RUTGERS EDUCATION AND EMPLOYMENT RESEARCH CENTER

NON-DEGREE CREDENTIAL QUALITY:

A CONCEPTUAL FRAMEWORK TO GUIDE MEASUREMENT

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JULY 2019

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ACKNOWLEDGEMENTS

The authors would like to thank the many people who contributed to this paper. We appreciate the feedback and thoughtful comments from colleagues through Lumina's Task Force for Credential Quality and the Non-Degree Credentials Research Network. At EERC, Laura Barrett-Hansen, Tracy Cangiano, and Victoria Coty skillfully provided research support through various phases of the project, and Angel Butts of The Word Angel LLC provided excellent editorial assistance. The authors are solely responsible for any errors.

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INTRODUCTION

Non-degree credentials are an increasingly prominent feature of America's credential landscape. Recent data show that more than one quarter of Americans hold a non-degree credential and that these credentials have become more prevalent over the last 15 years.[1] Despite their rising popularity, the environment in which these credentials are developed and awarded is a bit like the wild west. Non-degree credentials include a wide range of awards including credit and noncredit certificates; industry certifications; occupational licensure; apprenticeships; and badges and microcredentials.[2] Non-degree credentials offer the potential to develop and document skills and competencies needed to navigate today's ever-shifting technological, social, economic, and regulatory environments. But the diverse array of credentials makes it incredibly difficult for both students and employers to compare and assess the quality of any given program.[3] There is no single set of standards, no mechanism or system to help workers, employers, policymakers, and educational institutions to define quality or to measure it.[4] As a result, confusion about non-degree credentials and their quality reigns.

Many stakeholders would benefit from the clearing of that confusion. Potential credential earners – i.e., workers and students – need to understand the quality of non-degree credentials to make informed decisions about how to spend their time and money. This need is particularly acute for those historically underserved by higher education who may not have access to information to help discern which non-degree credentials are valuable investments. At the same time, state entities need to be able to recognize quality in order to wisely invest federal and state dollars in the training and education programs that are most likely to lead to employment in good jobs and a pathway to further education.[5] Employers also need the ability to assess the quality of credentials during hiring so they can employ individuals with the right set of skills, and educators need data on quality to consider how various credentials fit and/or stack into their educational pathways.[6] Defining quality across the range of non-degree credentials has also become important to policymakers as the country works to increase the attainment of postsecondary education.[7] Given the various needs of these stakeholders – students, employers, educators, and policymakers – the following paper explores the issue of understanding and assessing the quality of non-degree credentials.

The potential for non-degree credentials to both promote equity and reinforce existing inequities is a central component of our examination. Quality non-degree credentials have the potential to facilitate social mobility by acting as clear markers of competency that should be rewarded with valuable outcomes; however, low-quality non-degree credentials have the potential to perpetuate or even worsen inequality. Further, credentials that are unknown or are not rewarded in the marketplace pose the danger of offering false promises and causing people to squander scarce resources including time and money.[8] We have written this paper with an equity lens due to the importance of quality to ensuring equity in non-degree credentialing.

With equity concerns in mind throughout, we focus the paper that follows on three key questions:

- How can quality be conceptualized for non-degree credentials?
- What are possible measures of quality for non-degree credentials?
- How can stakeholders better measure and promote quality in non-degree credentials?

We begin the paper with a brief review of non-degree credentials and their defining characteristics. We then present a conceptual model of non-degree credential quality to illustrate the wide breadth of potential elements of quality. Based on this model, we suggest potential measures of quality. Finally, we provide recommendations for policy, practice, and further research, targeted to specific stakeholder groups, that build on existing systems.

DEFINITION AND PREVALENCE OF NON-DEGREE CREDENTIALS

Non-degree credentials include a wide array of credentials beyond academic degrees conferred by accredited educational institutions.[9,10] These include short- and long-term for-credit certificates; noncredit certificates; industry certifications; occupational licensure; apprenticeships; and badges and other emerging microcredentials. The National Center for Education Statistics' (NCES) Interagency Working Group on Expanded Measures of Enrollment and Attainment (GEMEnA) has established a working definition of non-degree credentials with the goal of creating more standardization in the discussion and measurement of these credentials.[11] We use the GEMEnA standards as our primary guide for defining non-degree credentials and align our analysis with other major reviews on the topic.[12] In addition, we briefly address digital badges and microcredentials as more recent additions to the credential landscape. Table 1 provides an overview of the definitions we used to categorize non-degree credentials in the following research.

TABLE 1: DEFINITIONS OF SIX CATEGORIES OF NON-DEGREE CREDENTIALS

TYPE	DEFINITION
SUB-BACCALAUREATE FOR-CREDIT CERTIFICATE	Credential awarded by an educational institution for completion of a sub-baccalaureate credit-bearing educational program. Usually less than one year in length.
NON-CREDIT CERTIFICATE	Credential awarded by an institution (educational or workplace) for completion of a noncredit educational program. This includes bootcamps and military and employer training programs with clearly articulated learning outcomes.[13]
INDUSTRY CERTIFICATION	Credential awarded by an industry body or governmental agency for demonstration of skills, typically via examination, based on industry or occupational standards.
OCCUPATIONAL OR PROFESSIONAL LICENSURE	Credential awarded by a state or federal governmental agency for demonstration of skills in a specific occupation. Sometimes awarded for completion of an educational program. Often requires work experience in an occupation.
APPRENTICESHIP	Credential awarded after completion of structured educational and workplace program based on industry and occupational standards.
BADGES & OTHER MICROCREDENTIALS	Credential awarded for completion of a short program of study or for demonstration of a targeted set of skills. These are newly emerging.

As is clear in Table 1, non-degree credentials vary widely, but they generally share one common feature: They seek to document competencies. Some document learning that occurs in settings outside of the formal accredited education system, including experience in the workplace or knowledge gained through independent study.[14] Non-degree credentials are awarded by various organizations, including educational institutions, industry groups, occupational groups, workplaces, the military, unions, and the government. They are awarded based on a variety of criteria including course completion, competency demonstration, work experience, and examinations.

Until recently, little data existed on the incidence of non-degree credentials. To address this gap, the GEMEnA working group at NCES has added questions about "credentialing of education and training for work," including more questions about non-degree credentials, to national surveys.[15] As a result of these efforts, the recent fielding of the Adult Training and Education Survey (ATES), part of the National Household Education Survey Program, sought to document the prevalence of non-degree credentials in the United States. For the purposes of that study, non-degree credentials were defined as educational certificates, professional and industry certifications, and occupational licenses.[16] The survey found that in 2016, over one quarter (27 percent) of adults held a non-degree credential. The ATES also examined the incidence of different types of non-degree credentials and compared them with respondents' educational level. Of the 27 percent of adults who held a non-degree credential, 8 percent had a postsecondary certificate; 18 percent had a license; and 6 percent had a certification. Licenses and certifications were found to be more commonly held by adults with more education – 48 percent of adults with a graduate or professional degree had a license or a certificate compared to 5 percent of adults with less than a high school education. The ATES survey findings confirmed those from the 2008 fielding of the nationally representative Survey of Income and Program Participation (SIPP), which included a module with questions about non-degree credentials using the GEMEnA definition.

NON-DEGREE CREDENTIAL QUALITY AND ITS MEASUREMENT

Non-degree credential quality is a complicated concept comprised of multiple distinct elements. To help make sense of this complexity, we offer a conceptual model designed to help us, first, to articulate and define the elements of credential quality, and then to identify existing and potential measures of quality. The following four elements of credential quality are distinct from each other, and understanding each one is important to understanding the overall concept:

Credential Design

This element includes numerous features, usually decided on by the credential grantor, that define what a credential represents in terms of the competencies it marks and how it seeks to do so. Credential design is a fundamental element of quality.

Competencies

These are the skills and knowledge that the credential aims to represent. A well-designed credential is expected to result in an individual's acquisition of a set of competencies.

Market Processes

This term refers to the ways that a credential comes to be recognized and have currency in the world, which are based on the competencies it marks. Market processes are an essential but often overlooked element in understanding the quality of non-degree credentials.

Outcomes

The accumulation of competencies represented by credentials are expected to generate outcomes of value, typically in terms of the educational, employment, and social advancement of individuals, employers, and society.

Figure 1 summarizes these four distinct elements of non-degree credential quality and provides a conceptual framework for the examination that follows. A simplistic model of non-degree credential quality operates on the assumption that a well-designed credential leads to individuals with a desired set of competencies who go on to achieve positive outcomes. However, as many who seek to understand how credentials operate already know, credential quality is more complicated in the real world due to the vastly confusing credentialing landscape, with its many forms of credentials and their frequent lack of transparency, and the many race- and gender-based inequities that exist within it. Since non-degree credentials are often new and therefore do not have established meanings, their market processes are particularly important in order to ensure that a well-designed credential and an individual with the desired set of competencies leads to outcomes of value.

While recognizing that credentials exist in a broader societal context that influences how they are offered, and that credentials are offered by institutions that have their own elements of quality, this model focuses on the credential itself and its elements of quality. These broader societal and institutional elements are important but are addressed in other areas (for an example, see the Credential Quality Initiative report).

FIGURE 1: CONCEPTUAL MODEL OF NON-DEGREE CREDENTIAL QUALITY

CREDENTIAL DESIGN

- Content relevance
- Instructional process
- Assessment process
- Stackability and portability
- Transparency
- Accessibility and affordability

COMPETENCIES

- Demonstrated competencies including general knowledge, specialized skills, personal skills and social skills

MARKET PROCESSES

- Awareness of credential and/or credential granter
- Endorsements and validations
- Organizational policies and practices
- State regulations
- Employer hiring policies and practices
- Educational institutions' recognition of learning

OUTCOMES

INDIVIDUAL

EMPLOYMENT

- Job attainment
- Promotion
- Wage gains
- Retention

EDUCATIONAL

- Stacking of additional credentials
- Completion of academic degree(s)

SOCIAL

- Inproved health and well-being
- Greater civic Involvement
- Intergenerational benefits

SOCIETAL

EMPLOYER

- Employee pipeline
- Better retention
- Higher skills and productivity
- Increased diversity

SOCIETY

- Better public safety
- Increased efficiency
- Reduced inequality
- More civic engagement

The purpose of this paper is to construct a common framework to conceptualize non-degree credential quality. In the following sections, we propose four elements of quality and discuss each of them in turn, keeping our lens focused on their equity implications. We discuss each element's components, provide a brief overview of what is known about it in the existing research literature, and present potential measures for it. While we briefly touch on these quality measures, ongoing work is needed to fully develop a standard of measures for determining non-degree credential quality and for examining their use in creating entry ramps onto career pathways and into the marketplace.

