutsourcing.com/; Selingo, *College Unbound: The Future of Higher Education and What It Means for Students,* 163.

56. Some programs of this type are privately funded. Boeing, for example, pays manufacturing companies to provide 10–15 weeks of on-the-job training to unemployed workers, with an expectation that trainees continue on as full-time employees at the company at which they are trained. See Deborah Kobes, "Making On-the-Job Training Work: Lessons from the Boeing Manufacturing On-the-Job Training Project," Jobs for the Future (November 2013), http://www.jff.org/sites/default/files/publications/materials/NFWS_MakingOnTheJobTrainingWork_110413.pdf.

vantages in securing employment (such as single mothers or individuals with criminal records).[57]

Apprenticeships are another form of work-based learning and can either be provided by a single employer or be part of a larger training program coordinated by multiple entities, usually in a single geographic region. In some industries, individuals must complete some school-based training before beginning an apprenticeship and, in many cases, apprenticeships can count toward college credit. Apprenticeships are particularly popular in the electrical, construction, and manufacturing industries and, according to the Department of Labor, nearly 500,000 individuals participated in apprenticeships in 2015.[58] Programs typically last one to three years, and participants usually receive industry-specified instruction and wages throughout their training.[59] One innovative recent example is a regionally based apprenticeship program for welders and machine operators in Ohio that brings together several small and medium-size manufacturers to coordinate training standards, wages, and curricula. The program allows participants to receive college credit and credentials from the National Career Readiness Center and from industry-specific organizations. Unions also provide registered apprenticeships and other training options for entry-level employees to gain career skills and earn industry-recognized certifications.[60]

Intersections and Future Directions

Work-based training often draws on resources from certificate or academic programs from higher education institutions and may help an employee progress toward a certificate, an industry-recognized certification, a license, or a degree. Certificate programs often prepare students directly for industry-recognized certification assessments, and corporations frequently partner with educational institutions so that students earn an employer-recognized certification and job-relevant training as they earn a certificate or degree. For example, in Ford's Technical Career Entry Program, students alternate between classroom time and Ford internships while earning an associate's degree from a partner col-

57. See Indivar Dutta Gupta, Kali Grant, Matthew Eckel, and Peter Edelman, "Lessons Learned from 40 Years of Subsidized Employment Programs: A Framework, Review of Models, and Recommendations for Helping Disadvantaged Workers," Georgetown Center of Poverty and Inequality (Spring 2016), https://www.law.georgetown.edu/academics/centers-institutes/poverty-inequality/current-projects/upload/GCPI-Subsidized-Employment-Paper-20160413.pdf; "What Works in Job Training: A Synthesis of the Evidence," U.S. Department of Labor (July 22, 2014), https://www.dol.gov/asp/evaluation/jdt/jdt.pdf.

58. "Data and Statistics," Apprenticeship USA, https://www.doleta.gov/oa/data_statistics.cfm.

59. See "What Works in Job Training: A Synthesis of the Evidence," https://www.dol.gov/asp/evaluation/jdt/jdt.pdf.

60. See Terry Grobe, Nancy Martin, and Andrea Steinberg, "Creating Pathways to Employment: The Role of Industry Partnerships in Preparing Low-Income Young Adults for Careers in High-Demand Industries," National Fund for Workforce Solutions (June 2015), https://nationalfund.org/wp-content/uploads/2016/10/Creating-Pathways-to-Employment-073015.pdf.

lege, as well as Ford Service Technician Specialty Training credentials.[61] The Cisco Networking Academy, which provides self-study materials for Cisco certifications, also partners with secondary and postsecondary institutions to train students for certification.[62]

Partnerships often cohere around regional, sector-based needs and are driven by local employers and educational institutions.[63] For example, in and around Charlotte, North Carolina, several manufacturing companies and Central Piedmont Community College participate in the Apprentice 2000 program, which provides participants with 8,000 hours of apprenticeship training and academic study and leads to an associate's degree from Central Piedmont Community College, a Journeyman's Card, and certificates from the state of North Carolina and the U.S. Department of Labor.[64] Des Moines Area Community College's Accumold and Vermeer Scholars programs have partnered with local manufacturers so that students earn degrees or certificates while receiving job training at a local company. Business partners are able to take an active role in shaping their future workforce by participating in the recruitment and screening of program participants.

Finally, employers have a long tradition of helping students earn degrees from traditional institutions. For example, courses taken through corporate training programs at Jiffy Lube, Starbucks, and McDonald's are all validated by ACE so that students can transfer the credit they earn to select degree programs. Corporations commonly assist employees pursuing a degree, and several targeted partnerships have recently emerged between companies and universities. These programs offer enrollees more wrap-around support, advisement, and resources than typical tuition reimbursement programs. For example, in 2015, Starbucks and Arizona State University launched a partnership through which employees could pursue four-year, online degrees tuition-free. Similarly, JetBlue covers most of the cost for employees pursuing a degree at Thomas Edison University.[65]

61. ASSET Datasheet, New Ford Tech, https://www.newfordtech.com/assets/pdf/Datasheet-ASSET.pdf.

62. "Cisco Learning Network," Cisco, https://learningnetwork.cisco.com/welcome.

63. See "Accumold Scholars," http://www.accumoldscholars.com/; Rob Denson and Karen Stiles, "Empty Seats, Open Jobs, Know More," in STEMconnector, *Advancing a Jobs-Driven Economy: Higher Education and Business Partnerships Lead the Way* (New York: Morgan James Publishing, 2015), 54–59.

64. Apprenticeship 2000, http://apprenticeship2000.com/zwp/.

65. Amanda Ripley, "The Upwardly Mobile Barista," *The Atlantic Monthly* (May 2016), http://www.theatlantic.com/magazine/archive/2015/05/the-upwardly-mobile-barista/389513/; "JetBlue Takes Fresh Approach to Employer-Sponsored Education with Launch of JetBlue Scholars," *Business Wire* (April 18, 2016), http://www.businesswire.com/news/home/20160418006299/en/JetBlue-Takes-Fresh-Approach-Employer-Sponsored-Education-Launch.

