California Department of Education

Measures for a College and Career Indicator: Research Brief on Career Preparedness Assessments

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Educational Policy Improvement Center (EPIC)

Introduction

In September of 2012, Governor Jerry Brown signed into law Senate Bill (SB) 1458, which calls for California's school accountability system to shift from a near-exclusive reliance on state test scores to a broader range of measures demonstrating student achievement. At the high school level, starting in the 2015–2016 school year, the Academic Performance Index (API) will include an indicator composed of measures reflecting students' college and career preparedness.

To determine exactly what measures will be included in this new indicator, the State Superintendent of Public Instruction and the State Board of Education will consider input from regional public meetings, a statewide survey, and recommendations from the Public Schools Accountability Act (PSAA) Advisory Committee. To further support this decision-making process, the California Department of Education (CDE) has contracted with the Educational Policy Improvement Center (EPIC) to conduct analyses of six different types or clusters of potential measures of college and career preparedness, summarized in a series of white papers and a final summary report.

This white paper considers the career preparedness assessments used most widely by state educational systems—specifically ACT's WorkKeys, the Armed Services Vocational Aptitude Battery (ASVAB), the National Occupational Competency Testing Institute (NOCTI), and industry certification assessments—as measures to be considered for California's College and Career Indicator (CCI). This paper begins by presenting a brief overview of career preparedness assessments and their current applications in other states' accountability systems. Next, career preparedness assessments are evaluated against an analytical framework to determine their technical quality, stakeholder relevance, and system utility when used as component measures of accountability. The paper concludes with a summary analysis of the strengths, weaknesses, and trade-offs to using career preparedness assessments within the CCI.

Career Preparedness Assessments

What it means to be prepared for a career has changed dramatically over the past century. Formerly, the goal of the education system, for those students who left school and directly entered the workforce, was to prepare them for jobs, not careers. Close to three quarters of the employment in the U.S. economy at the beginning of the 20th century was related to manufacturing and agriculture. Since then, the economy has shifted toward service- and knowledge-based occupations that value problem solving and creativity. This transition, which has been rapidly increasing in recent years, has meant that the skills and education needed to be successful in today's economy are quite different from those required to succeed fifty or sixty years ago.

The U.S. education system has not been able to adapt at the pace necessary to remain in step with the changing economy. Although new programs have been instituted, many schools have found it challenging to move beyond the types of vocational education or job-training programs that originated in the 1920s. Vocationally oriented students were

historically tracked or streamed apart from their academically oriented peers and taught a completely different curriculum aligned to the needs of entry-level positions that required highly specialized skills or repetitive manual labor. Although high schools have made many attempts to move beyond grouping students based on their employment goals, remnants of tracking and of traditional vocational education linger in many high schools today.

An increasing number of high schools, however, are taking steps to create options for students who are interested in acquiring the foundational skills necessary to be prepared for a career. This new form of education is widely known as Career and Technical Education, or CTE. It emphasizes preparation for new jobs in new fields that require more education and different skills. Much of the knowledge and many of the skills developed in CTE programs are also required of students going on to college, which forms the basis of a definition of college *and* career preparedness. In 2006, ACT released an influential study concluding that college and career readiness were essentially the same in terms of English and mathematics skills (ACT, 2006).

Conley (2013) cautions that it is tempting to assume that college and career preparedness are the same, for two reasons. First, it makes defining college and career preparedness much easier. Second, assuming college and career preparedness are the same solves the problem of how to educate a diverse student body with varied postsecondary goals. However, research has shown that although college and career preparedness share a great deal of foundational knowledge in English and mathematics, the detailed knowledge and skills that any individual student needs to be prepared for a specific career or to succeed in a particular major in college is dependent on the academic demands and requirements of the major or career-training program the student chooses to pursue (Conley, McGaughy, Brown, van der Valk, & Young, 2009; WestEd & EPIC, 2013). Preparation for a bachelor's degree is somewhat different than preparation for a career certificate program because the bachelor's program requires a broader set of English and mathematics knowledge and skill due to the demands of general education courses that cover the breadth of knowledge in multiple subjects and fields.

Skills important to college and career preparedness include the learning strategies and techniques necessary to be successful in bachelor's and career training programs. These skills include, among others, persistence, study strategies, ownership of learning, and cognitive capabilities such as formulating problems, collecting information, and interpreting and analyzing findings (Conley & McGaughy, 2012). In other words, *both* metacognitive and cognitive skills predict *both* college and career success (Pellegrino & Hilton, 2012). Mastering metacognitive skills may be even more important for career-oriented students because they are much more closely associated with job success. (Conley & McGaughy, 2012). People who can manage their time, follow directions, remember instructions, communicate with coworkers and customers, and make good decisions are much more likely to exhibit high levels of job performance and be successful in the workplace (Ng, Eby, Sorensen, & Feldman, 2005).

Conley (2013) identifies three levels of career preparedness: (a) work prepared, (b) job prepared, and (c) career pathway prepared. Work preparedness includes the ability to get to work on time and engage with coworkers constructively in a professional manner. Job preparedness involves participating successfully in a job-training program that requires (at the most basic level) the ability to listen, follow directions, and communicate with others. Being career pathway prepared requires mastering the personal skills necessary for the other two levels in addition to the academic and technical skills required to move vertically or branch out horizontally within an occupational area. This level of career preparedness requires some postsecondary education, whether participating in a certificate program, training at a trade school, or pursuing an associate's degree. To be truly career prepared for today's economy, students must master the skills of all three levels. This is different from college preparedness in the sense that being college prepared is judged much more on mastery of English and mathematics skills at a level that exceeds the need for remediation.

Defining career preparedness is an essential precursor to its effective measurement. Career preparedness has received less attention in the literature than has college preparedness, in part because it does not lend itself as well to a single list of knowledge and skills that are prerequisite for success in all careers. However, organizations have attempted to define the complex concept of career preparedness and to identify some generalizable preparedness criteria that span multiple careers. The Career Readiness Partner Council, which includes 25 organizations including Achieve, the Asia Society, and ConnectEd, asserts that an individual prepared for a successful career is proficient in the academic and technical knowledge and skills related to a specific career field and also has an understanding of employability skills (Career Readiness Partner Council, 2014). The Association for Career and Technical Education (ACTE) states that career preparedness involves three major sets of knowledge and skills: academics, employability, and job-specific skills. In addition to possessing skills in these three areas, students who are prepared for careers need to have the ability to apply and transfer academic knowledge across diverse scenarios and contexts (ACTE, 2010).