CREDENTIAL DESIGN

Credential design includes many factors that affect quality and their implications for equity. Some existing frameworks begin to map these out as they relate to credential quality. The American Council on Education's (ACE) Quality Dimensions for Connected Credentials, for example, provides a helpful framework that we draw from, but because that study focuses on credential quality broadly, we modify it to capture the unique aspects of non-degree credentials.[17] Our conceptualization of non-degree credential design includes: competency relevance; instructional processes; assessment processes; stackability and portability; transparency; accessibility and affordability; and enrollment criteria. Many of these design components are established at the time a credential is created, some are updated over time, and some are subject to the implementation of the credential. We discuss each of these components of non-degree credential design and their potential quality measures below.

Competency relevance

A foundational element of non-degree credential quality is how well its content aligns with workplace needs and other educational pathways – in other words, the relevance of the competencies the credential represents. From an employment perspective, this can be examined in two ways: by the alignment of the skills and competencies reflected in the credential and by the numbers of opportunities typically available to individuals with this credential in the job market.[18] Content is well aligned with skills and competencies when the curriculum or assessment reflects current labor market needs based on industry standards (as with industry certifications), occupational standards (as with occupational licensure), or both (as with apprenticeship).[19] It is crucial that its content is updated regularly to maintain market alignment over time. In addition, relevance also refers to a credential's alignment with job opportunities.

CREDENTIAL DESIGN

The projected labor market demand for the competencies reflected by the credential is an important consideration in the credential design process to ensure that the credential will lead to employment opportunities for its holders. In short, it is important to demonstrate that the credential is in demand. In addition to relevance for employment, content is well aligned with educational pathways when the curriculum includes competencies that meet current standards for learning and, therefore, can lead to continued education and long-term advancement opportunities for credential holders. Existing competency frameworks can help make competencies explicit to guide this process.[20] Competency relevance can be measured by determining the extent to which the following statements are true:

- Industry is involved in the creation of curriculum or examinations.
- Ongoing processes ensure continued industry engagement.
- Review of labor market data indicates a need for the credential.
- Credential grantor or an external entity conducts post-design reviews of curriculum or examination to ensure alignment with industry and occupational standards.
- Educational actors are involved in the design of curriculum to ensure alignment with educational pathways.

Instructional process

For non-degree credentials with an educational component, such as noncredit certificates or apprenticeships, effective teaching and learning techniques that meet the educational needs of all students regardless of their background are an important element of quality. Inclusive teaching and learning practices can be applied to the instruction related to non-degree credentials to ensure that all students can fully access the learning benefits.[21] Traditional accreditation practices, particularly those focused on improvements in relevance and those aimed at developing student-focused teaching strategies, can also inform the review of instructional practices.[22] Apprenticeships, particularly registered apprenticeships, often have standards of quality that guide instruction.[23] Instructional processes can be measured by determining the extent to which the following statements are true:

- Instruction is tailored to the needs of all students to develop industry-specific skills.
- Instructors are up-to-date in their knowledge of occupational competencies.

Assessment process - initial and ongoing

It is essential that any assessment resulting in the awarding of a non-degree credential has predictive validity – that it measures what it is intended to predict – and that it operates fairly across all students, ensuring they are equitably assessed. This is particularly true with regard to non-degree credentials that are awarded based on a test. Standardized tests are common for industry certifications and occupational licensure and can include hands-on, competency-based exams or written or online tests to assess conceptual knowledge and its application.[24] Such assessments must be constructed carefully to ensure they avoid bias.[25] Additionally, non-degree credentials may have mechanisms built into them to ensure that holders maintain and demonstrate their competency over time. Often there are requirements for continuing education – to maintain occupational licensure,[26] for example – and many industry certifications and licenses are time-limited. Holders of those credentials must provide evidence that they are up-to-date with competencies if they are to remain in good standing. Assessment processes, both initial and ongoing, can be measured by determining the extent to which the following statements are true:

- Assessments measure the skills and competencies they are intended to measure.
- Passing the required assessments indicates that the credential holder has the competencies the credential is intended to represent.
- Assessment processes treat all students fairly and accommodate the needs of diverse learners.
- Continuing education is required and appropriate.
- A renewal process exists to maintain the credential.

Stackability and portability

With the growing recognition of the importance of career pathways, whether the non-degree credential can be stacked or latticed with other credentials is an important indicator of quality. Similarly, non-degree credentials must be portable. A credential is portable when it is widely recognized by educational institutions and allows the credential holder to move along an educational pathway.[27] It is also portable when it is widely recognized by employers in the associated industries and across geographic locales, allowing the credential holder to change jobs and possibly advance in their career.[28] This strengthens the credential holders' ability to find employment by broadening their options. Stackability and portability can be built into the design of a credential, ensuring connections to further educational pathways and to employment opportunities that promote long-term career advancement for all credential holders. Non-degree credentials can also be embedded into academic credentials.[29]

Ensuring that all non-degree credentials lead to further education is of particular value to historically underserved individuals and is essential to promoting equity. An important, related indicator of a non-degree credential's quality design is its modularity, or whether it has value on its own independent of other credentials. Stackability and portability can be measured by determining the extent to which the following statements are true:

- It can be added or "stacked" with other credentials to advance along a pathway, either in terms of education or employment.
- Its acceptance by employers was a central consideration in its design.

Transparency

When a non-degree credential is designed with transparency in mind, information about the competencies it represents is clear and made readily available to consumers and other stakeholders by the credential grantor.[30] Similarly, transparency calls for grantors to make available explicit information about the standards used to award their credentials, and it requires that information to be released in a way that allows for comparisons with other non-degree credentials.[31] Lack of transparency is a broad concern across all types of credentials, but especially non-degree credentials. When transparency is not present, non-degree credential holders can be prevented from realizing their full value despite making good-faith investments of time and resources to earn that award.[32] Particularly for historically marginalized individuals, making sure that these credentials are recognized and understood is essential to ensuring they lead to valuable outcomes that can counter existing forms of bias, particularly in employment. Transparency can be measured by determining the extent to which the following statements are true:

- The credentialing body provides information on specific competencies and outcomes to credential seekers, employers, and other stakeholders.
- The credentialing body provides information on how competencies are assessed to credential seekers, employers, and other stakeholders.

Accessibility and affordability

The accessibility of non-degree credentials – whether diverse populations of students can afford and complete them – is an important consideration. The first barrier to accessibility is cost. Some non-degree credentials include the cost of an examination, which can vary widely depending on the test, and others may include classroom-based training that can also range in cost. With very limited exceptions, the vast majority of non-degree credentials share in common that they are not included in federal financial aid funding, though modest funding is available through WIOA, Perkins, and American Apprenticeship Grants.[33,34] The lack of access to federal funding poses a barrier to enrollment, making embarking on an education pathway a greater risk; unfortunately, the same individuals who have traditionally been marginalized by the education system are disproportionally affected by this restriction.

Potential roadblocks to accessibility do not end with affordability; other issues to consider include whether non-degree credentials are equally accessible in terms of when instruction and assessments are scheduled, their location and outreach strategies, the overall approach of any support programs and systems in place to help people successfully attain them, and the overall climate for diversity.[35] The general openness of non-degree credentials to students and employees at various levels of education provides opportunities for many individuals to pursue career and educational advancement. Some non-degree credentials, like occupational licensures, may require an academic credential or the completion of a training program in addition to passing an exam. Others, such as for-credit certificate programs at community colleges, sometimes require students to demonstrate college-level proficiency, or to pass one or more remedial courses, in reading and math.[36] It is important that these requirements be relevant and appropriate for access to the non-degree credentials, and not exclusionary.

Measures of affordability and accessibility must begin by considering the overall cost of completing the non-degree credential. But other dimensions of this element should also be considered; these can be measured by determining the extent to which the following indicators are true:

- Financial aid or support, through public or private sources, is available to all students who need it, regardless of gender, race, or ethnic identity.
- Scheduling and support services are available to support completion.
- Location and outreach strategies are responsive to racially and ethnically diverse learners.
- Enrollment criteria are relevant and appropriate.

COMPETENCIES

Given that the essential stated function of a credential is to serve as a marker that its holder possesses a certain set of competencies, whether a credential's holders actually possess those competencies is an essential element of its quality. Further, if a credential is well-designed and well-executed, it would define those competencies and provide a mechanism to identify and measure them in their holders. Understanding the relationship between competencies and credentials is relatively simple. Understanding how to assess the quality of that relationship, however, is fraught with multiple challenges. Determining how competencies are to be measured is only the first challenge. Another challenge involves making sense of instances where credential holders vary in their competencies. They may hold some but not all competencies that the credential intends to mark. The current competency-based education reform efforts support the position that all competencies must be met before a credential can be awarded.[37]

Reaching a clear understanding of the competencies to be expected in a non-degree credential holder and what constitutes quality is an important step in outlining credential quality. For example, as noted earlier in this section, the ability of a non-degree credential to represent the competencies it claims to represent is an essential element of quality – both for employers, who need to know that potential employees have the skills they will need to perform their duties, and for credential holders, who have invested their time and resources in attaining a credential that is meaningful and can help lead them to their short- and long-term goals. It is not surprising, then, that academic programs are increasingly focused on articulating the learning outcomes of the credentials with which they are associated.[38] Non-degree credentials such as industry certifications and occupational licensure represent competencies that are assessed by their related examinations. These assessments are typically not overseen by an external entity or standard that provides quality assurance. Similarly, other non-degree credentials offered through more structured educational settings, like noncredit certificates, often do not have standard assessment protocols because most operate outside of traditional accreditation oversight.

COMPETENCIES

The measurement of competencies can be difficult at a large scale. Approaches that provide in-depth direct measurement of competency, such as formal assessment of skill based on hands-on observation, can be time intensive. Tests can be used to assess competencies but must be evaluated for fairness and for their ability to fully measure credential holders' knowledge and abilities (see previous discussion on assessments). For credentials based in educational programs, instructors may conduct their own assessment of their students' competency, but since such assessments are not external to the award of the certification, it is possible to question their reliability. Individuals may assess their own competency, but such assessments are limited based on students' self-knowledge. The question of how best to measure quality in terms of the actual competencies is not easily resolved, but efforts are currently under way that center on developing better strategies to assess learning fairly among all credential holders.[39]

Based on Connecting Credentials' beta Credentials Framework,[40] the quality of a non-degree credential can be measured by the extent to which, using appropriate and equitable assessment tools, its holders are able to demonstrate mastery of:

- A body of general knowledge within the field of study – in terms of a set of facts, principles, theories, and practices.
- A set of specialized skills including critical thinking and judgement, integrative application, and systems thinking.
- The personal skills required to succeed, including autonomy, responsibility, self-awareness, and self-reflectiveness.
- The social skills required to succeed, including good communication, involvement, teamwork, and leadership.