SKILLS-BASED SHORT COURSES

With the emergence and popularity of coding bootcamps, skills-based short courses, which have existed in some form for centuries, have gained renewed attention. These courses, which can stand on their own or be incorporated into other credentialing programs (such as certificate programs), are usually intensive courses that last for less than one year and focus solely on preparing students for jobs in specific fields. At the end of these courses, students may earn a credential (such as a short-term certificate) or compile a portfolio, and some, including coding bootcamps, offer job placement programs or job placement guarantees. This section gives a brief history and overview of offerings in this category (which overlaps with our other labor market and credentialing categories), but focuses on coding bootcamps because of their recent and rapid growth and relevance to changing employer needs.

History

Though this section focuses primarily on coding bootcamps, these offerings are part of a larger category of short, skills-based offerings that include short-term certificate programs and intensive short courses offered through schools of continuing education or professional schools. Continuing education for career advancement has its roots in nineteenth-century mechanics institutes and the lyceum movement, and universities began offering extension programs and short courses for in-demand fields in the final decades of the nineteenth century. For example, the University of Wisconsin-Madison began offering intensive 12-week short courses in farming education in 1886 (agriculture was a particular focus of early extension programs), and continues to offer short courses scheduled around the farming season.[66] As the meatpacking industry grew in Chicago in the early twentieth century, the University of Chicago's Meatpacking Institute began offering evening, correspondence, and full-time classes for men looking to enter or advance in the industry.[67]

Short-term certificate programs are also part of a longer history of vocational education at trade schools and community colleges. The number of institutions that offer these programs and the number of students who complete them have grown significantly over the past three decades. Trade schools that offer short-term certificates have emerged and evolved with their industries to meet the demand for employees or new schools. For example, for-profit career colleges emerged in the mid-nineteenth century to meet the growing need for workers with skills in fields like bookkeeping, stenography, typing, and electrical

66. See "About FISC," Farm and Industry Short Course, College of Agricultural and Life Sciences, University of Wisconsin-Madison, https://fisc.cals.wisc.edu/about-fisc/.

67. "Institute of Meatpacking: 1923–1928," University of Chicago University of Extension Records, https://www.lib.uchicago.edu/ead/pdf/ofcpreshjb-0052-002-03.pdf.

trades. The first beauty schools opened in the 1920s and 1930s in response to changing women's styles that required the use of new tools and technical skills.[68]

Much like career colleges and other trade schools, coding bootcamps, which emerged in 2012, have developed in response to a growing and urgent need for employees with skills in high-demand fields. These programs, which prepare students for entry-level positions in programming, data science, and related technical fields, have expanded rapidly over the past several years, from 2 in January 2012 with 49 enrolled students, to 34 in January 2014 with 2,550 students, to 91 full-time programs in 2016 (other estimates put the total number of providers closer to 200).[69]

Overview of Providers

Short-term certificate programs and skills-based short courses continue to be popular pathways for adult learners to build career-specific skills and earn credentials. Both are typically offered through Title IV for-profit and nonprofit institutions, extension programs at four-year schools, and unaccredited trade schools. While short-term certificate programs typically focus on vocational fields and are available to students without a previous postsecondary degree, bachelor's degree holders are increasingly earning certificates to augment their skill sets and advance in their careers. Short courses can be part of certificate programs or can be offered on their own through professional schools or schools of continuing education, in which case they typically cater to adults who have already earned secondary degrees. In the former category, the University of Wisconsin-Madison's College of Agricultural and Life Sciences offers six-week, intensive short courses for students looking to advance their skill set in the agricultural sciences. Students can stack short courses to earn one of six one-year or two-year certificates, and courses are advertised as alternatives to a four-year degree. Catering to a different demographic, New York University's Stern School of Business offers three- to five-day short courses in leadership and strategy, finance and risk management, and business analytics and marketing. These courses are targeted toward executives, and participants can earn professional credit for completion.[70]

Coding bootcamps, which also focus on intensive skill development, are the most recent additions to the category of short, skills-based courses. These programs usually last around 12 weeks, are full-time, and equip students with the skills needed for high-demand jobs as developers, designers, or data scientists in the technology industry. Bootcamps often partner with specific employers, have robust job placement programs, and focus on helping students build a

68. "The Vocational Age Emerges," Association for Career and Technical Education, https://www.acteonline.org/uploadedFiles/Assets_and_Documents/Global/files/CTE_Info/Research/Vocational-Age-Emerges_1876-1926.pdf.

69. Liz Eggleston, "2016 Coding Bootcamp Market Size Study," Course Report (June 2016), https://www.coursereport.com/reports/2016-coding-bootcamp-market-size-research.

70. See "Executive Education: Short Course," NYU Stern, http://www.stern.nyu.edu/programs-admissions/executive-education/short-courses/overview/what-are-short-courses.

portfolio of work to take with them out on the job market. Providers claim to boost graduate income by as much as 40 percent by equipping graduates with skills that are in high demand.[71] Bootcamps are mostly located in large, urban centers such as San Francisco, New York, and Seattle, cost $11,000 on average, and were projected to earn $200 million in revenue in 2016. Popular providers include General Assembly, Hack Reactor, and DevBootcamp.[72]

In 2016, Course Report, a directory and review site for coding bootcamps, reported that nearly 18,000 participants would complete coding bootcamps in that year. However, despite their rapid growth and media attention, coding bootcamps are not yet an alternative to undergraduate education. A 2015 survey of coding bootcamp completers found that 79 percent already had at least a bachelor's degree, and the average age of a participant was 31. Only 17 percent of completers had less than an associate's degree, and the majority of this group had completed some college (see Figure 5). On average, graduates had 7.6 years of work experience before enrolling in a bootcamp.[73]

Nevertheless, some indicators suggest these programs may emerge as undergraduate alternatives. First, because most coding bootcamp completers have little educational or professional experience with coding before enrolling, it would be inaccurate to equate completion of a coding bootcamp with the completion of an advanced degree, which usually builds upon a bachelor's degree or work experience in a similar subject. For example, in 2015, 45 percent of coding bootcamp graduates reported they coded "some in their free time," and 33 percent said they had no experience.[74]