Assessing the skills and dispositions necessary for career success has a long history. Medicine, law, automotive services, K–12 education, information technology, and many other occupations have relied on certification or licensing exams to qualify candidates for credentials that are widely accepted as indicators of preparedness to meet legal and technical requirements of a position. Thousands of industry-specific certification assessments exist nationwide (Muller & Beatty, 2008). These assessments do not measure the broad skills needed to be successful in *all* careers. The National Occupational Competency Testing Institute (NOCTI) offers more than 100 occupational and career pathway assessments used by secondary and postsecondary students, teacher candidates, and businesses. These exams were developed to provide valid and reliable career-specific CTE assessments.

Other vendors offer examinations of the basic skills necessary for career success. For example, ACT's job readiness assessment, known as WorkKeys, was designed to help employers select, hire, train, develop, and retain workers (ACT, 2014a). ACT introduced

WorkKeys in 1992 to measure the foundational and soft skills[1] necessary for entry-level employees to be successful in the workplace. It is one of the most recognized job skills assessment systems available to educators. Eight of the eleven WorkKeys assessments measure foundational skills. These assessments generate scale scores that correspond to levels, with the lowest level indicating least difficulty and the highest level indicating most difficulty (see Table 1). For instance, the Reading for Information, Applied Mathematics, and Locating Information assessments are scored on a scale of 65–90 points. In order to reach level 3 (the lowest level), individuals must score a 73 or higher. Individuals who reach level 3 or higher on the Applied Mathematics, Locating Information, and Reading for Information assessments can earn the National Career Readiness Certificate (NCRC). The four tiers of the NCRC are (in ascending order): bronze, silver, gold, and platinum. They correspond to the percentage of jobs in the WorkKeys database for which an individual has demonstrated requisite skills. For example, an individual at the platinum tier should be able to succeed at 99% of the jobs in the WorkKeys database, which lists more than 19,000 job titles.

Table 1. WorkKeys Assessments, Score Scales, and Length

Assessment	Skills	Score Scale	Length in Minutes
Applied Mathematics[a]	Foundational	5 Levels (3–7)	45–55
Locating Information[a]	Foundational	4 Levels (3–6)	45–55
Reading for Information[a]	Foundational	5 Levels (3–7)	45–55
Applied Technology	Foundational	4 Levels (3–6)	45–55
Business Writing	Foundational	5 Levels (1–5)	30
Listening for Understanding	Foundational	5 Levels (1–5)	45
Teamwork	Foundational	4 Levels (3–6)	64
Workplace Observation	Foundational	5 Levels (1–5)	55
Fit	Soft – Interests and Values	Percentiles (1–99)	15–20
Performance	Soft – Integrity Test	Percentiles (1–99)	10–15
Talent	Soft – Attitudes and Behaviors	Percentiles (1–99)	30–35

[a] A score of 3 or higher is required to earn the National Career Readiness Certificate (NCRC).

In addition to its foundational assessments, WorkKeys offers three assessments of soft skills. These are workplace fit, performance, and talent (see Table 1). These three measure interests, values, personal integrity, attitudes, and behaviors to ensure applicants are matched with the proper position and to predict success after hiring. The assessment scores are presented as percentiles for each skill assessed. For instance, the Talent assessment measures carefulness in addition to 12 other skills. A score of 90 indicates a respondent is more careful than 90% of test takers.

The National Occupational Competency Testing Institute (NOCTI) was conceived during a 1966 conference at Rutgers University on certifying teachers of vocational education who did not hold degrees. Representatives from 23 states in attendance diagnosed a need for valid and reliable national occupational competency exams to support the growing CTE field. Representatives determined this task to be too burdensome and an

[1] ACT defines soft skills as “the personal characteristics and behavioral skills that enhance an individual’s interactions, job performance, and career prospects such as adaptability, integrity, cooperation, and workplace discipline” (ACT, 2013).

inappropriate undertaking for state governments (NOCTI, 2014a). It was decided that a third-party organization with a representative from each state should be responsible for creating national occupational competency exams. Today, NOCTI operates under a consortium model with representatives from each state and a Board of Trustees. The consortium of state representatives, who generally are state directors of CTE in their respective states, oversee policy while the Board of Trustees oversees administration (NOCTI, 2014b).

NOCTI offers job-ready assessments across 16 industry sectors and pathway assessments across 11 industry sectors (see Table 2). Job-ready assessments measure technical skills and competencies at specific occupation levels within an industry. NOCTI also offers two employability skill assessments (21st Century Skills for Workplace Success and Workplace Readiness) for high school students. Job-ready assessments can be taken as only a pre-test, only a post-test, or a combination of both. There is also an option to take only a multiple-choice assessment or an assessment that combines multiple-choice and performance tasks. Pathway assessments measure skills obtained through course pathways as well as the soft skills contextualized to the chosen career field; they are broader than job-ready assessments. For instance, one job-ready assessment measures skills related to plumbing whereas a pathway assessment might measure skills necessary for maintenance operation, with plumbing being one occupation within that field. Pathway assessments are multiple-choice only, and can be taken as a pre- and post-test combination or post-test only. Like ACT's WorkKeys, NOCTI's assessment system has many features, including the ability for states to customize assessments to fit their unique CTE needs. Some states use the customization feature to align NOCTI assessments with their state CTE standards. Also, like WorkKeys, NOCTI offers some programs in which students can earn certificates by taking a series of NOCTI assessments.

