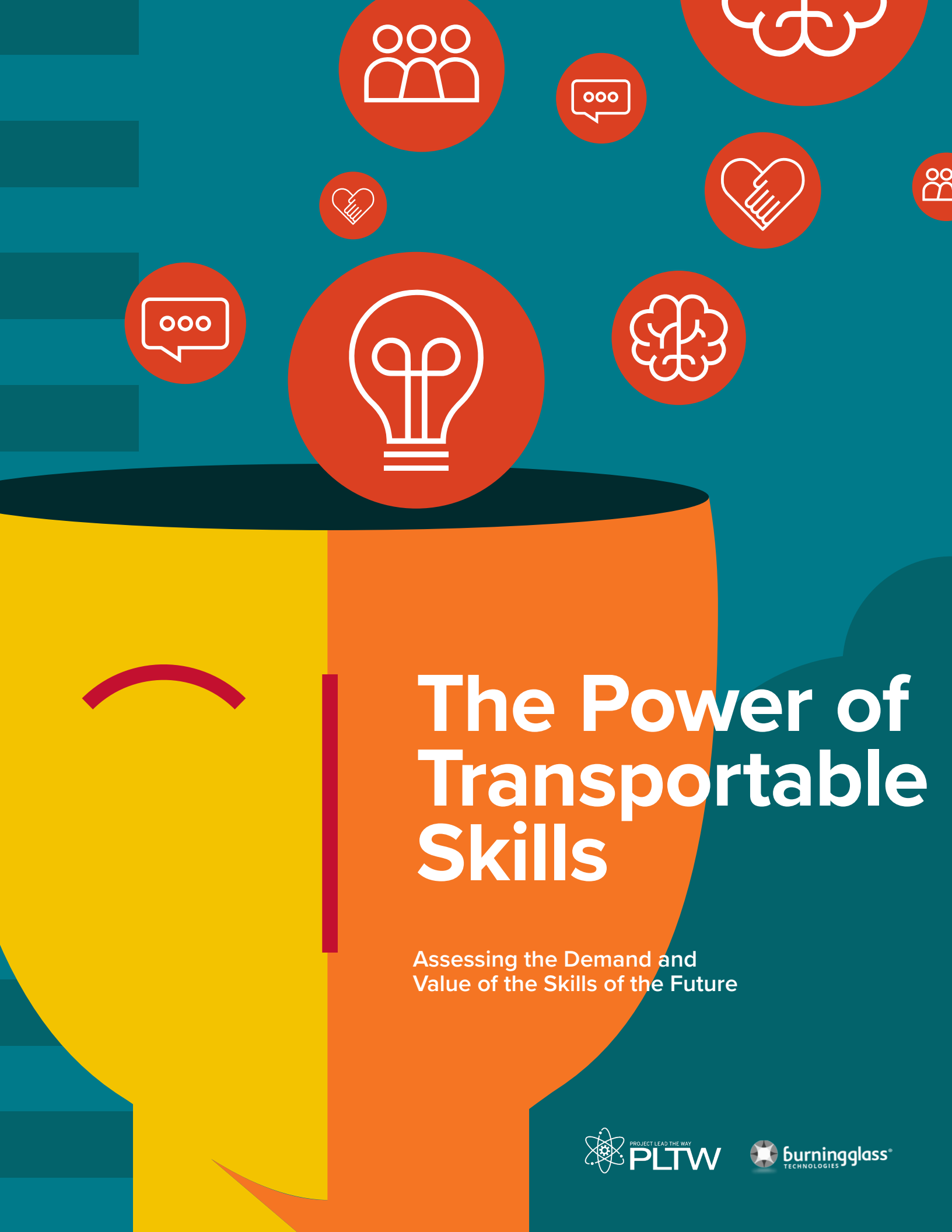




# The Power of Transportable Skills

Assessing the Demand and  
Value of the Skills of the Future

## Executive Summary

Economists, business leaders and educators agree: As technological innovations disrupt jobs and workers at a rapid pace, all workers, regardless of field, must be ready to adapt to new roles and develop new combinations of skills across the span of their career. However, some skills establish the core of a worker's success and will stand the test of time. Because workers can use these skills to navigate transitions from role to role, and job after job across virtually any industry, these particular skills are best understood as transportable. In the future of work, understanding and attaining these skills is essential.

Project Lead The Way (PLTW) and Burning Glass Technologies (Burning Glass) have joined forces to study workforce demand for five such transportable skills taught to millions of students each year in PLTW PreK-12 programs: **problem solving, critical and creative thinking, collaboration, communication, and ethical reasoning and mindset**. In studying them, they hope to understand the value of these skills to students, workers, and employers.

