THE COLORADO TALENT PIPELINE REPORT

PRESENTED TO THE COLORADO STATE LEGISLATURE JANUARY 2, 2015

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The Colorado Workforce Development Council is a powerful industry led coalition of state agencies and their local system partners, collaborating to align the work of economic development, workforce development, education and training to meet the needs of Colorado's students, jobseekers and businesses.

CWDC

In accordance with 24-46.3-103 C.R.S. as amended by SB14-205, this Talent Pipeline report was prepared by the Colorado Workforce Development Council (CWDC) in partnership with the Department of Higher Education, the Department of Education, the Department of Labor and Employment, and the Office of Economic Development and International Trade, with support from the Office of State Planning and Budgetingand the State Demography Office at the Department of Local Affairs.

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EXECUTIVE SUMMARY

In accordance with 24-46.3-103 C.R.S., this Talent Pipeline report was prepared by the Colorado Workforce Development Council (CWDC) in partnership with the Department of Higher Education, the Department of Education, the Department of Labor and Employment, and the Office of Economic Development and International Trade, with support from the Office of State Planning and Budgeting and the State Demography Office at the Department of Local Affairs. This report provides an overview of the state's educational attainment and educational pipeline data, occupations with positive outlooks, in-demand skills by occupations concentrated in our state's Key Industry Networks, and education/training strategies currently being enacted. As this is the first annual report, it also discusses perceived data limitations when analyzing our education and workforce systems.

Colorado has a reputation for meeting its workforce needs in part by importing a large share of highly educated workers; the state must also ensure that the education and training pipelines within the state are adequately preparing youth and adults for the workforce and are aligned with the needs of the economy. Our conventional talent pipeline—as measured by the number of 9th graders that complete a Colorado public high school degree, directly enter college, and earn a degree on-time—accounts for about 23 of every 100 9th graders. We know that other education and training opportunities exist and that many of the other 77 out of 100 students follow equally successful alternate paths, but we have limited data on most of these alternative pipelines. A significant challenge identified in this report is to increase our understanding and data about these other pathways.

This report also explores Colorado jobs that have high projected growth rates and openings, and typically offer a living wage. Many of the occupations on this list are in healthcare, information technology, construction and extraction, and business and finance. The vast majority of the jobs on this list expect some level of formalized postsecondary training/education. When we examine skills requirements of occupations concentrated in our Key Industries, skills that frequently appear across industries include active listening, complex problem solving and critical thinking, among others.

A final section provides next steps and recommendations for the CWDC and its partner agencies for improving our talent pipeline. While our state already has a number of strong data linkages across agency that allow us to follow aggregate trends, there still remain various transition points in data along the talent pipeline that we must continue to work toward closing. Through our experiences in preparing this report, we believe that better alignment of skills terms and definitions across entities would more clearly communicate the intersections and expectations for successful employment in Colorado. As we continue to use the career pathways model to align education, training and work based learning, it is integral that we provide accessible information that increases Coloradans' understanding of good career opportunities and the multiple pathways into them.

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INTRODUCTION

Colorado is recognized as having a strong economy, a low unemployment rate and a highly educated workforce. At the same time, our regional economies and educational attainment levels vary greatly. Supporting the economic success of Coloradans and Colorado businesses requires us to better understand and promote a thriving talent pipeline throughout our state. As the economy continues to grow and flourish, we must execute multiple strategies to meet our workforce needs, including supporting the success of our own "home grown" students and workers while continuing to attract workers from outside the state. While we have a reputation for importing educated workers to our state with relative ease, we must also support the growth of our own residents.

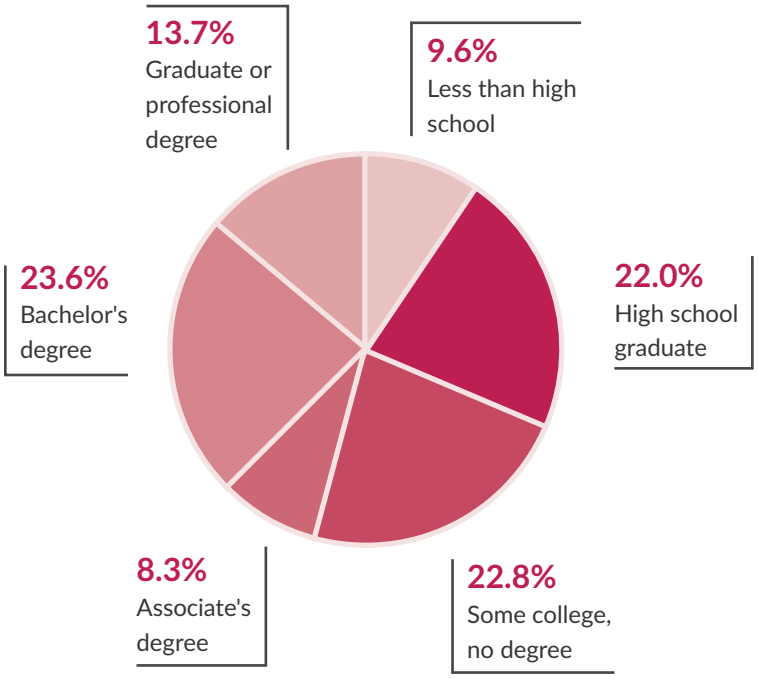
Pursuant to statute (C.R.S. §24-46.3-103), this first annual Talent Report will:

- Provide an overview of Colorado's populace in terms of migration, education and demographic patterns that impact our potential workforce pool;
- Discuss our state's top jobs, analyzing the opportunities and challenges they present;
- Analyze skill sets required for occupations in Colorado's Key Industries;
- Present a progress report on current career pathway efforts; and
- Share recommendations to advance Colorado's talent pipeline, career pathways and data-related practices/opportunities.

COLORADO'S TALENT PIPELINE: PAST, PRESENT AND FUTURE

Colorado has one of the most highly educated populations in the nation, with 68 percent of our adult population having some level of college training or credential.[1] Nearly 46 percent of our adult population has an associate's degree or higher (U.S. Census Bureau, 2013).

Figure 1: Colorado Educational Attainment, Adults 25 Years and Older



Source: U.S. Census Bureau; 2011-2013 American Community Survey, 3-year estimates

What is a Talent Pipeline?

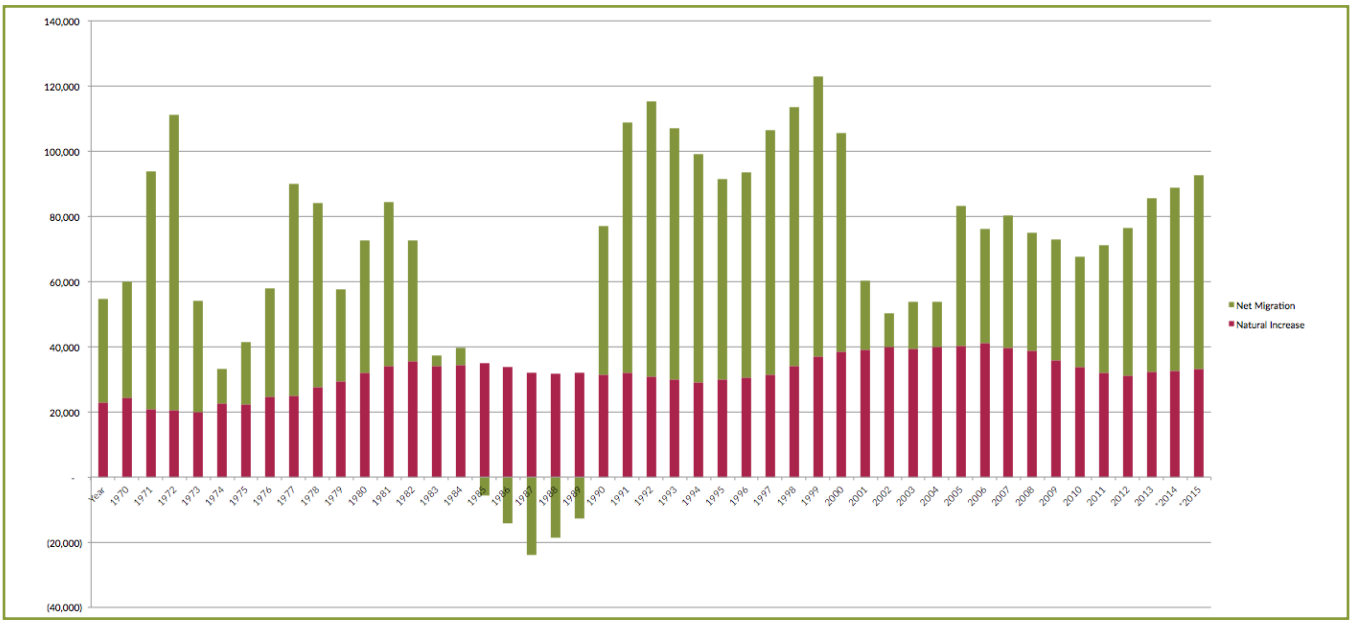
Our use of the term "talent pipeline" refers to the pool of potential workers to fill positions requiring various skills, knowledge and abilities in our state. In this case, we are focusing on the development of Coloradans through our secondary and postsecondary educational and training systems into the workforce.