Table 2. NOCTI Assessment Categories

Industry Sectors (number of occupations)
Agriculture, Food & Natural Resources[a]
Architecture & Construction[a]
Arts, A/V Technology & Communications[a]
Business, Management & Administration[a]
Education & Training[a]
Employability Skills
Finance[a]
Health Science[a]
Hospitality & Tourism[a]
Human Services[a]
Information Technology[a]
Law, Public Safety & Security[a]
Manufacturing
Marketing, Sales & Service
Science, Technology, Engineering & Mathematics
Transportation, Distribution & Logistics

[a] Both Job Ready and Pathway Industry Sector assessment categories

Aptitude testing has a long history in the military, beginning with the Army Alpha and Army Beta tests used during World War I for commanders to measure the “intelligence” of their personnel. The Army General Classification Test was used during World War II and was replaced with a series of separate tests used by each sector of the armed forces. The Armed Services Vocational Aptitude Battery (ASVAB) was created in 1968 as a measure of overall suitability of recruits and of their likely success in specific programs within the armed forces. By 1976 each branch of the armed forces used the ASVAB for enlistee selection and classification. The ASVAB is administered by the United States Military Entrance Processing Command and is used to predict an enlistee’s future academic and occupational success. The Department of Defense does not endorse the use of ASVAB for purposes other than measuring an individual’s qualifications for the military, despite some states (e.g., Kentucky and Missouri) using the ASVAB as a proxy for career preparedness, and other states (e.g., Virginia) using ASVAB to comply with the reporting requirements of the federal Carl D. Perkins Career and Technical Education Act (Perkins IV).

The ASVAB is a multiple-choice exam with 10 subtests covering four domains: verbal, math, science and technical, and spatial (see Table 3). Students complete all 10 subtests in one sitting. Scores from four subtests—word knowledge, paragraph comprehension, arithmetic reasoning, and mathematics knowledge—are used to compute the Armed Forces Qualification Test (AFQT) score, which establishes the minimum qualifications required to enlist in the Army, Navy, Air Force, or Marine Corps. Scores for both the ASVAB and AFQT are based on percentiles relative to a national sample of youth aged 18 to 23.

Table 3. ASVAB Subtests

Assessment	Type	Paper and Pencil		Computer	
		Questions	Minutes	Questions	Minutes
General Science	Science/technical	25	11	16	8
Arithmetic Reasoning	Math	30	36	16	39
Word Knowledge	Verbal	35	11	16	8
Paragraph Comprehension	Verbal	15	13	11	22
Mathematics Knowledge	Math	25	24	16	20
Electronics Information	Science/technical	20	9	16	8
Auto and Shop Information[a]	Science/technical	25	11	22	13
Mechanical Comprehension	Science/technical	25	19	16	20
Assembling Objects	Spatial	25	15	16	16
Total		**225**	**149**	**145**	**154**

[a] Two separate subtests for the computer-based assessment.

Although certification is part of both the WorkKeys and NOCTI assessment systems, many other groups confer industry certifications. The landscape is complex and includes professional associations such as the American Medical Certification Association, individual companies such as Microsoft and Cisco Systems, and partnerships between industry and school districts such as the Linked Learning and Regional Occupational Centers and Programs. Generally, industry certifications signal the completion of occupational training, an apprenticeship, or coursework, such as a CTE course pathway (Muller & Beatty, 2008).

Employers use industry certifications to ensure that applicants have the skills necessary to complete the duties and responsibilities required of them. However, many states use various industry certification exams that are developed internally or purchased externally to comply with federal requirements of Perkins IV. A few states use industry certifications to measure college and career preparedness in their accountability systems. However, most states rely on established career preparedness assessments such as WorkKeys and ASVAB (Center on Education Policy, 2013a). Although industry certification assessments test the precise knowledge and skills required for a specific career or occupation, states rely more heavily on WorkKeys and ASVAB in part because these measures have better established national norms and are easier to compare across states. While industry-specific certification is highly valid, it is also highly complex. The trade-offs between these two approaches are considered in more detail later in this white paper.

Career Preparedness in Accountability Systems

Including career preparedness in state accountability systems is a growing trend. This process begins by adopting a formal definition of career preparedness and then designating acceptable means to assess it. The Center on Education Policy (CEP) at George Washington University surveyed state directors of CTE or their designees in 46 states to generate a series of reports on how states define and assess career readiness. CEP reported that 14 of 46 states have definitions of career preparedness. Another 20 states, including California, are in the process of defining career preparedness. Other states are exploring the most practical, valid, and reliable way to assess career preparedness (CEP, 2013b).

The CEP survey found WorkKeys and ASVAB to be the most widely used career preparedness assessments, followed closely by NOCTI. Approximately 32 states indicated they use WorkKeys and ASVAB compared to 27 that use NOCTI. Five states administer WorkKeys statewide: Alabama, Illinois, Michigan, North Dakota, and Wyoming. Less widely used assessments include SkillsUSA's Work Force Ready System and the National Work Readiness Assessment. Most survey respondents did not describe in detail how they use WorkKeys, ASVAB, or NOCTI, but those states that did said they used these assessments for a variety of purposes including to comply with the reporting requirements under Perkins IV, to replace high school exit exams, as part of the data profiles for teacher evaluation, to award a career endorsement on a diploma, and to award performance scholarships (CEP, 2013a).

Illinois and North Carolina use WorkKeys as part of their accountability systems, while Missouri uses ASVAB, and Kentucky uses both WorkKeys and ASVAB. A number of other states including Alabama, Florida, Georgia, Indiana, Kentucky, New Jersey, and Ohio use industry certification as part of their accountability systems. No state indicated that it uses NOCTI for accountability purposes.

Kentucky and Missouri use college preparedness assessments and industry certifications for a variety of purposes. Kentucky's College and Career Readiness

indicator measures performance on WorkKeys, ASVAB, and industry certification. Students have the opportunity to earn the status of college ready, career ready, or both. To be deemed college ready, students must meet a benchmark score on the ACT test, ACT's Compass (college placement test), or the Kentucky Online Testing Program (KYOTE). Career-ready students must meet a benchmark on either WorkKeys or ASVAB *in addition to* meeting the benchmark on the Kentucky Occupational Skills Standards Assessment (KOSSA) or earning an industry certificate. Students can earn college- and career-ready status by meeting a benchmark on the ACT test, ACT's Compass, or KYOTE *and* meeting the benchmark on KOSSA or earning an industry certification. The benchmark score on WorkKeys is defined as meeting the silver level for all three NCRC assessments, which indicates that a student is prepared for 75% of the jobs in ACT's jobs database. To meet the benchmark for ASVAB, students must score a 55, which indicates that a student is prepared for a high percentage of high-tech military jobs. Kentucky only accepts industry certificates for jobs that earn a living wage for a family.

