SHARE

A Better Measure of Skills Gaps

UTILIZING ACT SKILL PROFILE AND ASSESSMENT DATA FOR STRATEGIC SKILL RESEARCH

ACT®

Executive Summary

01 **THE PHRASE "SKILLS GAP"** is used in the public arena very loosely with varying degrees of understanding of what a "gap" in "skills" actually means.

02 **THIS PAPER PROPOSES A SIMPLE DEFINITION** for the phrase "skills gap": the difference between the skills needed for a job versus those skills possessed by a prospective worker.

03 **SIGNIFICANT FOUNDATIONAL SKILLS GAPS EXIST** for U.S. WorkKeys® examinees with both middle and high levels of education for jobs that require a similar level of education.

04 **FOR MANUFACTURING, HEALTHCARE, CONSTRUCTION, AND ENERGY-RELATED** target occupations that require a middle or high level of education, the majority of U.S. examinees did not meet or exceed the Locating Information skill requirements.

05 **LESS THAN HALF OF U.S. EXAMINEES** with a middle or high education level met the Applied Mathematics skill requirements for the majority of manufacturing, construction, and energy jobs.

06 **DESPITE RESEARCH TO QUANTIFY GAPS** in the skills needed by industry and those in supply nationally, strategies should be developed to replicate similar research at a state or local level.

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Introduction

It is no secret that global markets and innovations in technology are driving rapid change in the U.S. economy. While much has been said over the years about the employment shift from goods-producing to service-providing industries, new research suggests that the shift is not due to sectoral employment change but rather a shift in the mix of jobs within industries and the types of skills that those jobs require.[1,2]

In addition, it has been suggested that upgrades in skills demanded by occupations that previously did not require higher education account for roughly 70% of the increase in postsecondary requirements.[3] Aside from shifts in occupational structure and increases within occupation skill requirements, it has also been noted that, over the past four decades, work tasks (and the skills needed to perform them) have become a better predictor of employment and wage growth than either educational level or occupational title.[4]

As the nation grapples with the aftereffects of the deepest recession in recent memory, policymakers struggle to find ways to integrate the millions of unemployed individuals whose current skills will continue to languish without immediate job prospects. There is a new reality for both workforce developers and education/training providers: that a significant segment of today's labor force does not have the requisite skills demanded by employers.[5] In addition, demographic shifts in the labor market are being felt in part due to the aging of the workforce, specifically the delay of retirement for older workers. Recent figures show that the labor force participation rate of older workers has increased by 5%, a trend largely due to recessionary pressures.[6]

The phrase "skills gap" is used in the public arena very loosely with varying degrees of understanding of what a "gap" in "skills" actually means. Definitions of the phrase vary widely, with different schools of thought approaching the issue in drastically different ways. Formal methodology for quantifying a "skills gap" is either completely lacking, as in much of the policy-oriented research, or is too convoluted, as is often the case in the economic literature. A balanced approach for "skills gap" analysis is needed that incorporates rigorous quantitative methods with an eye for practical application.

This paper seeks to enter the conversation by proposing a simple definition for the phrase "skills gap" by the most simple of interpretations: that a skills gap measures the difference between the skills needed for a job versus those skills possessed by a prospective worker. While this definition is not groundbreaking, its simplicity has been overlooked by those who have been forced to use indirect measures of "skills" both for jobs and the potential labor pool.

Quantifying skills of the labor pool at both a micro and macro level has proven to be extremely difficult at any level of geography. Education data from the U.S. Census or U.S. Bureau of Labor Statistics (BLS) Current Population Survey are often used by economic and workforce developers as a proxy for "skill level." A more costly but still aggregate measure of "skill" is often determined by surveying employers about the types of skills gaps that they encounter in either incumbent or prospective employees.

The importance of having a more precise measure of "skills" and resulting skills gaps cannot be understated. Often, the

aim of national policy research papers is to frame and inform conversations around specific topics, and their research recommendations are translated into written policies, developed curriculum, and training resources spent on trying to close identified "gaps." This paper posits that "skills gap" analysis should target identifiable skills. Initiatives based on findings of indirect measures of "skills" and "skills gaps" may invest precious time and resources in "skills" that are not in fact needed by employers. A balanced approach is needed for "skills gap" research that incorporates rigorous quantitative methods, uses a direct measure of skills, and has practical application for workforce policy.

> *There is a new reality for workforce developers and education/training providers: that a significant segment of today's labor force does not have the requisite skills demanded by employers.*

The paper will propose a skills gap methodology that uses more detailed and specific measures of skills for supply/demand analysis. A review of the literature on the methodology and use of the phrase "skills gap" follows, with highlights from the fields of workforce policy, industrial/organizational psychology, and economic-based research. Lastly, a gap analysis using the proposed methodology is conducted for four major industry sectors.

Literature Review

WORKFORCE POLICY RESEARCH

Much of the recent literature on skills gaps in the U.S. labor force was largely influenced by a seminal workforce policy paper, the U.S. Department of Labor (U.S. DOL) Secretary's Commission on Achieving Necessary Skills (SCANS) report, "What Work Requires of Schools: A SCANS Report for America 2000."[7] The report sought to help define skills needed for employment and proposed acceptable levels of proficiency for different skill sets. In addition, it suggested effective ways to access skill proficiency in the education and workforce development systems. While the SCANS report did not attempt to quantify any existing "gap" in skills, it did promote the idea that there were universally recognized skill sets that employers required of the labor force and, without which, students and job seekers would have difficulty finding gainful employment over a lifetime.