1 This includes individuals who fall into the "some college, no degree" category.

Educational Attainment Levels by Place of Birth

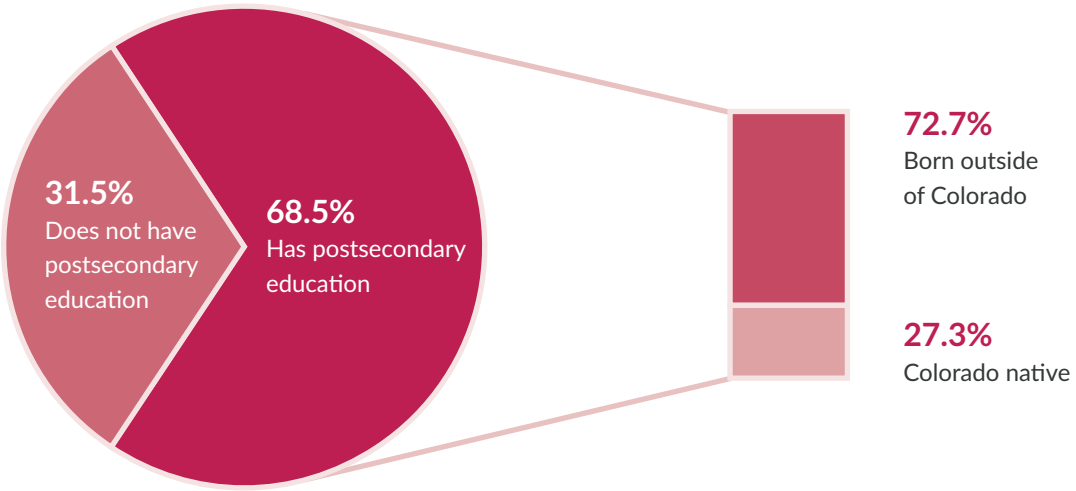
A large share of our adult population with postsecondary education can be attributed to the significant influx of people from other states who have been drawn to Colorado's positive economic prospects, moderate cost of living and attractive lifestyle. We have long been importing talent from other states to meet the needs of our growing economy.

Figure 2: Colorado Population Growth, 1970-2016



Source: Colorado Department of Local Affairs, State Demography Office

Figure 3: Colorado Postsecondary Education by Residency

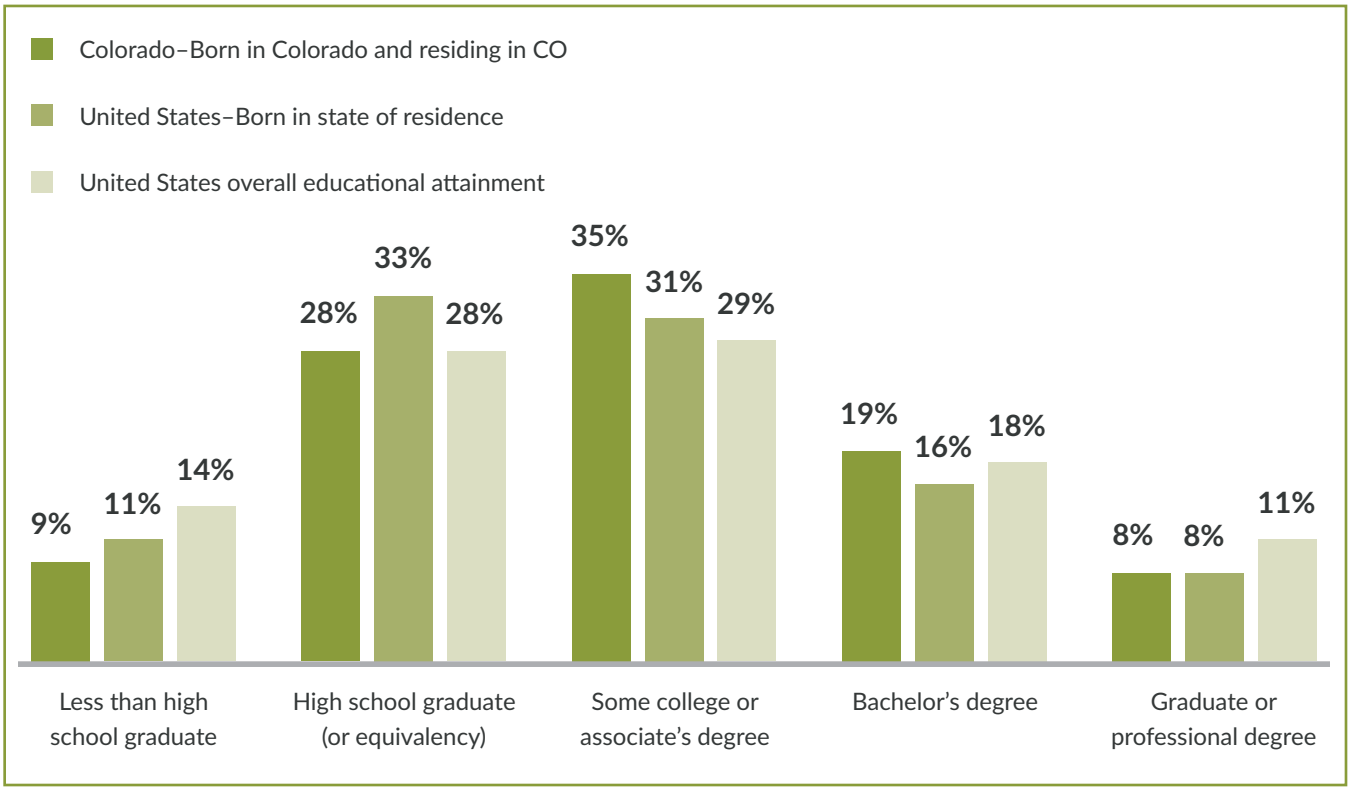


Source: U.S. Census Bureau; 2011-2013 American Community Survey, 3-year estimates

Understanding the degree to which individuals born outside of the state account for Colorado's highly educated populace is challenging. Figure 2, which relates educational attainment data with place of birth, provides some insight into the number of individuals going through our state's educational systems. However, there are limitations to this data; for example, there are students not born in our state who are enrolled in our K-12 education system.

We must keep two additional factors in mind in considering the degree to which individuals coming from other states contribute to our high educational attainment. First, Colorado currently ranks sixth in having the largest share of residents who were not born in-state. Seventy percent of Colorado residents were not born in Colorado; across the United States, the average share of adults not born in the state in which they reside is 50 percent (U.S. Census Bureau, 2013). Second, the same data show that people with higher levels of educational attainment have higher geographic mobility rates. So, while we tend to import workers from other states with high educational attainment levels, likewise, many native Coloradans with high levels of education leave the state in pursuit of opportunities elsewhere. In fact, Colorado appears to be doing relatively well retaining native Coloradans with postsecondary education, as compared to the nation-at-large, as depicted in the following chart.

Figure 4: Educational Attainment Levels by Residency



Source: U.S. Census Bureau; 2011-2013 American Community Survey, 3-year estimates

The data summarized above has led policy-makers to consider our talent pipeline and the degree to which we are or are not preparing our own students to meet workforce needs. Some considerations include:

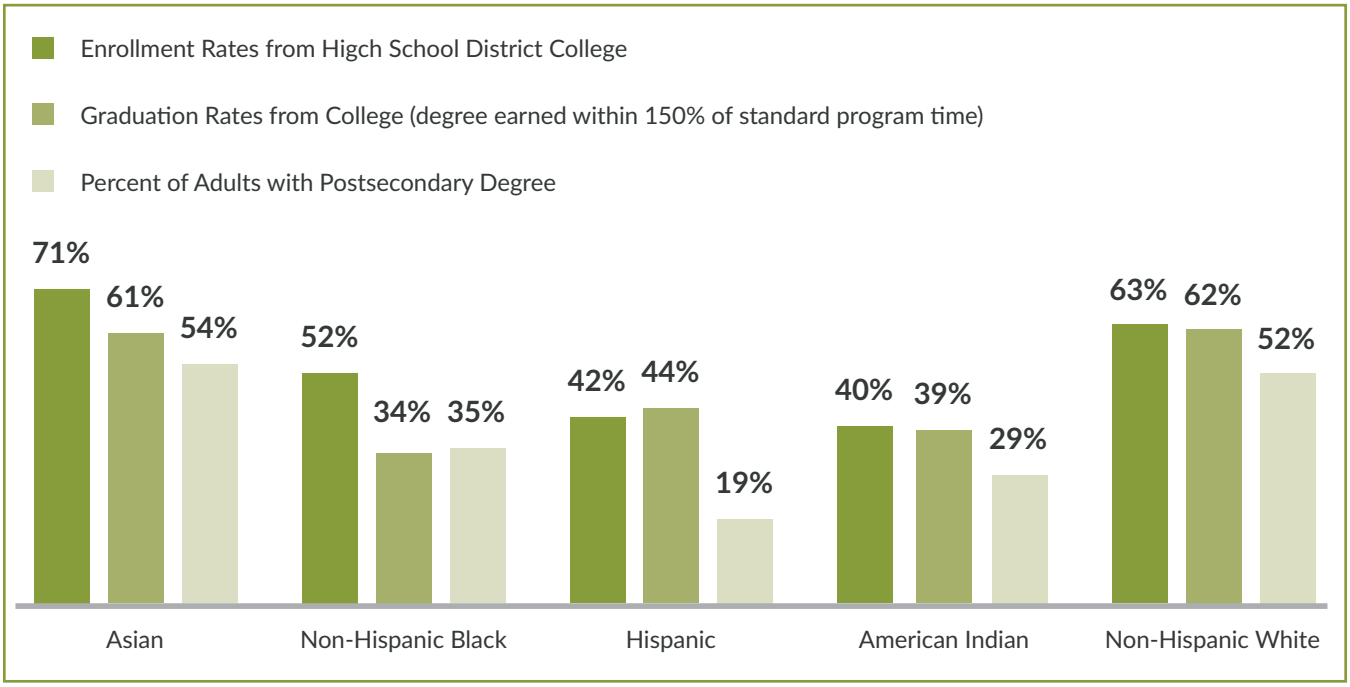
- While we have consistently been able to attract qualified talent from outside of the state, will we continue to do so as demographics shift across the nation and we compete with other states to replace retiring skilled workers?
- Does the quality of our education systems that also educate the children of skilled workers who move to Colorado for employment measure up to their demands? Will we remain attractive to out-of-state, in-demand talent and remain competitive in the inter-state and global job market?
- What is the impact of Colorado's ethnic educational attainment gap—that is, the college attainment rates of the Hispanic as compared to the non-Hispanic white population—on our overall educational attainment levels and goals?

Talent development can follow several trajectories. We are most able to obtain data on students who follow the "traditional" pathway of completing high school on-time, directly enrolling in college and then immediately entering the workforce. But there are many other routes—some with successful outcomes, some not. Increasing our understanding of these pathways to employment is integral to identifying the education and training needs of our state and how to build a comprehensive talent development system to meet them. The primary goal is to ensure we are applying resources effectively to provide every Coloradan with the tools to develop adequate skills to succeed in life and the labor market.

The Racial/Ethnic Educational Attainment Gap

While our state's overall educational attainment levels are quite high, there is variance in education levels for different subsets of our population, most notably between the Hispanic and non-Hispanic white segments of our population. Just 19 percent of Hispanic adults over 25 years old hold a college degree, as compared to 52 percent of non-Hispanic white adults (see Figure 5, below).

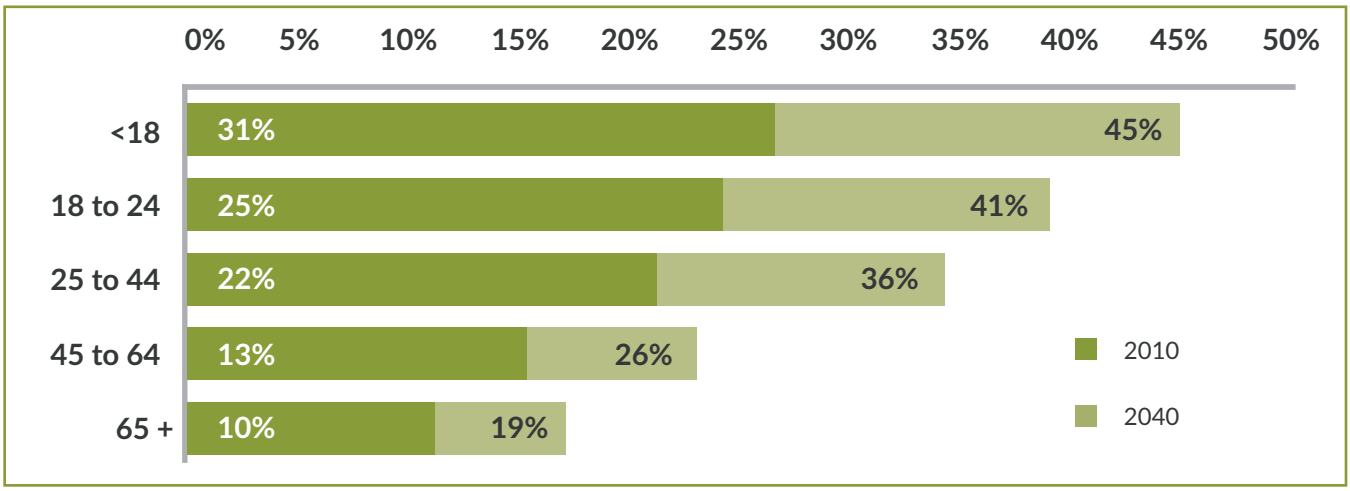
Figure 5: Educational Attainment Behavior by Race/Ethnicity



Source: Colorado Department of Higher Education; U.S. Census Bureau

We also know that the ethnic composition of our state is changing, with the young Hispanic population being the fastest growing segment of the state's population (see Figure 6, below). Yet, postsecondary enrollment and completion rates still lag significantly for our Hispanic, and overall underserved minority, population (Figure 5). By 2040, the non-white share of our primary working adult population (ages 25 to 64) is projected to be 43 percent (in 2010 it was 26 percent). With such a large and growing minority population, it is essential that this population has access to and finds success in educational and career pathways, if we are to continue to nurture a thriving state economy.

Figure 6: Hispanic Share of Colorado Population by Age Group



Source: Colorado Department of Local Affairs, State Demography Office

Today's Talent Pipeline

We estimate that for every 100 Colorado 9th graders, approximately 23 complete the traditional, or conventional, education pipeline of graduating from a public high school in four years, immediately entering a public or private college or university that fall, and completing a postsecondary credential within 150% of the standard program time. Of the 23 students who obtain a postsecondary credential, approximately 18 are found in the Colorado workforce the year following graduation, as some students continue their education and delay workforce entry or pursue opportunities outside of Colorado.

We know that we have too many leaks in this pipeline, and we know that some of our underserved populations experience those leaks more than others. Colorado is expected to have the third highest share of jobs that demand postsecondary training/education among all states by 2020 (Carnevale, Smith & Strohl, 2013), so we cannot remain comfortable with the status quo.

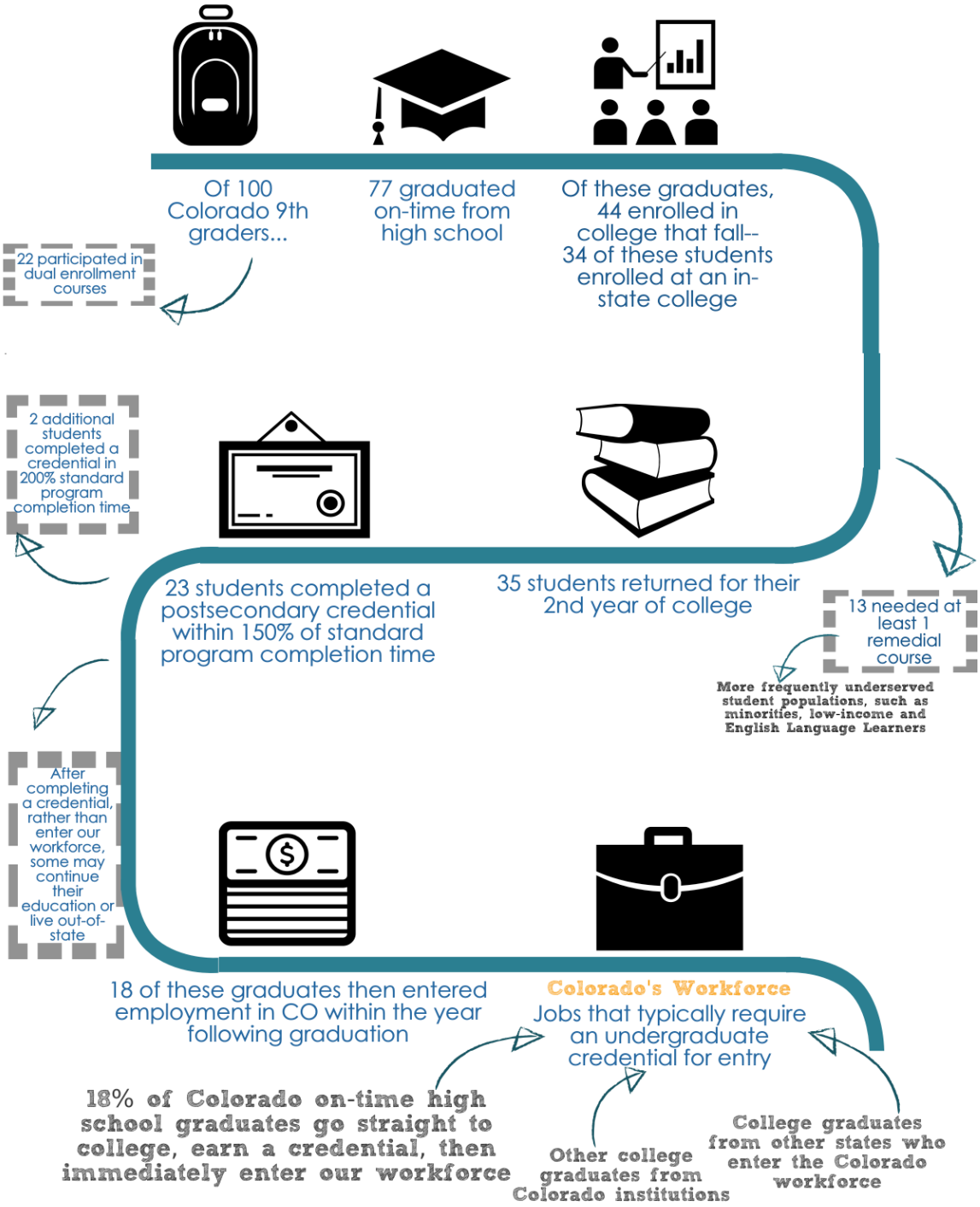
While we know leaks exist, as noted above, there are multiple pathways to education, training and success in the workforce. Students graduate from high school and then take a year off before enrolling in postsecondary education; some pursue an apprenticeship to develop specialized skills; others complete a postsecondary credential and then find employment in another state. These and various other alternative paths should not be viewed negatively or as leaks. We need to increase our understanding of what is happening to Coloradans who pursue alternative pathways to employment, and how we can support the development and continual upgrading of skills that are demanded of our workforce throughout our economy.