Missouri's college and career readiness indicator includes three measures: 1) percentage of graduates who scored at or above the state standard for participation and performance on the ACT test, SAT, ACT's Compass, or ASVAB; 2) percentage of graduates who earned a qualifying score on an AP, IB, or Technical Skills Attainment assessment; and 3) percentage of graduates who attend postsecondary education/training.[2] Department-approved measures include the ACT test, SAT, ACT's Compass, or ASVAB. Students earn points for their schools similar to the way a California student's performance contributes to their school's API score. For instance, the number of students who score 88–99 on ASVAB is multiplied by 1.25 and added to the school's total points to calculate Missouri's first measure. The rest of the calculations can be seen in Table 4.

Table 4. Missouri's ASVAB College and Career Readiness Calculation

ASVAB Score Levels	Multiplier for Number of Students at Level
Graduates scoring between 88–99	x 1.25
Graduates scoring between 63–87	x 1.00
Graduates scoring between 30–62	x 0.75
Graduates scoring < 30	x 0.25
Graduates not participating	x 0

Evaluation Against an Analytical Framework

Working in collaboration with the PSAA Advisory Committee, EPIC developed an analytical framework to provide a consistent, rigorous set of criteria by which each measure can be evaluated for its inclusion in the API. This framework was adapted from

[2] Graduates who attend post-secondary education or training, are in the military, or who complete a Department-approved Career Education program and are placed in an occupation directly related to their training within six months of graduating are counted towards this indicator.

the Advisory Committee's API Guiding Principles and was supplemented with additional criteria specific to the charge of designing a College and Career Indicator (CCI). Organized under the dimensions of technical quality, stakeholder relevance, and system utility, the following 10 criteria explore the extent to which each measure under consideration:

- has a research base demonstrating a relationship with postsecondary success;
- allows for fair comparisons;
- is stable;
- has value for students;
- is understandable to the public;
- measures content, skills, and competencies that can be taught and learned in school;
- emphasizes student performance, not educational processes;
- minimizes burden;
- includes as many students as possible; and
- recognizes a variety of postsecondary pathways.

The design of the framework acknowledges that satisfaction of the above criteria is not a simple binary decision of yes or no. Analyses will be nuanced, supported by research, and summarized on a consistent scale. Additionally, analyses may sometimes place criteria in conflict with one another (e.g., a measure may have a strong evidence base but place an extraordinary implementation burden on schools). The purpose of this work is not to make recommendations, but rather to provide decision makers with the necessary information to identify strengths, weaknesses, and trade-offs associated with each measure considered for inclusion in the College and Career Indicator. Each criterion below will be rated on a three-point scale: strong, moderate, or weak.

The following subsections evaluate career preparedness assessments against the analytical framework as a general cluster or class of assessments. WorkKeys, NOCTI, ASVAB, and industry certifications are assigned separate evaluative criteria ratings because of fundamental differences in their design, format, content coverage, purpose, and levels of maturity. Differences are discussed in the ensuing sections.

A. Technical Quality

For the purpose of this white paper, technical quality is defined as having predictive validity for forecasting how students will perform in postsecondary pathways, allowing fair comparisons among different subpopulations of students, and having sufficient stability to allow for examination of trends.

A1. Relationship to Postsecondary Success

The first of the 10 evaluative criteria considers the empirical research base to ascertain the degree to which it describes the relationship between the measure and postsecondary success. For the purposes of this project, research on postsecondary success may include a wide array of outcome variables including college matriculation,

persistence, course grades, grade-point average, and degree completion. Career success outcome variables may be defined extrinsically (e.g., salary or promotion) or intrinsically (e.g., self-reported job satisfaction).

Although WorkKeys has been used since 1992, relatively few independent validation studies have been conducted (Hendrick, 2006). ACT's technical manuals state that criterion-, content-, and construct-related evidence is used to validate the three NCRC WorkKeys assessments (ACT, 2008a, 2008b, 2008c).[3] The WorkKeys Fit assessment, a measure of soft skills, has been found to have construct validity as a measure of desirable work attitudes and outcomes (Swaney, Allen, Casillas, Hanson, & Robbins, 2012).[4]

Other validity evidence comes from approximately 25 case studies published on ACT's website. Two of the case studies analyzed a hospital and a defense contractor for the U.S. Navy that each administered WorkKeys to new employees. Both organizations experienced reductions in employee turnover, as well as other benefits (ACT, 2014b; 2014c). Similar effects were found in the other case studies. Hendrick (2006) independently interviewed representatives of 12 companies and found that using WorkKeys for preemployment testing improved the retention rate for new employees. Other research conducted independent of ACT has shown that WorkKeys is a weak predictor of college success (Bowles, 2004; Lindon, 2010). This is not entirely surprising, considering that WorkKeys is designed to measure career preparedness, but nevertheless noteworthy because ACT has elsewhere defined college and career preparedness as being functionally comparable.

Few studies exist that analyze the validity of ASVAB for predicting career success for civilian occupations. Military-sponsored studies of ASVAB have demonstrated its predictive validity (Welsh, Kucinkas, & Curran, 1990; Campbell & Knapp, 2001; Wolfe, Larson, & Alderton, 2006). Welsh, Kucinkas, and Curran analyzed 172 studies showing ASVAB as a predictor of success in military technical training schools, first-term attrition from the military, and overall military job performance. Wolfe, Larson, and Alderton (2006) called ASVAB a "remarkably good predictor" (p. 21) of recruits' grades at nine Navy technical schools. Campbell and Knapp (2001) benefited from an expansive data collection effort from 1982 and 1994 in what is regarded as one of the largest personnel studies ever attempted at the time (Borman, Klimoski, & Ilgen, 2003). The authors, and the 366 other contributors, analyzed many thousands of soldiers and found that ASVAB predicted performance both during training and subsequent tours of duty (Campbell & Knapp, 2001).