To investigate demand for transportable skills, Burning Glass mined its database of more than 150 million unique online job postings in the United States, mapped these skills to its taxonomy of 17,420 discrete skills, and pinpointed openings requesting any of the five transportable skills. In doing so, they answered: How often, and in what fields, are these competencies sought by employers? How valuable are they to workers across the economy? How does their value evolve over the course of one's career?

The findings are clear: transportable skills are among the most demanded and most valued skills in the job market. Analysis yielded the following insights:

### **Demand for transportable skills outpaces that for all other skills.**

Transportable skills are the four most-required skills in the entire labor market, with the fifth skill in greater demand than 99.8 percent of all skills tracked.

### **Industries and career areas across the economy prize these skills.**

Eighty-five percent of all industries across the economic spectrum seek out at least one of these skills.

### **Transportable skills are valued at every stage of a career.**

Fifty-seven percent of entry-level openings request at least one of these skills, while 68 percent of managerial openings request at least one transportable skill.

### **Transportable skills serve as a hedge against automation.**

Seventy-four percent of occupations at low risk of automation request transportable skills in a majority of openings, whereas jobs with a high risk of automation request transportable skills in just 48 percent of occupations.

### **When combined with technical skills and other transportable skills, demand for transportable skills climbs.**

Ninety-one percent of STEM occupations request transportable skills in a majority of openings, compared to 55 percent of non-STEM occupations.

### **Given these findings, the authors recommend the following action steps:**

- **Students** master these skills early and demonstrate them to educators and prospective employers.
- **K-12 educators** teach and measure student attainment of transportable skills in the classroom, and collaborate with employer partners to communicate their value.
- **Higher education** should support students' continued development of transportable skills, balance emphasis between technical and transportable skills, and require that students demonstrate transportable skills in graduation requirements.
- **Employers** should articulate the importance of these skills to external stakeholders, include them in job postings as required competencies, and support the creation of career learning that imparts them at all education levels.
- **Intermediary organizations, government agencies, and non-profits** should help bridge the PreK-12 system, industry, and higher education to support high-quality and relevant career learning for all students, rooted in clear metrics that signal student attainment of transportable skills.

## Introduction

Are there a set of core workplace skills that all students and workers need to acquire, that can be used across all stages of a career, and that, because of their universal utility, are transportable from job to job, from employer to employer, across the economy?

Project Lead The Way (PLTW) and Burning Glass Technologies (Burning Glass) have joined forces to study the national demand for, and professional and career impact of, key transportable skills: problem solving, critical and creative thinking, collaboration, communication, ethical reasoning and mindset.<sup>1</sup>

For decades, employers across industries and sectors have called attention to the importance of balancing technical skills with a vitally important set of non-technical skills. These creative, critical, and social competencies have distinct qualities: they are useful in many fields, effective within constantly changing workplaces and industries, and of great value to both individuals and organizations. Furthermore, because these skills have value in virtually all organizational contexts and are distinct from areas of technical expertise or content knowledge, they are eminently transportable across transitions in roles, responsibilities, companies, industries, sectors, and careers.

While traditional assessments of achievement have left employers unable to measure the impact of these transportable skills on employees' talent and performance in the workplace, recent scholarship strongly suggests that they are essential to the success of individual workers and teams, employers and industries, and even entire economies.<sup>2,3</sup>

PLTW is a nationally recognized nonprofit organization: in all 50 states and the District of Columbia, PreK-12 educators now teach its ambitious, experiential STEM courses to

millions of PreK-12 students, equipping them for high achievement in school and work. As its footprint grows, PLTW maintains a steadfast focus on two goals: teaching the technical skills needed for success in nationally critical career fields—including computer science, engineering, and biomedical science—and developing student mastery of transportable skills.

Years of student success in developing and applying transportable skills leaves no doubt in the mind of PLTW educators and leaders: transportable skills play a powerful role in both the academic success of PLTW students and, upon their entry into the workforce, in their professional advancement. What PLTW requires is concrete evidence of the demand for these skills, and of their value, in the modern workplace. To strengthen the national case for action, and to better assist students, educational institutions, and employers to build capacity, PLTW turned to Burning Glass for help in capturing the full role and impact of these skills in the U.S. job market and workforce.

