Deliverable 3.3.2.1.2: Measuring Career Readiness in High School Literature Scan

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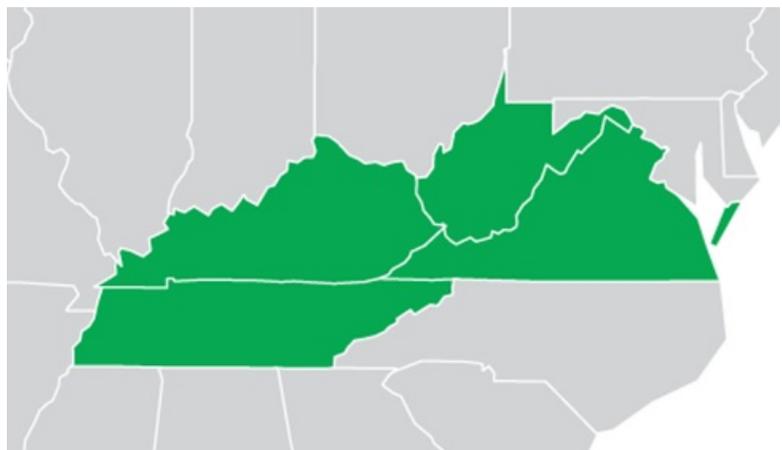
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Measuring Career Readiness in High School Literature Scan

Introduction

Seismic shifts in the predominant industries and jobs that drive the global economy (Carnevale, Jayasundera, & Gulish, 2016) and the constantly changing nature of work (English, 2018) have sparked a national reassessment of the United States' systems of K–16 education and workforce preparation. To meet demand, education policymakers who have focused for a generation on sharpening academic rigor in reading and mathematics today call for a "well-rounded" approach that prepares high school graduates for both college and careers (English, Cushing, Therriault, & Rasmussen, 2018). This policy evolution responds to multiple signals of the need for this change, including low rates of college completion (U.S. Department of Education, 2016), high rates of college remediation (Bailey, 2009; Complete College America, 2012), and rising employer critiques of the preparedness of incoming graduates, not just in academic and technical skills, but also general employability skills (Lippman, Ryberg, Carney, & Moore, 2015; Manpower Group, 2016; Rosenberg, Heimler, & Morote, 2012).

Recent federal legislation encourages state and local education agencies to provide evidence of graduates' readiness for the workplace and to align educational programs with the local labor market. For example the Every Student Succeeds Act (ESSA) of 2015 focused more attention on career readiness by requiring states to include multiple measures of college and career readiness in their accountability plans and to provide a well-rounded education that goes beyond emphasizing core academic content (Every Student Succeeds Act [ESSA], 2015). The 2018 reauthorization of the Carl D. Perkins Career and Technical Education Act, which informs secondary Career and Technical Education (CTE) programming, encourages states to align programs of study to local labor market needs and to track new types of program quality indicators, including metrics of student participation in work-based learning experiences and the proportion of students concentrating in CTE by taking at least two courses in the same career field and earning recognized postsecondary credentials or credits. Finally, the 2013 Workforce Innovation and Opportunity Act (WIOA)—federal legislation guiding the nation's employment training programs—mandates greater integration of traditional job training

activities and secondary CTE activities with the goal of strengthening the alignment of training, education, and support services to high-demand career opportunities (Cushing, Therriault, & English, 2017).

Despite this increasing emphasis on career readiness in federal legislation, there is no commonly agreed upon definition of what it is or how to measure it. Literature on career readiness uses multiple definitions that emphasize different skills, including interpersonal and intrapersonal competencies (for example, U.S. Chamber of Commerce Foundation, 2016), postsecondary transition knowledge and skills (for example, Conley, 2012), or industry-specific skills (for example, McREL, 2016).

The goal of this literature scan is not to identify "the one best framework" but to provide an overview of common approaches and equip Regional Educational Laboratory (REL) staff with strategies and resources to help stakeholders select or develop a framework that aligns to their purpose and context and to identify measures that align to the constructs in the selected framework. A second goal of this literature scan is to provide REL staff resources and strategies for sifting through the array of tools available for measuring career readiness in ways that are valid, reliable, fair, and useful in different contexts. To address these two goals, this literature scan includes two sections. The first focuses on career readiness frameworks and is organized around the question, "What should we measure?" The second focuses on measurement and is organized around the question, "How should we measure?" Both sections tackle questions for which there is little consensus in the field. As such, this literature scan will not comprehensively answer either question but will provide REL staff with an overview of the main considerations and challenges that the field is currently grappling with. It concludes with a discussion of implications for how REL staff can best support their stakeholders and directions for future research.

Career readiness frameworks: what should we measure?

Career readiness frameworks articulate the knowledge, skills, and dispositions necessary for success in the workforce. Frameworks are useful for both researchers and practitioners because they help answer the question, "How will we know if we're successful?" A framework can serve as a guide for researchers on what needs to be measured and can be useful for practitioners to backwards map the program features needed to ensure students are developing the right knowledge and skills. Many prominent national and international organizations have invested in developing frameworks, often involving stakeholders from both education and industry in the development process.

The first question to consider when selecting or developing a career readiness framework is "success for whom?" One of the main differentiators between frameworks is whether they are designed to capture the student, school/district, or industry perspective. For example, a framework designed to measure career readiness from the student perspective that will be used to provide formative feedback and career guidance to high school juniors and a framework designed to capture career readiness from an employer perspective might legitimately include both overlapping and distinct components. A second and related consideration is scope. Some frameworks are designed to capture the knowledge and skills necessary for career and college readiness, and some focus in more narrowly on cross-cutting career readiness skills, which are referred to as "employability skills" in some places and "21st century skills" in others. The broadest frameworks also include readiness for "citizenship," which can include attributes that contribute to broader societal goals such as social responsibility, civic literacy, and environmental literacy or individual well-being such as financial literacy or health literacy.

Once stakeholders have identified the perspective their framework will capture and the scope of knowledge and skills it will cover, the next step is specifying the components at a sufficient level of detail that appropriate assessments can be selected to measure them. In identifying which components to include, stakeholders should consider the extent to which there is evidence supporting the connection between a specific component and student success

in college and the workforce.

This section first describes the two characteristics of frameworks—perspective and scope—in greater detail, then describes the common and unique competencies of the 13 frameworks identified and reviewed in this literature scan, and finally discusses the evidence base supporting the link between the knowledge and competencies commonly included in frameworks and students' college and workforce outcomes. Exhibit 1 provides the definitions of terminology used to describe career readiness knowledge and skills in this literature scan.

Exhibit 1: Career Readiness Terminology

The terminology used to describe career readiness knowledge and skills is both diverse and contentious. This literature scan uses the following terms:

Content knowledge. Mastery of the disciplinary content in core academic subject areas and the ability to apply or transfer what has been learned to complex and novel situations (EPIC, 2012).

Technical knowledge and skills. Industry specific knowledge and skills that include applied academic knowledge and skills (for example, reading, writing, math, science) as they are used in workplace settings. For example, the Office of Vocational and Adult Education (OVAE) and the National Association for State Directors of Career Technical Education Consortium (NASDCTEc) recognize 16 career clusters of pathways and occupations in the same field, each of which has an industry-validated knowledge and skills definition that includes what students need to know and be able to do to be successful in that field (NASDCTEc, 2012).

Competencies. Reflects individual students' malleable dispositions (mindsets, beliefs) and skills (strategies). Competencies can be organized into three domains:

- Intrapersonal competencies refer to ways of dealing with oneself, including ones' thoughts and emotions. These are the dispositions and skills directed and applied inwardly (Taylor et al., 2018).
- Interpersonal competencies refer to the dispositions and skills directed toward other people, institutions, or social structures (Taylor et al., 2018). They involve expressing information to others as well as interpreting others' messages and responding appropriately (National Research Council, 2012).
- Cognitive competencies are the processes individuals use to solve problems, make decisions, and create new ideas.

Employability Skills. Skills that are necessary to succeed in entry-level employment (sometimes referred to as "21st century skills"). Employability skills typically include both competencies and technical knowledge and skills.

In this literature scan, we adopt a broad definition of competencies that includes both dispositions and skills.

Dispositions include foundational mindsets and behaviors such as self-control, initiative, responsibility, and adaptability. Skills include learned strategies, such as collaboration, communication, and problem solving. Knowledge and competencies are interrelated and mutually reinforcing. For example, students are more likely to be able to solve problems (a skill) if they have initiative (a disposition) and possess the relevant content knowledge (Educational Policy Improvement Center, 2012).

Research suggests that dispositions are malleable in response to interventions and not fixed attributes that cannot be changed by individuals' experiences (Nagaoka, Farrington, Ehrlich, & Heath, 2015; Roberts et al., 2017; Walton & Billera, 2016).