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[3] No construct-related evidence was presented to validate the Locating Information assessment.

[4] ACT commissioned an external study in 2010 to address the validity of WorkKeys in predicting job success. The results of this study are contained in a press release on ACT's website. The authors of the study, Schmidt and Scharf, concluded that WorkKeys was a valid predictor of performance of job applicants by being a content-valid measure of general cognitive ability necessary to perform workplace tasks (ACT, 2014d). ACT does not release the study itself or any details beyond what is contained in the press release.

NOCTI uses industry test development guidelines, standards, and pilot testing to ensure the content validity of all their assessments (NOCTI, 2014c). NOCTI's process for assessing validity includes eight steps: (1) developing standards and competencies, (2) developing the assessment blueprint, (3) developing items and performance tasks, (4) piloting the assessment, (5) analyzing pilot results, (6) establishing cut scores, (7) reviewing and incorporating edits, and (8) finalizing the assessment. Teams of subject matter experts develop individual assessment standards and competencies, either through a review of existing national standards or by facilitating job and task analyses to define new standards. The pilot test results are analyzed to ensure the fairness of test items and the reliability of the assessment overall.

Overall, peer-reviewed research on the relationship between career preparedness assessments and postsecondary success is limited. WorkKeys appears to be a measure of potential career success but requires additional independent research. The highly specialized nature of many military tasks suggests a need for ASVAB research in civilian contexts if it is to be considered as a reliable indicator of career success in civilian occupations. More research is needed to establish NOCTI's validity. The wide variety of available industry certification assessments makes it difficult to impossible to make any generalizations about validity beyond the specific industry being assessed. A review of research found only unsubstantiated claims suggesting that employers value industry certificates more than a score on standardized career preparedness assessments that do not result in a certificate, such as ASVAB and some WorkKeys and NOCTI assessments (Foster & Pritz, 2006).

The limited findings on the validity and reliability of these measures should not be interpreted as a lack of validity or reliability. These measures meet the real-world test of having been widely used and valued in many settings where career preparedness information is necessary. How well they would measure a school's ability to prepare students for careers is less clear. Educators, policymakers, and other constituents have historically been much more interested in college preparedness than in career preparedness, which has led to far more research in the former area than the latter. Findings about the relationship between current assessments of career preparedness should be interpreted with these limitations in mind.

WorkKeys:	**Moderate**
NOCTI:	**Moderate**
ASVAB:	**Weak**
Industry Certification:	**Weak**

A2. Fair Comparisons

This evaluative criterion is based on the assumption that the API must give all students a fair chance to show what they know and have learned. For the purposes of this white paper, the extent to which a measure provides fair comparisons across students and schools is determined by careful attention to bias.

Few studies have explored the fairness of career preparedness assessments. Research has found that African American students scored significantly lower than White students

on the three NCRC WorkKeys assessments: Applied Mathematics, Locating Information, and Reading for Information (Barnes, 2002; Stone, 2007).[5] In terms of gender, Barnes (2002) analyzed the results on two WorkKeys assessments from one community in Alabama and found no significant differences between males and females on the Applied Mathematics and Reading for Information assessments. Stone (2007) also analyzed data from Alabama and found that females scored significantly lower than males on the Applied Mathematics assessment at one WorkKeys testing center. The author did not hypothesize on why males scored higher than females. Wise et al. (1992) found no significant differences between Whites and African Americans or males and females in ASVAB scores. The authors did not analyze differences between other racial/ethnic groups.

No independent research was found that has explored the fairness of the various NOCTI assessments. However, NOCTI conducts bias reviews on test items for new assessments. This includes verifying that bias does not exist in terms of language usage, stereotyping (cultural, minority, gender, etc.), or representational unfairness (gender, ethnicity, etc.). If any biases are found, the test item is flagged and revised to eliminate bias (NOCTI, 2012).

Another fairness concern is access to industry certifications. Access likely depends on local preferences, available resources, and the extent of partnerships between businesses and schools. CDE would need to collect information on access issues if industry certifications are incorporated into the CCI as a measure of career preparedness. Currently no data are collected on the various industry certifications that California high schools use to satisfy Perkins IV reporting requirements.

Claims about the fairness of career preparedness assessments in relation to schools and subgroups of students cannot be determined with confidence because of a lack of peer-reviewed, independent studies, as well as conflicting findings among the studies that do exist. Some of the research suggests that scores correlate with demographic factors, which lessens the utility of the assessments in determining aptitude or readiness independent of race, ethnicity, or gender. Large-scale studies evaluating statewide samples are needed to determine whether incorporating career preparedness assessments would result in fair comparisons within and across schools. Despite a lack of independent research specific to fairness, ACT and ASVAB routinely conduct analyses, including differential item functioning, to ensure that test items and scores are fair and unbiased.

WorkKeys:	**Moderate**
NOCTI:	**Moderate**
ASVAB:	**Moderate**
Industry Certification:	**Weak**

[5] Barnes (2002) found significant differences on the WorkKeys assessments for Applied Mathematics and Reading for Information, whereas Stone (2007) found significant differences across all three assessments.

A3. Stability

This evaluative criterion is chiefly concerned with how the measure contributes to the comparability and flexibility of the API as a whole over time. In order to measure school performance and improvement consistently and comparably over time, all components of a measurement system should be based on definitions that remain relatively constant from year to year. Likewise, the core measures within the College and Career Indicator system need to be reasonably stable. If they are, then the API has some capacity to incorporate future component measures of preparedness, which is important due to the dynamic nature of college and career preparedness.

Ensuring the stability of career preparedness assessments provides a unique challenge to states. Equating assessment results becomes increasingly difficult as the number of occupations and career clusters grows. For instance, NOCTI offers approximately 100 job-ready and 33 pathway assessments across 16 different industry sectors, and thousands of industry certification assessments can be found, many of which are highly localized (Muller & Beatty, 2008). The sustainability of these assessments over time depends on local agreements, such as those that might be struck between a school or district and a local hiring authority, and the assessment might change with changes in the personnel making decisions at that local authority.