MARKET PROCESSES

Market processes are an essential but often overlooked element of non-degree credential quality. At the most basic level, a quality non-degree credential must be well-designed, and individuals who earn the credential must hold the competencies associated with that credential. However, good design and expected competencies are not enough to ensure that positive outcomes are achieved. When the design process is complete, and the non-degree credential reaches the public, it becomes subject to market processes: People develop ideas about it, organizations assess it, and it is used (or not) by employers, educational institutions, and others. This market process is an important component in yielding outcomes of value for individuals, employers, and society. If a non-degree credential is to provide access to valuable outcomes that individuals from historically marginalized groups would not otherwise have access to, it must be designed and administered in a way that ensures these market processes operate fairly and effectively. Market processes involve a complex set of interactions between the following influences: efforts to promote transparency; awareness of the credential and/or credential-granting organization; endorsements and validations; state regulation; employer hiring policies and practices; and educational institutions' recognition of learning. In this section, we discuss each of these influences in turn.

Transparency initiatives

While individual credentials can be designed with transparency in mind (as discussed previously), larger initiatives exist that go beyond individual credentials and institutions to promote the transparency of credentials more broadly, including non-degree credentials. The Credential Registry is one significant effort to take existing credentials and make their content much more transparent.[41] Other efforts include Consumer Report Cards, Scorecards, and the Eligible Training Provider list.[42] The Job Data Exchange helps employers better convey their skill needs to consumers and education providers.[43] These resources are discussed further in the next section. The quality of a non-degree credential can be measured by the extent to which the following statements about its post-design transparency are true:

- Mechanisms are in place to provide information to potential consumers about the competencies represented by the credential.
- Mechanisms are in place to provide information to potential employers and other stakeholders about the competencies represented by the credential.

MARKET PROCESSES

Awareness of the credential and/or the credential grantor

How key stakeholders, including employers, educational institutions, policymakers, and the public at large, perceive non-degree credentials and the institutions that grant them is an important component in how these credentials lead to outcomes of value. These stakeholders may develop their perceptions based on the credential grantor's reputation or through direct interactions with credential holders who possess particular competencies. Employers may have preconceived ideas about the competencies credential holders possess and how well they think those competencies align with the ones they are looking for in potential workers.[44] Similarly, stakeholders at educational institutions may have perceptions of the competencies that are included in credentials granted by other parties and how they align with their own requirements in terms of stackability. Additionally, stakeholders' awareness and trust in the credential-granting organization is based on the organization's authority and accumulated reputation.[45] These stakeholder perceptions about the credential grantor can play a fundamental role in creating meaning for the credential itself, which poses particular challenges for non-degree credentials that are newer or not as well-established – and, potentially, those who hold them. Measures of stakeholders' perceptions of non-degree credentials are difficult to generate, as they can be subjective and hard to articulate; surveys can help to access some of those ideas. Measures of stakeholders' perceptions of non-degree credentials are difficult to generate, as they can be subjective and hard to articulate. Surveys can help to access some of those ideas; the quality indicators we propose herein can serve as guides for designing appropriate survey instruments. The quality of a non-degree credential can be measured by determining whether employers, educational institutions, and/or the public possess the following:

- A clear understanding of the set of competencies the credential is intended to represent.
- Positive perceptions of credential holders.
- Positive perceptions of the credential-granting organization.

Endorsements and validations

A recommendation from an influential professional and/or industry association or organization can promote a non-degree credential by giving it legitimacy and encouraging its use by other organizations. In such cases, key stakeholders are understood to value the non-degree credential as a good representation of relevant competencies. Apart from more formal endorsements, common practices within a field can be influential, as organizations tend to mimic the behaviors of leaders in their field.[46] Therefore, if one large employer adopts a credential standard, others in the field may begin to recognize it as well. In addition, external entities now provide formal reviews and validation of non-degree credentials. This is an emergent area of activity as accreditors begin to reform their practices in recognition of the changing educational landscape, and other organizations begin to step in to provide quality assurance.[47] Additionally, emergent organizations such as ANSI are beginning to develop processes to oversee non-degree credentials.[48] External reviews, which are discussed further in the next section on recommendations for policy and practice, must be done on a widespread basis across non-degree credentials to ensure equity in outcomes. The quality of a non-degree credential can be measured by determining whether and how many of the following industry or field endorsements are present:

- Endorsement by one or more influential organization(s) (i.e., professional or industry association, large employer).
- Adoption by one or more industry leader(s) or other large employer(s) as a standard for employment.
- Receipt of a positive review and/or assessment by one or more outside organization(s).

MARKET PROCESSES

State regulation

Sometimes, as in the case of occupational licensure, the use of a credential is regulated and required by a government entity, though the specific fields and requirements subject to regulation vary widely across states and occupations.[49] By definition, licenses restrict entry into occupations, but in the process, some can also systematically exclude certain populations. It is therefore important to examine and ensure that these kinds of regulations do not create or perpetuate inequalities in access to particular occupations by excluding people from entry.[50,51] With regard to non-degree credentials, opportunities must be fairly allocated. For example, occupational licensure poses several equity concerns, including the exclusion of people with criminal backgrounds and barriers for military spouses who frequently move from state to state.[52] The quality of a non-degree credential can be confirmed in cases where the following statements about state regulation are true:

- The credential is a state requirement for all individuals wishing to work in the relevant occupation.
- The credential is awarded by the state by way of a system of requirements and processes that are executed in an equitable manner.

Employer hiring policies and practices

The response of industry employers to a non-degree credential is an important indicator of how the credential gets translated into use. Employers may list the credential on job descriptions as a preference or a requirement, or their hiring managers may use the credential when hiring as part of company policy or their individual preference. Efforts to change these practices to make sure that competencies represented by credentials are more transparent are under way.[53] Use of a non-degree credential in hiring varies by type. Data from Burning Glass indicates that the demand for industry certifications exceeds demand by employers for other types of non-degree credentials.[54,55] Employers' preference for industry certifications is likely a response to those credentials' reliance upon standardized industry-wide criteria; this may imply to them a predictability that the varied sets of competencies represented by certificates from diverse institutions cannot.[56] Employers may choose to use non-degree credentials as part of their hiring process to demonstrate quality or legitimacy to the market beyond job seekers. Such postings can show to the public a level of employee expertise and readiness by indicating an "endorsement of service quality by a reputable agency."[57] If individuals have equal access to attaining non-degree credentials, use of those credentials in hiring can help alleviate discriminatory practices that other forms of screening in the hiring process tend to perpetuate.

MARKET PROCESSES

The quality of a non-degree credential can be measured by the extent to which the following statements about hiring practices and policies are true:

- The non-degree credential is listed as required or preferred on job postings.
- The non-degree credential is required or preferred for hiring or advancement as part of company policy.

Educational institutions' recognition of learning

Several policies and practices at educational institutions are important facilitators of the use of non-degree credentials. These include assigning academic credit or credit equivalency; translating credit via prior learning assessments (PLA); and stacking or latticing non-degree credentials on an educational pathway. For-credit certificates may be transferable from one institution to another through credit transfer. Other non-degree credentials, including noncredit certificates and industry certifications, can lead to academic credit through a review by the institution or an outside body.[58] Apprenticeships may involve articulation agreements with a two- or four-year college so that the apprentice can earn academic credits for completing the apprenticeship or have the apprenticeship assessed for credit upon its completion.[59] The recognition of learning represented by non-degree credentials can provide opportunities for individuals to advance who may not otherwise have had access to educational pathways. However, having a PLA policy on the books is little help to credential holders unless it is routinely exercised. For that reason, we offer a two-dimensional measure of this aspect of the market process that takes into consideration the actual use of the PLA policy by institutions to yield credit for credential holders in an equitable manner. The quality of a non-degree credential can be confirmed in cases where the following statements about educational institutions' recognition of learning are true:

- The non-degree credential is recognized by at least one educational institution as part of its PLA policy.
- The non-degree credential has successfully been translated into credit by at least one educational institution using its PLA policy.
- Institutions that accept the non-degree credential as part of its PLA policy have clear standards for PLA that ensure it is equitably awarded.
- Institutions that accept the non-degree credential have PLA policies that do not unfairly burden students in documenting their learning.
- Institutions that accept the non-degree credential as part of its PLA policy have a clear system and the necessary supports in place to ensure all students have access to the process.

OUTCOMES

Outcomes – most often employment outcomes but also education and social outcomes – reflect the value of a credential for its holders and other stakeholders. Among the elements of non-degree credential quality represented in the conceptual model, outcomes are most often referred to when discussing quality. Because outcomes flow from the most fundamental measure of quality – the actual set of competencies a credential is intended to document in its holder – measuring them comprises the last step in the process of determining non-degree credential quality. They are also moderated by market processes that facilitate their emergence. If a non-degree credential is well-designed around a set of competencies, and it is well-translated, we can expect individuals who hold that credential to have more positive outcomes than those who do not. In the following sections, we present a number of measurable outcomes of non-degree credentials. These include educational, economic, and social outcomes for individuals, as well as outcomes for employers and society. Understanding these outcomes and the extent to which they are equitable across racial and ethnic groups is essential to ensuring they promote opportunity and social mobility. We discuss each of the outcomes and the potential measures associated with them.

Individual employment outcomes

Since non-degree credentials are primarily occupationally oriented, employment outcomes are often of primary interest in any quality evaluation. Heightened concerns about employment rates and the somewhat greater availability of employment data through state longitudinal data systems also increases the visibility of outcomes-related data. However, despite that focus, very little consensus exists about how to define and measure a positive employment outcome.

Many possible measures of employment outcomes among non-degree credential holders already exist. One important measure simply indicates whether the credential holder was employed after completing the credential. According to major surveys in this area – the SIPP and the ATES – holders of non-degree credentials are more likely to be employed than those who do not hold the credential.[60] Further analysis of the ATES data reveals gender inequities, however: Men are more likely to be employed and earn more than women who hold the same credential type.[61] The ATES data also indicate higher earnings among non-degree credential holders; this difference is particularly pronounced among non-degree credential holders with no formal degree (people with some college but no degree and those who did not attend college).[62] Further, the ATES documents that the majority of individuals with a non-degree credential report their credential helped them find employment.[63] A more specific measure of employment is whether the individual was employed in a job that is related to the credential, but such information is rarely collected. Additionally, retention at a job once employed is another important employment outcome.

OUTCOMES

Earnings are another employment outcome of great interest, but they are complicated as a measure by the many ways they can be calculated. Several considerations can be factored in when selecting a measure. Multiples types of earnings measures are available, and they all communicate data differently; use of the median, the mean, or the range may present earnings data with potentially different implications for interpretation.[64] Another issue is the timing of the measure; that is, at what point in time earnings are measured relative to the conferring of the non-degree credential. This consideration can reflect assumptions about whether the credential is designed for immediate employment versus longer-term durability and mobility in the labor market, as well as questions about the specificity of skill level and whether the credential has short-term versus long-term value.