Furthermore, coding bootcamps, more so than traditional programs, have leveraged scholarships and specialized programs to attract and support students from demographic groups not often found in computer science departments. In 2014, only 14.7 percent of those who received bachelor's degrees in computer science or computer engineering were women.[75] By contrast, 36 percent of 2015 coding bootcamp completers were female.[76] Additionally, a little more than 20 percent of coding bootcamp completers were of Hispanic origin, compared with 7.7 percent of those with bachelor's degrees in computer science and computer

71. Eggleston, "2016 Coding Bootcamp Market Size Study"; Goldie Blumenstyk, "As Coding Bootcamps Grow, One Tries a Nonprofit Model," *The Chronicle of Higher Education* (August 2, 2016), http://chronicle.com/article/As-Coding-Boot-Camps-Grow-One/237329.

72. Eggleston, "2016 Coding Bootcamp Market Size Study."

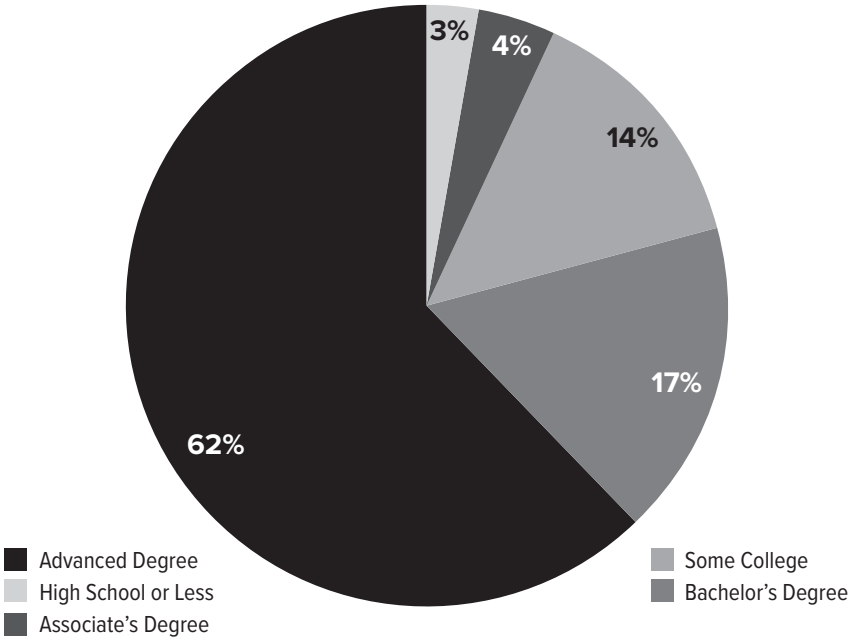
73. Liz Eggleston, "2015 Coding Bootcamp Alumni & Demographics Study," Course Report (October 25, 2015), https://www.coursereport.com/reports/2015-coding-bootcamp-job-placement-demographics-report#Table1.

74. Ibid.

75. Stuart Zweben and Betsy Bizot, "2014 Taulbee Survey," Computing Research Association (July 2015), http://cra.org/crn/wp-content/uploads/sites/7/2015/06/2014-Taulbee-Survey.pdf.

76. Eggleston, "2015 Coding Bootcamp Alumni & Demographics Study."

Figure 5: Coding Bootcamp Completers by Previous Education Level, 2015



Source: Liz Eggleston, "2015 Coding Bootcamp Alumni & Demographics Study," Course Report (October 25, 2015), https://www.coursereport.com/reports/2015-coding-bootcamp-job-placement-demographics-report#Table1.

engineering.[77] Part of the reason for this is cost. While the unavailability of federal financial aid means that most participants pay for coding bootcamps out of pocket, the opportunity costs associated with coding bootcamps are significantly lower than those associated with a degree program. Yet starting salaries for coding bootcamp graduates and bachelor's degree holders are similar.[78]

Intersections and Future Directions

The financial aid status quo for bootcamps may be changing. Four of the eight partnerships selected for EQUIP were between traditional institutions and coding bootcamps: SUNY Empire State College and the Flatiron School; the University of Texas, Austin, and MakerSquare; Wilmington University and Zip Code Wilmington; and Marylhurst University and Epicodus. These programs enroll under-

77. Ibid.; Zweben and Bizot, "2014 Taulbee Survey."

78. Eggleston, "2015 Coding Bootcamp Alumni & Demographics Study"; Alex Williams, "Coding Bootcamp vs. College," Course Report (September 16, 2015), https://www.coursereport.com/blog/coding-bootcamp-vs-college.

graduate students who are already enrolled at the partner institutions.[79] Except for the Wilmington partnership, each offers students a certificate of completion.

Other partnerships between universities and coding bootcamps have emerged outside of the EQUIP program. These include a partnership between coding bootcamp Galvanize and the University of New Haven to offer students an accelerated data science master's degree, and a partnership between Lynn University and General Assembly to offer a semester-long technology design bootcamp to undergraduates. At least one institution—Northeastern University—has opened its own analytics bootcamp, called Level.[80] Tuition for these programs is at least as high as degree program tuition (Lynn University's bootcamp is $16,000 for 16 weeks), and most are not eligible to receive federal financial aid. In addition, while some are open to undergraduates, most, like other coding bootcamps, target working professionals.[81]

MOOCS AND ONLINE MICRO-CREDENTIALS

Massive Open Online Courses (MOOCs) are online courses that accommodate high or unlimited enrollment. The core component of MOOC content is usually the video lecture with supplementary problem sets, readings, assessments, and user forums or other collaborative features. Students can audit self-paced courses for free or pay a variable price (usually under $100) to earn a verified badge or certificate for completing a scheduled course or series of courses.[82] MOOCs, in general, are broadly distributed across subjects and disciplines. Some providers specialize in certain types of content, and the percentage of computer science, programming, and business courses has grown disproportionately in recent years.[83]

79. See Emily Deruy, "Financial Aid Now Pays for Coding Bootcamps and MOOCs," *The Atlantic* (October 14, 2015), http://www.theatlantic.com/politics/archive/2015/10/financial-aid-now-pays-for-coding-bootcamps-and-moocs/433116/; "FACT SHEET: ED Launches Initiative for Low-Income Students to Access New Generation of Higher Education Providers," U.S. Department of Education Press Release (August 16, 2016), http://www.ed.gov/news/press-releases/fact-sheet-ed-launches-initiative-low-income-students-access-new-generation-higher-education-providers.