Perspective

Frameworks that are designed to capture success from a student or school/district perspective typically include both college and career readiness. The inclusion of college makes sense from a student or educator perspective because labor market economists estimate 65 percent of all jobs will require some postsecondary education and training by 2020 (Carnevale, Smith & Strohl, 2013). Moreover, as of 2016, 80 percent of "good jobs" already required some postsecondary education and training (Georgetown University Center on Education and the Workforce, 2018).[1] Frameworks from the school/district perspective typically include the same components that are included from the student perspective, with the addition of the institutional supports or resources that are necessary to support students in becoming college and career ready. Frameworks designed from all three perspectives typically include employability skills, but they are the central focus of frameworks designed from an industry perspective.

Although not an exhaustive list of frameworks, the examples below indicate the range of perspectives and the breadth of thought leadership (exhibit 2; see appendix for a list of all 13 frameworks reviewed). Most college and career readiness frameworks articulate an overlapping set of concepts, although their terminology and level of detail vary.

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[1] The authors define "good jobs" as those paying a minimum of $35,000 for workers between the ages of 25 and 44 and at least $45,000 for workers between the ages of 45 and 64 (Georgetown University Center on Education and the Workforce, 2018).

Exhibit 2. Examples of career readiness frameworks by perspective

Perspective[a]	Framework	Domains
Student/college and career readiness	David Conley's Four Keys to College and Career Readiness (2012) The Four Keys draws on 18 years of work by Conley and colleagues including: "a proficiency-based college admissions system developed for the Oregon University System, a national study on college readiness standards sponsored by the Association of American Universities, multiple analyses of entry-level college courses sponsored by the College Board and others, college and career readiness standards developed under the sponsorship of the Texas Higher Education Coordinating Board and subsequent studies of their validity relative to college and careers, a study of career preparation programs sponsored by the National Assessment Governing Board, and two major studies sponsored by the Bill & Melinda Gates Foundation on the alignment of the Common Core State Standards to college and career readiness." (Conley, 2012 pg. 1)	The Four Keys are • **Key cognitive strategies:** including problem formulation, research, interpretation, communication, and precision and accuracy. • **Key content knowledge**: including the structure of knowledge, technical knowledge and skills, challenge level, value, attribution, and effort. • **Key learning skills and techniques:** ownership of learning and learning techniques. • **Key transition knowledge and skills:** postsecondary awareness, postsecondary costs, matriculation, career awareness, role and identity, and self-advocacy.
Student/career readiness	Common Career Technical Core (CCTC) (2012) The CCTC is a collaborative effort between states, business representatives, and educators to set a common benchmark for the skills and knowledge students should possess after completing a Career and Technical Education (CTE) program. The resulting tool includes a list of 12 career ready practices (CRP) which can be applied to all levels, disciplines, and programs, as well as standards for each of the 16 career clusters and their corresponding pathways. The National Association of State Directors of Career Technical Education Consortium (NASDCTEc) developed the CCTC in 2012.	Career ready practices (CRPs) include: • Act as a responsible and contributing citizen and employee. • Apply appropriate academic and technical skills. • Attend to personal health and financial well-being. • Communicate clearly, effectively, and with reason. • Consider the environmental, social, and economic impacts of decisions. • Demonstrate creativity and innovation. • Employ valid and reliable research strategies. • Utilize critical thinking skills to make sense of problems and persevere in solving them. • Model integrity, ethical leadership, and effective management. • Plan education and career path aligned to personal goals. • Use technology to enhance productivity. • Work productively in teams while using cultural/global competence.

Perspective[a]	Framework	Domains
School[b]/college and career readiness	The College and Career Readiness Success (CCRS) Organizer (2014) The National High School Center developed the CCRS Organizer in 2014 the College and Career Readiness Success Center later revised it to incorporate feedback from content-area experts from workforce, education, and non-profit communities. The final version displays the various elements that impact a student's ability to succeed in college at the institutional and individual levels and is intended to facilitate discussion and inform collaboration, strategy alignment, and decisionmaking around college and career readiness.	The CCRS includes four categories: • Goals and expectations: What learners should know and be able to achieve to be college and career ready. Includes academic content, pathway knowledge, and lifelong learning skills. • Outcomes and measures: Indicators that learners are meeting expectations for college and career readiness and success. Includes on-track indicators for readiness, measures of postsecondary readiness, and measures of postsecondary success. • Resources and structures: What institutions need in order to enable learner readiness for college and career. Includes feedback, processes, and resources. • Pathways and supports: What institutions need to provide to enable learners to achieve college and career readiness. Includes academic organization, supports, and enrichment and preparation.
School[b]/college and career readiness	Framework for 21st Century Learning Definitions (2019) In 2002 a coalition of business, education, and policy leaders founded Partnership for 21st Century Skills (P21) to advocate for 21st century skills development in U.S. K–12 education. P21 developed this framework through collaboration with teachers, education experts, and business leaders. The framework defines and illustrates the skills and knowledge students need to succeed in work, life, and citizenship. In 2019 the P21 network joined Battelle for Kids and released a revised framework, which includes institutional structures and supports needed to enable learner readiness for college and career.	Institutional supports: • Standards and assessments. • Curriculum and instruction. • Professional development. • Learning environments. Essential skills: • Key subjects (English, mathematics, science) and 21st century themes (for example, global awareness, civic literacy, financial literacy). • Life & career skills. • Learning & innovation skills. • Information, media, & technology skills.
Industry/career readiness	Employability Skills Framework (2013) The Office of Career, Technical, and Adult Education, U.S. Department of Education developed this framework. The goal was to provide a unifying framework that cuts across workforce development and education sectors. A group of career and technical education, adult education, workforce development, and business organizations guided its development.	Employability skills are general skills necessary for success in the labor market at all employment levels and in all sectors. Categories are: • Applied knowledge: applied academic skills, critical thinking skills, and resource management. • Effective relationships: interpersonal skills and personal qualities.

Perspective[a]	Framework	Domains
		• Workplace skills: resource management, information use, communication skills, systems thinking, and technology use.
Industry/career readiness	National Network Common Employability Skills (2015) Created by the National Network of Business and Industry Associations in 2015, this framework is intended to serve as "the foundation for all industries to map skill requirements to credentials and career paths," and thereby understand the skills that all industries believe prepare individuals to succeed (National Network of Business and Industry Association, 2015, pg. 3). The National Network includes leaders in manufacturing, retail, health care, energy, construction, hospitality, transportation, and information technology.	The employability skills are: • Personal skills (integrity, initiative, dependability & reliability, adaptability, and professionalism). • Applied knowledge (reading, writing, mathematics, science, technology, and critical thinking). • Workplace skills (planning and organizing, problem solving, decisionmaking, business fundamentals, customer focus, and working with tools & technology). • People skills (teamwork, communication, respect).

[a] The authors of this document categorized the frameworks by student, school, and industry perspectives. These designations do not reflect the opinions of the organizations that developed the frameworks. The authors also categorized frameworks as either "college and career readiness" or "career readiness" on the basis of their stated purpose and the scope of domains covered.

[b] For the purposes of the literature scan, the school perspective represents the education system broadly, including schools, local education agencies and state education agencies.

Student perspective

Frameworks designed from the student perspective are oriented around the individualized nature of students' post high school aspirations. A student's career interests will influence the knowledge and skill profiles required to be successful, and therefore the measure of success should take into account the individualization of the match between knowledge and skills, on the one hand, and aspirations on the other (Conley, 2012). For example, to address this individualization of the career path, Conley's Four Keys includes "transition knowledge and skills," which captures the knowledge and skills necessary for high school graduates to successfully navigate the transition to life beyond high school. These include knowing which courses to take in high school in order to be admitted to an appropriate postsecondary program and understanding the financial aid options and procedures. There are frameworks designed from the student perspective that focus more narrowly on the knowledge and skills needed for success in the workforce, but even these frameworks include some reference to students' navigation of their own postsecondary path. For example, The Career Ready Practices

framework developed by NASDCTEc includes a practice focused on "planning one's own educational and career path." These navigational knowledge and skills are critical to an individual student's success after high school.

School perspective

Career readiness frameworks designed from the school, district, or state education agency perspective also often include both college and career readiness. These frameworks are distinct from frameworks designed from the student perspective because they also include instructional or institutional supports that educators must provide to ensure their students are graduating college and career ready. For example, the College and Career Readiness Success (CCRS) Organizer includes a category called "pathways and supports," which includes school-level support strategies such as guidance on postsecondary transitions, individualized learning strategies for all students, and work- and context-based learning opportunities. The CCRS Organizer also includes "resources and structures" that are typically organized at the district or state levels, such as accountability, external alignment across systems and institutions, and data systems. Similarly, the Partnership for 21st Century Skills (P21) framework includes standards and assessments, curriculum and instruction, professional development, and learning environments that support the development of the knowledge and skills students should have to succeed in work and life in the 21st century.