In addition to simple reporting of outcomes, additional types of earnings measures might be considered that include other factors in their calculation. First, earnings might be calculated relative to a threshold either based on occupational earning or a minimum threshold for earnings, like a living wage. Second, some calculations may consider how student demographics and prior experience are factored into the outcomes and whether to examine change from pre-credential to post-credential outcomes. Finally, return on investment can help provide a measure of whether the cost and the time required to complete the necessary training leads to wages with adequate returns.[65] If non-degree credentials do not clearly involve economic returns proportional to their cost, they become inaccessible to low-income populations who may wish to (or need to) pursue these credentials to gain entry to a career pathway. For example, many entry-level health occupations associated with non-degree credentials, such as Certified Nursing Assistant and Home Health Care Aide, lead to very low-paying jobs, and workers can go uncompensated for the cost of training.

Earnings, job placement and retention are not the only important employment outcomes. Another important outcome to consider is credential holders' personal satisfaction with their employment, particularly for fields where earnings may not be high but personal fulfillment may be. Much less is known about this outcome.

OUTCOMES

Non-degree credentials may be held in combination with other academic credentials, adding value to their economic outcomes by providing more targeted, workforce-oriented skills. Someone with a general bachelor's degree, for example, may seek an industry certification in a specific field, or a particular occupational licensure might require its holder to attain a certain educational credential. Research on licensure has found that they tend to be held in tandem with traditional degrees, and that individuals with more education often work in jobs that require licensure.[66] Combining non-degree credentials with academic credentials is a strategy many individuals pursue, and may be a way to maximize the value of non-degree credentials.[67] The quality of a non-degree credential can be measured by determining whether credential holders experience the following individual economic outcomes:

- Attained job immediately upon completion of the credential and longer-term
- Attained job in a related field immediately upon completion and longer-term
- Retention
- Promotion
- Median earnings – immediately upon completion of the credential and longer-term
- Earnings relative to a threshold – based on occupational earnings, or based on a minimum earnings threshold (e.g., a living wage)
- Positive change in earnings, before and after controlling for prior experience.
- Positive return on investment-based on earnings that factor in gains and costs
- Personal satisfaction with post-credential employment

Individual educational outcomes

While not as often a focus as employment, positive education outcomes are also an important indicator of quality, so they, too, must be measured. Non-degree credentials can document competencies gained through learning.[68] In the best cases, this can help credential holders earn credit from an institution that will allow them to progress along an educational pathway.[69] However, the learning undertaken to earn a non-degree credential does not always "count" in traditional academic settings, and therefore, it does not always assist students and workers as they progress along an educational pathway, which is an essential element to promoting equity.[70] This measure is limited by data availability in that it requires longitudinal data systems of educational pathways, as the existence of these vary substantially by state. As state longitudinal data systems become more functional, more data are becoming available. This may allow data sets to expand to include educational data, which will in turn enable the study of non-degree credential holders' movement along educational pathways.

OUTCOMES

Educational outcomes can be measured by determining the extent to which the following statements are true:

- Non-degree credential holders can stack the credential to progress on an educational pathway.
- Students can earn PLA credits for their non-degree credential.
- Individuals who begin the non-degree program (when relevant) complete and attain the credential.

Individual social outcomes. In addition to their educational and employment outcomes, non-degree credentials also can lead to important social outcomes for individuals. Education more broadly has been shown to lead to several types of social outcomes, and the same would be expected from non-degree credentials. These outcomes include improvements in individual well-being and health, greater civic engagement, increased understanding of racial and ethnic diversity, and intergenerational improvements in education, well-being, and wealth.[71] Individual social outcomes can be measured by determining the extent to which the following conditions exist among credential holders:

- Positive effects on the well-being and health of credential holders.
- Increased civic engagement
- Intergenerational improvements in education, well-being, and wealth.
- Increased racial and ethnic diversity

Employer outcomes

In addition to the individual, employers may accrue several outcomes of value from non-degree credentials. Employers' use of some non-degree credentials has been found to expedite hiring and reduce costs related to in-house training and turnover.[72] Some analyses conclude that licenses can improve job matching rather than restrict entry into occupations.[73] Employers typically use credentials to help find qualified workers with the perception that credentials represent the competencies they need their employees to possess. If credentials are equitably awarded to individuals and employers address bias and their use of credentials in hiring, this can facilitate greater equity in hiring practices and increase diversity in the workplace.

Employers also perceive credentials as a tool to facilitate hiring the most skilled, and therefore most productive, workers. More skilled, qualified, and productive workers often lead to higher levels of employee retention.[74] For example, graduates of registered apprenticeships tend to remain within the company in which their apprenticeship was located – 87 to 89 percent three years post-employment – reducing the cost of worker replacement and recruitment.[75]

OUTCOMES

Research on registered apprenticeship has shown they provide employers with a pipeline of qualified employees by training workers in the specifics of the employer's processes, leading to increased productivity and innovation, as well as increased safety.[76] Employer outcomes can be measured by determining the extent to which the following statements are true, with use of the credential:

- Employee pipeline measures improve, including quicker time to hire and reduced recruitment costs.
- Retention measures improve, including reduced staff turnover and recruitment costs.
- Higher skilled workforce.
- Improved productivity in the workplace.
- Increased diversity in the workforce.

Societal outcomes

Non-degree credential outcomes also occur at a societal level. These outcomes, which focus on consumer safety and health as well as efficiency and equity, are not often measured. Occupational licensure and, to a lesser extent, certifications seek to protect consumer safety and health by ensuring that workers who perform jobs related to public safety – such as jobs in the medical field – are qualified to do so.[77] The "signaling" capacity of industrial certifications to confirm that employees have been trained to industry standards assists the public in making more informed choices about vendor use, thereby helping to grow quality businesses.[78] In terms of efficiency, non-degree credentials have the potential to spur economic activity through increased productivity. The return on investment (ROI) of apprenticeships not only results in higher federal and state tax returns, and thus an increased tax base, but also contributes to local economic development.. Sub-baccalaureate workforce programs and their related occupational certificates have been found to help reduce poverty and unemployment in local labor markets, making them important avenues for addressing racial and ethnic disparities at a societal level.[80] This has been especially true for those who have weak labor force experiences[81] and those in rural areas where many jobs do not require degrees.[82] As with other forms of education, non-degree credentials may also lead to greater civic awareness and engagement depending on their goals and content. Individual societal outcomes can be measured by determining the extent to which the following statements are true:

- The credential contributes to public safety.
- The credential increases consumer efficiency.
- The credential contributes to reduced racial and ethnic inequality.
- The credential leads to higher rates of civic engagement.

SUGGESTIONS ON USING THIS FRAMEWORK

These four elements – credential design, competency, market processes, and outcomes – and their components is important to understanding and measuring non-degree credential quality. Together, they provide an overall picture of quality – where it exists and where it can be improved. While one overall summary measure of credential quality is appealing, in practice, going from the making of the credential to producing quality outcomes is a complex endeavor with no simple single indicator. Credential quality must be judged in relationship to its context, the ultimate goals of the credential, and its stakeholders. Rather than propose one overall measure, we offer some observations on how to view non-degree credential quality overall, and some suggestions on using this framework.

Quality elements as a guide

The framework in this paper lays out a broad view of elements of quality for non-degree credentials, as well as suggestions for indicators of these elements. These indicators can be used to guide thinking about measurement. They should not be read as definitive recommendations; rather, they are intended to spur thinking among stakeholders to develop indicators that are most relevant to their specific credentials and goals for these credentials. Appendix A provides a summary table of the quality elements and our suggested indicators. that may be used as a guide to spur this development.

Quality elements as diagnostic tools

While all four elements of our model are important, they are not always equally present across all non-degree credentials. When one or more of the four elements is missing, gaps in credential quality become apparent. The most commonly measured elements are outcomes, particularly employment outcomes. Starting from outcomes as a point of measurement can help uncover areas for improving other elements. For example, if individual education or employment outcomes are absent or do not meet standards, there may be a weakness in credential design and/or market processes. These particular weaknesses would lead to one of the following quality assessments:

- **Low Quality:** Foundational elements of quality are not met – i.e., credential design is not quality (or is missing quality in one or more of its components) and does not lead to the expected competencies.
- **Undervalued:** Foundational elements of quality are met – i.e., credential design is quality and leads to the expected competencies – but the credential does not have the adequate market processes necessary to lead to outcomes of value.

Quality relative to goals

In general, non-degree credential quality should be assessed relative to the goals of the credential. The occupational goal associated with the non-degree credential can vary substantially, and this variation can shape the range of possible outcomes. Generally, non-degree credentials may mark competencies related to the following types of occupational goals. A credential seeker with an occupational goal may hope to accomplish one of the following:

- Gain a narrow set of competencies within an occupational area for occupational enhancement, or
- Gain a set of broad competencies in an occupational area for entry into an occupation.

The educational goals associated with non-degree credentials can also vary widely, particularly among those credentials that lead to entry into an occupation. These goals tend to vary based on educational-attainment levels in a career pathway. Thus, a credential seeker with an educational goal may hope to accomplish one of the following:

- Gain entry to an entry-level job where more education is required to advance,
- Gain entry to a "mid-skill" job where more education may be helpful but is not required for advancement, or
- Gain entry to an occupation that does not require more education for career success.

The type of occupational and/or educational goal associated with the non-degree credential will relate to how the credential will be designed and which outcomes may be most relevant to examine. Understanding the goal of the credential can also help to define the time horizon for looking at outcomes – whether these should be immediate or more long-term, and even potentially how much to weight the importance of the four elements of non-degree credential quality relative to one another.

Importance of examining equity

Equity implications are an essential, ongoing consideration for every element of quality. As discussed, each aspect of credential design can be examined with a view toward how it may help or hinder individuals from traditionally marginalized groups. While credentials may help equalize opportunity by providing a standard measure of competency for individuals, outcomes may not always be equitable. Differences in outcomes by gender, race/ethnicity, disability, and other characteristics still exist. Within the realm of non-degree credentials, recent analyses show differentials across gender even for holders of the same credentials.[84] Consideration of these existing inequities is essential when examining outcomes and is needed to identify ongoing areas of inequity.

Quality relative to context

Particularly with market processes, the context of the non-degree credential matters. Each occupation has different standards for hiring and advancement – some require non-degree credential (e.g., occupational licensure), while others only suggest the credential. Likewise, some industries have embraced or endorsed certifications (e.g., healthcare), while others have not. Further, despite the goal of portability, credentials are often specific to or favored in a limited geographic region.[85] This does not necessarily have to be limiting; while portability is important, it is also true that local labor markets differ in their culture and needs. Thus, the outcomes of value for credentials are often a product of the context in which they are created and consumed. In fact, there may be specific credential markets at work with their own dynamics.

RECOMMENDATIONS FOR POLICY AND PRACTICE

Many efforts are under way to assess the quality of non-degree credentials. In this section, we review these activities and provide recommendations for how stakeholder groups can improve and expand on them to better document and promote non-degree credential quality. We have geared our recommendations toward the following stakeholder groups: educational institutions; employers and industry organizations; policymakers, including state agencies; and national organizations. All of these actors have different reasons for examining the quality of non-degree credentials, and they all do this work in different ways and prioritize different portions of the model in those assessments. The conceptual model and the examples of current systems for measurement help provide a framework for what quality is and some suggestions on how to measure it. We provide some steps to take in this direction that build on existing structures.