Burning Glass uses its unparalleled repository of U.S. job openings data in its work with hundreds of companies, industries, and associations, and educational, civic, and philanthropic institutions. It partnered with PLTW to develop an understanding of demand for these transportable competencies, and to document the roles they play in the workplace and the job market. In the work of PLTW, particularly its intention to reliably and routinely assess the development of these much-prized skills in students, Burning Glass sees the potential for a transformation in researchers' and practitioners' understanding of these skills, and their pivotal role in student learning and workforce development.



**Problem Solving**



**Critical and Creative Thinking**



**Collaboration**



**Communication**



**Ethical Reasoning and Mindset**

## Rationale

PLTW has long taught transportable skills through both its classroom content and pedagogical approach. However, technological and logistical limitations prevented their measurement through existing assessments. Because of these skills' value in the modern job market, PLTW spent years developing the first-of-its-kind assessment that can measure both subject-matter knowledge and mastery of in-demand, transportable skills aligned to industry standards and best practices. To pinpoint the transportable skills to include in these assessments, PLTW brought together a thoughtful panel of

well-respected industry experts, faculty from higher education institutions, and PLTW teachers. These subject-matter experts were tasked to identify skills that have value across the public, for profit, and nonprofit sectors and create student currency in the classroom, college, and beyond. The panel responded with these five skills: problem solving, critical and creative thinking, collaboration, communication, and ethical reasoning and mindset. Through this report, PLTW hopes to demonstrate the importance of transportable skills in the current labor market and into the future.

## Methodology

To investigate the demand for these transportable skills, Burning Glass mined its database of more than 150 million unique online job postings in the United States, mapped these five skills to the Burning Glass taxonomy of 17,420 discrete skills, and pinpointed openings requesting any of the five skills. Once defined, the demand for these skills was evaluated across the economy for the 12-month period from October 2017 through September 2018—during which there were 25,778,046 unique openings within the U.S. The goals of this work were to determine how often and in what fields these competencies are sought by employers, how valued these skills are, and how their value evolves over the course of one's career.<sup>4</sup>

## Key Findings

- 1 Demand for transportable skills outpaces all other skills and spans a diverse range of careers and industries.**
- 2 Transportable skills are valued at every stage of a career: They are critical to career entry, advancement, and future-proofing.**
- 3 When combined with other transportable skills or technical skills, transportable skills are in even greater demand.**

1

Demand for transportable skills outpaces all other skills and spans a diverse range of careers and industries.

Transportable skills are in greater demand than virtually any others.

As illustrated in Table 1, the four most-required skills in the economy are transportable skills: communication, problem solving, collaboration, and critical and creative thinking. Employers request communication skills in more than 8.6 million openings studied, making it the most commonly required skill in the entire job market. Three other transportable skills—problem solving, collaboration, and critical and creative thinking—are the second, third, and fourth most-requested skills, respectively, with over 4.5 million openings requesting each skill. The final transportable skill studied, ethical reasoning and mindset, is more commonly requested than 99.8 percent of the 17,420 skills that Burning Glass tracks. Across the entire job market, more than half of all job postings in the past year have specifically sought one or more of these competencies. In the last four quarters, 13,665,649 postings in the U.S. requested at least one transportable skill—53 percent of the 25.8 million postings in this period.

Table 1. Most-Demanded Skills in the Job Market

| SKILLS                         | TOTAL OPENINGS | RANK |
|--------------------------------|----------------|------|
| Communication                  | 8,657,707      | 1    |
| Problem Solving                | 5,776,671      | 2    |
| Collaboration                  | 4,997,561      | 3    |
| Creative and Critical Thinking | 4,543,580      | 4    |
| Customer Service               | 3,831,705      | 5    |
| Organizational Skills          | 3,174,456      | 6    |
| Sales                          | 2,744,465      | 7    |
| Microsoft Excel                | 2,737,512      | 8    |
| Physical Abilities             | 2,669,991      | 9    |
| Scheduling                     | 2,655,007      | 10   |
| Ethical Reasoning and Mindset  | 939,987        | 31   |
| Leadership                     | 899,359        | 32   |
| Accounting                     | 826,711        | 33   |

Transportable skills are sought across a diverse set of career areas and industries.

The high demand for transportable skills spans a broad spectrum of industries and careers. Fourteen of 24 career areas <sup>5</sup> request these skills in a majority of openings, ranging from marketing and information technology to clerical, customer support, and maintenance roles. Ten of these career areas seek transportable skills in at least 65 percent of their job openings.