Industry perspective

Frameworks designed from the industry perspective typically focus more narrowly on the "employability skills" needed for success in the workforce and cover these skills in greater depth. These frameworks largely do not focus on the specific knowledge and skills sought by any one employer or industry sector but are meant to capture the cross-cutting or transferable skills that are important in the modern workplace. For example, the Employability Skills Framework developed by the U.S. Department of Education's Office of Career, Technical, and Adult Education includes "workplace skills" such as resource management, information use, communication skills, systems thinking, and technology use. Employability skills typically include interpersonal, intrapersonal, and cognitive competencies. Sometimes employability

skills also include a technical knowledge and skills component that refers to industry-specific knowledge or skills and applied academic knowledge.

Scope

Depending on the perspective they are designed to capture and the objectives of the authoring organizations, frameworks can vary dramatically in the breadth of domains that are covered and depth with which they are treated. College and career readiness frameworks typically cover the broadest set of domains, including academic content knowledge, college knowledge or career pathway navigation skills, and cognitive, intrapersonal and interpersonal competencies. However, these frameworks cover a broader range of topics and often go into less depth within the domains that they cover.

A review of the domains included in 13 commonly referenced college and career ready frameworks (exhibit 3) demonstrates both commonalities and differences. All four of the college and career readiness frameworks reviewed include academic content knowledge as compared with only one of the career readiness frameworks. Both categories of frameworks typically include technical knowledge and skills, which refers to knowledge and skills that are industry specific and also includes applied academic knowledge (10 out of 13 frameworks). All frameworks reviewed included some reference to interpersonal, intrapersonal, and cognitive competencies, however they varied greatly in the number of competencies identified, with the career readiness frameworks going into greater depth in these domains, on average. For example, the CCRS Organizer includes "employability skills" as one subcomponent, with some examples provided, but does not provide a comprehensive list of what these skills are. By contrast many of the career readiness frameworks focus on a narrower set of domains but go into each in much greater depth (for example, focusing exclusively on employability skills).

Exhibit 3. Domain coverage by framework

Scope	Framework	College knowledge/ career path navigation	Academic content knowledge	Technical knowledge & skills*	Cognitive competencies	Intrapersonal competencies	Interpersonal competencies	Institutional supports
College and Career Readiness	Council of Chief State School Officers (CCSSO), Innovation Lab Network (ILN) Framework for College, Career, and Citizenship Readiness		X	X	X	X	X	
	David Conley, Four Keys to College and Career Readiness	X	X	X	X	X	X	
	CCRSC, College and Career Readiness Success Organizer	X	X	X	X	X	X	X
	P21 Framework for 21st Century Learning	X	X		X	X	X	X
Career Readiness	NASDCTEc Common Career Technical Core	X		X	X	X	X	
	Career Readiness Partner Council (CRPC), What it Means to be Career Ready	X	X	X	X	X	X	
	National Research Council, 21st Century Skills				X	X	X	
	U.S. Department of Edcuation (U.S. DOE), Employability Skills Framework			X	X	X	X	
	National Network of Business and Industry Associations (National Network), Common Employability Skills			X	X	X	X	
	Measures of Human Achievement (MHA) Labs, The Building Blocks				X	X	X	
	The Organisation for Economic Co-operation and Development (OECD), Definition and Selection of Key Competencies (DeSeCo)			X	X	X	X	
	SkillsUSA, Employability Framework			X	X	X	X	
	Joyce Foundation, Personal Success Skills Framework			X	X	X	X	
	Total Frameworks	**4**	**5**	**10**	**13**	**13**	**13**	**2**

Source: Authors' calculations

*The category Technical Knowledge and Skills includes *applied* academic knowledge.

Commonalities and differences in the competencies included across frameworks

Exhibit 4 provides an expanded view of the three competency domains—intrapersonal, interpersonal, and cognitive competencies—displaying the specific dispositions and skills included in each framework. Some frameworks may reference a broad competency like critical thinking, while others may specify narrower skills within critical thinking, such as planning, problem solving, decisionmaking, or analysis. To show differences in level of detail of each framework, exhibit 4 includes data on both the broad competencies and specific dispositions and skills. The "general" columns identify frameworks that reference the broad competency level (for example, critical thinking) and the "total" columns indicate which frameworks referenced either the broad competency or any of the component dispositions or skills.

Exhibit 4. Competencies by framework

Framework	Growth Mindset	Integrity	Self-awareness	Intellectual Openness	Pro-active/positive attitude (general)	Pro-active/positive attitude (total)	Goal Setting	Active listening and observation	Asks questions and seeks help when needed	Motivation	Perseverence	Self-monitoring/evaluation	Time Management	Metacognitive Skills	Self-regulation (general)	Self-regulation (total)	Flexibility/adaptability	Initiative	Dependability	Responsibility	Professionalism and service orientation	Work Ethic/Conscientiousness (general)	Work Ethic/Conscientiousness (total)	Leadership and management	Negotiation/Conflict Management	Respect for Differences	Teamwork/collaboration (general)	Teamwork/collaboration (total)	Communication	Empathy/social awareness	Planning and organization	Problem Solving	Decisionmaking	Analysis and reasoning	Critical Thinking (general)	Critical Thinking (total)	Research/Learning Skills	Systems Thinking	Technology Skills	Creativity/ Innovation
CCSSO, ILN Framework																																								
David Conley, Four Keys																																								
MHA Labs, The Building Blocks																																								
NASDCTEc, Common Career Technical Core																																								
CRPC, What it Means to be Career Ready																																								
National Network, Common Employability Skills																																								
National Research Council, 21st Century Skills																																								
OECD, DeSeCo																																								
P21 Framework for 21st Century Learning																																								
SkillsUSA, Employability Framework																																								
The Joyce Foundation, Personal Success Framework																																								
U.S. DOE, Employability Skills Framework																																								
Total Frameworks	2	5	4	3	3	**8**	5	5	2	3	5	5	7	4	5	**10**	8	8	4	5	6	3	**12**	8	5	6	12	**12**	**11**	**6**	6	9	9	4	8	**12**	**6**	**2**	**10**	**5**

Source: Authors' calculations

Note: This exhibit does not include the CCRSC College and Career Readieness Success Organizer because it does not specify compentency subcomponents with suffiecient detail.

All frameworks included at least one disposition or skill associated with teamwork/collaboration, work ethic, and critical thinking. The majority of frameworks included a disposition or skill associated with the intrapersonal competencies of pro-active/positive attitudes and self-regulation, however which disposition or skill varied substantially with only time management listed on a majority of frameworks. The following "consensus" competencies and component behaviors and skills appear on at least six of the twelve frameworks.[2]

- Intrapersonal competencies:
  - Positive/pro-active attitude.
  - Self-regulation.
    - Time management.
  - Work ethic/conscientiousness.
    - Flexibility/adaptability.
    - Initiative.
    - Professionalism.
- Interpersonal competencies:
  - Communication.
  - Teamwork.
    - Leadership.
    - Respect for differences.
  - Empathy/social awareness.
- Cognitive competencies:
  - Critical thinking.
    - Planning and organizing.
    - Problem solving.
    - Decisionmaking.
  - Research/learning skills.
  - Technology skills.

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[2] We excluded the CCRS Organizer from this analysis because it does not go into competencies at a sufficient level of detail.

Evidence of relationships to college and workforce outcomes

Ideally, stakeholders should consider the evidence base when selecting which domains of knowledge and competencies (i.e., academic content knowledge; college knowledge and navigation skills; technical knowledge and skills; and intrapersonal, interpersonal and cognitive competencies) and which component dispositions and skills to include in a career readiness or college and career readiness framework. Because more than two-thirds of jobs now require at least some postsecondary education, it is important to consider the extent to which the domains of knowledge and competencies under consideration predict success in college as well as success in the workforce.

College success

The academic content knowledge and cognitive competency predictors of college success are reasonably well researched, although there are more studies on enrollment and early indicators of success (persistence, attainment of an industry certification) than on completion (Hein, Smerdon, & Quill, 2013). In a review of 80 research studies, staff at the CCRS Center identified multiple measures of academic knowledge that predict postsecondary success, including meeting or exceeding benchmark scores on state and national assessments; completing specific mathematics coursetaking pathways (for example, taking algebra in grade 8 and algebra II in grade 9); scoring a 3 or higher on Advanced Placement final exams or a 4 or higher on International Baccalaureate final exams; reaching certain thresholds on the Scholastic Aptitude Test (SAT) or American College Testing (ACT), and participation in dual enrollment courses (Hein, Smerdon, & Quill, 2013). It is worth noting that the more recent Common Core State Standards-aligned assessments place a greater emphasis on cognitive competencies such as critical thinking than their predecessors, but these assessments have not yet demonstrated predictive validity for college or career outcomes (Chatterji, 2019).

Grade point average (GPA) is also a strong predictor of college success, and recent research suggests that it is a stronger predictor of earning a bachelor's degree than SAT or ACT test scores (Chingos, 2018; Hein, Smerdon, & Quill, 2013). GPA is believed to be a strong predictor in part because it captures not only academic performance but also intrapersonal competencies

such as motivation and perseverance.