The following illustration outlines some of the variations affecting our state's talent pipeline, also depicting where we may have some gaps in our knowledge. Table 1 then outlines some of the data points we currently rely on, as well as some of the data limitations that we face.

Figure 7: The Colorado Talent Pipeline (see next two pages)

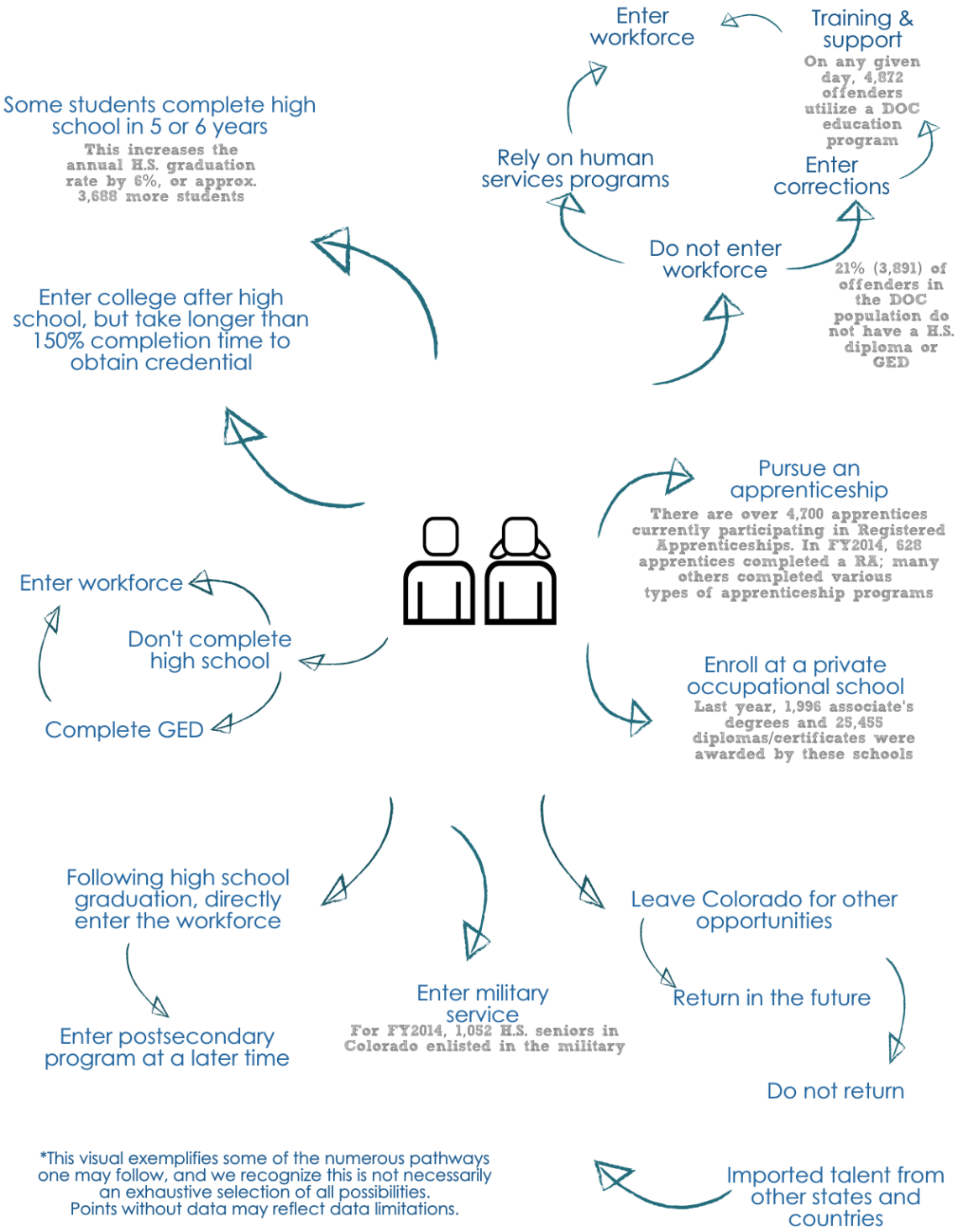
The Colorado

Our conventional concept of a talent pipeline is the progression of our high school graduates who enroll directly in college, complete a credential, then enter our workforce, as depicted below...



Talent Pipeline

...but it is also important to understand the numerous points of entry into education/training opportunities and/or our state's workforce.



*This visual exemplifies some of the numerous pathways one may follow, and we recognize this is not necessarily an exhaustive selection of all possibilities. Points without data may reflect data limitations.

Table 1: Education and Labor Data in Colorado

What we know	What we know we don't know
Colorado public high school graduates linked to Colorado public and three private postsecondary institutions so that we understand performance outcomes at the postsecondary level (CDE, CDHE)	Colorado high school graduates linked directly to Colorado labor data, to better understand aggregate trends in our H.S. graduates' employment outcomes.
Public postsecondary institution graduates linked to Colorado wage data to understand aggregate earning trends on the Colorado labor market (CDHE, CDLE)	Postsecondary institution graduates linked to other states' labor data to understand migration and earning trends, and which types of graduates may be attracted to employment opportunities out-of-state and why. We are also unable to track graduate e arnings by occupation.
Public community college and four year college/university data (plus three private non-profits) (CDHE)	Detailed student-level information from private colleges and occupational schools, which leaves us unable to provide any information on aggregate employment/earning trends on the job market. We also cannot follow our H.S. graduates into these schools.
Occupational forecasts for Colorado (CDLE)	Registered Apprenticeship outcomes by apprenticeship type, or statewide, centralized data on informal apprenticeship opportunities.
Unemployment rates by educational attainment level (CPS, ACS)	Current labor supply by qualifications/occupations. Some tools provide insights to the number of individuals seeking employment in specific occupations, but we do not know the number of people not employed in their field of study or expertise.
Colorado migration trends, levels of education by state native v. non-native (ACS)	
Information on a living wage in Colorado	
O*NET occupational information, such as skills scores	

Note: There may be additional components that we are not aware of as gaps in knowledge/accessibility.

Why Should Colorado Care about "Leaks" in the Pipeline?

What happens to those Coloradans who do not obtain adequate preparation and training to pursue a passion, technical specialization or advance through a career path? Studies have shown that those with lower levels of education typically have higher unemployment rates, less stable and lucrative job prospects, less opportunities for mobility, lower levels of health and lower earning potential. All of these potential roadblocks are not just burdens on the individual—when we leave a Coloradan behind, we are setting up ourselves as a society to fiscally bear increased costs in social services, while reducing the opportunity for our state to receive more tax monies from those lost earnings and productivity.