Table 2: Sample Career Areas Requesting Transportable Skills in At Least 65% of Openings

| CAREER AREA                    | SHARE OF OPENINGS CALLING FOR TRANSPORTABLE SKILLS |
|--------------------------------|----------------------------------------------------|
| Marketing and Public Relations | 79%                                                |
| Human Resources                | 72%                                                |
| Planning and Analysis          | 71%                                                |
| Finance                        | 70%                                                |
| Information Technology         | 68%                                                |
| Science and Research           | 67%                                                |
| Design, Media, and Writing     | 67%                                                |
| Clerical and Administrative    | 66%                                                |
| Engineering                    | 65%                                                |
| Customer and Client Support    | 65%                                                |

The breadth of industries with high levels of demand for these skills further illustrates their broad appeal. All but three of 20 core industries<sup>6</sup>—85 percent of all industries—seek out at least one of these skills in a majority of openings. As with career areas, the concentration of requests for these skills across roles—in management, IT, manufacturing, finance, technical, and

professional services—demonstrates that their necessity ranges from non-technical, direct-service contexts to also include technical, financial, and scientific sectors. Furthermore, a notably diverse range of industries demand these skills, in sectors ranging from education, mining, and manufacturing to finance, professional services, and agriculture.

Table 3. Sample Industries Requesting Transportable Skills in At Least 65% of Openings

| INDUSTRY                                         | SHARE OF OPENINGS CALLING FOR TRANSPORTABLE SKILLS |
|--------------------------------------------------|----------------------------------------------------|
| Management of Companies and Enterprises          | 76%                                                |
| Finance and Insurance                            | 75%                                                |
| Information/IT                                   | 70%                                                |
| Professional, Scientific, and Technical Services | 69%                                                |
| Utilities                                        | 68%                                                |
| Manufacturing                                    | 66%                                                |
| Mining, Quarrying, and Oil and Gas Extraction    | 65%                                                |

On closer examination, while the aggregate demand for transportable skills is high, some industries are especially likely to emphasize specific skills. Communication is most likely to receive emphasis across industries, while problem solving is most highly valued in the utilities and

manufacturing industries. Critical and creative thinking and collaboration are each most likely to be stressed in management, finance and insurance, and information. Ethical reasoning scores high in all of these industries, and is especially important in finance and utilities.

**Table 4. Relative Industry Concentration of Demand by Transportable Skill**

| CONCENTRATION OF DEMAND BY TRANSPORTABLE SKILL AND SAMPLE INDUSTRIES |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                                      |  |  |  |  |  |
|                                                                      | Problem Solving                                                                   | Critical and Creative Thinking                                                    | Collaboration                                                                       | Communication                                                                       | Ethical Reasoning and Mindset                                                       |
| Overall Share of Openings Requesting Skill                           | 19%                                                                               | 34%                                                                               | 18%                                                                                 | 4%                                                                                  | 22%                                                                                 |
| Management of Companies and Enterprises                              | +51%                                                                              | +54%                                                                              | +78%                                                                                | +61%                                                                                | +43%                                                                                |
| Finance and Insurance                                                | +59%                                                                              | +61%                                                                              | +67%                                                                                | +91%                                                                                | +47%                                                                                |
| Information/IT                                                       | +53%                                                                              | +30%                                                                              | +63%                                                                                | +47%                                                                                | +51%                                                                                |
| Professional, Scientific, and Technical Services                     | +33%                                                                              | +31%                                                                              | +45%                                                                                | +33%                                                                                | +57%                                                                                |
| Utilities                                                            | +26%                                                                              | +28%                                                                              | +0%                                                                                 | +90%                                                                                | +84%                                                                                |
| Manufacturing                                                        | +21%                                                                              | +20%                                                                              | +22%                                                                                | +43%                                                                                | +61%                                                                                |
| Mining, Quarrying, and Oil and Gas Extraction                        | +2%                                                                               | +31%                                                                              | -16%                                                                                | +0%                                                                                 | +39%                                                                                |
| Agriculture, Forestry, Fishing and Hunting                           | +20%                                                                              | +12%                                                                              | +18%                                                                                | +25%                                                                                | +36%                                                                                |
| Real Estate and Rental and Leasing                                   | -8%                                                                               | +21%                                                                              | +38%                                                                                | +18%                                                                                | +5%                                                                                 |
| Wholesale Trade                                                      | +19%                                                                              | +10%                                                                              | +9%                                                                                 | +29%                                                                                | +19%                                                                                |

Relative Concentration of Skill Demand by Industry

For additional detail on the careers included within these industries, see appendix on page 11. Additional industries beyond those above certainly have significant demand for transportable skills, such as Healthcare and Social Assistance. However, their demand is frequently implicit, which prevents

accurate comparison by relative demand. Transportable skills are indeed crucial for would-be healthcare professionals—as evidenced by the 656,463 positions that explicitly require communications skills, 397,545 seeking problem solving skills, or 362,238 roles that demand collaboration among qualified applicants.