Many workforce policy papers that address the problem of "skills gap" can be separated into two categories: (1) those that utilize employer surveys to collect data about employer perceptions of skills gaps and (2) those that impute skills gaps from aggregate labor supply and demand data using level of education as a proxy for skill level. A few workforce research papers have attempted to quantify skills gaps by comparing benchmarked skill sets identified as in-demand by employers and comparing them with labor force skill assessment databases. A brief review of the various research conducted in each category follows.

Using Employer Surveys to Assess Skills Gaps

The amount of workforce survey research on skills gaps is sizable, which is surprising considering the significant costs of large-scale survey data collection and administration. Research by Holzer consisted of a phone survey to organizations hiring non-college workers who were asked about skills needed for both filled and vacant jobs.[8] Another survey by the Conference Board investigated shortages of workplace basic skills (defined as quantitative literacy, communication, applying information, critical thinking, and teamwork) based on employer responses.[9] More recent employer skills gap surveys have investigated employer perceptions of basic employability skills gaps across industry sectors.[10, 11, 12]

Researching skills gaps from employer-based surveys is problematic in that the data collected are based on employer perceptions of labor market skills gaps, usually without any benchmarking of actual labor market skill sets. Often, the individual filling out the survey may not have direct knowledge of the skill sets needed for on-the-job success and may be even more removed from knowing the skill sets for both incumbent and prospective employees. Other aspects of employer skills gap surveys that are problematic concern the focus of some on

the skill deficiencies in new workforce entrants.[13,14] Such studies are useful for providing the education system feedback on the employability skills of their recent graduates, but unfortunately they ignore the issue of addressing the significant skills gaps in the dislocated and incumbent workforce.

Using Labor Supply/Demand Indicators for Skills Gap Analysis

Several workforce policy papers follow more traditional economic-theory driven approaches to skills gap analysis by imputing skills gaps from aggregate labor supply and demand data. Generally, such research follows classic economic theory in using level of education as a proxy for skill level.[15] Research conducted by Peters investigates the skill mismatch or gap between an industry skill demand minus the county skill supply.[16] In this instance, skill supply was determined by using education data from the U.S. Census. Demand was defined as the average proportion of high-, semi-, and low-skilled workers within an industry (using breakouts of occupations within industry from the U.S. BLS Occupational Employment Survey) with level of educational attainment used as a proxy for skill.

More current analysis using the same skills gap methodology has been conducted for all 50 states to examine how regional skill mismatch and housing market trends affect national unemployment.[17] The method of using education as a proxy for skill level is used in various other workforce policy papers by consolidating skill into the three categories of low, middle, and high skills.[18]

The practice of using education variables as a proxy of skill level, while common, is also somewhat varied in implementation. A focus on "middle skill" gaps has been popular among workforce policy researchers, mainly due to the large share of employment and respective openings that this segment represents. Some middle-skill gap research has targeted trends in unemployment rates against rising job vacancies.[19] Other research on skills gaps has compared the number of annual degree completers for mid-level training programs against statewide estimated openings for middle-skill jobs.[20]

As the nation's leaders focus on the need to increase the level of skills and education of the overall labor force, research about the skills required for middle-skill jobs will become more prevalent.[21]

A few workforce policy research examples attempt to quantify the "skills gap" of the labor market using detailed data on measurable skills. The Ohio Business Roundtable and the Ohio Department of Education launched the Ohio Skills Gap Initiative to determine the foundational skills and skill levels entry-level employees needed to succeed in the workplace.[22] Skill supply was defined using workplace skill assessment scores of the population and demand determined from skill levels profiled in a national database of jobs, ACT, Inc.–JobPro (more information on the JobPro database can be found on page 10). Gaps were

analyzed for a subset of entry-level jobs, which were grouped into five job clusters with average skill levels determined for each cluster. A skills gap was identified if the supply met 80% of the skill requirements (determined by JobPro skill levels) required to qualify for 80% of the jobs in each cluster. Other studies conducted over the years have addressed skills gaps using the same skill assessment and skill profile datasets.[23, 24]

Hybrid Approaches Using Surveys and Labor Supply/Demand Indicators

Several workforce studies have analyzed skills gaps by utilizing a mix of workforce survey research and aggregate labor market supply/demand indicators. This hybrid approach of using both survey and labor market supply/demand data is recognized as a "best practice" of addressing skills gaps for many state workforce agencies and labor market information offices in the U.S.[25] One example of this hybrid approach is to determine skill supply from responses to telephone-based labor shed surveys and skill demand on employer job vacancy surveys.[26] Another variation of this hybrid approach to skills gap analysis includes more general comparisons of aggregate labor market supply indicators from the U.S. BLS occupational projections data in combination with employer job vacancy survey data to represent skill demand.[27] In each case, the hybrid approach provides a balanced approach that incorporates both aggregate and customized data to determine gaps in skills.