Opportunity Youth

Research on opportunity youth (also known as disconnected youth—youth ages 16-24 who may have dropped out of high school or college and also have trouble securing stable attachment to the labor market) describes significant social and financial burdens through lost output/wages and lost taxes, above average levels of criminal involvement and high use of social services. Minorities and males disproportionately represent opportunity youth. For more information, visit: The Economic Value of Opportunity Youth

Table 2: Colorado Unemployment and Earnings by Education Level

Educational Attainment	Unemployment Rate	Median Earnings ($)
Less than high school graduate	8.9%	21,624
High School graduate	4.7%	30,011
Some college or associate's degree	4.4%	33,594
Bachelor's degree	3.1%	46,891
Graduate or professional degree		61,730

Source: U.S. Census Bureau; 2013 American Community Survey, 1-year estimates; Current Population Survey

The youth unemployment rate (ages 16 to 19) still remains higher than what it was immediately prior to the recession (Current Population Survey). In addition, the long-term unemployed (individuals out of work for 26+ weeks, or those exhausting unemployment benefits) face a unique combination of social, emotional and skill deficiencies caused by the duration of their unemployment that require intensive "wraparound" services to address these issues effectively, while rapidly moving individuals to paid work experience and reemployment. As of November 2014, there were 47,200 individuals considered long-term unemployed. The long-term unemployed currently make up about one-third of all unemployed persons.

Colorado is a great place to live, and we are fortunate that individuals chose to move to and stay in Colorado for a variety of reasons. We have a strong economy that requires workers at every skill level. Data show that even as Colorado continues to grow following the Great Recession, we still have educational attainment gaps and/or additional challenges along the way to employment for various subsets of our population. To meet the needs of our residents and Colorado's businesses, we must consider every asset available to fill the Talent Pipeline to ensure sustainable economic vitality. We must empower our students, jobseekers, unemployed and underemployed with good information and support systems to assist in career path choices that will work for their individual needs, as well as be responsive to industry demand.

COLORADO'S TOP JOBS

Having briefly analyzed Colorado's talent pipeline, we now turn to "top jobs" in Colorado. This report uses labor market data from Colorado's Office of Labor Market Information to identify jobs that meet three criteria: projected high openings, above average growth rates and typically offering a living wage for the average family size. This is not an exhaustive list of occupations that offer opportunities for Coloradans; rather, it offers a glimpse into some promising industries in our state overall and can thereby help guide our directed efforts in developing our state's workforce talent in various sectors. Also, many occupations that do not exist today may be in high demand in the near future, so we look to this list to provide us with a sense of fields where we can anticipate burgeoning opportunity. Further analysis of these jobs will be conducted in the Department of Higher Education's forthcoming annual Skills for Jobs Legislative Report.

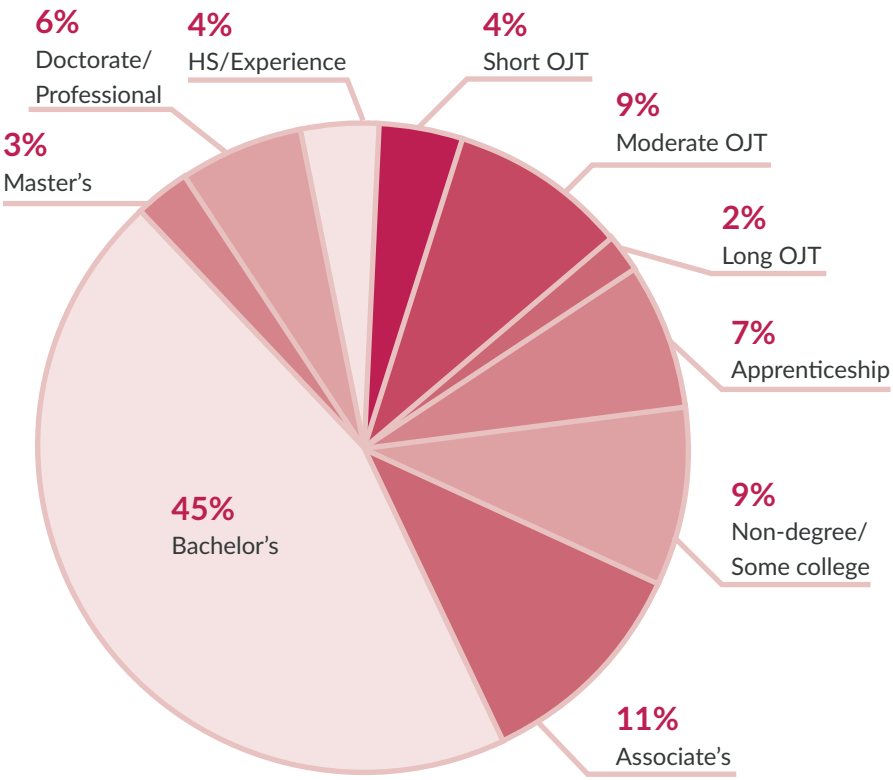
Following is a sampling of some occupations found in this list by field. The complete list can be found in Appendix A.

Table 3: Selection of Occupations from Top Jobs List

Skilled Trades	Finance
Carpenters	Accountants and Auditors
Electricians	Credit Analysts
Industrial Machinery Mechanics	Financial Analysts
Plumbers, Pipefitters, Steamfitters	Personal Financial Advisors
Healthcare	**Information Technology**
Dental Hygienists	Computer Network Architects
Occupational Therapists	Computer User Support Specialists
Pharmacists	Software Developers
Physician Assistants	Web Developers
Registered Nurses	

Of note, 81 percent of job openings in this list are for occupations that typically require some level of postsecondary education for entry, whether it is an apprenticeship, certificate or degree (see Figure 8, below).

Figure 8: Where are the "Top Job" Openings by Typical Entry Level Education?



Technology is increasingly impacting our economy and our lives, and many occupations in this list are often defined as requiring high levels of competency in one or more STEM (Science, Technology, Engineering and Math) areas. According to the Brookings Institution's definition of STEM occupations,[2] 55 percent of the jobs on this list are considered STEM, while about 20 percent of occupations across our state's workforce overall are classified as STEM. Since this list includes high representation from finance, IT and healthcare occupations, most of which Brookings defines as STEM, it is appropriate that so many jobs on this list fall under this classification. According to the Bureau of Labor Statistics definition of STEM occupations, 38 percent of jobs in this list are STEM, while out of all occupations in Colorado, about 14 percent are STEM by this definition. The STEM occupations listed here are also jobs that are more likely to expect some level of postsecondary education than that of non-STEM occupations.

2 The Brookings Institution uses O*NET scores to establish occupations that require above average knowledge in one or multiple STEM categories.

CRITICAL SKILLS ACROSS COLORADO'S KEY INDUSTRIES

We now turn to the skills required for the most highly concentrated occupations within each of Colorado's Key Industries using O*NET skills scores as assigned to each occupation.[3] While a worker can be expected to exhibit a skill that does not appear on a list, the skills listed here are considered the most vital demanded of skilled workers employed in these occupations. We also explore where K-12 student indicators and O*NET skills intersect.

Across industry, as measured by O*NET scores, the most in-demand skills include critical thinking, active listening, reading comprehension, speaking, judgment and decision making, and complex problem solving. While we relied on O*NET skills scores to conduct this analysis, we believe it would be a worthwhile exercise to validate the rankings of these skill sets through sector partnerships and other business organizations.

O*NET Skill Definitions

Active Listening — Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.

Critical Thinking — Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.

Complex Problem Solving — Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.

Judgment and Decision Making — Considering the relative costs and benefits of potential actions to choose the most appropriate one.

Reading Comprehension — Understanding written sentences and paragraphs in work related documents.

Speaking — Talking to others to convey information effectively.

For more information, visit: O•NET Online

K-12 Student Outcomes

Academic Competencies – math skills, literacy skills, and critical thinking skills

Professional Competencies – ability to manage time, collaborate with others, and independently learn new things

Entrepreneurial Competencies – the ability to manage professional risk, make interesting connections, and learn from failure

Personal Competencies – deep knowledge of self that students can use to make good decisions that play on their strengths

Civic Competencies – drive to contribute as a member of the community and the workforce

3 The Occupational Information Network (O*NET) program is the national source of occupational information under the direction of USDOL/ETA. O*NET skills scores are derived from surveys of workers from each occupation.

CRITICAL SKILLS ACROSS COLORADO'S KEY INDUSTRIES

Understanding where in-demand skills exist in the workforce directly relates to Colorado's Graduation Guidelines, which are intended to assist students in gaining work-ready skills while in high school. At the secondary level, the goal is for all students to understand and articulate their individual skill-set, how they relate to potential careers and jobs, and graduate with these in-demand skills from high school. Colorado industry representatives are clear that students who graduate from high school and seek to work in Colorado need in-demand skills that meet business, industry, and higher education standards. Graduation guidelines are a roadmap to help students and their families plan for success after high school by demonstratingtheir knowledge, skills and abilities to enter the workforce, military or higher education without significant training or remediation.

A national survey was conducted of recent H.S. graduates to assess the areas in which they feel most and least prepared for work or further education following H.S.

Rising to the Challenge PowerPoint

The Council of Chief State School Officers recently released a series of recommendations for K-12 public schools to best prepare students for college and/or career readiness. Recommendations include heightened responsiveness to the labor market by collaborating with the employer community, and greater emphasis on career pathways and preparation.