2

Transportable skills are valued at every stage of a career: They are critical to career entry, advancement, and future-proofing.

Transportable skills help entry-level workers get their foot in the door.

Transportable skills are important at the outset of one’s career. Among entry-level job postings, defined as requesting 0-2 years of experience, 57 percent of openings request at least one of these skills. Furthermore, 30 percent of entry-level openings seek at least two transportable skills. This suggests that transportable skills are likely to help a worker gain a foothold early in one’s career.

Transportable skills are critical for workers looking to enter careers that are the most

lucrative. Out of all high-paying occupations that are available to workers starting their careers,<sup>7</sup> 78 percent request transportable skills in a majority of openings. In some high-paying roles available to new workers, transportable skills are particularly valued.

Occupations such as “Business Analyst” and “Network Administrator” both advertise entry-level salaries well above \$60,000 and require transportable skills in more than 70 percent of openings.

Table 5: Sample High-Paying Entry-Level Occupations Requesting Transportable Skills

| OCCUPATION            | SHARE OF OPENINGS REQUESTING TRANSPORTABLE SKILLS | MEDIAN ENTRY-LEVEL SALARY | MEDIAN SALARY FOR ALL EXPERIENCE LEVELS |
|-----------------------|---------------------------------------------------|---------------------------|-----------------------------------------|
| Financial Analyst     | 79%                                               | \$60,000                  | \$68,000                                |
| Network Administrator | 74%                                               | \$65,000                  | \$74,000                                |
| Business Analyst      | 72%                                               | \$66,000                  | \$77,000                                |
| Auditor               | 71%                                               | \$65,000                  | \$74,000                                |
| Data Analyst          | 71%                                               | \$60,000                  | \$68,000                                |

Transportable skills support worker advancement.

Transportable skills also serve an important role supporting a worker’s ability to advance. Among openings for advanced jobs, defined as those requesting at least 10 years of experience, 75 percent call for at least one transportable skill. Moreover, 68 percent of managerial openings request at least one transportable skill, as compared to 49 percent of non-managerial openings—a notable gap of nearly 20 percentage points. These advantages persist even when each transportable skill is analyzed individually: managerial jobs are over 50 percent more likely to request each skill than non-managerial jobs.

Ethical reasoning has particular power as an in-demand skill for managers. While each of the transportable skills is more likely to be requested in managerial jobs than non-managerial jobs, ethical reasoning and mindset is 350 percent more likely to be requested in managerial job openings. Indeed, this underscores the significant concentration of demand for ethical reasoning and mindset in higher-level positions.

Table 6: Concentration of Demand for Transportable Skills in Managerial Jobs

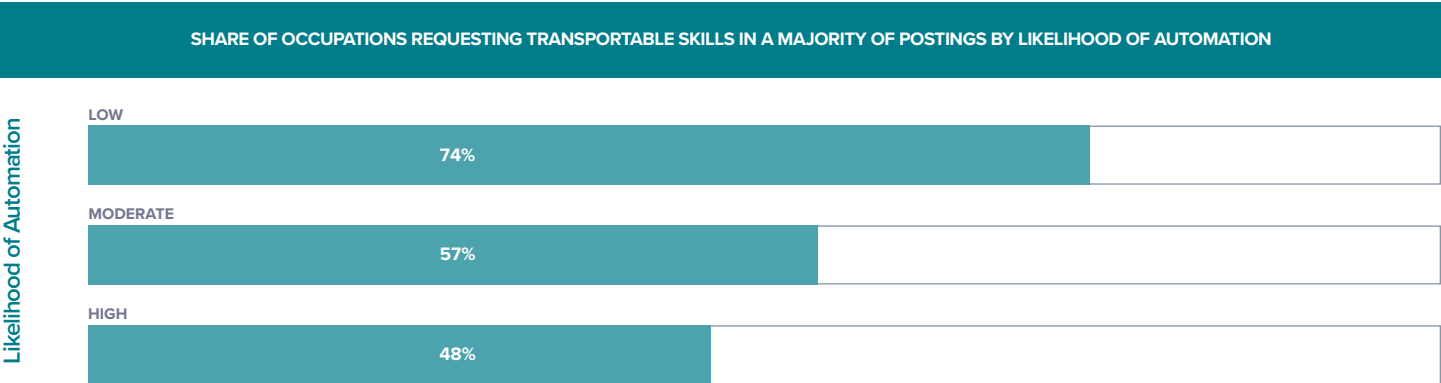
| SKILL                          | INCREASED CONCENTRATION OF DEMAND<br>IN MANAGERIAL JOB OPENINGS |
|--------------------------------|-----------------------------------------------------------------|
| Ethical Reasoning and Mindset  | +350%                                                           |
| Problem Solving                | +83%                                                            |
| Collaboration                  | +81%                                                            |
| Critical and Creative Thinking | +53%                                                            |
| Communication                  | +52%                                                            |

Transportable skills serve as a hedge against automation.