INDUSTRIAL/ORGANIZATIONAL PSYCHOLOGY RESEARCH

The phrase "skills gap" is used in industrial/organizational (I/O) psychology literature within the context of competency analysis and modeling. The concept of competency analysis and modeling was the focus of a Society for Industrial/Organizational Psychology Association (SIOP) task force in 2000.[28] The task force was charged with studying the related issues of job analysis and the burgeoning practice of competency modeling used as a method for addressing the strategic needs of organizations. Specifically, it noted that job boundaries were increasingly becoming blurred and that this trend necessitated the use of competency-based approaches to job analysis. While the task force concluded that there was disagreement among practitioners at the time regarding a common definition for competencies and competency modeling, the importance of such research continued to be a focus in the literature over the years.[29, 30]

A gradual consensus formed in the competency analysis research conducted soon thereafter around defining the process of competency modeling. Competency modeling generally includes the steps of: (1) competency mapping, (2) competency gap analysis, (3) competency development, and (4) competency monitoring.[31] The second step of the competency modeling, a competency gap analysis, has been defined as the gap between the competencies that employees possess in comparison with the competencies required by an organization. While there is a noted distinction between the concepts of "competencies" and "skills," the I/O literature uses the terms "competency gap" and "skills gap" interchangeably in researching the process of competency modeling. This report will not enter into the fray of determining the appropriateness of investigating either competencies or skills, but rather will provide a review of the methodologies used in conducting a gap analysis in the context of the I/O literature.

Irrespective of the use of "competency" or "skill," the results of a gap analysis are often used by I/O and human resource management researchers to indicate whether present employees have the necessary skills and competencies for their jobs and, if not, where they need development.[32] The practice of using competency modeling and gap analysis to meet the goals and strategies of a business is referred to in the I/O literature as competency management.[33] This concept includes a larger framework of documenting, mapping, and assessing competencies, sometimes in the context of future, as well as current, organizational needs.[34] Within competency management practices, a gap analysis is critical to minimizing time spent in training and

enabling workers to focus on specific skills that they lack.[35] The ability to create cost effectiveness in organizational training systems has increased the use of competency management systems in large organizations, resulting in more granular distinctions in the definition and use of skills gap research.

The I/O literature has many variations on defining and implementing competency or skills gap analysis. While some of the gap analysis is conducted within the context of an organization, there are also many examples of I/O gap analysis conducted from an industry-wide perspective.[36] In addition to variations on research context, the literature also contains major differences in the definition of skill supply and demand. In defining the concept of gap analysis, some of the I/O research uses supervisory perception to define skill supply and demand.[37] Research by McClain defined a skills gap as any difference between supervisors' perceptions of the importance of a skill versus their perception of actual skills possessed by entry-level employees.[38] Other researchers have defined supply as skills identified by hospitality educators as important, and demand as skills identified as important by industry recruiters.[39] A critique of this approach is the assumption that perception of skill importance by educators can be used as a proxy for skills possessed, either by graduates or by entry-level workers. Similar problems exist in studies that utilize self-reported skill level to determine supply rather than actual assessed level of skills.[40]

ECONOMIC RESEARCH

The phrase "skills gap" can also be explored in the context of a classical economic theory in which the term "skill mismatch" is more commonly used. According to economic theory, skill mismatch is used to describe a gap between the demand and supply sides of the labor market. Many economists have used the term "skill mismatch" to describe patterns in structural unemployment, a situation in which jobs are available but cannot be filled due to a lack of necessary skills in the unemployed. There are generally three main approaches to defining skills, both in terms of supply and demand, in the economic literature: (1) a job analyst definition of the skill/educational requirement for each occupation, (2) a measure of a worker's self-assessment of educational requirement from surveys, and (3) a distribution of education calculated for each occupation.[41]

The most common approach in the economic literature is the use of education or level as a proxy for skill level with some variation in terms of the categories of educational attainment used for analysis.[42] A common approach is to use a dichotomous grouping of "skilled" and "non-skilled" labor with "skilled" defined as those who have completed their upper-secondary education (high school diploma/GED) and "unskilled" as all others.[43] Other researchers group labor into broad categories of occupations (i.e., skilled manual, professional) to better differentiate between skill groups.[44] Concerns have been raised regarding the use of level of education as a proxy for skill level due to problems with comparability of over time and geography.[45]

A few economic studies have investigated whether educational mismatches necessarily imply mismatches between acquired and required skills and found that, while the two are related, educational mismatches do not imply mismatches between available and required knowledge and skills.[46] More recent economic mismatch studies have utilized the traditional I/O approach of job analysis to specify the level of skills needed for specific job titles in lieu of more indirect proxy measures.[47] Other approaches that blend economic and I/O practices include supervisory assessments of skill performance and worker skill levels to investigate skill mismatches.[48]

> *Of particular note is the researchers' finding that, since 2007, work tasks (and the skills needed to perform them) have become a better predictor of employment and wage growth than either educational level or occupational title.*

Recent research by Acemoglu has focused on the need to recognize that workers of a given skill level can perform a variety of changing tasks in response to changes in labor market conditions and technology.[49] The study investigates the impact of recent technological developments that have enabled information and communication technologies to replace, or permit the offshoring of, work previously performed by middle-skill jobs. The study found that patterns of job polarization and wage shifts over the past four decades have been caused by a substantial change in the wage returns to certain types of skills and a measurable shift in the assignment of skills to tasks. Of particular note is the researchers' finding that, since 2007, work tasks (and the skills needed to perform them) have become a better predictor of employment and wage growth than either educational level or occupational title.