WorkKeys and ASVAB are more stable because of stronger institutional commitments on both the development and use sides. Each assessment stays relatively constant from year to year through regular equating studies designed to ensure comparability of test forms and items. However, no research that analyzes data from statewide administrations is available to substantiate claims that WorkKeys scores are consistent and comparable across schools and academic years.

NOCTI uses an internal consistency model to evaluate the reliability of test items. This process is designed to ensure that each test item consistently measures the same underlying test construct. It is worth noting that NOCTI assessments are revised and revaluated routinely to ensure that each assessment is an accurate reflection of current industry standards, practices, procedures, requirements, and guidelines, which can change frequently (NOCTI, 2012).

One potential threat to the stability of career preparedness assessments is social desirability bias (Huws, Reddy, & Talcott, 2009), because students self-report soft skills on the WorkKeys and NOCTI assessments. This does not mean that the information is not potentially useful. Triangulating multiple data sources offers one way to confirm responses from self-report questionnaires. However, neither WorkKeys nor NOCTI has explicit methods for triangulating. For more detailed strategies, see the white paper in this series on Innovative Measures (Conley, 2014).

The stability of career preparedness assessments depends on the assessment under examination. Equating the scores and ensuring the quality of the various NOCTI and industry certification assessments would be challenging given the diversity of knowledge and skills being measured. This does not necessarily mean that any of these assessments cannot be stable measures of career preparedness. Longitudinal analyses

of statewide results on such assessments may lead to new techniques and strategies for efficiently and effectively equating scores from different assessments while controlling for potential biases. However, this work would require a commitment by the state to conduct the necessary studies and to update them periodically.

WorkKeys:	**Moderate**
NOCTI:	**Moderate**
ASVAB:	**Moderate**
Industry Certification:	**Weak**

B. Stakeholder Relevance

Accountability measures that are relevant to a variety of education stakeholder groups for more purposes than solely rating a school or district provide greater value to the levels of the education system than measures that meet only school and district accountability requirements. To the extent that measures can serve multiple purposes, they may help increase stakeholder acceptance of an accountability system.

B1. Value to Students

This evaluative criterion is chiefly concerned with whether the component measures of the CCI are likely to be actionable and accepted by students. Rather than an assessment or data point that is only valuable in making system-level determinations of school quality, a CCI with student currency reflects and creates incentives for behaviors and performances that directly affect or improve an individual student's prospects for success after high school.

The direct value of career preparedness assessments is highest for students who plan to enter the military, obtain an industry certificate, or are eligible to earn college credit based on the results of a NOCTI assessment. The ASVAB satisfies one enlistment requirement for students aspiring to enter the armed forces. One of the main purposes of industry certificates is to signal to prospective employers that applicants hold the skills necessary to meet legal and professional requirements of the position. Certain industries such as automotive services and information technology place more importance on industry certificates (Foster & Pritz, 2006). Little research is available to substantiate claims that earning an industry certificate leads to higher rates of employee retention, higher wages, or less time looking for a job (Muller & Beatty, 2008). However, one study found that companies using WorkKeys had higher rates of retention for new employees (Hendrick, 2006). Every NOCTI assessment has the potential to provide students with college credit. More than 1,500 colleges and universities, including more than 100 in California, accept credit recommendations from the National College Credit Recommendation Service. Students must meet a 70% benchmark on one or more NOCTI assessments to be eligible for college credit (NOCTI, 2013).

Students could realize many potentially indirect benefits from completing career preparedness assessments. One study found that students had generally positive perceptions of WorkKeys because it served as an academic and career-planning tool (Schultz & Stern, 2013). ASVAB offers a career exploration tool that combines scores

from ASVAB with an interest self-assessment to provide students with career information related to their interests and aptitude. Research has shown that the ASVAB career exploration tool is an effective recruiting tool for the military (Laurence, Wall, Barnes, & Dela Rosa, 1998) and has the potential to reduce career indecision among adolescents (Baker, 2002). Career preparedness assessments that measure work- and job-prepared skills, such as the WorkKeys and NOCTI assessments of soft skills, provide students with information on learning how to learn. This can lead to greater self-awareness and improvements in academic and job performance. Lastly, industry certificates can improve student self-efficacy about the skills and competencies obtained (Foster & Pritz, 2006).

WorkKeys:	**Moderate**
NOCTI:	**Moderate with potential for Strong**
ASVAB:	**Weak**
Industry Certification:	**Strong**

B2. Public Understanding

The API is intended to give educational stakeholders—educators, parents, students, and the public at large—a clear picture of a school's status and growth. The College and Career Indicator should therefore clearly communicate how it supports college and career preparedness in a way that is easily understood by laypersons as well as educators.

The use of career preparedness assessments in education is relatively uncommon and recent. Therefore, few constituents are likely to know about the states that use these assessments in their accountability systems. However, much of the public is aware of these types of career preparedness assessments for purposes other than educational accountability. For example, the concept of industry certificates, credentials, or licenses is familiar to most people as they are used in areas such as medicine, law, automotive services, K–12 education, or information technology, among many others. The same is true of assessments such as WorkKeys, which was aimed initially at improving the job prospects for dislocated workers, out-of-school youth, and other individuals without the work experience or credentials necessary to secure a job that pays a living wage (Muller & Beatty, 2008).

Each type of career preparedness assessment would require different levels of informational outreach to increase public awareness and understanding. WorkKeys has the most exposure but is still largely unfamiliar to those outside a small circle of educators and employers. It also has the additional challenge of assessing soft skills, an area that is unfamiliar to most stakeholders. This does not mean that stakeholders would not understand the results of such assessments, only that they would have to be informed of their uses and convinced of their reliability.

The purpose of the ASVAB would be readily apparent to most individuals, but its application to postsecondary preparedness may be less apparent. College admissions staff in particular may not be amenable to accepting such scores as preparedness measures, and the ASVAB's makers themselves discourage uses beyond the military's

purposes. The NOCTI assessments are specific to an occupation or industry and are easily understood within that industry's context. The same is true of industry certification exams. However, little information about these assessments is generally available, and their makers are not necessarily as concerned about communicating with audiences beyond those who take the tests or use the results. WorkKeys and NOCTI provide much more information about their assessments on their respective websites, and their websites also have more resources and features than the ASVAB site. These resources and features help stakeholders interpret scores and understand assessment formats, both of which can improve understanding.