As technological and structural changes impact the workforce—such as artificial intelligence and automation-related technologies—it is imperative for workers to build skills that protect them from this disruptive new normal. Transportable skills are more likely to be required for jobs that are at low risk of automation. Across the labor market, 74 percent of occupations at low risk of automation request

transportable skills in a majority of openings. However, just 48 percent of jobs at high risk of automation request transportable skills, and 57 percent of occupations at moderate risk of automation call for these skills. The possession of transportable skills appears to reduce the risk of automation-driven job loss, and to increase potential for career longevity.

Chart 1. Share of Occupations Commonly Requesting Transportable Skills by Likelihood of Automation



3

When combined with other transportable skills or technical skills, transportable skills are in even greater demand.

Transportable skills are in especially high demand in STEM-related fields.

Transportable skills are integral to technical and STEM-related positions. In fact, they are more commonly requested in STEM fields than most others. Within STEM-related occupations, transportable skills are 39 percent more likely to be requested than in non-STEM occupations. Across specific roles, 91 percent of STEM occupations request transportable skills in a majority of openings, as compared to 55 percent of non-STEM occupations.

The increased emphasis on transportable skills in STEM roles is consistent across each individual skill, though there are starker differences for some skills than others. For example, communication is 41 percent more likely to be requested in STEM jobs than non-STEM jobs; by comparison, problem solving has the greatest discrepancy between demand in STEM and non-STEM jobs, and is 156 percent more likely to be requested in STEM job openings.

Table 7. Concentration of Demand for Transportable Skills in STEM

| SKILL                          | INCREASED CONCENTRATION OF DEMAND IN STEM JOB OPENINGS |
|--------------------------------|--------------------------------------------------------|
| Problem Solving                | 156%                                                   |
| Critical and Creative Thinking | 47%                                                    |
| Communication                  | 41%                                                    |
| Collaboration                  | 41%                                                    |
| Ethical Reasoning and Mindset  | 33%                                                    |

Mixing transportable skills with one another can increase compensation.

While employers clearly value the combination of transportable skills and technical skills, they also value combining multiple transportable skills. Jobs requesting more than one of these skills have average salaries up to \$21,810 greater than the average for all jobs. While such

correlation does not mean that each worker with this set of skills will earn these levels of pay, it does demonstrate a notable pattern: workers with a combination of transportable skills are more likely to be qualified for high-paying, high-skill jobs.

Table 8. Average Salary Premium by Number of Transportable Skills Requested

| NUMBER OF TRANSPORTABLE SKILLS REQUESTED | AVERAGE SALARY PREMIUM |
|------------------------------------------|------------------------|
| 1                                        | +\$1,402               |
| 2                                        | +\$3,544               |
| 3                                        | +\$8,529               |
| 4                                        | +\$14,220              |
| 5                                        | +\$21,810              |

Transportable Skills at Work

CYBERSECURITY ENGINEER

While transportable skills are critical across roles, they are most valuable when combined with technical capabilities. For example, some 70 percent of cybersecurity engineer openings request transportable skills. These professionals must pair these skills with advanced information technology, information security, and analytics. They apply their transportable skills when they quickly identify and diagnose threats and solve problems. In addition, they create solutions related to these threats, collaborate with different teams to mitigate these threats, and effectively communicate action plans with a broad range of stakeholders.

Transportable Skills at Work

FINANCIAL ANALYST

At least one transportable skill is included in 79 percent of financial analyst openings. Financial analysts must combine strong quantitative skills and business acumen—such as financial modeling, economics, and data analysis—with other abilities. They need to be able to think critically, analyze a variety of factors related to business outcomes, weigh the ethical implications of different investment decisions, and persuasively communicate analysis findings to decision-makers.