A Proposed Methodology: ACT Skills Gap

A review of the literature has shown the breadth of the use of the phrase "skills gap" in the public arena. While the formal methodological approaches of the economic literature are desirable in their ability to quantify "gaps," such research is often too complicated for public digestion and is not easily replicated for application in regional and local workforce and economic development initiatives. The need for a more precise measure of "skills" also cannot be overlooked, as much of the work outside the industrial/organizational psychology literature uses indirect measures of skills as a proxy for actual skills. It is obvious that a balanced approach is needed for "skills gap" analysis that incorporates rigorous quantitative methods with the need for practical application.

Fortunately, ACT is in the unique position of having a proprietary skills database, JobPro, a national repository of occupational skill and task data for more than 18,000 jobs that have been profiled over 17 years. Data in JobPro are derived from occupational job profiles conducted by ACT-trained job profilers that benchmark the skills and tasks needed for occupations for specific industries. The JobPro database is an ideal repository of skill data in that it is representative of both the range of occupational titles covered by the Occupational Information Network (O*Net) and in terms of the distribution of levels of education found across the U.S. Bureau of Labor Statistics Standard Occupational Classification (SOC).[50] Additionally, ACT has a proprietary skill assessment database for the WorkKeys® assessments which contains population skill level scores for competencies deemed to be foundational for workplace and lifelong career success. ACT WorkKeys assessments are a suite of skill assessments that measure the foundational skills important to many occupations throughout various industry sectors. This combination of detailed skill supply and demand data at a national level allows for a more precise analysis of the scope and nature of the U.S. skills gap.

> *It is obvious that a balanced approach is needed for "skills gap" analysis that incorporates rigorous quantitative methods with the need for practical application.*

This research attempted to quantify actual skill gaps at a national level for four targeted industry sectors: manufacturing, healthcare, energy, and construction. Together, these industry sectors represent nearly 25% of total U.S. industry employment.[51] To determine skills needed by each of the four industry sectors, researchers analyzed national industry/occupational staffing patterns and the long-term occupational projections (both for the 2008–2018 time period) from the U.S. Bureau of Labor Statistics.[52] A targeted occupational cluster was developed for each of the four industry sectors by selecting industry-specific occupations (at least 10% of overall employment in an occupation was represented by that industry). Occupations were selected that were projected to not decline in their share of overall employment within the industry over the long term. Occupations within each of the four targeted occupational clusters were then grouped into low, middle, and high education groupings based on the U.S. Bureau of Labor Statistics Most Significant Source of Education/Training by SOC code.[53]

U.S. EXAMINEE SKILL SUPPLY

Skill supply was determined by analyzing examinee scores on three WorkKeys assessments (Reading for Information, Locating Information, and Applied Mathematics) for individuals throughout the U.S. Examinees were grouped into low, middle, and high education groupings for a rough match of requisite education and training needed for the three skill demand groups. Educational level achieved was determined via self-reported data that are included in the user registration section of the WorkKeys assessment process. Skills gap was defined as a gap between the skills needed for a job requiring a given level of education versus those skills possessed by workers for a comparable level of education.

Each of the WorkKeys assessments is scaled independently of each other. Performance is reported in "levels" with a range from a low score of 3 to a high score of 7 for Applied Mathematics and Reading for Information, and from 3 to 6 for Locating Information. Individuals who are not able to score at the minimum (Level 3) are reported as being "Below 3."

In each skill area, Level 3 is set at the perceived lowest level that employers value for their jobs. Individuals scoring below a Level 3 are considered not to have the necessary level of skill for any job that requires that skill area. For the low education group of U.S. examinees, 10% of individuals scored below a level 3 in Locating Information and would not be considered qualified for any job that has the locating information skill as a job requirement.

U.S. EXAMINEES
HIGH EDUCATION GROUP
January 2006–December 2010

LEVEL	APPLIED MATHEMATICS	READING FOR INFORMATION	LOCATING INFORMATION
7	12%	21%	NA*
6	32%	38%	2%
5	34%	27%	37%
4	16%	11%	50%
3	4%	1%	8%
Below 3	2%	1%	3%

**Not applicable. Numbers may not total to 100% due to rounding.*

U.S. EXAMINEES
MIDDLE EDUCATION GROUP
January 2006–December 2010

LEVEL	APPLIED MATHEMATICS	READING FOR INFORMATION	LOCATING INFORMATION
7	7%	8%	NA*
6	23%	24%	1%
5	31%	38%	26%
4	22%	24%	54%
3	12%	4%	12%
Below 3	5%	3%	6%

**Not applicable. Numbers may not total to 100% due to rounding.*

U.S. EXAMINEES
LOW EDUCATION GROUP
January 2006–December 2010

LEVEL	APPLIED MATHEMATICS	READING FOR INFORMATION	LOCATING INFORMATION
7	7%	4%	NA*
6	18%	17%	0%
5	27%	34%	17%
4	23%	32%	54%
3	17%	7%	19%
Below 3	8%	5%	10%

**Not applicable. Numbers may not total to 100% due to rounding.*

U.S. TARGET INDUSTRY SKILL DEMAND

Demand for skills was determined via occupational profiles in the ACT JobPro database, a compendium of the tasks and skills needed for more than 18,000 jobs profiled throughout the U.S. The occupational profiles in JobPro follow the O*Net taxonomy of occupational codes and were used to match skill profiles with the three education groups for each of the four targeted occupational clusters. Only occupational profiles conducted in the most recent five years were used for analysis, as tasks and skill sets are assumed to change over a period of time for many occupations.