There is also evidence to suggest that there is a relationship between the domain of college knowledge and navigation skills and postsecondary enrollment. For example, submitting the Free Application for Federal Student Aid (FAFSA) and a college application, coupled with immediate, full-time enrollment in a postsecondary academic or career-focused program, is associated with postsecondary persistence (Nagaoka et al., 2009). Participation in college preparatory activities, such as summer transition and orientation programs, and high school-to-college bridge programs is also associated with college success (Barnett et al., 2012; Mishook, 2012).

There is much less evidence on the relationship between intrapersonal and interpersonal competencies on college success. A recent review by the National Academies of Sciences, Engineering, and Medicine found that only limited research has been conducted to date on the potential relationships between intra- and interpersonal competencies and students' college success, with a particular lack of research on interpersonal competencies (National Academies of Science Engineering and Medicine, 2017). The review also found that the existing research was conducted almost entirely in 4-year institutions. The authors did find research that supports a relationship between several intrapersonal competencies and college success, including behaviors related to conscientiousness or work ethic, academic self-efficacy, growth mindset, utility goals and values, intrinsic goals and interest, pro-social goals and values, and positive future self. This does not mean that these are the only dispositions that predict college success; the research community lacks quality studies for many of the intra- and interpersonal competencies that career readiness frameworks current reference.

Workforce success

Research suggests that the combined effects of educational attainment and standardized test scores account for only about 10 to 20 percent of the observed variation in individual earnings. Adding demographic characteristics, family background, and work experience still usually leaves about two-thirds of the variance in earnings unexplained (Bowles, Gintis, &

Osborne, 2001). Similarly, a meta-analysis of personnel selection research found that cognitive indicators predict only 26 percent of the variance in job performance (Schmidt & Hunter, 1998). Researchers have argued that considering intra- and interpersonal competencies will improve these predictions (Gaertner & Roberts, 2017). There is some research suggesting that intrapersonal competencies as measured in adolescence, such as conscientiousness, are predictive of workforce outcomes (Dudley, Orvis, Lebiecki & Cortina, 2006; Lindqvist & Vestman, 2011; Borghans, Duckworth, Heckman, & Weel, 2008; Brunello & Schlotter, 2010). Relatively few research studies have tracked individuals all the way from high school to the workforce and these studies provide data on only a very limited number of intra- or interpersonal competencies (Darche & Stern, 2013).

Although there is limited data on the predictive validity of high school measures of intra- and interpersonal competencies on success in the workforce, many of the "consensus" competencies identified by the analysis of frameworks have face validity. Many of the frameworks reviewed were created with input from industry representatives. Moreover, a 2006 survey that asked more than 400 employers across the United States to rate the importance of both basic academic knowledge and skills and intra- and interpersonal competencies found that employers rated work ethic, teamwork, oral communication, and critical thinking/problem solving as more important to overall job performance than any of the disciplinary academic knowledge items, including reading comprehension and mathematics skills (Casner-Lotto, Barrington, & Wright, 2006). Notably, these four competencies were also the most frequently referenced in our review of frameworks.

To succeed in the workforce, high school career and technical education (CTE) courses and programs of study teach industry-specific technical knowledge and skills and for decades, have assessed skills in various ways to determine students' preparation for jobs and careers. Programs have used a variety of measurement approaches, including the growing use of test-based industry credentials. There are thousands of industry credentials available to high school CTE students and very limited published literature demonstrating their value in the labor market (ExcelinED & Burning Glass Technologies, 2019). Additional information on the use of

credentials to measure technical knowledge and skills is provided in the *Measuring technical knowledge and skills* section of this document.

Measuring career readiness: how should we measure?

Once researchers and stakeholders have identified what constitutes career readiness, they must figure out how to measure it. Compared with measuring competencies and technical knowledge and skills, researchers and practitioners have a better understanding of how to measure academic content knowledge. In addition, the academic content knowledge measures that researchers and practitioners use are more consistent and many are widely used (for example, GPA, SAT, ACT, SBAC, PARCC, and the Northwest Evaluation Association MAP assessments). Because the research base on measuring academic content knowledge is more established, the remainder of this literature scan focuses on the career readiness constructs for which there is less of a consensus on measurement: intrapersonal, interpersonal, and cognitive competencies and technical knowledge and skills.

Exhibit 5. Measurement Terminology

Construct. The underlying concept or characteristic that an assessment is designed to measure. Reliability/precision. The degree to which an assessment is free of random errors of measurement for a given group so that the assessment produces consistent results for an individual.
Validity. The degree to which accumulated evidence and theory support a specific interpretation of assessment results for a given use (face validity) and the extent to which the assessment predicts relevant, future criterion measures (predictive validity).
Fairness. The assessment is free from biases that introduce construct-irrelevant variance associated with individual characteristics and contextual factors, which compromises the validity of scores.

Terminology adapted from the Standards for Educational and Psychological Testing (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 2014).

In general instruments that researchers and practitioners use to collect data for measuring career readiness should be reliable, valid, and fair (exhibit 5; American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 2014). Beyond these generalized measurement considerations, other key measurement considerations depend on the purpose behind the measurement and the types of competencies and technical knowledge and skills that the measurement is supposed to capture. This section discusses the various measurement considerations by measurement purpose and competency, knowledge, and skill type; provides a list of valuable resources for

finding and developing career readiness instruments; and provides some examples of instruments.

Purposes for measuring career readiness

Selecting appropriate measures of career readiness centrally depends on the purpose and stakes of the measurement. Purpose drives decisions about the constructs assessed, the assessment methods used, and the audiences who receive the results. The stakes of the assessments also inform selection decisions. The higher the stakes, the more critical the need for reliability and validation of the instrument. Measurement experts have emphasized that validity is not an inherent feature of a measure itself but rather a characteristic of a measure with respect to a particular end use (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 2014). Furthermore, validity is not an all-or-nothing concept, rather, it is something that evolves over time as more evidence accumulates. This section briefly introduces some of the elements to consider when choosing assessments to address the three primary purposes for measuring career readiness at the secondary level. These include providing students with formative feedback to develop their career-relevant skills or explore career interests and options, supporting program evaluation, and meeting accountability requirements.

Formative feedback

Secondary students facing the transition to college and career need accurate information and regular coaching to develop the interpersonal, intrapersonal, and applied skills that will help them succeed. To guide the development of these skills, many programs include formative assessments such as self-reports and ratings by peers, supervisors, and teachers. By reflecting on such ratings, students can improve these skills and see how they improve over time (Shechtman et al., 2016). Often educators measure students' performance on the more applied competencies in traditional ways, using both written and performance-based assessments (Shavelson, Baxter, & Pine, 1991). If used formatively, educators enjoy flexibility around which tools to select (Black & Wiliam, 2005). Educators may also want to incorporate measurement of the supportive skillsets associated with success in school and life. For example, educators may

measure efficacy in interpersonal skills, such as teamwork and communication, through multiple types of rating rubrics during group projects (Yarnall & Remold, in press). Intrapersonal skills, such as work ethic, may be measured using validated assessments (Hill & Petty, 1995; Petty, 1993), and the results can support personal reflection. Measures used for formative feedback should be brief, easily collected, and contextually appropriate (Duckworth & Yaeger, 2015). Additionally, they should be sensitive to short-term changes and provide short-term feedback on progress that has or has not been made (Bryk, Gomez, Grunow, & LeMahieu, 2015).

Secondary students also may benefit from taking formative assessments that give them feedback on how their attitudes, values, interests, and skills prepare them to enter specific types of future careers. Often used by guidance counselors, several instruments are available, including the Strong Interest Inventory (Strong, 1935), the Minnesota Importance Questionnaire (Gay et al., 1971), Holland's Vocational Preference Inventory (Holland, 1958), and Holland's Self-Directed Search (Holland, 1990). The Strong Interest Inventory historically predicted occupation based on scales measuring basic interests and general occupational themes. Developers updated the Strong inventory in 1994 to incorporate a "personal style" scale based on Holland's theories of how an individual's personality traits predict occupation. Validity studies show slight variations in the how well each of the three subscales predicts occupation, with basic interest scale showing the strongest results (Donnay & Borgen, 1996). When using such assessments, educators also may find the career development theory of Donald Super and Jean Pierre Jordan (1973) useful. Their theory identifies the years from age 15 to 24 as devoted to career exploration, which is characterized by tentativeness, transition, and trial.

Program evaluation

Educators participating in structured career readiness programs—such as career-focused dual-enrollment courses, work-based learning, career planning curricula, employability skills badging systems, and career academies—often need to use assessments to gather formative and summative information about program implementation and outcomes to share with

funders, partners, school boards, and parents. Such information may be used to improve implementation and inform efforts to replicate or scale up a program. Low-stakes evaluations focus on informing internal decisions and high-stakes evaluations provide critical information about program effectiveness. To ensure validity of measurement, program evaluation metrics need to be able to detect change over time and, when conducting between-school program evaluation, need to be valid for between-school comparisons. Assessments should align with program goals and reflect the overall logic of how the program expects to achieve its outcomes.