## Implications and Action Steps

The evidence is clear: workers of tomorrow should seek to attain and hone transportable skills. Across sectors and industries, from entry-level roles to senior positions, employers require workers with these skills. Students and workers who develop these skills will enjoy demonstrably better employment, earnings, and mobility options than workers who do not share their skill sets. Further, in an age when worker

retention is threatened by automation, transportable skills can mean the difference between advancement and displacement. In short, transportable skills are needed for workforce success. Those students who develop them and can demonstrate them to institutions of higher education and employers will have an advantage throughout their academic and career trajectories.

**The findings suggest that stakeholders have a clear interest in absorbing the implications of this research, and responding concretely. The authors urge these action steps:**

### FOR STUDENTS:

- Begin mastering transportable skills at an early age
- Find ways to demonstrate proficiency in these skills to educators and prospective employers

### FOR HIGHER EDUCATION:

- Support students' development by including learning opportunities associated with transportable skills in multiple curricula
- Emphasize the importance of creating a balance between technical and transportable skills
- Require that students demonstrate transportable skills as a core part of their graduation requirement

### FOR PREK-12 EDUCATORS:

- Communicate the central value of these skills to all stakeholders, particularly students
- Help students develop these skills by integrating them into curricula
- Collaborate with employer partners on career learning that stresses these skills
- Develop ways to quantify and assess proficiency in these skills in ways traditional assessments do not

### FOR EMPLOYERS:

- Clearly communicate the value of these skills to students and educators
- Consistently include these skills in all relevant job openings
- Partner with educators and other stakeholders to build a pipeline of students and future workers with these skills

### FOR INTERMEDIARY ORGANIZATIONS, GOVERNMENT AGENCIES, AND NON-PROFITS:

- Encourage collaboration between the PreK-12 system, industry, and higher education to support the delivery of high-quality and relevant career learning to all students
- Demand clear metrics that signal student and worker proficiencies in transportable skills

## Conclusion

The key takeaway of this research is clear. Transportable skills are of great importance to workers, both today and well into the future. Indeed, as new technologies and hiring patterns make work less predictable, transportable skills will only increase in value. Therefore, educators and employers alike must invest in growing a workforce proficient in these skills, placing the development of these skills on an equal footing with building technical knowledge.

Increasing the emphasis on transportable skills will require a mindset shift for many.

Thoughtfully integrating these skills into curricula will necessitate close collaboration between education and workforce stakeholders. Building on the insights within this research—as well as the resulting recommendations—educators, employers, and other stakeholders can engage in further discourse on the value of these skills and initiate efforts to integrate them into the classroom. This will refocus attention on transportable skills, both among students and the institutions that serve them, and lay the foundation for a workforce well-prepared for the jobs of the future.

## Data and Methodology Appendix

### Online Job Posting Data From Burning Glass Technologies

To quantify demand for transportable skills, Burning Glass mined its comprehensive database of over 150 million unique online job postings dating back to 2007. Burning Glass’ “spidering” technology extracts information from close to 50,000 online job boards, newspapers, and employer sites on a daily basis and de-duplicates postings for the same job, whether it is posted multiple times on the same site or across multiple sites.

Burning Glass applies detailed text analytics to code and extract granular data from job postings. This approach contextualizes each job posting and therefore can extract more relevant data than keyword-based approaches. For example, Burning Glass software distinguishes between budget analysis as a skill, a contractor who must complete jobs on-time and on-budget, and a clerk at a budget car rental service. Burning Glass maintains a team of analysts who constantly monitor labor market trends to identify new and emerging skills and to include them in the coding rules and taxonomies.

All Burning Glass online job posting data in this analysis reflect the 12-month period from October 2017 through September 2018.

#### STEM Definition

STEM jobs cover the following areas: science, information technology, engineering, and math. We define STEM jobs as those that have substantial math and science requirements included within the standard course of training or as part of the qualifications that employers specifically request in postings.

This definition includes a range of “analyst” jobs, such as analysts, logistics analysts, and business intelligence analysts, which call for significant mathematics training. These analyst jobs represent a far larger portion of the demand for mathematics skills in the labor market than traditional “math” roles such as statisticians or actuaries.

#### Managerial Definition

Managerial jobs include all occupations that commonly include managerial, supervisory, or executive responsibilities. This definition includes a total of 98 occupations ranging from line supervisors to chief executive officers.