States Announce Actions to Close the Skills Gap for All Students

Table 4: Intersections between High Ranking Occupational Skills & K-12 Student Outcomes

Competencies & Skills	Academic	Professional	Personal	Entrepreneurial	Civic
Active Listening	x	x			
Complex Problem Solving		x		x	
Critical Thinking	x				
Judgment and Decisions			x		x
Reading Comprehension	x				
Speaking		x			

*Top Rated O*NET Skills by Key Industry*

The following table shows how skills rank across skilled professions in our state's Key Industries. A score of 50 or greater indicates that the skill is typically needed in order to perform the duties of an occupation; the higher the score, the greater the level of skill proficiency required for the occupation. This proficiency can be developed through training and/or experience. This table includes the top ten skills that had an average score that met or exceeded 50 by each key industry network. The actual average scores are also included to understand how some industries, on average, may have higher or lower requirements of proficiency levels. An asterisk next to a score signifies that this score exceeds the average score for all occupations. Top skills score lists by key industry, as well as a complete list of the definitions for all O*NET skills, can be found in Appendices B and C.

Table 5: Top Ten ONET Skills Scores by Key Industry Network

Key Industry Network	Active Learning	Active Listening	Complex Problem Solving	Coordination	Critical Thinking	Judgment and Decision Making	Monitoring	Operation and Control	Operation Monitoring	Reading Comprehension	Service Orientation	Social Perceptiveness	Speaking	Systems Analysis	Time Management	Writing
Advanced Manufacturing		3, 59.9	6, 55.3*	9, 52.1	1, 61.3	7, 54.9	5, 57.8*			2, 60.3			4, 58.0		8, 52.3	10, 50.0
Aerospace	9, 54.9*	3, 65.6*	5, 62.7*	9, 54.9*	1, 68.3*	6, 60.7*	7, 58.3*			2, 67.3*			4, 63.0			8, 57.9*
Bioscience	9, 54.1*	3, 65.1	5, 59.1*		2, 65.3*	6, 58.5*	7, 57.6			1, 65.8*			4, 62.0		10, 53.5*	8, 57.3*
Creative Industries		1, 67.5*	7, 57.8*	10, 54.9*	4, 64.0*	5, 58.2*	8, 56.6			2, 65.5*			3, 64.4*		9, 54.9*	6, 57.9*
Electronics		3, 66.1*	5, 61.3*	10, 54.6*	2, 66.5*	6, 60.1*	8, 57.0			1, 68.4*			4, 63.8*		9, 54.7*	7, 58.8*
Energy & Natural Resources		2, 59.3	8, 54.2	9, 53.3	1, 61.2	6, 55.7	3, 57.6		7, 54.9*	5, 56.2			4, 57.5		10, 53.0	
Financial Services	10, 55.4*	1, 72.6*	7, 59.2*		4, 67.6*	6, 62.6*				3, 68.6*		8, 59.0*	2, 71.3*		9, 56.9*	5, 63.6*
Food & Agriculture		1, 55.8		6, 52.9	2, 55.6	9. 50.0	5, 53.6	7, 51.4*	4, 53.9*				3, 54.8		8, 50.1	
Health & Wellness	10, 59.1*	1, 74.0*			3, 68.3*	8, 61.6*	7, 64.0*			4, 68.2*	6, 65.6*	5, 68.0*	2, 72.1*			9, 61.4*
Infrastructure Engineering	10, 52.7*	2, 62.7	6, 57.1*	8, 55.1*	1, 64.4*	5, 57.1*	7, 56.6			3, 62.0*			4, 60.1		9, 64.3*	
Technology & Information	10, 54.6*	3, 65.1	5, 61.6*		1, 67.6*	6, 58.6*	8, 56.2			2, 66.7*			4, 61.7	9, 55.5*		7, 56.7*
Tourism & Outdoor Recreation		2, 67.9*		5, 60.5*	6, 60.3	9, 56.7	7, 60.1*			8, 57.4	4, 62.7*	3, 63.2*	1, 69.6*		10, 55.6*	
Transportation & Logistics		2, 62.1	10, 52.6	6, 54.7*	3, 59.3	9, 53.5	5, 57.4			4, 58.1		7, 54.5	1, 62.3		8, 54.1*	

For the complete list of ONET skills, see Appendix C or onetonline.org. This table only includes skills that were the highest scoring for occupations in these KIN.

The first number signifies where the highest scores rank (1-10) for that KIN.

The second number (50+) signifies the average score across top skilled occupations for that KIN. The higher the number, the higher the level of proficiency typically required.

An asterisk (*) signifies that the score exceeds the average skill score for all occupations.

POLICY & PRACTICE LINKED TO THE COLORADO TALENT DEVELOPMENT SYSTEM

In recent years, Colorado has taken a number of steps and implemented practices to anticipate and address the workforce demands of our state's economy. The Colorado Blueprint, described in more detail below, helped prioritize the direction of our state's economic development, while cross-agency collaboration and the Sector Strategies framework have contributed to progress in developing partnerships and career pathways that support the development of talent to better align with key industry demand.

The Colorado Blueprint & the Key Industry Initiative: Setting the Stage

One of the first tasks that Governor Hickenlooper embarked on when he took office in 2011 was to create a bottom-up economic development strategy—the Colorado Blueprint—which is the policy framework that guides Colorado's work toward economic vitality. The Office of Economic Development and International Trade (OEDIT) led the effort to identify six core objectives described in the Colorado Blueprint. The Colorado Workforce Development Council (CWDC), together with its strategic state agency and regional partners, leads the efforts toward meeting Core Objective V, to **Educate and Train the Workforce of the Future.**

The Colorado Blueprint Core Objectives

I. Build a Business-Friendly Environment
II. Retain, Grow & Recruit Companies
III. Increase Access to Capital
IV. Create & Market a Stronger Colorado Brand
V. Educate & Train the Workforce of the Future
VI. Cultivate Innovation & Technology

Using the Blueprint and labor market data, OEDIT then identified fourteen "Key Industries" as critical to Colorado's economy. Business leaders from each of the Key Industries developed a strategic business plan focused on the needs of their respective industries statewide. The input from the business community led to several universal themes relatedto education and training:

1. Improve the perception and awareness of career paths (i.e., what it means to work in different industries).
2. Increase opportunities for hands-on work experience (e.g., internships, on-the-job training, etc.).
3. Identify career and education pathways within particular industries.
4. Provide training opportunities for staff who work with students and job seekers (i.e., teachers, counselors, workforce center staff) to learn about careers and career pathways so that they are able to share this knowledge with students.

Colorado's 14 Key Industries

Advanced Manufacturing
Aerospace
Bioscience
Creative Industries
Defense & Homeland Security
Electronics
Energy & Natural Resources
Financial Services
Food & Agriculture
Health & Wellness
Infrastructure Engineering
Technology & Information
Tourism & Outdoor Recreation
Transportation & Logistics

CWDC commissioned the Woolsey Group, LLC to complete a report on work experiences in Colorado, as creating opportunities for more work experiences and internships continues to be a top priority of industry partners. See the report here.

As reflected in this report, Colorado's talent pipeline is complex, and we have begun to develop and build from a foundation of best practices to address talent development for our unique labor force needs. Coordinated by the CWDC, a coalition of state agencies, local partners and industry is working to ensure that Colorado's workforce development, education and training efforts are aligned to meet the needs of Colorado's economy, focusing in particular on sector partnerships and career pathways.

Sectors Strategies: Collaborating to Align Education and Training to Meet the Needs of Colorado's Economy

Colorado has declared a statewide priority to develop industry-led career pathways for thriving industries within the state's regional economies. A career pathway is a series of connected education and training programs, work experiences and student support services that enable individuals to secure a job or advance in an industry or occupation. The vehicle for creating such pathways is sector partnerships—regional, industry-led partnerships of private and public partners, in a specific region, for a specific industry. The goal of sector partnerships is for private and public partners to coordinate and collaborate around the opportunities and requirements for the industry to grow in their region. Active sector partnerships have the ability to help drive the development of career pathways with education partners, so as to better meet their workforce needs.

For more information on Colorado's public workforce system, sector partnerships, and career pathways, please see our most recent annual report published here.