Create awareness of non-degree credential quality and how to measure it

Efforts are under way to expand awareness and reduce confusion about non-degree credentials. Connecting Credentials, an initiative led by Lumina Foundation and the Corporation for a Skilled Workforce (CSW), developed a beta Credentials Framework, which is currently being field tested. This framework uses competencies as common reference points to help users understand and compare the levels of knowledge and skills that underlie all credentials – including degrees, certificates, industry certifications, licenses, apprenticeships, and badges. Credential Engine, also funded by Lumina Foundation, has developed the Credential Registry – a centralized registry of credential information, a common credentialing language, and a credential search engine – that has sought to increase literacy around credentialing.[86] This initiative offers great potential for providing an infrastructure through which to understand and measure non-degree credential quality. Collectively, these efforts have been foundational in promoting awareness and discussion of non-degree credential quality using a consistent set of terms across all types of credentials.

These important efforts could use the framework outlined in this paper to inform their work by providing a lens through which to view components of quality and the resultant outcomes. These national efforts seek to understand quality and create transparency in a way that would be useful to various stakeholders seeking to assess the quality of non-degree credentials. However, while these efforts are useful, stakeholders may have to do their own work to understand quality and create transparency. Working in tandem with existing initiatives, the framework we propose can help bolster efforts to understand and measure non-degree credential quality.

Specific stakeholders can do the following to promote awareness of non-degree credential quality and its measurement:

- ***Educational institutions*** should carefully consider non-degree credentials and their quality, both in their efforts to create credentials and in their work to review credentials. Educational institutions should examine their processes and procedures around non-degree credentials, including how noncredit coursework flows into credit-bearing programs within their institution. Additionally, these institutions should take time to examine their existing PLA and credit-review policies and practices by asking three important questions: Do these policies exist? Are they being used by students? Are they fairly applied to students? How can they be improved? Do they produce equitable outcomes? It is important for educational institutions to engage their community in conversations about the creation and consumption of non-degree credentials, how to learn more about the competencies they signify, and how to identify ways to align them with existing educational pathways to promote portability. They may also consider having their credentials reviewed by national organizations, using Lumina's beta Credential Framework to award credit, and adding them to the Credential Registry.

- ***Employers*** should engage in conversations about non-degree credentials to better understand the competencies that these credentials represent. A more thoughtful review of non-degree credential quality can lead to hiring practices that recognize these competencies. Employers should also work to create awareness within their organizations about the skills required for different jobs and build that knowledge into their HR practices. A better understanding of the skills needed for a job will help employers and hiring managers align those skills with existing non-degree credentials. They can also examine the competencies attained through their own training and seek opportunities to better document these competencies. Efforts that seek to promote competency-based job descriptions, such as the Job Data Exchange, serve as models for this approach.[87]

- ***Policymakers*** should facilitate conversations about quality non-degree credentials and begin to develop ways to define quality using available data and other metrics outlined in the framework. These conversations can lead to publicly available lists and make quality non-degree credentials more transparent to public entities and consumers. Current efforts are under way to facilitate these discussions at the state level. The National Skills Coalition is conducting work with state higher education and workforce departments, and the Education Strategy Group is working with states to conduct these conversations within the K-12 system. The need to collect this information and to make it available is discussed more below.

Collect better information on non-degree credential quality and outcomes

Beyond the recent ATES survey, data on prevalence and quality of non-degree credentials is limited. A recent scan of all 50 states found that no states collect comprehensive data on non-degree credentials.[88] Some types of non-degree credentials are documented more frequently in data sets than others. A review published in 2014 by the Department of Education's Office of Career, Technical, and Adult Education found that 23 states collect data on noncredit enrollments and/or on the completion of certificates and other non-degree credentials but that very few have the ability to collect outcomes data related to those awards.[89] Educational institutions typically collect very little data on noncredit students, and when they do, they often use data systems that are isolated from the main institutional tracking system to do so.[90]

Data on industry-recognized credentials is also very limited.[91] Efforts are currently under way to gather industry certification data through partnerships with industry certifying groups.[92] States often oversee occupational licensure and therefore have data on them, but these data are typically not linked to educational or state data systems. They are sometimes reported to colleges to show the pass rates associated with their professional programs, but that is not always the case. Apprenticeship data are collected by states on registered apprenticeship but often are not collected on non-registered apprenticeship.

Availability of critical data is a big concern. Most states only have data on a small portion of non-degree credentials, largely limited to for-credit credentials from public institutions. They lack data on credentials awarded by private institutions and credentials awarded outside of the academy. Some states have worked to integrate both tracking and quality efforts for non-degree credentials into the development and implementation of Statewide Longitudinal Data Systems (SLDS). The inclusion of non-degree credentials into a states' SLDS is often aligned with meeting statewide educational goals. A recent survey by the Workforce Data Quality Campaign documented the progress states have made with the inclusion of non-degree credentials in their SLDS.[93] The survey also looked at how some states are thinking about assessing and documenting quality of non-degree credentials. In total, the survey found that thirty-six states have data on for-credit certificates, 27 have most data on registered apprenticeship certificates, and 22 states report having all or most licensing data. Further, establishing data sharing between credential awarding bodies and the state is another challenge, as is the reality that because most available data relates to labor market outcomes, states have come to define quality primarily in terms of these outcomes. It would behoove states to also include educational pathways in their metrics, and, where possible, to use more qualitative measures to assess credential design as they create valued credential lists.

Given the limited data on non-degree credentials, most efforts to assess quality credentials to date have focused on for-credit credentials offered at public institutions. This leaves a large swathe of the credentials discussed herein uncounted and unchecked in terms of quality. Further, given a propensity to privilege economic indicators over other ones, many evaluations of quality (at least on the state and national levels) have assessed quality by looking only at labor market outcomes. The result of this is that the many other factors of quality (educational, societal, etc.) that we have outlined in the conceptual model above are not being used or accounted for in the systems that exist to determine quality. Without these data it is impossible to know how they are impacting the trajectories of traditionally underserved individuals and whether they are helping or hindering efforts at promoting equity. While we argue that a more inclusive and holistic view of what quality means would be helpful, we understand that this ideal might be challenging to achieve given the limitations of data in terms of both data points and data sharing. That being said, many of the current efforts to assess quality that we will discuss in the remainder of this section prioritize one area of the conceptual model in their determination of quality. All stakeholders need better information to improve the transparency of credentials – that is clear for all credentials but particularly for non-degree credentials.

Overall there is a significant need to develop systems for better data collection and measurement; to that end, continued support is needed to promote GEMEnA as well as other existing data-collection efforts. It is essential to encourage more entities to share data and to examine their systems for ways to better collect data on non-degree credentials.

Specific stakeholders can do the following to collect and share information on non-degree credential quality and their outcomes; these data should be broken down by racial and ethnic groups to uncover potential inequities:

- ***Educational institutions*** and other providers should uniformly collect and report data on non-degree credentials. They should consider ways to integrate these data into existing data systems to allow for the tracking of movement into further education.

- ***Industry groups*** should collect and report data on industry certifications; these efforts have begun and can be expanded.

- ***Policymakers*** should think more carefully about how to incentivize their involvement to create more data-collection systems. Ultimately, promoting better data sharing – among educational institutions, industry certification bodies, and state departments that oversee occupational licensure – is a public policy issue. Policies on data collection and reporting for non-degree credential quality are important to create transparency and knowledge of outcomes. Workforce boards also have an important role in establishing policies and systems for data collection.

Develop and promote systems to assess non-degree credential quality

Even if data were available, the many stakeholders in the credential landscape need systems to use these data to assess non-degree credential quality. Depending on the stakeholder, the assessor, and data availability, priority could be placed on any level of the conceptual model, whether credential design, competencies, translation processes, or outcomes of value. Third-party validations and transparency initiatives offer examples of systems that can help with this process. Assessments of quality operate with different amounts of information and are informed by different aspects of the quality process as outlined in the conceptual model.

These assessments are often conducted using information that is relatively easy to access. Reviews of curriculum and competencies are commonly available, for example, as are assessments based on outcomes – particularly on labor market outcomes, as they are often the easiest to track and may represent the primary goal for many stakeholders. In this section, we discuss the efforts of three groups of stakeholders – educational institutions, national organizations, and states – to create and build systems to assess the quality of non-degree credentials.

Assessments by educational institutions. Educational institutions create and deliver non-degree credentials, but they frequently are also asked to assess the quality of non-degree credentials held by students. Prior learning assessments are a common mechanism for granting credit for non-degree credentials at educational institutions. Third-party assessments, like the ACE's Credit Recommendation Services or those done by Thomas Edison State University, are often used in this process. There are also initiatives like Quality Matters reviews that allow institutions to demonstrate the quality of their credentials using a system that builds upon more traditional curriculum reviews common to for-credit coursework.

Emergent systems for quality assessment by national organizations. Some national organizations are leading the charge to assess the quality of non-degree credentials to help various stakeholders understand the landscape of non-degree credentials and guide decision-making. The work of these national groups has been stimulated by research, policymakers, and philanthropy, which have all sought to better understand quality in non-degree credentials.

Multiple efforts seek to develop systems that can help assess competencies. One significant effort is the beta Credentials Framework, developed through Lumina's Connecting Credentials initiative.[95] This framework delineates the levels of competencies that are possible from a credential, including specialized, personal, and social knowledge and skills. Another major effort is the nonprofit Credential Engine (previously discussed), an important system for capturing and disseminating information on credential quality. The mission of the Credential Engine is "to create credential transparency, reveal the credential marketplace, increase credential literacy, and empower everyone to make more informed decisions about credentials and their value." All of these efforts to create learning outcomes standards, as well as others currently under way, can make the competencies indicated by a credential clearer and easier to assess.

The QA (Quality Assurance) Commons for Higher and Postsecondary Education is encouraging accreditation reform efforts to develop quality metrics and review processes for a range of non-degree credentials.[96] Other existing efforts that review and assess non-degree credentials include the credit-review processes of organizations like the American Council on Education. Credit review provides a process to translate workplace learning into academic credit.[97] American National Standards Institute (ANSI) has developed a certificate accreditation program to review the quality of certificate-granting programs in term of instructional design, assessment, and use.[98] ANSI has also developed a standard for certification bodies to ensure quality in their operations.[99]

Reporting and rating systems by states. States have established and/or are creating new systems to assess the quality of non-degree credentials. These systems are designed to meet several different goals: e.g., to comply with state and federal policies, rules, and regulations with respect to financial decision-making; to help residents make informed decisions about educational outcomes; and/or to document the progress of non-degree credential holders toward further post-secondary credential or workforce goals.