Accountability

Accountability is perhaps the highest bar for measurement. Measures must be collectable in a standardized way across all of the students in a district or state, and they must be valid and reliable for capturing between-school differences. Moreover, it is necessary for aggregated data to reasonably distinguish between schools throughout the majority of the distribution, which is not always the case for student report data (Goldhaber & Loeb, 2013; Raudenbush & Jean, 2012). Because of the scale of administration, it is also important that assessments used for accountability are cost-effective and are not overly burdensome on respondents. Finally, due to the high-stakes nature of accountability, measures must not be overly sensitive to faking or data manipulation (for example, coaching students on the "right" answer to survey questions).

As of 2016, few states included in their accountability systems either formal or informal measures of employability skills (English, 2018). Currently, states rely on multiple measurement instruments to meet the high-stakes goal of holding state education systems accountable for offering a "well-rounded education" (English, 2018). In practice most states rely on four measures: Advanced Placement (AP) and International Baccalaureate (IB) attainment, completion of dual-enrollment coursework, completion of CTE courses or programs of study, and attainment on the college entrance examinations (Scholastic Aptitude Test [SAT] or the American College Testing [ACT]). Many of the two-thirds of states using multiple measures have developed readiness indicator systems that assign weights to each sub-indicator to produce a composite meta-indicator score of a school's college and career readiness performance (for more details by state, see Achieve & Advance CTE, 2016). States also varied on how much they

reported on industry certification attainment.

Approaches to measuring career readiness

A multitude of instruments are available for collecting data on career readiness skills. In 2012, Baez estimated that there were more than 2,500 assessments for work-related intrapersonal and interpersonal competencies on the commercial market alone. This section discusses considerations when selecting instruments to collect data on career readiness competencies (intrapersonal, interpersonal, and cognitive) and technical knowledge and skills as they relate to the three major purposes for measurement identified in the previous section.

Measuring competencies

Multiple types of instruments are available to measure the competency components of the various frameworks. The three most common approaches are self-report surveys, teacher-report surveys, and performance-based assessments. In a recent practitioner guide, Choosing and Using SEL Competency Assessments, developed by staff from The Collaborative for Academic, Social, and Emotional Learning (CASEL) and RAND, the authors make the case that the distinction between dispositions and skills is more critical to determining the best assessment approach rather than the type of competency (e.g., intrapersonal versus interpersonal; Taylor et al., 2018). Self-report surveys (or interviews) are the best approaches to measuring intrapersonal dispositions that have to do with individuals' self-awareness or mindset (e.g., growth mindset, self-efficacy) and interpersonal dispositions that have to do with their awareness of or feelings towards others (e.g., empathy, social awareness; Duckworth & Yeager, 2015; Taylor et al., 2018). These dispositions are fundamentally internal processes that are difficult for others to accurately interpret through observation of externally manifested behaviors (Duckworth & Yeager, 2015).

By contrast, teacher-report surveys or performance-based assessments are typically better approach for measuring skills (whether they be intrapersonal, interpersonal, or cognitive) because these approaches allow students to demonstrate their ability to use their competencies in an applied setting (e.g., observation and/or rubrics assessments of

performance in group projects; Taylor et al., 2018). Nonetheless, some of these skills are very complex and difficult to measure well even with the best assessments. Researchers have noted that the measurement of some interpersonal skills are particularly challenging because they are multi-faceted constructs (Bedwell et al., 2011; National Research Council, 2011; Stecher & Hamilton, 2014). For example, communication skills can include active listening, oral communication, written communication, assertive communication, and nonverbal communication (National Research Council, 2011, pp. 43–44).

The three main approaches to measuring competencies (self-report survey, teacher-report survey, and performance-based assessments) each have different strengths and limitations. In choosing which is most appropriate, stakeholders must consider the interplay between these strengths and limitations and their intended purpose. For example, assessments that are difficult to implement at scale would not be well suited for accountability purposes but might be feasible for a smaller program evaluation.

Surveys. In general, surveys have the advantage of being relatively cheap, easy to administer and score, and reliable. A core limitation of self-report surveys is the potential for test-taker biases that can weaken validity. The two most noteworthy sources of bias are social desirability bias and reference bias. Social desirability bias is the tendency to respond in ways that are culturally appropriate, acceptable, or desirable, instead of truthfully (Bedwell, Fiore & Salas, 2011). Reference bias is the tendency to evaluate oneself in comparison to one's own group of peers rather than to a broader or more objective set of standards. A classic example of reference bias can be seen in the Programme for International Student Assessment where some of the countries with the lowest proficiency scores have the highest self-concept about their abilities (Kyllonen, 2012). Teacher-report surveys are less susceptible to social desirability bias than student-report surveys but are still subject to reference bias. Reference bias limits the comparability of survey results across classrooms and schools and therefore limits their value for measurement purposes that involve between school comparisons (Duckworth & Yeager, 2015).

In addition to test-taker biases, surveys are more susceptible to faking than performance-

based assessments (Duckworth & Yeager, 2015). This is particularly a concern for high-stakes assessment purposes such as accountability. Finally, stakeholders must also consider the likelihood of achieving an acceptable survey response rate. Low survey response rates can lead to nonresponse bias, as responding to the survey may be related to relevant student characteristics (Groves & Peytcheva, 2008). The U.S. Department of Education (2012) recommends having survey response rates of at least 85 percent to avoid nonresponse bias and using corrective weighting procedures in cases where the response rate is less than 85 percent.

There are several relatively new methods for reducing reference bias in survey data, including situational judgment tests (SJT) and anchoring vignettes. SJTs present students with situations and ask them for the best (or typical) response to the situation (Kyllonen, 2012). Though this type of survey is still threatened by social desirability bias, the question formatting likely makes it less prone to suffer from reference bias. According to a meta-analysis, SJTs typically have relatively high predictive validity (McDaniel, Hartman, Whetzel, & Grubb, 2007). Anchoring vignettes are brief descriptions of hypothetical persons or situations that serve as anchors for calibrating respondents' ratings (Hopkins & King, 2010). For example, respondents might be asked to rate three hypothetical people who vary on a construct such as conscientiousness, then to rate themselves. Adjusting survey scores using anchoring vignettes has been shown to resolve paradoxical findings attributed to reference bias (Duckworth & Yeager, 2015). However, the extent to which vignettes fully correct for reference bias is not currently known and they add substantially to respondent burden (Kyllonen & Bertling, 2013).

Performance-based assessments. Performance tasks enable measurement of skills from each of the three main competency groups. They have the potential to allow for an assessment of competencies in a more realistic setting. These assessments can take many forms, including discipline-embedded projects and game-based simulations. However, it can be difficult to elicit behaviors in a way that is truly indicative of how a person would behave in the real world (Duckworth & Yeager, 2015). Performance tasks also do not rely upon the subjective judgments of students or teachers, which eliminates both reference bias and social desirability bias that can arise with surveys (Duckworth & Yeager, 2015). Education reform advocates have

recommended the use of performance tasks to capture student ability in cognitive competencies that traditional multiple-choice assessments are less able to measure, such as the ability to analyze, synthesize, critique, or investigate (Darling-Hammond & Adamson, 2013). Typically, performance tasks are high cost, burdensome to respondents, and can be challenging to use to measure growth over time as students become familiar or bored with the task and creating similar but different performance tasks can be challenging (Duckworth & Yeager, 2015). With these limitations, performance tasks may be difficult to use for accountability purposes or in other situations where a large number of students need to be evaluated or there is a need to evaluate over time.

Digital performance tasks do however offer promising possibilities because of their potential to standardize task presentation and automate scoring, for example, through engagement with avatars and complex simulated environments (Shechtman, Yarnall, Stites, & Cheng, 2016). It is also possible that game-based performance tasks could be used to collect data on intrapersonal skills (e.g., task persistence) via data mining, reducing fakability concerns (Gaertner & Roberts, 2017). More research on the reliability and validity of these new approaches is needed.

Measuring technical knowledge and skills

Perkins requires states to measure CTE students' technical knowledge and skills, to which states have taken different approaches over time. For example, in 2006, one third of states assessed technical knowledge and skills through end-of-program exams that were either state-developed or developed by third party vendors (National Research Center for Career and Technical Education, 2006). As a result, there was little consistency in how states assessed technical skill attainment for Perkins reporting purposes. As of 2013, a survey conducted by the Center on Education Policy (CEP), found that states typically use different assessments for measuring applied academic knowledge and skills and technical knowledge and skills. The most commonly reported assessments for measuring employability skills and/or applied academics were:

- The ASVAB, which was developed by the U.S. Department of Defense and is typically available to any student, particularly those interested in a military career (32 states).