#### Likelihood of Automation

To investigate the relationship between likelihood of automation and transportable skills, Burning Glass assigned to each occupation a “likelihood of automation” score which reflects the probability of computerization for an occupation within the next 20 years. These probabilities are based on the Oxford University study on automation, *The Future of Employment: How Susceptible Are Jobs to Computerisation?*<sup>8</sup>

Occupations were then categorized into three categories based upon their likelihood of automation. The breakdown of these categorizations are as follows:

**High risk of automation:** Greater than 75 percent likelihood of automation

**Medium risk of automation:** 25 percent to 75 percent likelihood of automation

**Low risk of automation:** Less than 25 percent likelihood of automation

#### Career Areas Included in Analysis

Agriculture, Horticulture, and the Outdoors  
Analysis  
Business Management and Operations  
Clerical and Administrative  
Clinical Healthcare  
Community and Social Services  
Construction, Extraction, and Architecture  
Customer and Client Support  
Design, Media, and Writing  
Education and Training  
Engineering  
Finance  
Hospitality, Food, and Tourism  
Human Resources  
Information Technology  
Law, Compliance, and Public Safety  
Maintenance, Repair, and Installation  
Manufacturing and Production  
Marketing and Public Relations  
Performing Arts  
Personal Services  
Sales  
Science and Research  
Transportation

#### Industries Included in Analysis

Accommodation and Food Services  
Administrative and Support and Waste Management and Remediation Services  
Agriculture, Forestry, Fishing, and Hunting  
Waste Management and Remediation Services  
Arts, Entertainment, and Recreation  
Construction  
Educational Services  
Finance and Insurance  
Health Care and Social Assistance  
Information/IT  
Management of Companies and Enterprises  
Manufacturing  
Mining, Quarrying, and Oil and Gas Extraction  
Other Services (except Public Administration)  
Professional, Scientific, and Technical Services  
Public Administration  
Real Estate and Rental and Leasing  
Retail Trade  
Transportation and Warehousing  
Utilities  
Wholesale Trade

## References

- 1 The five transportable skills represent those identified as most crucial by PLTW's expert panel in the development of the PLTW EoC Assessment. Additional skills, such as organization, may be considered "transportable" but are not included for the purpose of this research.
- 2 Brent Orrell, "STEM without Fruit: How Noncognitive Skills Improve Workforce Outcomes," American Enterprise Institute, November 2018, <https://www.aei.org/publication/stem-without-fruit-how-noncognitive-skills-improve-workforce-outcomes>
- 3 David J. Deming, "The Growing Importance of Social Skills in the Labor Market," National Bureau of Economic Research, Working Paper No. 21473, June 2017, <https://www.nber.org/papers/w21473>
- 4 Job postings are one window into demand for transportable skills. Employers often assess these skills through other means, such as interviews, so there is likely implicit demand for these skills in addition to the explicit demand in job postings. Therefore, the explicit demand for transportable skills likely reflects a lower bound for these skills' true demand.
- 5 Career areas represent groupings of related occupations in general functional categories—such as finance, information technology, or production. The career areas used in this analysis are taken from Burning Glass's occupational classification system, which is a modified version of the O\*NET occupational taxonomy. For a full list of career areas, visit [https://www.bls.gov/soc/2018/major\\_groups.htm](https://www.bls.gov/soc/2018/major_groups.htm).
- 6 Industries analyzed in this report include 2-digit industry sectors from the North American Industry Classification System (NAICS). For a full list of industries, visit [https://www.bls.gov/iag/tgs/iag\\_index\\_alpha.htm](https://www.bls.gov/iag/tgs/iag_index_alpha.htm).
- 7 High-paying occupations available to workers starting their careers include roles with median salaries of at least \$65,000 across all experience levels and high demand for workers with less than two years of previous work experience.
- 8 Carl Benedikt Frey and Michael A. Osborne, "The Future of Employment: How Susceptible Are Jobs to Computerisation?", Oxford Martin Programme on Technology and Employment, September 2013; <https://www.oxfordmartin.ox.ac.uk/downloads/academic/future-of-employment.pdf>

## About Project Lead The Way

Project Lead The Way (PLTW) is a nonprofit organization that provides a transformative learning experience for PreK-12 students and teachers across the U.S. PLTW empowers students to develop in-demand, transportable knowledge and skills through pathways in computer science, engineering, and biomedical science. PLTW's teacher training and resources support teachers as they engage their students in real-world learning. To learn more, **visit [pltw.org](https://pltw.org)**.

## About Burning Glass Technologies

Burning Glass Technologies delivers job market analytics that empower employers, workers, and educators to make data-driven decisions. The company's artificial intelligence technology analyzes hundreds of millions of job postings and real-life career transitions to provide insight into labor market patterns. This real-time strategic intelligence offers crucial insights, such as which jobs are most in demand, the specific skills employers need, and the career directions that offer the highest potential for workers. For more information, **visit [burning-glass.com](https://burning-glass.com)**.