To determine choices about workforce training, every state has an Eligible Training Provider List (ETPL) developed under the Workforce Investment Act of 1998 and continued under the Workforce Innovation and Opportunity Act (WIOA) to identify training opportunities that are eligible for WIOA Individual Training Account funds. Under WIOA, states are responsible for ensuring the quality and value of all training programs on the ETPL, as well as for measuring performance information about each program. A state's WIOA plans should include robust quality standards for the range of programs on their ETPL.[100] How these lists are implemented, however, varies drastically by state, and some states are better than others in determining the quality of credentials and making sure that the list is kept up-to-date. In addition, these lists are not likely to be comprehensive, as they tend to focus exclusively on credentials that fit the needs of WIOA clients. Some states have developed consumer scorecards using data from public institutions and WIOA providers to track the results of credential earners in the labor market.

As non-degree credentials become increasingly prevalent, numerous states have engaged in discussions to figure out what constitutes non-degree credential quality. Thirty states noted that they are in the process of creating lists of credentials that hold value in the labor market.[101] States are using the following methodologies to compile these lists: analyzing labor market information; having conversations with employers; and examining the wage and employment outcomes of people with a variety of non-degree credentials. Sector strategies – or workforce development strategies that gather parties from education, industry, the workforce development system, and economic development – may provide a resource to help build these systems. The framework for non-degree credential quality could also be used to inform these efforts. Below, we outline the ways in which policymakers, educational institutions, and employers could each play an important role in assessing quality credentials and trainings for local, regional, and state needs.

- ***Educational institutions*** should further develop and seriously implement, on a wide scale, approaches to document and recognize learning, beginning with their own PLA policies and their acceptance of third-party assessments of learning. They should work with policymakers to develop information-rich lists of local non-degree credentials, use those lists as they perform their own credential reviews and in their PLA efforts, and make sure the credentials of quality they create are on those lists and up-to-date. They must ensure that the access to and awarding of PLA credits are equally available across all students, and that these processes do not unfairly burden students in documenting their learning.

- ***Employers*** need to find ways to better document the learning that occurs in the workplace and make workers aware of the competencies they are learning, particularly through training programs but also for competencies gained on-the-job.[102] All these instances of work-based learning have value and can be recognized if their learning outcomes are better articulated and competencies are documented.

- ***Policymakers*** should develop a statewide or regional credential registry to be used by all stakeholders. Policymakers can play an important role in fostering conversations and aligning policy and practice across different stakeholders, particularly across educational institutions and employers. Policymakers should also promote PLA efforts and monitor outcomes to ensure fair and equitable processes are in place.

Promote and understand the use of data on non-degree credential quality

An important aspect of using data on non-degree quality is to understand how stakeholders use and interpret information on quality. Informal assessments of quality occur in advising at institutions and local workforce boards, by employers in their hiring and promotion processes, and by people considering a non-degree credential for their own career. These decisions can be made with or without data. When data are available to guide these decisions, it is important to understand how these data are interpreted and used. Below, we discuss ways each stakeholder group can promote and understand the use of data on non-degree credential quality.

- ***For educational institutions,*** data may uncover credentials that are not leading to economic or social outcomes of value because they are educationally undervalued. In this case, higher education institutions may need to focus on improving their valuing and use of non-degree credentials. Data can help identify areas for improvement. A review of credential design may identify a need for more collaboration with employers (regional, national, local) or for a greater incorporation of work-based learning opportunities. Low enrollment levels by students of color may reveal concerns about accessibility or affordability that need to be addressed. Institutions might discover that transparency is lacking and that perhaps students need to be able to more clearly articulate the competencies they acquired. Alternately, the institutions may seek to better document its offerings through competency-based digital credentials or to conduct additional marketing and outreach on the credential to create awareness. Ways to improve market processes might be identified, such the solicitation of a third-party validation, heightening recognition of learning through PLA policies, or raising awareness of these policies.

- ***For employers,*** quality assessment of non-degree credentials occurs in their hiring and promotion practices. They may identify ways to improve the use of credentials by developing a better understanding of their competencies. This greater awareness might inspire more recognition and use of competency-based language in hiring, promotion, and retention practices. Employers may also recognize the need for participation in the development and implementation of non-degree credentials, as well as the need to be able to clearly articulate their competency needs to credential grantors. Based on their views about credential quality, they may seek to use the data to change hiring practices. If they find that non-degree credentials in their market are economically undervalued, they might focus on improving the use of those credentials.

- ***For policymakers,*** there is a need to promote policies to get educational institutions to correct for educational undervaluing and to get employers to correct for economic undervaluing. They play an important role in shaping the common understanding about non-degree credential quality through their ability to convene stakeholders who are developing and using non-degree credentials within their states and in local areas through sector strategies or other methods. As they review non-degree credential quality measures, they can have significant decision-making power to provide financial aid for the development and promotion of high-quality non-degree credentials. They also need to ensure that individuals are presented with a full range of credential options and are not tracked into one type of credential. As one of many options, non-degree credentials should be guaranteed to be high-quality to guard against the creation of a two-tiered system that further perpetuates inequality. Rather, a menu of quality non-degree credential options should be simply another pathway to further economic mobility.

Appendix A: Summary of Non-Degree Credential Quality Elements and Suggested Indicators

CREDENTIAL DESIGN	
COMPETENCY RELEVANCE	▪ Industry is involved in the creation of curriculum or examinations. ▪ Ongoing processes ensure continued industry engagement. ▪ Review of labor market data indicates a need for the credential. ▪ Credential grantor or an external entity conducts post-design reviews of curriculum or examination to ensure alignment with industry and occupational standards. ▪ Educational actors are involved in the design of curriculum to ensure alignment with educational pathways.
INSTRUCTIONAL PROCESS ASSESSMENT PROCESS –	▪ Instruction is tailored to the needs of all students to develop industry-specific skills. ▪ Instructors are up-to-date in their knowledge of occupational competencies.
INITIAL AND ONGOING	▪ Assessments measure the skills and competencies they are intended to measure. ▪ Passing the required assessments indicates that the credential holder has the competencies the credential is intended to represent. ▪ Assessment processes treats all students fairly and are considerate of the needs of diverse learners. ▪ Continuing education is required and appropriate. ▪ A renewal process exists to maintain the credential.
STACKABILITY AND PORTABILITY	▪ It can be added or "stacked" with other credentials to advance along a pathway, either in terms of education or employment. ▪ Its acceptance by employers was a central consideration in its design.

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CREDENTIAL DESIGN *(continued)*

TRANSPARENCY	▪ The credentialing body provides information on specific competencies and outcomes to credential seekers, employers, and other stakeholders. ▪ The credentialing body provides information on how competencies are assessed to credential seekers, employers, and other stakeholders.
ACCESSIBILITY AND AFFORDABILITY	▪ Financial aid or support, through public or private sources is available to all students who need it, regardless of gender, race, or ethnic identity. ▪ Scheduling and support services are available to support completion. ▪ Location and outreach strategies are responsive to racially and ethnically diverse learners ▪ Enrollment criteria are relevant and appropriate

DEMONSTRATED COMPETENCIES

DEMONSTRATED COMPETENCIES	Credential holders consistently demonstrate mastery of: ▪ A body of general knowledge within the field of study – in terms of a set of facts, principles, theories, and practices. ▪ A set of specialized skills including critical thinking and judgement, integrative application, and systems thinking. ▪ The personal skills required to succeed, including autonomy, responsibility, self-awareness, and self-reflectiveness. ▪ The social skills required to succeed, including good communication, involvement, teamwork, and leadership.

MARKET PROCESSES	
TRANSPARENCY INITIATIVES	▪ Mechanisms are in place to provide information to potential consumers about the competencies represented by the credential. ▪ Mechanisms are in place to provide information to potential employers and other stakeholders about the competencies represented by the credential.
AWARENESS OF THE CREDENTIAL AND/OR THE CREDENTIAL GRANTOR	Employers, educational institutions, and/or the public hold: ▪ A clear understanding of the set of competencies the credential is intended to represent. ▪ Positive perceptions of credential holders. ▪ Positive perceptions of the credential-granting organization.
ENDORSEMENTS OR VALIDATIONS	The credential has: ▪ Endorsement by an influential organization (i.e., professional or industry association, large employer) ▪ Adoption by an industry leader or other large employer as a standard for employment ▪ Review and/or assessment by one or more outside organization(s)
STATE REGULATION	▪ The credential is a state requirement for all individuals wishing to work in the relevant occupation. ▪ The credential is awarded by the state by way of a system of requirements and processes that are executed in an equitable manner.
EMPLOYER HIRING POLICIES AND PRACTICES	▪ The non-degree credential is listed as required or preferred on job postings. ▪ The non-degree credential is required or preferred for hiring or advancement as part of company policy.

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MARKET PROCESSES *(continued)*

EDUCATIONAL INSTITUTIONS' RECOGNITION OF LEARNING	▪ The non-degree credential is recognized by at least one educational institution as part of its PLA policy. ▪ The non-degree credential has successfully been translated into credit by at least one educational institution using its PLA policy. ▪ Institutions that accept the non-degree credential as part of its PLA policy have clear standards for PLA to ensure it is equitably awarded ▪ Institutions that accept the non-degree credential have PLA policies that do not unfairly burden students in documenting their learning ▪ Institutions that accept the non-degree credential as part of its PLA policy have a clear system and the necessary supports in place to ensure all students have access to the process.

OUTCOMES

INDIVIDUAL EMPLOYMENT OUTCOMES	▪ Attained job immediately upon completion of the credential and longer-term ▪ Attained job in related field immediately upon completion and longer-term ▪ Retention ▪ Promotion ▪ Median earnings rise immediately upon completion of the credential and longer-term ▪ Earnings relative to a threshold based on occupational earnings, or based on a minimum earnings threshold, e.g., a living wage ▪ Positive change in earnings, before and after controlling for prior experience ▪ Positive return on investment-based on earnings that factor in gains and costs ▪ Personal satisfaction with post-credential employment

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OUTCOMES *(continued)*	
INDIVIDUAL EDUCATIONAL OUTCOMES	▪ Credential holders can stack the credential to progress on an educational pathway. ▪ Students can earn PLA credits for their non-degree credential. ▪ Individuals who begin the non-degree credential program (when relevant) complete and attain the credential.
INDIVIDUAL SOCIAL OUTCOMES	▪ Positive effects in the well-being and health of credential holders. ▪ Increased civic engagement. ▪ Intergenerational improvements in education, well-being., and wealth. ▪ Increased racial and ethnic diversity
EMPLOYER OUTCOMES	▪ Employee pipeline measures improve, including quicker time to hire and reduced recruitment costs. ▪ Retention measures improve, including reduced staff turnover and recruitment costs. ▪ Higher skilled workforce. ▪ Improved productivity in the workplace. ▪ Increased racial and ethnic diversity in the workforce.
SOCIETAL OUTCOMES	▪ The credential contributes to public safety. ▪ The credential increases consumer efficiency. ▪ The credential contributes to reduced racial and ethnic inequality. ▪ The credential leads to higher rates of civic engagement.