- WorkKeys, a job skills assessment system developed by ACT (32 states).

- The National Occupational Competency Testing Institute (NOCTI) assessments (22 states).

The CEP survey also found that the majority of states and/or their districts assess high school CTE students for industry-specific technical skills. The most commonly reported assessments used by states for measuring technical skills were:

- Industry-based certification and/or licensing exams (38 states).

- NOCTI assessments (27 states).

- SkillsUSA assessments (23 states).

- State-developed assessments (20 states)

- Locally-developed assessments (16 states).

States most commonly used industry-based certifications to measure technical skills. However, there are thousands of CTE certifications and credentials available in the United States that students can earn. These credentials are meant to signal to employers that the student is prepared for a particular career or has certain skill sets that are valuable to employers (Muller & Beatty, 2009). Because these data can be monitored and obtained through an administrative dataset, these indicators are relatively easy to use for accountability purposes but the evidence of technical quality and predictive validity of many of the CTE credentials is limited (ExcelinEd & Burning Glass Technologies, 2019).

In general, more research is needed to assess the value of credentials. Research suggests that employers are more likely to care about industry-specific credentials as opposed to more general work-readiness certificates (Muller & Beatty, 2009). It is estimated that in the United States, employers demand only 19 percent of credentials that students earn in grades K–12 (ExcelinEd & Burning Glass Technologies, 2019). Credentials may not be desirable because they do not have value or because there is an oversupply of students with these credentials

(ExcelinEd & Burning Glass Technologies, 2019). As many occupations require some type of license or certificate, however, there is some capacity for credentials to be used as a measure of career readiness. In any case, the value of a credential as a measure of career readiness is at least in part determined by the value of the credential in the labor market. If a credential does not lead to a viable career option or is not valued by employers, student attainment of the credential does not translate into career readiness.

Resources and example instruments

Several resources are available to help researchers and practitioners identify and select existing instruments and develop new instruments (Exhibit 6). Many of these resources are narrowly focused on instruments that measure interpersonal and intrapersonal competencies and/or are focused on a small subset of relevant career readiness competencies. In particular, these resources have little to say about instruments for measuring technical knowledge and skills. To fill these gaps in the available resources, this section also includes information about some of the instruments that measure a wide range of competencies, as these may be more efficient to implement, and common instruments for measuring technical knowledge and skills (Exhibit 7).

Exhibit 6. Instrument Finder and Development Resources

RAND Education Assessment Finder (RAND, 2018): A web-based tool that allows the user to identify assessments for measuring interpersonal, intrapersonal, and higher-order cognitive competencies. Includes information for a variety of assessment types, including respondent type, method of administration, item format and length, primary constructs, cost, grade level, and evidence of technical quality. Available from: https://www.rand.org/education-and-labor/projects/assessments.html

Measuring Skills and Dispositions: Existing Assessment Review (Conley, 2014): Includes a summary of existing assessments that measure skills that are a part of Conley's Four Keys to College and Career Readiness Framework, with information on primary constructs, administrative ease, implementation, feasibility, cost, and technical evidence. Available from: https://www.erblearn.org/sites/default/files/images/services/Education%20Articles/A-New-Era-for-Educational-Assessment-092414_DavidConley_20141021.pdf

Research-Based Instruments for Measuring Students' Soft Skills (REL Mid-Atlantic, 2019): Includes a summary of research-based instruments that measure self-awareness, self-management, social awareness, relationship skills, and responsible decisionmaking, including information on subscales, sample survey items, survey mode, and cost. Available from: https://ies.ed.gov/ncee/edlabs/regions/midatlantic/app/pdf/RELMA_Soft_Skills_FactSheet_020719.pdf

Are You Ready to Assess Social and Emotional Development? Tools Index (American Institutes for Research, 2015): Provides information on instruments for measuring social and emotional knowledge, attitudes, and skills; including respondent type, primary constructs, item format and length, cost, grade level, and settings for use. Available from: https://www.air.org/sites/default/files/AIR%20Ready%20to%20Assess_ACT_rev.pdf

Social and Emotional Learning Assessment Guide (Assessment Working Group, 2018)**:** An interactive online tool to help practitioners select and use currently available assessments for measuring social and emotional competencies. Available from: http://measuringsel.casel.org/assessment-guide/

National Center for Education Statistics (NCES) Statistical Standards (NCES, 2012): The U.S. Department of Education's standards for collecting information through surveys, including information on planning and designing surveys and collecting, processing, and analyzing survey data. Available from: https://nces.ed.gov/statprog/2012/

Survey Development Methods for Educators (REL Northeast and Islands, 2016): A series of practitioner-friendly guides that are developed around the NCES (2012) statistical standards for developing, administering, and analyzing survey data. Available from: https://ies.ed.gov/ncee/edlabs/projects/project.asp?projectID=4482

Exhibit 7. Examples of instruments for measuring career readiness competencies

Example instruments	Core competency/skill components	Instrument type	Instrument format and availability	Outcome measures	Evidence of technical quality
ACT Tessera Mental Toughness Scale for Adolescents For more information see https://www.act.org/content/dam/act/unsecured/documents/R1675-tessera-tech-bulletin-2018-08.pdf	• Intrapersonal • Interpersonal	Survey	• Completed by students online. • Available in English, Japanese, and Spanish. • 93 survey items. • Fee charged for use.	• Grit/responsibility. • Teamwork/cooperation. • Composure/resilience. • Curiosity/integrity. • Leadership/communication style.	**Reliability:** intraclass correlation coefficients greater than or equal to 0.95. **Predictive validity:** Composite score correlates with GPA.
CampusReady For more information see https://www.inflexion.org/project/campusready/	• Intrapersonal • Interpersonal • Cognitive	Survey	• Completed by staff or students, online. • Available in English. • 30–60 survey items. • Fee charged for use.	Aligned with the Four Keys to College and Career Readiness framework, measuring: • Cognitive strategies. • Content knowledge. • Academic behaviors. • Contextual skills and awareness.	**Reliability:** Coefficient alpha ranged from 0.70 to 0.91. **Predictive validity:** Composite score correlates with GPA.
College and Work Readiness Assessment Plus For more information see https://cae.org/flagship-assessments-cla-cwra/cwra-critical-thinking-instrument-for-high-schools-middle-schools/about-cwra/	• Cognitive • Technical knowledge and skills	Performance task	• Completed by students online. • Available in English. • 60-minute performance task plus four selected response questions. • Fee charged for use.	• Analysis and problem solving. • Writing effectiveness. • Writing mechanics. • Scientific and quantitative reasoning. • Critical reading and evaluation. • Critiquing an argument.	**Reliability:** no evidence identified. **Predictive validity:** Score correlates with IB test scores.

Example instruments	Core competency/skill components	Instrument type	Instrument format and availability	Outcome measures	Evidence of technical quality
ThinkReady For more information see https://www.inflexion.org/project/thinkready/	• Interpersonal • Cognitive	Performance task	• Completed by students on paper or online. • Available in English. • Length varies; takes from a few class periods up to several weeks. • Number of items varies. • Fee charged for use.	• Problem formulation. • Research. • Interpretation. • Communication. • Precision/accuracy.	**Reliability:** no evidence identified. **Predictive validity:** no evidence identified.
WorkKeys Assessments For more information see https://www.act.org/content/act/en/products-and-services/workkeys-for-employers/assessments.html	This suite of assessments covers: • Intrapersonal • Interpersonal • Cognitive • Technical knowledge and skills	CTE assessments	• Completed by students online (some of the assessments are also available in a paper version). • Most of the assessments available in English only. • Length varies by assessment; takes from 15-55 minutes. • Number of items varies by assessment. • Fee charged for use.	Separate assessments for: • Applied math. • Graphic literacy. • Workplace documents. • Applied technology. • Business writing. • Workplace observation. • Fit (gauges personal interests and matches to a work environment type). • Talent (carefulness, cooperation, creativity, discipline, goodwill, influence, optimism, order, savvy, sociability, stability, and striving).	**Reliability:** no evidence identified. **Predictive validity:** no evidence identified.

Example instruments	Core competency/skill components	Instrument type	Instrument format and availability	Outcome measures	Evidence of technical quality
NOCTI For more information see https://www.nocti.org/Products.cfm?m=2	This suite of assessments covers: • Intrapersonal • Interpersonal • Cognitive • Technical knowledge and skills	CTE assessments	• Specific format depends on the assessment type. • Most assessments completed by students online (some paper versions available). • Most assessments include a written component and a performance component, and it takes roughly 4-6 hours to complete both components. • Fee charged for use.	Tested competencies/skills depend on the particular assessment. Ranges from general employability competencies to specific occupational skills for more than 70 occupations.	**Reliability:** no evidence identified. **Predictive validity:** no evidence identified.
NWRC For more information see http://www.workreadiness.com/nwrcred.html	• Intrapersonal • Interpersonal • Cognitive • Technical knowledge and skills	CTE assessment	• Completed by students online. • Must go to one of the 213 assessment centers to take the assessment; centers currently available in 23 states. • Fee charged for use.	• Speak. • Listen. • Observe. • Locate information. • Read. • Math. • Solve problems. • Cooperate. • Resolve conflict. • Take responsibility for learning.	**Reliability:** no evidence identified. **Predictive validity:** no evidence identified; currently working on this evidence.