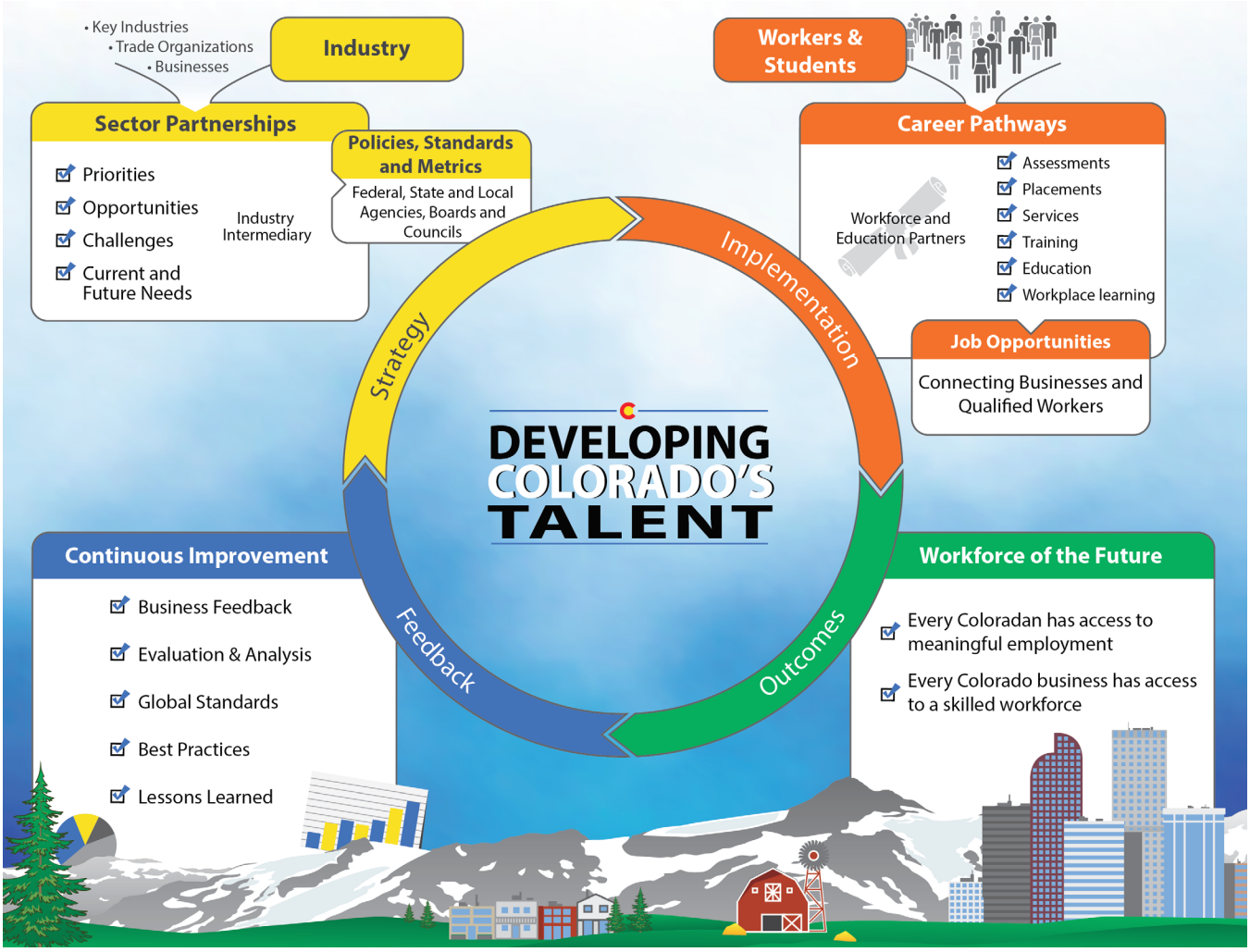
The following infographic (Figure 9) and narrative describe how this vision is translated into action, through the strategies of Sector Partnerships and Career Pathways.

Composition of the CWDC

The CWDC is composed of representatives from across the state that represent industries critical to Colorado's economy: Cabinet-level positions that impact workforce, education, and economic development, elected officials (including the Governor, state legislators, and county commissioners), appointed workforce and education leaders, representatives from community-based organizations, and organized labor.

Watch a video overview of how sector partnerships and career pathways are filling Colorado's talent pipeline.

Figure 9: Strategies for Developing Colorado's Talent Pipeline



For the last ten years, Colorado has been a pioneer in sector-based workforce strategies. With the implementation of the Colorado Blueprint and the strategic input from businesses within the Key Industry Networks, the CWDC partners (the Colorado Department of Labor and Employment, Office of Economic Development and International Trade, Colorado Department of Higher Education, Colorado Department of Education) launched the next generation of sector partnerships in 2013, providing a framework for aligning sector partnerships and career pathways across the state. In 2014, this framework was expanded to provide intensive technical assistance to the regional sector partnerships, including step-by-step guides for both sector partnerships and career pathways, monthly peer networking calls, and one-on-one coaching to help facilitate the growth of partnerships within the regions.

Currently, Coloradans are in the process of developing over 30 sector partnerships across the state in industries like Manufacturing, Health & Wellness, Energy, Technology & Information, and Tourism & Outdoor Recreation. As the momentum continues to build, new sector partnership opportunities are being explored and more partnerships are being formed. As sector partnerships are being established, they go through various stages of development: exploring, emerging and active.

A Timeline of Sector Partnerships in Colorado

- WELLS Center: Successes include the development of the WELLS Center at the Fitzsimons Medical Campus, which has offered state-of-the-art patient simulation training to over 10,000 health care workers each year from all major health care systems within the state, and the Metro-Denver Health Care Partnership, which utilizes WELLS Center training.
- Sector Pilot Grants: From 2009-2013, over 1,100 people received industry-driven training through Colorado's ten pilot sector partnerships, and 93 percent received industry-recognized credentials. Pilot grants were extended into Program Year 2013 in many of the local workforce regions.
- Sectors Summit: The Next Generation: Held in January 2013, this statewide conference served as a launching pad for modern and collaborative sector partnerships that are industry-driven and focused on the development of career pathways. 32 new or expanding sector partnerships were identified by regional teams.
- Legislative Support: Governor Hickenlooper signed Colorado Senate Bill 14-205 in May 2014, which codifies sector partnerships as the framework to align workforce development, economic development, and education in our state to meet the needs of our key industries. This legislation arose from the acute need to match the skills and competencies required for key industry jobs with the development of career pathways to provide those skills.
- Sectors Summit II: Growing the Talent Pipeline: This follow-up event to its wildly successful predecessor continued the momentum of learning, networking, and sharing best practices to sustain and support sector partnerships around the state. Of the 335 people that attended the Sectors Summit II, 27 percent were state agency or organization partners, 13 percent were industry representatives, 21 percent were from education, and 29 percent were regional staff from workforce centers, economic development, and industry trade associations.

Table 6: Status of Sector Partnerships

Exploring Stage, currently 17 partnerships	Emerging Stage, currently 10 partnerships	Active Stage, currently 12 partnerships
Advanced Manufacturing: 2 Health and Wellness: 1 Energy & Natural Resources: 4 Food & Agriculture: 3 Creative Industries: 1 Tourism & Outdoor Recreation: 4 Construction: 2	Advanced Manufacturing: 1 Health and Wellness: 5 Technology and Information: 1 Energy & Natural Resources: 2 Creative Industries: 1	Advanced Manufacturing: 5 Health and Wellness: 5 Hospitality: 1 Energy & Natural Resources: 1

To see a sector partnership at work, here is a video overview of the Denver Healthcare Sector Partnership.

Current career pathway efforts include an initiative jointly led by the CWDC and the Colorado Community College System (CCCS), with partners from all aspects of the unconventional talent pipeline. With a technical assistance grant from the U.S. Office of Vocational and Adult Education, CCCS and CWDC are developing a prototype for a career pathway system across multiple education and training programs, to navigate and coordinate the multiple resources and funding streams that could support the statewide development of career pathway systems, and to establish shared or common performance metrics to evaluate career pathway systems. Over the last year, Colorado developed and released a "Step-by-Step Guide" for Career Pathways that has received national attention. The guide was created from best practices throughout Colorado and beyond, including the development of a statewide manufacturing career pathway resulting from legislation in 2013. Several Key Industries are working within this framework to develop industry specific career pathways:

To see an example of a career map and how an ICAP (Individual Career and Academic Plan) also fits into it, visit: Colorado Manufacturing Careers

- Manufacturing: The five active manufacturing sector partnerships and statewide organizations, such as Manufacturer's Edge and the Colorado Advanced Manufacturing Alliance, are collaborating around a variety of resources to build out regional and statewide career pathways.
- Healthcare: The five active healthcare sector partnerships have each identified workforce as a critical issue and are leveraging existing work in healthcare career pathways, along with a recent NGA Policy Academy on Healthcare Work force to increase the awareness and expand opportunities for individuals to succeed in these careers.
- Information Technology: The Colorado Technology Association is convening an effort to launch an IT Sector Partnership, and has partnered with the Colorado Urban Workforce Alliance to work with public partners in the Metro-Denver area to capitalize on some recent grants as well as their own foundation focused on developing the Technology Talent Pipeline.
- Additionally, conversations have begun with statewide and regional business organizations and public partners for Con struction, Energy & Natural Resources, Hospitality, and Finance.

In the spring of 2013, the Colorado General Assembly addressed this need with the passage of House Bill 13-1165, which authorized the creation of Manufacturing Career Pathways. Advanced Manufacturing is a growing sector in many regions in Colorado and, at present, the state has determined that it is not producing the quantity or quality of workers necessary to support existing manufacturing or meet the future needs of this sector. The goal of HB13-1165 is to work with advanced manufacturing employers to identify the top occupations and job-specific needs within the sector.