80. Maxine Joselow, "Coding Goes Mainstream," *Inside Higher Ed* (August 10, 2016), https://www.insidehighered.com/news/2016/08/10/traditional-colleges-enter-coding-boot-camp-market.

81. Ray Batra, "What Happens When Universities and Bootcamps Join Forces?" EdSurge (May 10, 2016), https://www.edsurge.com/news/2016-05-10-what-happens-when-universities-and-bootcamps-join-forces. Like enrollees at most analytics and data science bootcamps, a large share of Level students already hold advanced degrees.

82. Justin Pope, "What Are MOOCs Good For?" *MIT Technology Review* (December 15, 2014), https://www.technologyreview.com/s/533406/what-are-moocs-good-for/.

83. "By the Numbers: MOOCs in 2015," Class Central, https://www.class-central.com/report/moocs-2015-stats/; "State of the MOOC 2016: A Year of Massive Landscape Change for Massive Open Online Courses," Online Course Report (2016), http://www.onlinecoursereport.com/state-of-the-mooc-2016-a-year-of-massive-landscape-change-for-massive-open-online-courses/.

History

MOOCs have their roots in correspondence courses and distance education, and draw on a long history of in-person and distance lifelong learning options. The emergence of multimedia technology, such as radio, television, and the video cassette, enabled providers of distance learning to extend their reach dramatically in the second half of the twentieth century, enabling remote, media-based correspondence courses for credit and enrichment. The expansion of the Internet in the late 1990s and 2000s dramatically reduced the marginal cost of enrollment and essentially eliminated geographic boundaries to participation. The first official MOOC was offered by Stephen Downes and George Siemens at the University of Manitoba in 2008. Since then, the numbers of courses offered and providers have increased rapidly.[84]

Overview of Current Providers

Today, popular MOOC providers in the postsecondary space include edX, a nonprofit, open-source MOOC platform created by Harvard and MIT that partners with universities and cultural organizations to create courses; Coursera, a proprietary provider with more than a thousand courses from nearly 150 postsecondary schools; and Udacity, which partners with companies such as Google and Apple to teach skills that are in particularly high demand at these companies (in many ways, these courses are a form of employer-provided training).[85] Each of these providers offered its first courses in 2011 or 2012. The expansion and the excitement that surrounded this emergence led some to call 2012 the "year of the MOOC."[86]

Since 2012, MOOC offerings, enrollments, and providers have continued to grow. In March 2012, 11 MOOCs were offered. In March 2015, 2,400 MOOCs were offered by faculty at about 400 universities, and roughly 17 million students had enrolled. In March 2016, nearly 4,200 MOOCs were offered by faculty at about 500 universities, and 35 million students had enrolled (see Figure 6).[87] Because platforms that host MOOCs like edX and Coursera emerge frequently, finding an accurate count is difficult, though one plausible estimate for 2015, provided by Class Central, is 80.[88]

84. Juliana Marques, "A Short History of MOOCs and Distance Learning," *MOOC News and Reviews* (April 17, 2013), http://moocnewsandreviews.com/a-short-history-of-moocs-and-distance-learning/.

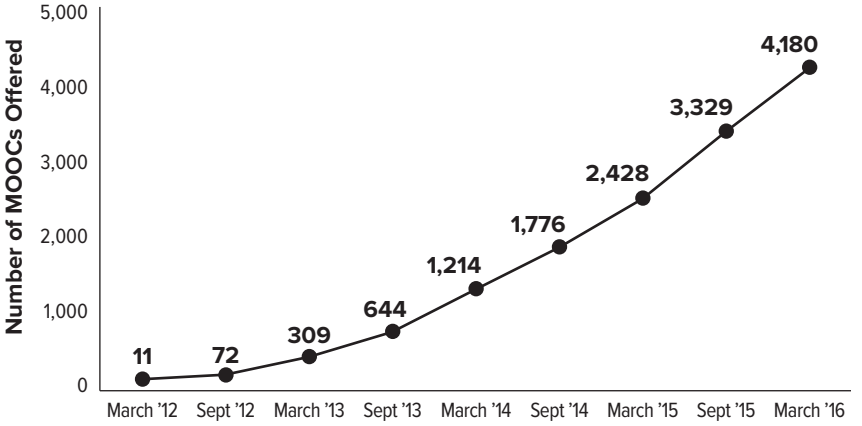
85. For a list of common providers, see "By the Numbers: MOOCs in 2015."

86. See, for example, Laura Pappano, "The Year of the MOOC," *The New York Times* (November 2, 2012).

87. "By the Numbers: MOOCs in 2015."

88. Of these providers, Coursera captures the largest share of the market (36.5 percent); edX the next largest (17.1 percent); and Canvas.net, a new player on the field, captures 6.92 percent. (Udacity captures only 2.95 percent of the market but because of its specialized focus and innovative model, has received disproportionate attention.) "By the Numbers: MOOCs in 2015."

Figure 6: Increases in MOOC Offerings, March 2012 to March 2016



Source: "By the Numbers: MOOCs in 2015," Class Central, https://www.class-central.com/report/moocs-2015-stats/; "State of the MOOC 2016: A Year of Massive Landscape Change for Massive Open Online Courses," Online Course Report (2016), http://www.onlinecoursereport.com/state-of-the-mooc-2016-a-year-of-massive-landscape-change-for-massive-open-online-courses/.