[1] Cronen, S., McQuiggan, M., Isenberg, E., & Grandy, S. (2018). *Adult training and education: Results from the National Household Education Surveys program of 2016*. Washington, DC: National Center for Education Statistics.

[2] Brown, J., & Kurzweil, M. (2017). *The complex universe of alternative postsecondary credentials and pathways*. Cambridge, MA: Academy of Arts and Sciences; Cronen, McQuiggan, Isenberg, & Grandy, 2018.

[3] Connecting Credentials. (2015). *Making the case for reforming the U.S. credentialing system*. Indianapolis, IN: Lumina Foundation.

[4] Connecting Credentials. (2016). *Lessons from the National Summit on Credentialing and next steps in the national dialogue.* Indianapolis, IN: Lumina Foundation.

[5] Advance CTE. (2016). *Credentials of value: State strategies for identifying and endorsing industry-recognized credentials*. Silver Spring, MD: author.

[6] Connecting Credentials, 2016.

[7] Leventoff, J. (2018). *Measuring non-degree credential attainment*. Washington, DC: National Skills Coalition.

[8] Fuller, J., Raman, M., et al. (October 2017). *Dismissed by Degrees. How degree inflation is undermining U.S. competitiveness and hurting America's middle class*. Published by Accenture, Grads of Life, Harvard Business School, 5.

[9] Traditional academic degrees include high school diplomas, associate degrees, or bachelor's degrees; they document formal classroom-based learning offered through educational programs at accredited institutions.

[10] In 2015, Lumina Foundation partner Connecting Credentials offered the following definition of a credential: "A documented award by a responsible and authorized body that has determined that an individual has achieved specific learning outcomes relative to a given standard. Credential in this context is an umbrella term that includes degrees, diplomas, licenses, certificates, badges, and professional/industry certifications" (2015, 11).

[11] National Center for Education Statistics. (2019). *Working definitions of non-degree credentials.* Washington, DC: author. Retrieved from https://nces.ed.gov/surveys/gemena/definitions.asp

[12] Brown & Kurzweil, 2017; Leventoff, 2018.

[13] Military training grants access to particular occupational positions within the military based on the completion of both classroom-based and work-based learning; The levels of the positions are defined by military occupational specialty codes, and trainings are specific to each branch of the military.

[14] Van Noy, M., James, H., & Bedley, C. (2016). *Reconceptualizing learning: A review of the literature on informal learning*. Piscataway, NJ; Rutgers' Education and Employment Research Center.

[15] National Center for Education Statistics. (n.d.). About GEMEnA. Retrieved from https://nces.ed.gov/surveys/gemena/

[16] Cronen, McQuiggan, Isenberg, & Grandy, 2018.

[17] Everhart, D., Ganzglass, E., Casilli, C., Hickey, D., and Muramatsu, B. (2016). *Quality dimensions for connected credentials*. Washington, DC: American Council on Education.

[18] Cleary, J, Kerrigan, M., & Van Noy, M. (2017). Towards a new understanding of labor market alignment. In M. Paulsen (Ed.), *Higher Education: Handbook of Theory and Research* (577-629), Switzerland: Springer Nature.

[19] Curriculum development processes at colleges can help guide efforts to align program content with employer needs. For example, the DACUM method (http://www.dacum.org/) provides a formal structure for gathering information from industry.

[20] Some examples of these standards include those developed for online learning (e.g., Quality Matters, available from https://www.qualitymatters.org/) or the broader standards for CTE outlined by the Association for Career & Technical Education (2018 *ACTE Quality CTE Program of Study Framework*, available from https://www.acteonline.org/wp-content/uploads/2019/01/HighQualityCTEFramework2018.pdf).

[21] Tuitt, F., Haynes, C., & Stewart, S. (2018). *Race, equity, and the learning environment: The global relevance of critical and inclusive pedagogies*. Sterling, VA: Stylus; Hockings, C. (2010). *Inclusive learning and teaching in higher education: A synthesis of research* [PDF file]. York, U.K.: EvidenceNet. Retrieved from https://www.heacademy.ac.uk/system/files/inclusive_teaching_and_learning_in_he_synthesis_200410_0.pdf

[22] Ransom, T., Knepler, E., and Zapata-Gieti, C. (2018). *New approaches to judging quality in higher education.* Washington, DC: Council for Higher Education Accreditation.

[23] Lerman, R., Eyster, L., and Chambers, K. (2009). *The benefits and challenges of registered apprenticeship: The sponsor's perspective*. Washington, DC: Urban Institute; President's Task Force on Apprenticeship Expansion. (2018, May 10). *Final Report to: The President of the United States* [PDF file]. Washington, DC:DOL-DOE. Retrieved from https://www.dol.gov/apprenticeship/docs/task-force-apprenticeship-expansion-report.pdf

[24] Prebill, M., & McCarthy, M. (2018). *Building better degrees using industry certifications: Lessons from the field*. Washington, DC.: New America Foundation. Retrieved from https://d1y8sb8igg2f8e.cloudfront.net/documents/Building_Better_Degrees_Using_Industry_Certifications_2018-09-17_130631.pdf; Kleiner, M., & Krueger, A. (2013). Analyzing the extent and influence of occupational licensing on the labor market. *Journal of Labor Economics,* 31(1), S173-S202.

[25] Montenegro, E., & Jankowski, N. A. (2017, January). *Equity and assessment: Moving towards culturally responsive assessment* (Occasional Paper No. 29). Urbana, IL: University of Illinois and Indiana University, National Institute for Learning Outcomes Assessment (NILOA); Autor, D., & Scarborough, D. (2008). Does job testing harm minority workers? Evidence from retail establishments. *The Quarterly Journal of Economics*, 123(1), 219-277.

[26] Ewert, S., and Kominski, R. (2014). *Measuring alternative educational credentials: 2012*. Washington, DC: U.S. Census Bureau.

[27] Austin, J., Mellow, G., Rosin, M., and Seltzer, M. (2012). *Portable, stackable credentials: A new model for industry-specific career pathways*. New York, NY: McGraw-Hill Research Foundation; Everhart, Ganzglass, Casilli, Hickey, and Muramatsu, 2016.

[28] Ibid.

[29] Prebill & McCarthy, 2018.

[30] Connecting Credentials, 2016.

[31] Connecting Credentials. (2015b). *A beta Credentials Framework* [PDF file]. Indianapolis, IN: Lumina Foundation. Retrieved from http://connectingcredentials.org/wp-content/uploads/2015/05/ConnectingCredentials-4-29-30.pdf

[32] Credential Engine (2018). *Counting U.S. secondary and postsecondary credentials*. Washington, DC: author.

[33] Exceptions include some for-credit certificates which, depending on their length, can receive financial aid, and in some very rare instances noncredit certificates, which can sometimes be approved as clock-hour programs and qualify for federal financial aid (again, depending on their length).

[34] Brown & Kurzweil, 2017; National Skills Coalition (2019). *Making Pell work: JOBS Act will assure quality credentials for America's workers* [PDF file]. Washington DC: author https://www.nationalskillscoalition.org/action/take-action/body/Make-Pell-Work_JOBS-Act-will-assure-quality-credentials.pdf; Brown, K. (2018) Putting Pell grants to work for students: How modernizing our federal higher education policy can improve outcomes for students and employers in today's economy [PDF file]. Washington, DC: National Skills Coalition. Retrieved from https://www.nationalskillscoalition.org/resources/publications/file/Putting-Pell-Grants-to-work-for-working-students-1.pdf

[35] Hurtado, S., Milen, J., Clayton-Pederson, A., & Allen, W. (1998). Enhancing campus climates for racial/ethnic diversity. *The Review of Higher Education,* 21(3), 279-302.

[36] This can create an enrollment barrier that prevents these students from accessing for-credit programs offered by public institutions and result in such individuals enrolling in for-profit institutions, which often do not require such remediation. See Rosenbaum, J. E., Cepa, K., and Rosenbaum, J. (2013). Beyond the one-size-fits-all college degree. *Contexts 12*(1), 48-52. Retrieved from https://doi.org/10.1177/1536504213476248

[37] Le, C., Wolfe, R., & Steinberg, A. (2014). *The past and the promise: Today's Competency Education Movement.* Boston, MA: Jobs for the Future; Lumina Foundation. (2017). *Real life learning* [PDF file]. Indianapolis, IN: author. Retrieved from https://www.luminafoundation.org/files/resources/focus-summer-2017.pdf

[38] Jankowski, N., Timmer, J., Kinzie, J., and Kuh, G. (2018). *Assessment that matters: Trending toward practices that document authentic student learning*. Urbana, IL: National Institute for Learning Outcomes Assessment, University of Illinois and Indiana University.

[39] Connecting Credentials, 2016.

[40] Connecting Credentials, 2015b.

[41] Credential Engine. (2019). About us: Credential registry overview. Retrieved from https://credentialengine.org/

[42] Leventoff, 2018; Decker, P., & Perez-Johnson, I. (2004). Individual training accounts, eligible training provider lists, and consumer report systems. In C. O'Leary, R. Straits, & S. Wandner (Eds.), *Job Training in the United States* (177-210). Kalamazoo, MI: W.E. Upjohn Institute; U.S. Department of Education. (2019). College Scorecard. Retrieved from https://collegescorecard.ed.gov/

[43] U. S. Chamber of Commerce Foundation. (n.d.) Job Data Exchange (JDX). Retrieved from https://www.uschamberfoundation.org/workforce-development/JDX

[44] Van Noy, M. (2011). *Credentials in context: The meaning and use of associate degrees in the employment of IT technicians* (unpublished doctoral dissertation). Columbia University, New York, NY.

[45] Meyer, J. (1977). The effects of education as an institution. *American Journal of Sociology, 83*(1), 55–77.

[46] DiMaggio, P., & Powell, W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review 48*(2): 147–160.

[47] Lakin, M. ,& Nellum, C. (2015). *Credit for prior learning: Charting institutional practice for sustainability.* Washington DC: American Council on Education; For an example, see Colorado Community College System. (n.d.). *Prior learning assessment credit manual*. Denver, CO: author. Retrieved from http://www.njc.edu/~/media/Publications/18xPLAManualpdf.ashx

[48] https://www.ansi.org/accreditation/credentialing/Default

[49] DiMaggio & Powell, 1983.

[50] National Conference of State Legislatures. (2017). *The state of occupational licensing: Research, state policies, and trends*. Washington, DC: author; Carpenter, D., Knepper, L., Erickson, A., and Ross, J. (2012). *License to work: A national study of burdens from occupational licensing*. Arlington, VA: Institute for Justice.

[51] Occupational closure must be done for just reasons – such as to ensure the safety of patients in the case of medical licensures, or even to keep wages strong when the number of open positions in a given field drops below the number of licensed workers. But when those closures happen, they must be executed fairly– not in a way that protects certain groups of individuals and systematically excludes others.

[52] Ibid.

[53] U. S. Chamber of Commerce Foundation, *Job Data Exchange (JDX)*.