An occupational profile, or skill level required for a given occupation, is the median skill level set for all the profiles of jobs with the same O*Net code. A median skill score for three WorkKeys skills (Reading for Information, Locating Information, and Applied Mathematics) was created for each O*Net code. A skill level required for each of the three education groupings for each industry was then created by establishing the level at the 85th percentile for each grouping. This represents the skill levels required for entry into 85% of those occupations. The reasoning for establishing a skill threshold for each grouping is to show the ability of the skill supply to meet skill demand for the majority of occupations within a targeted industry.

MANUFACTURING

The educational distribution of targeted manufacturing occupations indicates a slightly larger proportion of occupations represented in the low and high education groups. Occupations were selected due to either a stable or increasing share of employment within an industry over the long term in addition to having a relatively high concentration of employment within a particular industry sector.

An analysis of the skill requirements for the targeted manufacturing occupations is provided in the table above. The results indicate that the lowest level of skills required for the majority of target manufacturing occupations in the low education group is a level 4, with the highest skill requirements in the middle and high education groups at a level 6.

EDUCATIONAL DISTRIBUTION OF TARGETED MANUFACTURING OCCUPATIONS (SOC)

EDUCATION GROUP	TYPICAL LEVEL OF EDUCATION/EXPERIENCE REQUIRED	# OF OCCUPATIONS
HIGH EDUCATION	Bachelor's or higher degree, plus work experience	7
	Bachelor's degree	10
MIDDLE EDUCATION	Associate degree	6
	Postsecondary vocational award	4
	Work experience in a related occupation	3
LOW EDUCATION	Long-term on-the-job training	7
	Moderate-term on-the-job training	18
	Short-term on-the-job training	7
TOTAL		62

U.S. MANUFACTURING SKILL REQUIREMENTS

January 2006–December 2010

EDUCATION GROUP	APPLIED MATHEMATICS (RANGE: 3–7)	READING FOR INFORMATION (RANGE: 3–7)	LOCATING INFORMATION (RANGE: 3–6)
SKILL LEVEL REQUIRED FOR 85% OF OCCUPATIONS			
HIGH EDUCATION OCCUPATIONS	6	6	5
MIDDLE EDUCATION OCCUPATIONS	6	5	5
LOW EDUCATION OCCUPATIONS	4	4	4

HEALTHCARE

The educational distribution of targeted healthcare occupations indicates a relatively equal proportion of occupations represented in the low, middle, and high education groups.

An analysis of the skill requirements indicates that the lowest level of skills required for the majority of target healthcare occupations in the low education group is a level 4, with the highest skill requirements across the three education groups at a level 6.

EDUCATIONAL DISTRIBUTION OF TARGETED HEALTHCARE OCCUPATIONS (SOC)

EDUCATION GROUP	TYPICAL LEVEL OF EDUCATION/EXPERIENCE REQUIRED	# OF OCCUPATIONS
HIGH EDUCATION	Master's degree	3
	Bachelor's degree or higher degree, plus work experience	4
	Bachelor's degree	6
MIDDLE EDUCATION	Associate degree	8
	Postsecondary vocational award	8
	Work experience in a related occupation	1
LOW EDUCATION	Moderate-term on-the-job training	6
	Short-term on-the-job training	12
TOTAL		48

U.S. HEALTHCARE SKILL REQUIREMENTS

January 2006–December 2010

EDUCATION GROUP	APPLIED MATHEMATICS (RANGE: 3–7)	READING FOR INFORMATION (RANGE: 3–7)	LOCATING INFORMATION (RANGE: 3–6)
SKILL LEVEL REQUIRED FOR 85% OF OCCUPATIONS			
HIGH EDUCATION OCCUPATIONS	5	6	5
MIDDLE EDUCATION OCCUPATIONS	5	5	5
LOW EDUCATION OCCUPATIONS	4	5	4

ENERGY

The educational distribution of targeted energy occupations indicates a higher proportion of occupations represented in the low education group (58%) compared to either the high or middle education groups (23% and 19%, respectively).

An analysis of the skill requirements indicates that the lowest level of skills required for the majority of target energy occupations in the low education group is a level 4, with the highest skill requirements in the high education group at a level 7.