Example instruments	Core competency/skill components	Instrument type	Instrument format and availability	Outcome measures	Evidence of technical quality
SkillsUSA career essentials suite For more information see https://www.careeressentials.org/	• Intrapersonal • Interpersonal • Cognitive • Technical knowledge and skills	CTE assessment	• Specific format depends on the assessment type. • Completed by students online. • Fee charged for use.	Tested competencies/skills depend on the particular assessment. Ranges from general employability competencies to specific occupational skills for more than 30 occupations.	**Reliability:** no evidence identified. **Predictive validity:** no evidence identified.

Discussion

It is unlikely that stakeholders across all schools, districts, and states will come to a consensus on one framework for college and career readiness. And given that these stakeholders may have different purposes and are operating in different contexts, that may be appropriate. However, it is important that stakeholders have access to resources and strategies for developing or selecting a framework that is appropriate for their purpose and will legitimately prepare students for eventual success in the workforce. The first step is considering the perspective of the framework and the scope of knowledge and competencies of interest. Ideally, in selecting which knowledge and competencies to include, stakeholders should be able to choose those that have evidence of increasing students' postsecondary and workforce success. Research has established that academic knowledge and skills predict postsecondary success, as do key cognitive competencies. The evidence base for intrapersonal and interpersonal competencies and technical knowledge and skills is limited. While the research field plays catch up, stakeholders must rely on face validity by seeking input from industry representatives.

While there are many frameworks that weave together the various components of career readiness, the methods for measuring career readiness are not so easily woven together. Because of the strengths and limitations associated with the various types of measurement instruments in terms of their ability to measure components of career readiness, a comprehensive, quality measure of career readiness requires multiple instruments. Implementing multiple instruments is resource intensive, however, and requires a strategy for compiling an efficient and comprehensive suite of instruments. Researchers could make improvements to the field by assisting with this process.

Adding to the challenges of measuring career readiness, the available instruments are often not well suited for the different purposes for measuring career readiness. Measuring career readiness for accountability purposes is especially challenging because it requires the implementation of instruments on a large scale. The field should work towards improving

performance tasks so that they are more feasible for accountability purposes or find ways to improve standardized assessments so they better capture some of the more complex intrapersonal, interpersonal, and cognitive skills (Darling-Hammond & Adamson, 2013). Topol, Olson, and Roeber (2010) provide three suggestions for making high-quality assessments more affordable:

- Take advantage of economies of scale by participating in a state assessment consortium.
- Use technology for assessment development, distribution, and scoring.
- Use professional development stipends to pay teachers to score open-ended items.

In addition to needing a comprehensive system of instruments, states need better data systems for tracking career readiness measures. For example, only half of the states collect CTE credential data (ExcelinEd & Burning Glass Technologies, 2019). Further, many states lack data on employment outcomes (New Skills for Youth Initiative, 2019). These data would allow for the validation of instruments in terms of their ability to predict success in the workforce. CTE credentials, in particular, have a very limited research base in terms of validity, likely because of these data limitations. Researchers and practitioners should work together to identify data needs and produce evidence for instrument quality.

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Appendix

Exhibit A-1. Frameworks

Framework	Domain	Component	Subcomponent	Name in framework
CCSSO, Innovation Lab Network State Frameworks for College, Career, and Citizenship Readiness	Cognitive competencies	Creativity / innovation	Creativity / innovation	Creativity / innovation
		Critical thinking	(General)	Critical thinking
			Problem solving	Problem solving
	Interpersonal	Communication skills	Communication	Communicating effectively
		Empathy skills / awareness	Empathy skills / awareness	Social awareness & empathy
		Teamwork skills	(General)	Working collaboratively
			Leadership / management	Leadership
	Intrapersonal	Pro-active/positive attitude	(General)	Agency (self-efficacy)
		Self-regulation skills	(General)	Self-control
				Study skills & learning how to learn
			Goal setting	Goal management
			Metacognition	Metacognition & self-awareness
			Perseverance	Resilience
			Time management	Time management
		Work ethic	Flexibility / adaptability	Adaptability
			Initiative	Initiative
	Miscellaneous	Miscellaneous	Miscellaneous	Ethical behavior & civic responsibility
David Conley, Four Keys to College and Career Readiness	Cognitive competencies	Critical thinking	Planning / organization	Organizing and constructing work
			Problem solving	Problem solving
		Research skills	Research skills	Analyzing/evaluating findings
				Identifying sources and collecting information
		Technology skills	Technology skills	Technology skills
	Interpersonal	Teamwork skills	(General)	Collaborative learning

Framework	Domain	Component	Subcomponent	Name in framework
	Intrapersonal	Pro-active/positive attitude	Self-awareness	Self-awareness
		Self-regulation skills	(General)	Reason for success/failure in mastering content knowledge
				Study skills
			Asks questions / seeks help when needed	Help seeking
			Goal setting	Goal setting
			Metacognition	Memorization techniques
			Motivation	Motivation
			Perseverance	Persistence
			Self-monitoring/evaluation	Progress monitoring
				Self-monitoring
			Time management	Time management
		Work ethic	Dependability	Precision/accuracy of work
	Miscellaneous	Miscellaneous	Miscellaneous	Ownership of learning
MHA Labs, MHA Building Blocks	Cognitive competencies	Critical thinking	Decisionmaking	Avoids actions that have produced undesirable consequences or results in the past.
				Evaluates the advantages and disadvantages associated with each potential solution identified for a problem.
				Identifies alternative ideas/processes that are more effective than the ones previously used/suggested.
				Selects and implements best solution based on evaluation of advantages and disadvantages of each potential solution.
			Planning / organization	Accurately estimates level of effort and establishes realistic timelines.
				Breaks goals into actionable steps.
				Organizes information that serves the purpose of the message, context, and audience.
			Problem solving	Defines problems by considering all potential parts and related causes.
				Generates potential solutions to a problem, seeking and leveraging diverse perspectives.
		Research skills	Research skills	Gathers and organizes relevant information about a problem from multiple sources.

Framework	Domain	Component	Subcomponent	Name in framework
	Interpersonal	Communication skills	Communication	Uses and adjusts communication strategies as needed based on the purpose of the message, context, and audience.
		Empathy skills / awareness	Empathy skills / awareness	Provides feedback in a manner that is sensitive to others' situations/feelings.
				Takes into consideration others' situations/feelings.
		Teamwork skills	(General)	Balances own needs with the needs of others.
				Encourages the ideas, opinions, and contributions of others, leveraging individual strengths.
				Helps team members complete tasks, as needed.
			Negotiation / conflict management skills	Clarifies areas of disagreement/conflict that need to be addressed to achieve a common goal.
				Seeks to obtain resolution of disagreements/conflicts to achieve a common goal.
			Respect for differences	Develops and implements strategies for navigating in different cultures/contexts (that is, manages different patterns of behavior, rules, and norms).
	Intrapersonal	Pro-active/positive attitude	Growth mindset	Demonstrates a belief that one's own actions are associated with goal attainment.
			Self-awareness	Sets and prioritizes goals that reflect a self-awareness of one's capabilities, interests, emotions, and/or needs.
		Self-regulation skills	(General)	Maintains focus on tasks despite internal (for example, emotional) and/or external distractions.
			Active listening / observation	Signals listening according to the rules/norms of the context and audience.
			Asks questions / seeks help when needed	Asks questions to deepen and/or clarify one's understanding when listening to others.
				Seeks input to gauge others' understanding of the message.
			Perseverance	Strives to overcome barriers/setbacks, seeking assistance when needed.
			Self-monitoring/evaluation	Monitors progress and own performance, adjusting approach as necessary.
			Time management	Manages time to complete tasks on schedule.
		Work ethic	Dependability	Completes tasks as they have been assigned or agreed upon by the group.