Despite their growth, claims that MOOCs would revolutionize undergraduate postsecondary education have not yet come to fruition. MOOC course completion rates are extremely low; approximately 6 percent of those who start a course complete it. For those who start a course with the intention to finish, completion rates are a bit higher, at 22 percent.[89] This low completion rate may be due, in part, to who enrolls in the courses. Most MOOC users are already well-educated and may be browsing courses for specific information or enrichment. At least 70 percent of enrollees have one or more degree, and most students are between the ages of 25 and 40.[90]

Still, learners do seem to value the MOOCs they take. In 2015, Coursera surveyed 52,000 respondents who had taken MOOCs on the Coursera platform. Fifty-two percent of respondents indicated that career benefits were their primary reason for enrolling in a MOOC, and, of those, 33 percent reported

89. Based on a survey and log data from nine HarvardX courses. See Justin Reich, "MOOC Completion and Retention in the Context of Student Intent," *Educause Review* (December 8, 2014), http://er.educause.edu/articles/2014/12/mooc-completion-and-retention-in-the-context-of-student-intent. More promisingly, 85 percent of participants who took a MOOC through Microsoft, AT&T, or McKinsey & Company for professional development completed the course. See "State of the MOOC 2016: A Year of Massive Landscape Change for Massive Open Online Courses," Online Course Report (2016), http://www.onlinecoursereport.com/state-of-the-mooc-2016-a-year-of-massive-landscape-change-for-massive-open-online-courses/.

90. Ho, Chuang, Reich, et al., "HarvardX and MITx: Two Years of Open Online Courses."

that they had realized tangible career benefits. Slightly larger shares of respondents without bachelor's degrees reported these sorts of benefits.[91]

Intersections and Future Directions

As the initial excitement around MOOCs has died down, providers have also developed new strategies to make their offerings valuable. In 2014 and 2015, some MOOC providers began bundling courses into specializations or "nanodegrees." These course series result in a digital badge or certificate, which completers can display on social media and share with employers. They tend to be in high-demand areas that will help participants advance in their careers and increase their earning potential. For example, in a model that borrows from trade schools, industry certification programs, and bootcamps, Udacity works with prominent technology companies to develop and offer micro-credentials they call "nanodegrees" in fields like data science, programming, iOS, and Android development. Udacity also provides its learners with personalized career support, and offers a "premium" option with a job placement guarantee. Rather than charge by course or credential, Udacity charges premium subscribers $200–$300 monthly for unlimited access, and students can complete a nanodegree as quickly or slowly as they like.[92]

MOOC providers have also begun partnering with colleges and universities to offer portions of degree programs. Arizona State University's Global Freshman Academy (GFA), which had a soft launch in 2015, allows any student in the world to take freshman classes on the edX platform for $200 a credit (charged only after they pass the course). Students can take individual courses that count toward a degree, and if they finish a series of eight GFA courses, they earn full credit for their freshman year at ASU for roughly half the cost of the average annual in-state tuition at a public university. Students can go on to enroll as sophomores at ASU or transfer the credits to any institution that accepts ASU credits. Currently, financial aid is not available to GFA students, and the program is too nascent to have produced any reportable outcomes.[93] Similar programs exist at the graduate level, notably MIT's supply chain mas-

91. Chen Zhenghao, Brandon Alcorn, Gayle Christensen, Nicholas Eriksson, Daphne Koller, and Ezekial K. Emanuel, "Who's Benefiting from MOOCs, and Why," *Harvard Business Review* (September 22, 2015), https://hbr.org/2015/09/whos-benefiting-from-moocs-and-why; "Coursera Study Shows Positive Career and Educational Outcomes for Learners," Coursera Blog (September 22, 2015), http://coursera.tumblr.com/post/129636349192/coursera-study-shows-positive-career-and.

92. Dhawal Shah, "Udacity's Nanodegree Plus Comes with a Job Guarantee," Class Central (January 25, 2016), https://www.class-central.com/report/udacitys-nanodegree-plus-comes-job-guarantee/; "Nanodegree Programs," Udacity, https://www.udacity.com/nanodegree.

93. See "Global Freshman Academy," http://gfa.asu.edu/; Charles Huckabee, "Arizona State and edX Will Offer an Online Freshman Year, Open to All," *Chronicle of Higher Education* (April 23, 2015), http://www.chronicle.com/blogs/ticker/arizona-state-and-edx-will-offer-an-online-freshman-year-open-to-all/97685.

ter's degree program and Georgia Tech's online master of science degree in computer science.[94]

MOOCs are increasingly being recognized as alternative pathways to a degree. In October 2015, edX was approved as a provider by the ACE Alternative Credit project. As a result, students who pass approved courses on the edX platform can use them as transferable general education credits at participating colleges and universities.[95] StraighterLine, a provider of low-cost online courses developed by publishers, is also accredited by the ACE Alternative Credit project, as well as the Distance Education Accrediting Council, and its courses provide transferable credit to more than 100 colleges and universities.[96] StraighterLine has also partnered with the Dallas County Community College District to offer pathways to Associate of Science in Business and Associate of Arts in Criminal Justice degrees. The program, which was selected for an EQUIP partnership, costs $99 per credit (with materials) and allows students to complete up to 75 percent of their coursework by taking StraighterLine Courses.

COMPETENCY-BASED EDUCATION

In the broadest sense, competency-based programs offer an alternative pathway to a degree by awarding academic credit when students demonstrate competency in designated learning outcomes rather than when they pass courses that meet requirements for instructional time. Generally, one of two approaches to competency-based education is followed: a *credentialing* approach that awards students academic credit based on assessment of their prior learning, independent of the program; and an *instructional* approach, in which students are taught material on a more flexible schedule than that of traditional academic programs, with the aim of achieving the competency-based learning outcomes. In lieu of instructors, students are often guided through their learning by a coach or mentor. Programs that take the instructional approach culminate in certificates, associate's degrees, and bachelor's degrees, and the most common

94. Carl Straumsheim, "MIT's New Model," *Inside Higher Ed* (October 8, 2015), https://www.insidehighered.com/news/2015/10/08/massachusetts-institute-technology-launch-half-mooc-half-person-masters-degree; Carl Straumsheim, "Georgia Tech's Next Steps," *Inside Higher Ed* (April 27, 2016), https://www.insidehighered.com/news/2016/04/27/georgia-tech-plans-next-steps-online-masters-degree-computer-science.