EDUCATIONAL DISTRIBUTION OF TARGETED ENERGY OCCUPATIONS (SOC)

EDUCATION GROUP	TYPICAL LEVEL OF EDUCATION/EXPERIENCE REQUIRED	# OF OCCUPATIONS
HIGH EDUCATION	Bachelor's or higher degree, plus work experience	1
	Bachelor's degree	5
MIDDLE EDUCATION	Postsecondary vocational award	2
	Work experience in a related occupation	3
LOW EDUCATION	Long-term on-the-job training	8
	Moderate-term on-the-job training	4
	Short-term on-the-job training	3
TOTAL		26

U.S. ENERGY SKILL REQUIREMENTS

January 2006–December 2010

EDUCATION GROUP	APPLIED MATHEMATICS (RANGE: 3–7)	READING FOR INFORMATION (RANGE: 3–7)	LOCATING INFORMATION (RANGE: 3–6)
SKILL LEVEL REQUIRED FOR 85% OF OCCUPATIONS			
HIGH EDUCATION OCCUPATIONS	7	6	6
MIDDLE EDUCATION OCCUPATIONS	5	5	5
LOW EDUCATION OCCUPATIONS	5	5	4

CONSTRUCTION

Roughly two-thirds of the targeted occupations in construction require a low level of education compared to the 20% that require a middle level of education and 13% that require a high level.

An analysis of the skill requirements indicates that the lowest level of skills required for the majority of target construction occupations in the low education group is a level 4, with the highest skill requirements in both the middle and high education groups at a level 6.

EDUCATIONAL DISTRIBUTION OF TARGETED CONSTRUCTION OCCUPATIONS (SOC)

EDUCATION GROUP	TYPICAL LEVEL OF EDUCATION/EXPERIENCE REQUIRED	# OF OCCUPATIONS
HIGH EDUCATION	Bachelor's degree or higher plus work experience	1
	Bachelor's degree	4
MIDDLE EDUCATION	Postsecondary vocational award	6
	Work experience in a related occupation	2
LOW EDUCATION	Long-term on-the-job training	12
	Moderate-term on-the-job training	11
	Short-term on-the-job training	4
TOTAL		40

U.S. CONSTRUCTION SKILL REQUIREMENTS

January 2006–December 2010

EDUCATION GROUP	APPLIED MATHEMATICS (RANGE: 3–7)	READING FOR INFORMATION (RANGE: 3–7)	LOCATING INFORMATION (RANGE: 3–6)
SKILL LEVEL REQUIRED FOR 85% OF OCCUPATIONS			
HIGH EDUCATION OCCUPATIONS	6	5	5
MIDDLE EDUCATION OCCUPATIONS	6	5	5
LOW EDUCATION OCCUPATIONS	5	5	4

SKILL GAP ANALYSIS

MANUFACTURING

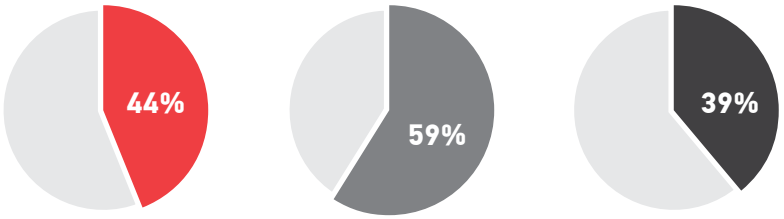
A comparison of the skills needed for targeted manufacturing occupations shows a significant skills gap for both middle and high education jobs.

The majority of U.S. examinees with a middle level of education did not meet the skill requirements for jobs that required a middle level of educational attainment (Applied Mathematics and Locating Information).

The skills gap for manufacturing jobs that require a high level of education is significant, with less than two-thirds of the highly educated U.S. examinees meeting skill levels required by employers.

U.S. EXAMINEES
HIGH EDUCATION GROUP

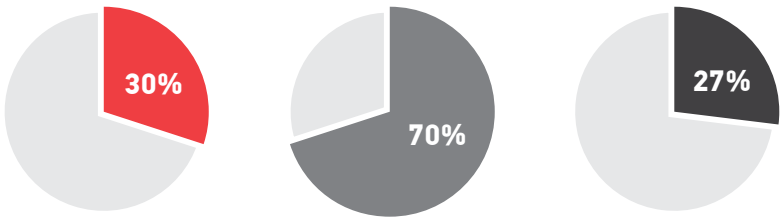
Examinees who Met or Exceeded Manufacturing Skill Requirements



APPLIED MATHEMATICS | READING FOR INFORMATION | LOCATING INFORMATION

U.S. EXAMINEES
MIDDLE EDUCATION GROUP

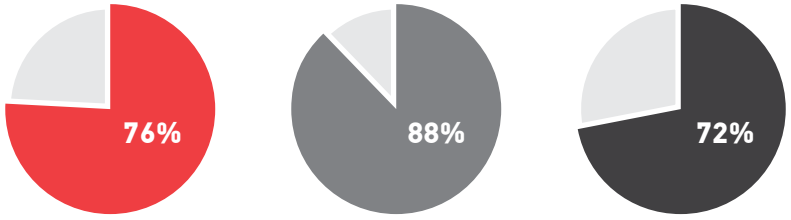
Examinees who Met or Exceeded Manufacturing Skill Requirements