WorkKeys:	**Moderate**
NOCTI:	**Moderate**
ASVAB:	**Moderate**
Industry Certification:	**Moderate**

B3. Content, Skills, and Competencies

In order for the API to provide a valid description of school quality, its component parts must measure content, skills, and competencies that are taught and learned in schools. This criterion addresses not just the validity of the accountability measure but also the actionability of a College and Career Indicator.

Instructional sensitivity differs for each career preparedness assessment. WorkKeys and ASVAB are less instructionally sensitive because they are not specific to an occupation that may be the focus of a particular CTE course or set of courses. The NOCTI assessments are more likely to measure the content, skills, and competencies taught in classrooms because they have the most potential for alignment to CTE pathways and can be designed specifically for secondary students. The customized assessment feature that NOCTI offers, and some states use, would allow California to align the CTE Model Curriculum Standards to the various NOCTI assessments, thus greatly improving instructional sensitivity. Industry certification assessments designed for secondary students are more instructionally sensitive than certificates that require postsecondary apprenticeships or other experiences outside the classroom (Foster & Pritz, 2006).

WorkKeys:	**Moderate**
NOCTI:	**Strong**
ASVAB:	**Moderate**
Industry Certification:	**Strong**

B4. Emphasis on Student Performance

The legislative charge to California's school accountability system is meant to focus on educational outcomes rather than inputs. As important as it is to account for different features of quality schooling (e.g., teachers, instructional resources, curriculum, and school organization), this evaluative criterion looks at the extent to which potential component measures of the College and Career Indicator emphasize student performance.

Regardless of how instructionally sensitive specific career preparedness assessments are, each assessment measures student performance and not educational inputs or processes. NOCTI and industry certification assessments generally measure content taught within CTE course sequences, and thus are a more direct measure of student performance than WorkKeys or ASVAB. As discussed above, the information gleaned from the WorkKeys and NOCTI assessments of soft skills in relation to student learning could lead to improvements in academic and work performance. This will only happen if educators have access to and understand this information and also have the capacity to implement teaching strategies that improve students' metacognition.

WorkKeys:	**Strong**
NOCTI:	**Strong**
ASVAB:	**Strong**
Industry Certification:	**Strong**

C. System Utility

Measures to be included in an accountability system have greater utility if they add minimal burden to the education system, yet include as many students as possible. The measures also are most useful when they are applicable to students who will pursue a variety of postsecondary pathways.

C1. Minimal Burden

Minimizing the burden of component measures of the CCI means constraining the time and cost of implementation and data collection processes to the maximum extent possible. This criterion considers direct and indirect effects (e.g., time to take a test and instructional time devoted to test prep) and the effects on students, teachers, administrators, and the system as a whole.

The system-level burden would be similar for ASVAB, NOCTI, and WorkKeys. Students electing to take one of these assessments would face some cost in terms of fees and test-time burden. Table 5 displays a side-by-side comparison of the relative costs for each assessment.

The direct burden to schools and districts would include administering the assessment and instructional time devoted to test prep. Test time varies from as little as 10 minutes for some WorkKeys assessments of soft skills to 6 hours for some pre- and post-NOCTI assessments. States assessing career preparedness have identified other potential burdens including providing professional development to teachers administering these assessments and ensuring alignment between assessments and curriculum (CEP, 2013c).

Table 5. WorkKeys, ASVAB, and NOCTI Test Time and Fees

Assessment	Test Time	Fees
ASVAB	• Approximately 2.5 hours	• Free
NOCTI	• Written and performance components separately take 2–3 hours each; if combined, 4–6 hours.	• $32 for the pre- and post-test with multiple choice and performance task questions administered online. • There are two options for NOCTI pathway assessments: - $16 for a pre- and post-test multiple-choice combination - $11 for a post-test multiple-choice assessment
WorkKeys[a]	• 45–55 min. – NCRC assessments • 30–55 min. – other foundational skills assessments • 10–30 min. – soft skills assessments	• $6 – NCRC assessments • $6–11 – other foundational skills assessments • $10–12 – soft skills assessments

[a] The WorkKeys fees presented in Table 5 correspond to ACT's Education/Government prices.

The CDE's responsibility would include ordering, aggregating, and analyzing scores across high schools. The exact cost of this analysis would depend on how the scores from career preparedness assessments are incorporated into the CCI. If NOCTI is incorporated into the CCI, substantial resources could be spent on aligning customized assessments to the California CTE Model Curriculum Standards. At the very least, the CDE would be responsible for equating the results across more than 100 NOCTI assessments.

The system-level burden for industry certifications could vary greatly due to differences across individual assessments. Students and schools would likely face similar burdens to those encountered with other career preparedness assessments. The CDE would face additional burdens. First, the wide variety of organizations offering industry certification assessments would make data collection difficult. Directors of CTE in 46 states surveyed by the Center for Education Policy (CEP) indicated that one of the main challenges to assessing career preparedness was collecting data from third-party assessment vendors. Second, evaluating the validity and reliability of each industry certification would be a complex undertaking that would require significant resources. Lastly, the CDE would be responsible for ensuring that scores on industry certification assessments are comparable to each other by equating scores across individual assessments.

The system-level burdens have the potential to vary widely among career preparedness assessments. The strong rating for WorkKeys and ASVAB indicates that these assessments would produce minimal system-level burdens. Equating the results across different assessments, as is the case with NOCTI and industry certifications, is potentially the largest and most unpredictable system-level burden. This burden is potentially larger for industry certifications because of substantial differences in design, format, content coverage, and purpose across the many available assessments.

Although NOCTI has available more than 100 assessments, the design, format, and purpose of each assessment stays relatively constant from year to year.