[54] Markow, W., Restuccia, D., and Taska, B. (2017). *The narrow ladder: The value of industry certifications in the job market*. Boston, MA: Burning Glass. Retrieved from https://www.burning-glass.com/research-project/certifications/

[55] In 2015 there were 1.5 million job postings seeking individuals with industry certifications versus 130,000 postings requesting certificates. However, only a limited number of certifications seem to have real value in hiring. Thus, Burning Glass (2017) found 50 certifications out of thousands account for two-thirds of job postings. According to their study, the top 5 most-requested industry certifications were: CPA, Project Management Certification (PMP), Certified Information Systems Security Professional (CISSP), Automotive Service Excellence Certification (ASE), and Cisco Certified Network Associate (CCNA).

[56] Ibid, p. 6.

[57] Bartlett, K. R. (2012). *A theoretical review of the signaling role of certifications in career and technical education* [PDF file]. SemanticScholar, p. 4. Retrieved from https://pdfs.semanticscholar.org/a774/6857e6adf8bbfaf70242ab99e8ee7f1791b0.pdf; Zanville, H., Porter, K., & Ganzglass, E. (2017, January). *Report on Phase I study: Embedding industry and professional certifications within higher education* (Connecting Credentials) [PDF file]. Washington, DC: Lumina Foundation, p. 5. Retrieved from https://www.luminafoundation.org/files/resources/report-on-phase-i-study-embedding-industry-professional-certifications-within-higher-education-january-2017.pdf

[58] Ganzglass, E. (2014, March). Scaling *"stackable credentials": Implications for implementation and policy*. Washington, DC: Center for Postsecondary and Economic Success, CLASP.

[59] U.S. Department of Labor. (2018). What is a registered apprenticeship? Retrieved from https://www.apprenticeship.gov/about-apprenticeship; McCarthy, M., Palmer, I., & Previl, M. (2019). *Eight Recommendations for Connecting Apprenticeship and Higher Education*. Washington, DC: New America.

[60] Ewert and Kominski , 2014.

[61] Tesfai, L., Dancy, K., & McCarthy, M. (2018). *Paying more and getting less: How nondegree credentials reflect labor market inequality between men and women*. Washington, DC: New America, Center on Education and Skills. Retrieved from https://www.newamerica.org/education-policy/reports/paying-more-and-getting-less/

[62] Cronen, McQuiggan, Isenberg, & Grandy, 2018.

[63] Ibid.

[64] Ruder, A., and Van Noy, M. (2015). Knowledge of earnings risk and major choice: Evidence from an information experiment. *Economics of Education Review*, 57(C), 80-90.

[65] Carpenter, Knepper, Erickson, and Ross, 2012.

[66] Bailey, T., and Belfield, C. (2018). *The impact of occupational licensing on labor market outcomes of college-educated workers* (CCRC Working Paper No. 104). New York, NY: Community College Research Center, Teachers College, Columbia University; Kleiner & Krueger, 2010.

[67] Bailey & Belfield, 2018; Prebill & McCarthy, 2018.

[68] Casilli & Knight, 2012.

[69] Connecting Credentials. (2017). *Improving Learner Mobility* (Work Group Report) [PDF file]. Washington, DC: Lumina Foundation. Retrieved from http://connectingcredentials.org/wp-content/uploads/2017/11/Learner-Mobility-Workgroup-report-FINAL.pdf

[70] Connecting Credentials, 2015; Connecting Credentials, 2016.

[71] Egerton, M. (2003). Higher education and civic engagement. *British Journal of Sociology, 53*(4), 603-620; Doyle, W. (2017). Does postsecondary education result in civic benefits? *The Journal of Higher Education, 88*(6), 863-893; Gurin, P., Dey, E., Hurtado, S., and Gurin, G. (2002, September). Diversity and Higher Education: Theory and Impact on Educational Outcomes. *Harvard Educational Review 72*(3), 330-367. https://doi.org/10.17763/haer.72.3.01151786u134n051

[72] Wyman, N. (2016, Nov 1) Why investing in apprenticeships makes good dollars and sense. *Forbes*. Retrieved from https://www.forbes.com/sites/nicholaswyman/2016/11/01/why-investing-in-apprenticeship-makes-good-dollars-and-sense/#15d610ae5de0

[73] Bailey & Belfield, 2018.

[74] Employer investment in tuition reimbursement has documented returns to employers. See the series of *Talent investments pay off* studies by Lumina Foundation, available from https://www.luminafoundation.org/resources/audience/talent-investment-studies; see also Koch, J. K. (2012) *Rates of return on investments in apprenticeships: Summary of the empirical evidence* [PDF file]. Retrieved from http://innovativeapprenticeship.org/wp-content/uploads/2017/03/Rates-of-Return-to-Investments-in-Apprenticeships-copy.pdf; Reed, D., Yung-Hsu, L. A., Kleinman, R., Mastri, A., Reed, D., Sattar, S., & Ziegler, J. (2012, July 25). *An effectiveness assessment and cost-benefit analysis of registered apprenticeship in 10 states*. Oakland, CA: Mathematica Policy Research; Wyman, 2016.

[75] United States Department of Labor (DOL). (n.d.). *Apprenticeship USA Toolkit: Research and Statistics*. Retrieved from https://www.dol.gov/apprenticeship/toolkit.htm; Koch, 2012; Helper, S. (2016, December 1). Are apprenticeships worth the investment? New Case Western Reserve University, U. S. Department of Commerce report documents value to companies when investing in apprentices. *The Daily*. Retrieved from https://thedaily.case.edu/apprenticeships-worth-investment/

[76] Colhorn, J., & Jenkins, N. (2015). *Recasting American apprenticeship: A summary of barriers to apprenticeship expansion research project* [PDF file]. Retrieved from https://assets.aspeninstitute.org/content/uploads/files/content/docs/pubs/RecastingApprenticeshipV2.pdf; Wyman, N. (2014). *Why apprenticeships deliver the best ROI*. Retrieved from http://www.thestaffingstream.com/2014/10/15/why-apprenticeships-deliver-the-best-roi/; DOL, *Apprenticeship USA Toolkit*; President's Task Force on Apprenticeship Expansion, 2018; Elejalde-Ruiz, A. (2017, April 24). Apprenticeship programs increasingly put workers on track for jobs in finance. *Chicago Tribune*. Retrieved from http://www.chicagotribune.com/business/ct-aon-finance-apprenticeship-0425-biz-20170424-story.html; Koch, 2012; Lerman, B. (2014). Do firms benefit from apprenticeship investments? *IZA World of Labor*: 55. https://www.doi.org/10.15185/izawol.55; DOL Employment & Training Administration, 2018.

[77] White House (2015). *Occupational Licensing: A Framework for Policymakers*. Washington DC: author.

[78] Bartlett, 2012.

[79] President's Task Force on Apprenticeship Expansion, 2018; Wyman, 2016; Koch, 2012.

[80] McKinney, L., Burridge, A., & Mukherjee, M. (2017). Occupational certificates: Examining student characteristics and enrollment outcomes across the public and for-profit sectors. *Teachers College Record* 119, 1–33; Belfield, C. R., & Bailey, T. (2017). *The labor market returns to sub-baccalaureate college: A review* (CAPSEE Working Paper). New York, NY: Center for Analysis of Postsecondary Education and Employment.; Xu, D., & Trimble, M. J. (2016). "What about certificates? Evidence on the labor market returns to non-degree community college awards in two states." *Educational Evaluation and Policy Analysis 38*(2), 272–292.

[81] Jepsen, C., Troske, K., & Coomes, P. (2014). The labor market returns to community college degrees, diplomas and certificates. *Journal of Labor Economics 32*(1), 95–121.

[82] Schmidt-Wilson, S., Downey, J. A., & Beck, A. E. (2018). Rural educational attainment: The importance of context. *Journal of Research in Rural Education 33*(1).

[83] Egerton, 2003; Doyle, 2017.

[84] Tesfai, Dancy, & McCarthy, 2018.

[85] Van Noy, 2011.

[86] This work was led by the George Washington University's Institute of Public Policy (GWIPP); Workcred, an affiliate of the American National Standards Institute; and Southern Illinois University (SIU), Carbondale's Center for Workforce Development.

[87] U. S. Chamber of Commerce Foundation, *Job Data Exchange (JDX)*.

[88] Leventoff, 2018.

[89] Sykes, A. R., Szuplat, M. A., & Decker, C. G. (2014). *Availability of data on noncredit education and postsecondary certifications: An analysis of selected state-level data systems*. Washington, DC: U.S. Department of Education.

[90] Van Noy, M., Jacobs, J., Korey, S., Bailey, T., & Hughes, K. (2008). *The landscape of noncredit workforce education: State policies and community college practices*. New York, NY: Community College Research Center, Teachers College, Columbia University.

[91] Sykes, Szuplat & Decker, 2014.

[92] Association for Career and Technical Education. (2017). Connecting industry-recognized certification data to education and workforce outcomes: Measuring the value added to skills, employment and wages. Baltimore, MD: author; Lumina Foundation. (2018). *Developing a public-private education and credentialing data infrastructure for attainment and outcomes*. Indianapolis, IN: author.

[93] Leventoff, 2018.

[94] Connecting Credentials, 2015b.

[95] Adelman, C., Ewell, P., Gaston, P., and Schneider, C. (2014). *The degree qualifications framework*. Indianapolis, IN: Lumina Foundation; Ewell, P. (2012). *The "quality agenda": An overview of current efforts to examine quality in higher education* (Innovative Practices). Washington, DC: American Council on Education. Retrieved from https://www.acenet.edu/news-room/Pages/The-Quality-Agenda-An-Overview-of-Current-Efforts-to-Examine-Quality-in-Higher-Ed.aspx

[96] The QA Commons for Higher and Postsecondary Education. (2019). Available from https://theqacommons.org/our-thinking/

[97] The American Council on Education. (2019). Credit. Retrieved from https://www.acenet.edu/news-room/Pages/College-Credit-Recommendation-Service-CREDIT.aspx

[98] American National Standards Institute (ANSI). (2019). Certificate accreditation program (ANSI-CAP) [PDF file]. Washington, DC: author. Retrieved from https://share.ansi.org/shared%20documents/News%20and%20Publications/Brochures/ANSICAP%20Brochure.pdf

[99] ANSI. (2019). ANCI accreditation for personnel certification bodies [PDF file]. Washington, DC: author. Retrieved from https://share.ansi.org/Shared%20Documents/News%20and%20Publications/Brochures/Accreditation_Brochures/Personnel-Accreditation-Brochure-2017.pdf

[100] CLASP. (2015, August). WIOA game plan for low income people (Opportunities for Action Series) [PDF file]. Washington, DC: author. Retrieved from https://www.clasp.org/sites/default/files/public/resources-and-publications/publication-1/Career-Pathways-ETPL-memo.pdf

[101] Leventoff, 2018.

[102] Van Noy, James, & Bedley, 2016.