Framework	Domain	Component	Subcomponent	Name in framework
				Follows rules/directions as required by the task/situation.
				Recognizes the consequences of one's actions.
			Flexibility / adaptability	Adapts approach in response to new conditions or others' actions.
			Initiative	Attempts to complete tasks independently before asking for help.
				Needs minimal supervision to complete tasks.
NASDCTEc, Common Career Technical Core	Cognitive competencies	Creativity / innovation	Creativity / innovation	Creativity / innovation
		Critical thinking	(General)	Critical thinking
			Decisionmaking	Decisionmaking
		Research skills	Research skills	Research skills
		Technology skills	Technology skills	Technology Use
	Interpersonal	Communication skills	Communication	Communication
		Teamwork skills	(General)	Teamwork
			Leadership / management	Management/Leadership
	Intrapersonal	Work ethic	Responsibility	Act as a responsible and contributing employee
	Miscellaneous	Miscellaneous	Miscellaneous.	Act as a responsible and contributing citizen
				Career planning
National Network, Defining Career Readiness	Cognitive competencies	Critical thinking	(General)	Critical thinking
			Decisionmaking	Decisionmaking
			Planning / organization	Goal setting / planning
		Technology skills	Technology skills	Technology use
	Interpersonal	Communication skills	Communication	Communication
		Teamwork skills	(General)	Working in a team
	Intrapersonal	Self-regulation skills	Goal setting	Goal setting / planning
		Work ethic	Initiative	Working independently
	Miscellaneous	Miscellaneous	Miscellaneous	Managing school/work transitions
National Network, Employability Skills	Cognitive competencies	Critical thinking	(General)	Critical thinking
			Decisionmaking	Decisionmaking

Framework	Domain	Component	Subcomponent	Name in framework
			Leadership / management	Coordination
				Interpersonal skills
				Leadership
				Social Influence with others
			Negotiation / conflict management skills	Conflict resolution
				Negotiation
			Respect for differences	Appreciation for diversity
	Intrapersonal	Pro-active/positive attitude	Integrity	Integrity
			Intellectual openness / curiosity	Continuous learning
				Intellectual interest and curiosity
		Self-regulation skills	(General)	Executive function
			Active listening / observation	Actively listening
			Metacognition	Metacognition
			Perseverance	Grit
				Perseverance
				Self-reinforcement
			Self-monitoring/evaluation	Self-evaluation
				Self-monitoring
		Work ethic	(General)	Career orientation
				Work ethic/conscientiousness
			Dependability	Productivity
			Flexibility / adaptability	Adaptability
				Flexibility
			Initiative	Initiative
				Self direction
			Professionalism and/or Service Orientation	Professionalism/ethics
				Service orientation
			Responsibility	Responsibility
				Responsibility / self-discipline
	Miscellaneous	Miscellaneous	Miscellaneous	Artistic and cultural appreciation
				Artistic and cultural appreciation

Framework	Domain	Component	Subcomponent	Name in framework
				Citizenship
				Trust
The Organisation for Economic Co-operation and Development (OECD), Definition and Selection of Key Competencies (DeSECo)	Cognitive competencies	Critical thinking	(General)	Critical thinking
			Decisionmaking	Judgment and decisionmaking
			Problem solving	Problem solving
		Systems thinking	Systems thinking	Act within the big picture
				Systems analysis
				Systems evaluation
		Technology skills	Technology skills	Use technology interactively
	Interpersonal	Communication skills	Communication	Speaking
		Empathy skills / awareness	Empathy skills / awareness	Relate well to others
				Social perceptiveness
		Teamwork skills	(General)	Cooperate
				Work in teams
			Leadership / management	Coordination
				Instructing
			Negotiation / conflict management skills	Manage and resolve conflicts
				Negotiation
				Persuasion
	Intrapersonal	Self-regulation skills	Active listening / observation	Active listening
			Goal setting	Form and conduct life plans and personal projects
			Self-monitoring/evaluation	Monitoring
			Time management	Time management
		Work ethic	Professionalism and/or service orientation	Service orientation
	Miscellaneous	Miscellaneous	Miscellaneous	Defend and assert rights, interests, limits, and needs
Partnership for the 21st Century, Framework for 21st Century Learning	Cognitive competencies	Creativity / innovation	Creativity / Innovation	Creative thinking
				Learning and innovation skills
		Critical thinking	Analysis / reasoning	Reason effectively
				Use and manage information

Framework	Domain	Component	Subcomponent	Name in framework
			Problem solving	Solve problems
		Research skills	Research skills	Access and evaluate information
		Technology skills	Technology skills	Analyze media
				Apply technology effectively
				Create media products
	Interpersonal	Communication skills	Communication	Communicate clearly
		Empathy skills / awareness	Empathy skills / awareness	Interact effectively with others
		Teamwork skills	(General)	Work effectively in diverse teams
				Working creatively with others
			Leadership / management	Be responsible to others
				Guide and lead others
	Intrapersonal	Self-regulation skills	Time management	Manage goals and time
		Work ethic	Flexibility / adaptability	Adapt to change
				Be flexible
			Initiative	Work independently
	Miscellaneous	Miscellaneous	Miscellaneous	Civil literacy
				Environmental literacy
				Financial literacy
				Global awareness
SkillsUSA, Employability Framework	Cognitive competencies	Critical thinking	Decisionmaking	Decisionmaking
			Planning / organization	Planning, organization and management
		Technology skills	Technology skills	Computer and technology literacy
	Interpersonal	Communication skills	Communication	Communication
		Teamwork skills	(General)	Teamwork
			Leadership / management	Leadership
			Respect for differences	Multicultural sensitivity and awareness

Framework	Domain	Component	Subcomponent	Name in framework
	Intrapersonal	Pro-active/positive attitude	Integrity	Integrity
		Self-regulation skills	Motivation	Self-motivation
		Work ethic	(General)	Work ethic/conscientiousness
			Flexibility / adaptability	Adaptability/flexibility
			Professionalism and/or service orientation	Professionalism
				Service orientation
			Responsibility	Responsibility / self-discipline
	Miscellaneous	Miscellaneous	Miscellaneous	Professional development
The Joyce Foundation, Personal Success Framework	Cognitive competencies	Creativity / innovation	Creativity / innovation	Creativity
				Innovation
		Critical thinking	(General)	Critical thinking
			Analysis / reasoning	Adaptive learning
				Analysis
				Interpretation
				Reasoning/argumentation
			Decisionmaking	Decisionmaking
			Problem solving	Problem solving
		Research skills	Research skills	Information literacy
		Technology skills	Technology skills	Information and communications technology literacy
	Interpersonal	Communication skills	Communication	Assertive communication
				Communication
				Oral communication
				Self-presentation
		Empathy skills / awareness	Empathy skills / awareness	Empathy/perspective-taking
		Teamwork skills	(General)	Cooperation
			Leadership / management	Coordination
				Social influence with others
			Negotiation / conflict management skills	Conflict resolution
				Negotiation

Framework	Domain	Component	Subcomponent	Name in framework
			Respect for differences	Appreciation for diversity
				Cultural awareness/competence
	Intrapersonal	Pro-active/positive attitude	(General)	Being proactive/prosocial
			Growth mindset	Growth mindset
			Integrity	Integrity
			Intellectual openness / curiosity	Continuous learning
				Intellectual interest and curiosity
			Self-awareness	Awareness of internal experiences
				Reflecting on own understandings
		Self-regulation skills	(General)	Executive function
				Self-regulation
			Active listening / observation	Active listening
			Goal setting	Goal pursuit and attainment
			Metacognition	Metacognitive skills
			Motivation	Motivating learning
			Perseverance	Grit
				Perseverance
				Self-reinforcing
			Self-monitoring/evaluation	Self-evaluation
				Self-monitoring
			Time management	Productivity
		Work ethic	(General)	Career orientation
				Work ethic/conscientiousness
			Flexibility / adaptability	Adaptability
				Flexibility
			Initiative	Initiative
				Self-direction
			Professionalism and/or service orientation	Professionalism/ethics
				Service orientation
			Responsibility	Responsibility
	Miscellaneous	Miscellaneous	Miscellaneous	Citizenship
				Trust

Framework	Domain	Component	Subcomponent	Name in framework
U.S. Department of Education, Employability Skills Framework	Cognitive competencies	Critical thinking	(General)	Thinks critically
			Analysis / reasoning	analyzes information
				Reasons
				Uses information
			Decisionmaking	Makes sound decisions
			Planning / organization	Plans and organizes
			Problem solving	Solves problems
		Research skills	Research skills	Locates information
				Organizes information
		Systems thinking	Systems thinking	Improves systems
				Monitors systems
				Understands and uses systems
		Technology skills	Technology skills	Understands and uses technology
	Interpersonal	Communication skills	Communication	Communicates information
				Communicates verbally
		Teamwork skills	(General)	Teamwork
			Leadership / management	leadership
			Negotiation / conflict management skills	Negotiation
			Respect for differences	Respects differences
	Intrapersonal	Pro-active/positive attitude	(General)	Positive attitude and self worth
			Integrity	Integrity
			Intellectual openness / curiosity	Willing to learn
			Self-awareness	Responsibility for personal growth
		Self-regulation skills	Active listening / observation	Listens actively
				Observes carefully
			Time management	Manages time
		Work ethic	Flexibility / adaptability	Flexibility
			Initiative	Initiative
				Works independently

Framework	Domain	Component	Subcomponent	Name in framework
			Professionalism and/or service orientation	Professionalism
				Responds to customer needs
			Responsibility	Responsibility / self-discipline