95. The ACE Alternative Credit Project was launched in October of 2015, when ACE selected 111 free or low-cost courses offered by nontraditional providers to approve for credit recommendation at about three dozen institutions. See "ACE Picks Courses for Alternative Credit Project," *Inside Higher Ed* (October 22, 2015), https://www.insidehighered.com/quicktakes/2015/10/22/ace-picks-courses-alternative-credit-project.

96. Alison Dulin Salisbury, "EdX Stays Committed to Universities, Offering Credits for MOOCs," *EdSurge* (November 23, 2015), https://www.edsurge.com/news/2015-11-23-edx-buckles-down-to-offer-credit-for-moocs.

areas of study are business, education, health care, and engineering.[97] Many programs combine both credentialing and instructional approaches.

History

Though competency-based learning and credentialing are often characterized as innovative, they have a long history. Since the end of World War I, institutions have awarded credit for military training and experiences. After World War II and through the 1970s, institutions and coordinating organizations created standardized exams to award credit, such as the Advanced Placement (AP) program, which awards college credit for passing standardized exams based on high school course work, and the College-Level Examination Program (CLEP), which validates mastery of a subject through independent study, prior coursework, or out-of-class experiences.[98] Organizations such as the American Council on Education and the Council for Adult and Experiential Learning and the National College Credit Recommendation Service also began to review extra-institutional experiences and provide recommendations to colleges and universities on how to award credit.

Instructional programs that allow students to progress based on demonstrated competence rather than classroom time have also existed for decades. For example, in the 1970s, Empire State College and other institutions began to offer adult students "learning contract" programs in which remote students worked with a mentor to develop a personalized learning plan for their education. These plans specified learning objectives, assessment procedures, and learning activities, such as independent study, internships, correspondence courses, travel, or even face-to-face courses at another institution. Programs usually culminated in a bachelor's degree.[99] Western Governors University, which was founded in 1998, is often marked as the first modern competency-based institution to take a fully realized instructional approach.[100]

97. For a good overview of competency-based education and its broad definition, see Robert Kelchen, "The Landscape of Competency Based Education: Enrollments, Demographics, and Affordability," American Enterprise Institute Series on Competency-Based Higher Education (January 2015), https://www.luminafoundation.org/files/resources/competency-based-education-landscape.pdf. See also Cecilia Le, Rebecca E. Wolfe, and Adria Steinberg, "The Past and the Promise: Today's Competency Education Movement," Jobs for the Future (September 2014), http://www.jff.org/sites/default/files/publications/materials/The-Past-The-Promise-091514.pdf; Preston Cooper, "Mastering the Skills, Not the Clock," *US News* (February 17, 2016), http://www.usnews.com/opinion/knowledge-bank/2016/02/17/the-approaching-revolution-of-competency-based-higher-education.

98. See Kelchen, "The Landscape of Competency Based Education: Enrollments, Demographics, and Affordability"; "Facts about WGU"; "2900 Colleges and Universities," CLEP, The College Board, https://clep.collegeboard.org/search/colleges.

99. Kate Ford, "Competency-Based Education: History, Opportunities, Challenges," University of Maryland University College Center for Innovation in Learning and Student Success (October 24, 2014), https://www.umuc.edu/innovatelearning/upload/cbe-lit-review-ford.pdf; Cross, "An Introduction to Non-Traditional Education in the United States."

100. Ford, "Competency-Based Education: History, Opportunities, Challenges."

Overview of Current Providers

The credentialing approach to competency-based education is widespread in postsecondary education. Most colleges and universities accept credit for AP and International Baccalaureate tests, and 2,900 colleges and universities accept credit through CLEP.[101] Some online and traditional universities accept college credit through DANTES Subject Standardized Tests, which were developed by the U.S. Department of Defense for military members and families but are also available to other nontraditional students.[102] In addition, the American Council on Education's College Credit Recommendation Service provides recommendations to 2,000 colleges and universities on how to award credit for more than 35,000 nonuniversity courses, exams, apprenticeships, and other forms of nontraditional training. The National College Credit Recommendation Service translates training and education programs into college credit equivalencies for 1,500 postsecondary institutions.[103]

The instructional approach is far less common. According to one study with strict definitional criteria, at least 34 schools offer self-paced programs.[104] Some institutions, such as Western Governors University, offer only competency-based programs, while other institutions offer these along with traditional programs. These include Southern New Hampshire University's College for America, Capella University, and the University of Wisconsin's UW Flexible Option. Tuition models also vary across schools and programs. Western Governors University offers a buffet model in which students pay a flat, six-month fee to take as many subjects (and assessments) as they want. In most other programs, students pay on a per credit basis. Because of this variation and deviation from the credit-hour model, competency-based programs require exemptions from the standard rules to be eligible to receive federal financial aid.[105]

Other programs that take the instructional approach incorporate competency-based elements into their curricula but maintain the traditional seat-time model and credit-hour structure, so they are self-paced only within a traditional term and are eligible for aid. Using this broader definition, Eduven-

101. See Kelchen, "The Landscape of Competency Based Education: Enrollments, Demographics, and Affordability"; "Facts about WGU"; "2900 Colleges and Universities." CLEP, The College Board, https://clep.collegeboard.org/search/colleges.

102. "Earning College Credit with DANTES Subject Standardized Tests," eLearners, http://www.elearners.com/military-friendly-colleges/earning-college-credit-with-dantes/. Other competency-based assessments that can be used for credit include the Excelsior College Examination Program and Thomas Edison Exam by Credit program, both of which can be used for transfer credit outside of these institutions.

103. See "The ACE CREDIT College and University Network," American Council on Education, http://www.acenet.edu/news-room/Pages/The-ACE-CREDIT-College-and-University-Network.aspx.