APPLIED MATHEMATICS | READING FOR INFORMATION | LOCATING INFORMATION

U.S. EXAMINEES
LOW EDUCATION GROUP

Examinees who Met or Exceeded Manufacturing Skill Requirements



APPLIED MATHEMATICS | READING FOR INFORMATION | LOCATING INFORMATION

HEALTHCARE

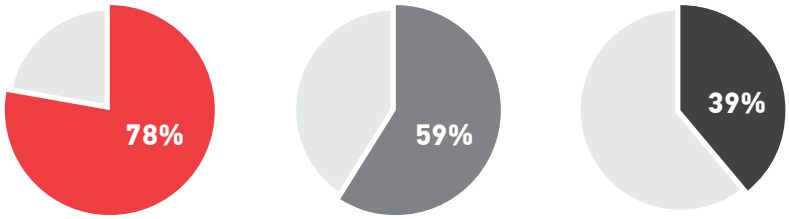
The largest skills gap for targeted healthcare occupations is for Locating Information for jobs that require a middle and high level of education.

Less than a third (27%) of U.S. examinees with a middle level of education met the Locating Information skill requirements for healthcare occupations that require a similar level of educational completion.

A slightly higher percentage of highly educated U.S. examinees met or exceeded the Locating Information skill requirements for healthcare occupations that require a similar level of education (39%).

U.S. EXAMINEES
HIGH EDUCATION GROUP

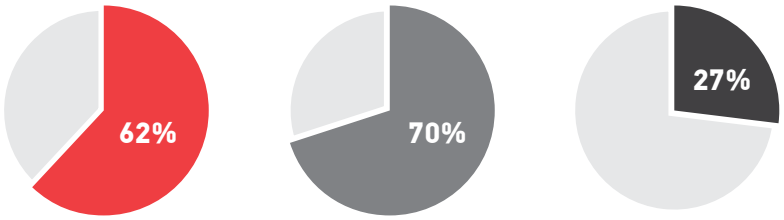
Examinees who Met or Exceeded Healthcare Skill Requirements



APPLIED MATHEMATICS | READING FOR INFORMATION | LOCATING INFORMATION

U.S. EXAMINEES
MIDDLE EDUCATION GROUP

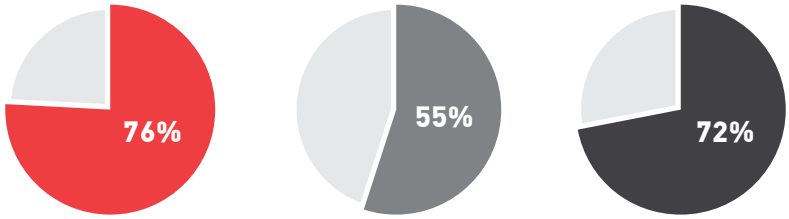
Examinees who Met or Exceeded Healthcare Skill Requirements



APPLIED MATHEMATICS | READING FOR INFORMATION | LOCATING INFORMATION

U.S. EXAMINEES
LOW EDUCATION GROUP

Examinees who Met or Exceeded Healthcare Skill Requirements



APPLIED MATHEMATICS | READING FOR INFORMATION | LOCATING INFORMATION

ENERGY

A comparison of the skills needed for targeted energy occupations shows a significant skills gap for jobs that require a high level of education. There is also a sizable gap in Locating Information skills for jobs that require a middle level of education completion.

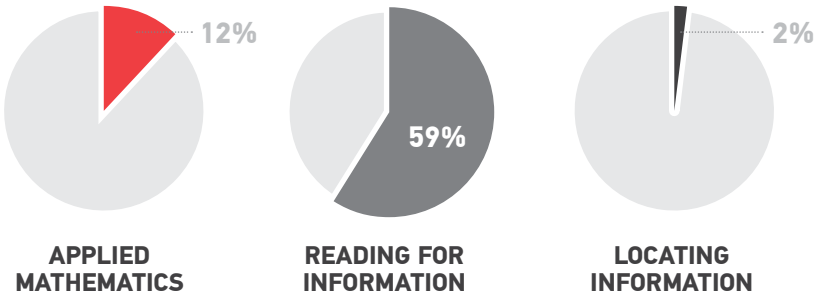
Less than a third (27%) of U.S. examinees with a middle level of education met the Locating Information skill requirements for energy occupations that require a similar level of educational completion.

A significant skills gap exists for energy occupations that require a high level of education for both Applied Mathematics and Locating Information.

A small percentage of highly educated U.S. examinees met or exceeded the Applied Mathematics (12%) and Locating Information (2%) skill requirements for targeted energy occupations that required a similar level of education.

U.S. EXAMINEES
HIGH EDUCATION GROUP

Examinees who Met or Exceeded Energy Skill Requirements



U.S. EXAMINEES
MIDDLE EDUCATION GROUP

Examinees who Met or Exceeded Energy Skill Requirements

U.S. EXAMINEES
LOW EDUCATION GROUP

Examinees who Met or Exceeded Energy Skill Requirements

CONSTRUCTION

Only half of the U.S. examinees with a low level of education met or exceeded the Applied Mathematics (52%) and Reading for Information (55%) skill requirements for targeted construction occupations that require a similar level of education.