WorkKeys:	**Strong**
NOCTI:	**Moderate**
ASVAB:	**Strong**
Industry Certification:	**Weak**

C2. Student Coverage

The API Guiding Principles state that the API should include as many students as possible in each school and district. This inclusion principle was cornerstone to an accountability system based entirely on universal measures (e.g., all students must take state assessments including populations requiring testing accommodations). The proposed College and Career Indicator is by necessity composed of conditional measures because not all students can be compelled to go to college, nor would it be desirable to do so. Students and their parents retain the right to choose which path makes the most sense for them, and college is only one option among many. In addition, students can demonstrate preparedness through an array of measures that are empirically linked to postsecondary success but that address different knowledge, skills, and aspirations. This evaluative criterion gives preference to scaled or scalable measures over local and unique ones.

California does not offer a statewide career preparedness assessment and thus no statewide participation numbers have been collected. As a conditional measure, there is potential for strong coverage for WorkKeys, ASVAB, and NOCTI. These assessments are offered online and can be administered to many students at once. Local access to industry certification assessments would drive the level of student coverage, which would likely vary by local preferences, available resources, and school culture (e.g., whether a school is more geared toward college- or career-going students).

WorkKeys:	**Moderate**
NOCTI:	**Moderate**
ASVAB:	**Moderate**
Industry Certification:	**Moderate**

C3. Postsecondary Pathways

The last criterion is less an evaluation of a measure than a categorization to inform more global decisions about the API. A College and Career Indicator must include component measures that collectively or individually recognize a diverse set of postsecondary pathways. Thus, this criterion identifies whether a component measure supports a college-going pathway, career-going pathway, both, or neither.

As the name implies, career preparedness assessments are geared almost exclusively toward the career-going postsecondary pathway. This does not mean that students intending on going to college cannot benefit from taking these assessments. The results from these assessments can provide valuable career-planning information (Schultz &

Stern, 2013) and potentially help students choose a major or develop a more targeted academic plan. The WorkKeys and NOCTI assessments of soft skills generate information that can improve student learning and subsequent performance in college and careers. Therefore, although these assessments are more immediately useful for career-oriented students, the results can be used by all students as career exploration tools or to improve the metacognitive skills necessary for success in both college and careers.

WorkKeys: **Moderate**
NOCTI: **Moderate**
ASVAB: **Moderate**
Industry Certification: **Moderate**

Conclusion

Career preparedness assessments have not been used broadly in education as measures of accountability. In addition, they have not necessarily been designed to be measures of the programs offered in K–12 education, but rather either of student general suitability for work (e.g., WorkKeys) or their skills in a specific occupational area (e.g., NOCTI or industry certification exams). The lack of independent, peer-reviewed research also makes it difficult to claim with any certainty whether career preparedness assessments are sufficiently valid, fair, and stable indicators of potential career success. Any use of such measures would have to be accompanied by an ongoing program of research and data collection to ascertain the effects on an instrument-by-instrument basis of using such scores and the technical qualities of each instrument in relation to the API. As with many of the other measures examined for potential inclusion in the API, career preparedness assessments offer many possibilities and an equal number of challenges, but they do reflect the evolving nature of the economy and do provide insight into an important dimension of preparedness that schools will want to be developing in more students in the future. Tables 6, 7, and 8 summarize the evaluative criteria ratings.

Table 6. Technical Quality Ratings

Career Preparedness Assessment	A. Technical Quality		
	A1	A2	A3
WorkKeys	Moderate	Moderate	Moderate
NOCTI	Moderate	Moderate	Moderate
ASVAB	Weak	Moderate	Moderate
Industry Certifications	Weak	Weak	Weak

Table 7. Stakeholder Relevance Ratings

Career Preparedness Assessment	B. Stakeholder Relevance			
	B1	B2	B3	B4
WorkKeys	Moderate	Moderate	Moderate	Strong
NOCTI	Moderate	Moderate	Strong	Strong
ASVAB	Weak	Moderate	Moderate	Strong
Industry Certifications	Strong	Moderate	Strong	Strong

Table 8. System Utility Ratings

Career Preparedness Assessment	C. System Utility		
	C1	C2	C3
WorkKeys	Strong	Moderate	Moderate
NOCTI	Moderate	Moderate	Moderate
ASVAB	Strong	Moderate	Moderate
Industry Certifications	Weak	Moderate	Moderate

Incorporating WorkKeys and ASVAB into the CCI demands examination of trade-offs between technical quality and stakeholder relevance. To date, WorkKeys and ASVAB offer the most data in terms of technical quality, although ASVAB's predictive validity research is specific to job performance in the military. The main value for students taking WorkKeys is earning the NCRC, although it is unclear how much employers value that designation. The only direct value ASVAB provides students is the ability to satisfy one enlistment requirement for joining the Armed Forces. WorkKeys and ASVAB have weak instructional sensitivity because they do not assess students directly on what is taught in school.

On the other hand, incorporating NOCTI and industry certifications into the CCI would present trade-offs between providing value to students and technical quality/system-level burdens. NOCTI and industry certifications have very little independent research establishing their technical quality. However, both NOCTI and industry certifications present direct value in the form of certifications that can be presented to employers as evidence of training, coursework, or other preparations. To a much greater extent than WorkKeys or ASVAB, NOCTI and industry certifications would produce large system-level burdens for the state, which would need to both ensure the technical quality of numerous assessments and equate scores across assessments.

The degree to which the career preparedness assessments analyzed in this white paper vary in design, format, content coverage, purpose, and levels of maturity should not be surprising. This variation reflects the complexity of career preparedness—no single assessment can measure all the necessary skills. WorkKeys focuses primarily on the foundational skills needed to be successful in many careers but lacks the focus on specific technical skills necessary for success in a particular occupation. Conversely, NOCTI and industry certifications measure the technical skills needed for specific careers at the expense of measuring the metacognitive skills critical for career success.

The lack of research surrounding career preparedness assessments, as evidenced by the low evaluative criteria ratings relative to other CCI measures reviewed in this white paper series, should also not be surprising. Although college and career preparedness are both relatively new fields in education, college preparedness has received the bulk of the attention. Vocational education, with its long tradition of tracking students, just recently reinvented itself as CTE, adding emphasis to students learning academic, technical, and metacognitive skills. A deeper understanding of career preparedness assessments will evolve as more researchers grapple with what it means to be prepared for a career, and more state accountability systems begin to prioritize career assessment.

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