104. Kelchen, "The Landscape of Competency Based Education: Enrollments, Demographics, and Affordability"; "Facts about WGU."

105. Kelchen, "The Landscape of Competency Based Education: Enrollments, Demographics, and Affordability."

tures counted 150 programs that incorporated some sort of competency-based framework, serving as many as 200,000 students (up from 50,000 in 1990).[106]

Perhaps because of their flexibility and recognition of prior learning, competency-based programs are particularly popular among older learners. At nine institutions closely analyzed in a 2015 American Enterprise Institute report, 38 percent of students were between the ages of 25 and 34, and 40 percent were between the ages of 35 and 49. Only 1 percent of enrolled students were first-time, full-time undergraduates, and 26 percent received Pell Grants. However, because not all degree programs at these institutions are eligible to receive financial aid, Pell Grant eligibility may be a poor measure of low-income student enrollment for these types of programs.[107]

Little data are available on outcomes for competency-based education programs. At the nine institutions analyzed in the American Enterprise Institute report, average six-year completion rates were 17 percent—more than 40 percentage points lower than the national average six-year completion rate for first-time, full-time undergraduates at Title IV schools. Of course, this compares two poorly matched groups, and completion rates vary by institution. For example, Western Governors University reports that among the 86 percent of students at the university who are 25 or older, just under 37 percent graduate within six years. This is about 10 percentage points higher than the national graduation rate for the age group.[108]

Future Directions and Intersections

One major obstacle to the expansion of competency-based programs is the fact that federal financial aid typically cannot be used for programs or assessment fees. The buffet-style tuition pricing model offered by institutions like Western Governors University holds promise for motivated students but penalizes those who move too slowly through their courses, which is common for adult learners who take online courses.[109]

However, these restrictions are slowly beginning to erode. In 2005, Congress included a "direct assessment" provision in its reauthorization of the Higher Education Act, which allows programs that use direct assessment to measure competencies to be eligible for federal financial aid (however, programs are eligible only if they translate competencies into credit hours on a student's transcript).[110] More recently, as part of an experimental sites initiative

106. Brian Fleming, "Mapping the Competency-Based Education Universe," Eduventures (February 17, 2015), http://www.eduventures.com/2015/02/mapping-the-competency-based-education-universe/.

107. Ibid.

108. See "WGU's Graduation Rates," Western Governors University, http://www.wgu.edu/tuition_financial_aid/brief_guide#.

109. For a more robust analysis of costs, see Kelchen, "The Landscape of Competency Based Education: Enrollments, Demographics, and Affordability."

110. Stephen R. Porter, "Competency-Based Education and Federal Student Aid," Competency-Based Education Network (March 2014), http://www.cbenetwork.org/sites/457/uploaded/files/Competency_Based_Education_and_Federal_Student_Aid.pdf.

in 2014, the U.S. Department of Education selected 40 colleges and universities to receive waivers from aid eligibility rules as they experimented with competency-based education and prior-learning assessment. Many of these colleges were part of a Lumina Foundation–funded group called the Competency-Based Education Network, which also provides resources to institutions to help them meet the requirements for receiving aid.[111]

Other institutions continue to work within the credit-hour framework while borrowing elements of curriculum design from direct assessment and other competency-based approaches. For example, the University of Maryland University College (UMUC) is redesigning its entire curriculum with a competency-based framework, so that each program will cohere around employer-informed competencies, learning activities, and assessments. UMUC is also prototyping a competency-based transcript to better match this academic model, and is experimenting with ways to incorporate self-paced options within the constraints of the semester. Similarly, in redesigning remedial math and English courses, many community colleges, including most schools within the North Carolina Community College System, have broken course content into one-unit modules through which students progress at their own pace.[112]

Finally, institutions are starting to work in a coordinated fashion to establish competencies—rather than the credit hour—as the currency of transfer.[113] The Lumina Foundation has outlined a framework for "connecting credentials" across multiple institutional contexts, and funds initiatives that translate various credentials into a common set of competencies.[114] A group of community colleges recently began an initiative called "Right Signals" that is implementing Lumina's credentials framework to recognize and verify the multiple experiences and credentials with which many of their students matriculate.[115]

111. Paul Fain, "Experimenting with Competency," *Inside Higher Ed* (January 13, 2015), https://www.insidehighered.com/news/2015/01/13/feds-move-ahead-experimental-sites-competency-based-education.

112. See Jessie Brown and Deanna Marcum, "Serving the Adult Student at University of Maryland University College," Ithaka S+R (June 9, 2016), http://www.sr.ithaka.org/wp-content/uploads/2016/06/SR_Case_Study_Serving_Adult_Student_UMUC_060916.pdf; Jessie Brown and Richard Spies, "Reshaping System Culture at the North Carolina Community College System," Ithaka S+R (September 10, 2015), http://www.sr.ithaka.org/wp-content/uploads/2015/09/SR_Case_Study_Reshaping_System_Culture_North_Carolina_Community_College_System091015.pdf.

113. Amy Latinen, "Cracking the Credit Hour," Competency-Based Education Network (September 2012), http://www.cbenetwork.org/sites/457/uploaded/files/Cracking_the_Credit_Hour_Sept5_0.pdf.

114. "Connecting Credentials: A Beta Credentials Framework," Lumina Foundation (June 11, 2015), https://www.luminafoundation.org/resources/connecting-credentials.

115. "The Right Signals Initiative," American Association of Community Colleges, http://www.aacc.nche.edu/Resources/Pages/right_signals.aspx. For more information on the project guidelines, see "Request for Proposals: The Right Signals Initiative," American Association of Community Colleges, http://www.aacc.nche.edu/Resources/Documents/Right_Signal_RFP2.pdf.