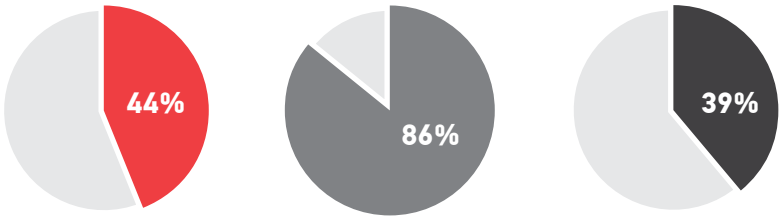
Significant skills gaps exist for targeted construction jobs that require both a middle and high level of education.

Less than a third of U.S. examinees with a middle level of education met the Applied Mathematics (30%) and Locating Information (27%) skill requirements for target construction jobs.

Less than half of U.S. examinees with a high level of education met the skill requirements for Applied Mathematics and Locating Information for target construction jobs.

U.S. EXAMINEES
HIGH EDUCATION GROUP

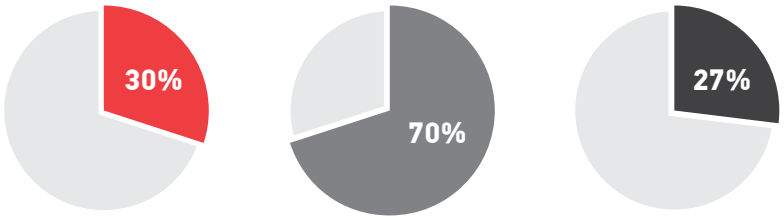
Examinees who Met or Exceeded Construction Skill Requirements



APPLIED MATHEMATICS | READING FOR INFORMATION | LOCATING INFORMATION

U.S. EXAMINEES
MIDDLE EDUCATION GROUP

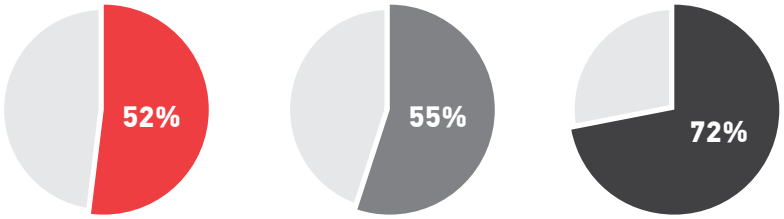
Examinees who Met or Exceeded Construction Skill Requirements



APPLIED MATHEMATICS | READING FOR INFORMATION | LOCATING INFORMATION

U.S. EXAMINEES
LOW EDUCATION GROUP

Examinees who Met or Exceeded Construction Skill Requirements



APPLIED MATHEMATICS | READING FOR INFORMATION | LOCATING INFORMATION

Conclusions

...as foundational skill requirements increase for occupations across many industries, a higher level of education does not prepare individuals for the level of workplace skills demanded by employers.

The goal of this research paper was to present a methodology for conducting skills gap analysis that is replicable, is applicable to economic and workforce developers, and utilizes a direct measure of skill supply and demand.

Any analysis of a potential mismatch of skill supply and demand should not be so convoluted as to confuse a public discourse about what skills are needed for the critical and in-demand jobs for our nation's largest industry sectors. Likewise, such research should have real application in conversations about achievable interventions to address skills gaps that may exist. Lastly, caution should be used in analyzing indirect measures of skills as a proxy for actual skill level. The results of this analysis imply that level of education does not necessarily relate to gaps in foundational on-the-job skills.

Significant foundational skills gaps exist for U.S. examinees with both middle and high levels of education for jobs that require a similar level of education. For manufacturing, healthcare, construction, and energy-related target occupations that require a middle or high level of education completion, the majority of U.S. examinees did not meet or exceed the skill requirements for Locating Information. Less than half of individuals with a middle or high education level met the Applied Mathematics skill requirements for the majority of manufacturing, construction, and energy jobs. This is somewhat surprising, considering that a higher level of education has often not been associated with potential skills gaps and that it was more of an issue for low- and middle-skill occupation groups. This research implies that, as foundational skill requirements increase for occupations across many industries, a higher level of education does not prepare individuals for the level of workplace skills demanded by employers. Rather, it would seem that the gap in foundational skills demanded by employers widens as the level of education increases. Reasons why the general population is deficient in the Locating Information may be due to a lack of secondary and postsecondary courses teaching the skill in a course by itself (vs. inclusion in existing curriculum—i.e., locating data in the periodic table in a science class). Additional research on potential skills gaps in other leading industry sectors is needed in order to determine whether similar gaps in foundational skills are industry specific or indicate a more pervasive trend. Furthermore, gap analysis on cross-industry occupational clusters such as Information Technology needs to be conducted to investigate potential skills gaps in occupations embedded within multiple industries.

Despite these efforts to quantify gaps in the skills needed by industry and those in supply nationally, a better strategy would be to replicate similar research at a state or local level. National skills gap research is limited in its ability to target specific workforce development initiatives where they are most needed. A combination of similar skill supply and demand data integrated with detailed employment history and education/training data could be achieved through the matching of state and local workforce agency case management datasets. From an individual perspective, additional detail about desired career paths and previous occupational certification could allow for more targeted occupational comparisons. Regionally, gap analysis that includes previous employment history could better inform economic developers about the existing skill levels for individuals previously employed in targeted occupations.

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