Conclusion

Alternatives to the traditional degree program are far from monolithic. For the most part, labor market training, skills-based short courses, and providers of MOOCs offer alternative credentials to the traditional bachelor's or associate's degree, while competency-based education programs provide alternative pathways to a degree. In all of the categories, programs can last from a few months to several years, can take place within or outside traditional academic institutions, and can deliver training via in-person instruction, online-instruction, hands-on work, or a mixture of modalities. Eligibility for financial aid also varies widely, and while the Department of Education has experimented with expansions in recent years, it has also tightened restrictions, especially for the for-profit sector.

Furthermore, the providers we discuss in this paper vary in terms of the demographic groups they serve. Certificate, work-based training programs and competency-based education programs tend to serve more adult learners who are from low-income backgrounds and have not previously earned a postsecondary credential. MOOCs and coding bootcamps, however, typically cater to more-advantaged individuals with bachelor's degrees or higher.

While each of these alternatives has roots that reach back decades if not longer, for a number of reasons, alternatives have increased in size, diversity, and importance in recent years, and are likely to continue to grow. Though the length and cost of alternative programs vary, most last for less than two years and cost significantly less than a four-year degree, the cost of which continues to rise rapidly. MOOCs and competency-based degrees deliver instruction online, and certificate programs can offer online or blended options, adding flexibility that not all traditional programs provide. A characteristic feature of all the programs discussed is their flexibility to align directly with specific employer needs and competencies in skill-based fields.

Despite these reasons for their appeal and likely growth, evidence of the efficacy and value of these alternatives—for students and taxpayers—is still thin. Robust data on many programs' features, cost, enrollment, and outcomes are simply not available, and the few programs for which there are data have not been rigorously assessed. Unfortunately, some of the evidence that does exist is not promising. MOOC completion rates hover around 5 percent, and completion rates for certificate programs are substantially lower than they are for bachelor's degree programs. Earnings premiums for certificate holders vary significantly by field, with the most common fields offering the lowest earnings. Additionally, men consistently reap larger benefits from these programs than women do.

Furthermore, many of these alternatives are offered by a segment of providers —for-profit postsecondary institutions—that has historically contained many

bad actors. Some for-profit providers—including many of those discussed in this paper—have admirable records of offering thoughtfully designed, high-quality programs. But a disappointingly large number of for-profit providers have taken advantage of students by charging high prices, delivering poor outcomes, and making inflated claims about earnings and job placement. Until recently, negative consequences for this type of behavior have been few, even for providers that participate in the federal financial aid system and are therefore subject to oversight and accreditation. That many alternative programs operate outside any system of quality assurance is also a cause for concern.

In light of this analysis, we recommend that policy-makers, funders, and the higher education community pursue three high-level strategies to improve consumer information and evidence about, access to, and quality control of alternative programs and credentials:

- First, adjust quality assurance processes to allow for accurate and comparable evaluation of alternative programs, robustly enforce quality standards for all providers, and accelerate the process of integrating quality alternative pathways and credentials into the federal financial aid system.
- Second, invest in a more comprehensive data system that captures longitudinal, student-record data on students' experiences across the full array of postsecondary pathways, as well as information about providers and their programs and credentials.
- Finally, support rigorous research on the efficacy and return on investment of existing and emerging alternative pathways and the value of alternative credentials.

Specific vocational skills have a shelf life. Some observers envision a world in which adults will respond to fluctuating economic pressures and employer needs by continually retooling their skill set through just-in-time, targeted, degree alternatives. To some extent, MOOCs and coding bootcamps are already delivering this benefit. Yet employers routinely report that advancement in management, creative, and professional roles requires not only ongoing skill development but also critical thinking, communication skills, and adaptability. These more general professional competencies are rarely the focus of short-term skills-focused programs but are (or should be) the domain of degree programs.

Therefore, amid the increasing dis-integration of postsecondary education into modular components, there is a continuing need for integration—what Georgetown University's Randy Bass calls the "rebundling" after the "unbundling."[116] We anticipate a future in which more opportunities exist to undertake and validate informal learning and accumulate targeted skills through the kinds of alternatives we describe. At the same time, these credentials will be more

116. Goldie Blumenstyk, "Why Georgetown's Randy Bass Wants to 'Rebundle' College," *The Chronicle of Higher Education* (May 25, 2016), http://www.chronicle.com/article/Why-Georgetowns-Randy-Bass/236592.

clearly and easily linked with academic coursework and degree pathways, as well as with the competencies these longer programs help their students develop.

Our review provides evidence that this rebundling, and the development of policies and structures that support it, is already underway. Some postsecondary institutions have created pathways for students to stack short-term credentials into degrees. Partnerships between employers and educational institutions integrate academic and vocational training, often leading to credentials from both sectors. And through the EQUIP program, the federal government is experimenting with providing aid for learning that takes place in bootcamps, MOOCs, and other alternatives, under the oversight of an accredited institution and an outcomes-focused quality assurance entity.

While these developments represent a change in course, they do not (yet) fulfill predictions that degrees and degree programs will be displaced by alternative providers. To the contrary, we expect degree programs to continue to evolve to live alongside these alternatives, to incorporate some of their most useful features, and to provide additional means to recognize, integrate, and perhaps bolster the learning opportunities they provide.

Contributors

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The American Academy's Commission on the Future of Undergraduate Education

Undergraduate education is one of the most important avenues of opportunity in American society, though the landscape is changing rapidly: there are more options than ever before for how and when Americans receive some form of a college experience. New populations of students attend nonprofit public and private colleges and universities as well as for-profit institutions to earn bachelor's and associate's degrees and certificates through face-to-face, online, and hybrid courses. Students of all ages study part time or full time, often at multiple institutions according to schedules that fit their lives. At the same time, emerging opportunities outside of the traditional boundaries of colleges and universities are responding increasingly to learner's needs, blurring the lines across postsecondary educational providers and student learning opportunities.

To address these topics and provide ideas for ensuring that individual Americans receive the education they need to thrive in the twenty-first century, the American Academy of Arts and Sciences, with generous funding from Carnegie Corporation of New York, established the Commission on the Future of Undergraduate Education. The Commission, which includes national leaders in education, business, and government, is studying how well students are being served by today's higher education models and identifying the challenges and opportunities that higher education will encounter in the decades ahead.

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