In addition to HB13-1165, Colorado was awarded a Colorado Helps Advanced Manufacturing Program/Trade Adjustment Assistance Community College and Career Training (CHAMP/TAACCCT) grant to support the development of career pathways in the advanced manufacturing sector. This grant is meant to foster deeper partnerships between community colleges, community partners and employers. Colorado sector partnerships are working together with CHAMP grant recipients to ensure alignment of this work and ongoing efforts around building industry-driven career pathways. This additional and substantial resource is a huge benefit to this work in Colorado. The following links provide more information on Manufacturing Career Pathways and the CHAMP/TAACCCT grant: http://cocareeractiontools.com/ http://www.doleta.gov/taaccct

Read the Colorado Advanced Manufacturing Career Paths Report

The Northern Colorado Manufacturing Partnership was launched in 2013 and is led by manufacturers in Larimer and Weld counties with a focus on supply chain and networking, rebranding the image of manufacturing, and vocational and technical education. Their rebranding effort is engaging youth and getting them excited about manufacturing careers. In the past few months, the Northern Colorado Manufacturing Partnership has sponsored more than 60 high school students in tours of six manufacturing facilities. The partnership is working with its local school districts and its industry partners to create career pathways for manufacturing. The partnership is currently in the process of hosting skills panels to identify the KSAs (knowledge, skills and abilities) of the critical occupations in manufacturing in their region.

The sector partnerships and career pathways as described in this section could not be successful without increased collaboration among Colorado state agencies and other partners. Colorado has made great progress with its alignment efforts. State agencies overseeing education, workforce and economic development are maintaining an unprecedented level of communication, data-sharing and collaboration. A willingness to explore innovative solutions, proactively expand proven practices, and share data has strengthened partnerships and trust across state-level organizations. For example, the Department of Education and the Department of Higher Education have made great strides in ensuring that secondary students are prepared to enter postsecondary education, which began with the passage of the 2008 Colorado Achievement Plan for Kids. Similarly, a new data-sharing agreement between DHE and the Department of Labor and Employment allows Colorado to track college graduates into the workforce, providing insights to how well our postsecondary system is meeting the state's workforce needs, and simultaneously

how well our education system is preparing students for career success. Additionally, as mentioned above, OEDIT has established the alignment of systems to Educate and Train the Workforce of the Future as one of six core objectives in the economic development plan for Colorado. By leveraging the collaboration of agencies through the CWDC, the implementation of this objective is "owned" by all system partners.

Colorado and the Workforce Innovation and Opportunity Act

Colorado's strategy for aligning and integrating sector strategies and career pathways provides a sustainable framework for continuing this important work into the future, and positions Colorado well for implementation of the Workforce Innovation and Opportunity Act (WIOA). As we look to the next evolution of the workforce system envisioned by WIOA, Colorado is poised to become a model for the nation. The new act mandates the use of sector partnerships, which are already the standard way of doing business in Colorado. WIOA also calls for standardized performance metrics across multiple programs, which include the effectiveness of serving employers. Improving our understanding of the talent pipeline lays the groundwork for understanding how to best meet the current and future needs of employers. Following this model will move the state's economy forward, ensure that Coloradans are ready to fill new roles, and lead the nation in business-driven talent development.

State and Federal Legislation support this Framework

This report is required by SB14-205 (24-46.3-103 C.R.S.) in addition to this report this legislation provides the framework for career pathway development by industry for Colorado, including a mechanism to receive and invest funds in industry specific career pathways; and the means to coordinate the work across agencies and partners for a more effective and efficient Talent Development System for Colorado.

NEXT STEPS

We believe that Colorado has gained momentum toward aligning our education, workforce and economic development systems to meet the needs of Colorado's economy today and in the future. We must continue to maintain Colorado's reputation as a great place to live, work and play, thereby attracting talent, while also focusing our resources on improving our ability to educate and train Coloradans for the jobs of today and tomorrow. Yet, this also requires cross-agency collaboration, ensuring that each agency is contributing to a more unified talent development system that will meet our workforce needs and support the growth of our economy. Convened and coordinated by the CWDC, the Departments of Education, Higher Education, Labor and Employment, and the Office of Economic Development and International Trade, along with other state, regional and local organizations, will continue to collaborate to address the challenges and opportunities identified in this report, and continue to develop integrated approaches to address them.

While we still have progress to make in better aligning the development of a skilled workforce to meet the demands of our state's economy, we must continue to build upon the successes we have experienced and the structures we have established.

Vision: We recognize that the State must first have a unified vision. The guiding documents informing this vision are in place in Colorado: the Colorado Blueprint, the state's economic development plan; CDE's Performance Plan; Colorado Competes, the state's Master Plan for higher education; and the Workforce Investment Act Five Year State Plan. Together, these documents lay the path for improving the economic vitality of the state and for developing a system that will continue to prepare all Coloradans to succeed in the economy. A myriad of other documents inform and guide the many programs, policies and initiatives. The CWDC will coordinate an effort to distill the key components of these documents into a ***single statewide talent agenda***.

Data: Colorado's state agencies are making great strides in connecting student data from K-12 through completion of post-secondary education and into the workforce, enabling education and policymakers to address policy questions and gauge the effectiveness of programs and initiatives designed to improve student success. Like most states, we are challenged by various data limitations that preclude us from achieving certain levels of analysis that we desire.

Partnerships: Colorado has earned trust across local, regional, state and private partners and is recognized nationally for its public-private and regional-state partnerships; we must continue to strengthen this asset through commitment to bottom-up economic development. Our challenge is to institutionalize these partnerships beyond individual relationships and into the fabric of Colorado's administration to ensure that the framework is strong enough to withstand leadership changes. Additionally, local partnerships in Colorado are more driven by local needs, strong local leadership, and a shared desire to work together in ad hoc ways to advance immediate needs. This bottom-up approach is core to what makes Colorado uniquely strong. Using trusted partnerships we must identify the best means for formalizing partnerships through modifying and codifying new uses of resources and formalizing shared goals.

Resources and Incentives: Colorado is strong because of its locally-based infrastructure. We are successful when we embrace this reality and focus on bottom-up approaches that are supported by leadership at the highest levels of the state. This approach both requires and leads to the elements described above— a unified vision supported by data and implemented through strong partnerships. These three elements in turn enable resources and incentives to become tools to empower further action. With further progress on a unified vision, shared data and strong partnerships, Colorado will be positioned to reassess how funding streams and incentives can be realigned to improve the talent development system.

Action: The CWDC will host an economic vitality dialogue co-chaired by the Executive Directors of the above agencies to be held in the first quarter of 2015, to formalize shared goals and develop an action plan for Colorado's Talent Pipeline.

Action: The results of this dialogue will be formalized and published by May 1, 2015.

Measures across Agency: Creating the Colorado Talent Development Dashboard

Colorado has excelled in many areas identified above, and yet as much as we have aligned across agencies and sectors, we are still working to weave these new groups into an efficient network of informed collaboration. We realize that we are missing a singular tool that measures effectiveness, eliminates inefficiencies, and assists us with guiding resources and incentives in our education and training systems.

NEXT STEPS

A focus point to continue to align efforts is the work required to create a Talent Development Dashboard that accurately reflects progress made toward meeting the economy's need for an appropriately skilled workforce, and the effectiveness of Colorado's Talent Development System to ensure that Coloradans have the education and training needed to compete for today and tomorrow's jobs.

The very act of creating this dashboard will assist us with identification of shared goals, unifying metrics, and tools for tracking progress on various fronts. Furthermore, the development of this dashboard will hold us all accountable to a strategic direction toward the creation of a unified talent development system that addresses the challenges identified in this report.

We will utilize resources such as SB14-205 (Colorado Talent Pipeline), HB14-1384 (the Colorado Opportunity Scholarship Initiative), and other related legislation and policy along with a recent award from the National Governors Association to create a Talent Development Dashboard and manage the processes required to develop it.

Action: Led by the CWDC, state agencies in partnership with local system operators will create this dashboard by the end of November 2015.

RECOMMENDATIONS

In preparing this report the agencies identified areas in which they jointly recommend further exploration. The CWDC will continue to coordinate the collaboration between CDE, CDHE, CDLE, and OEDIT, as well as other agencies and system partners, to ensure that these recommendations are addressed over the next several years as resources are available. Much of this work has started and agencies will continue to work toward the recommendations outlined below. Our hope is that future resources can be targeted toward these priority areas of expanding our understanding of the needs of employers, students, and job seekers and the state and system partners' ability to meet them.

- *As identified in this report, multiple transition points in the talent pipeline lack continuity of data that will allow tracking and reporting on the current and future state of Colorado's Talent Pipeline (such as the ability to identify how many students directly enter the workforce following high school). Develop policies and mechanisms to collect and use data in a way that provides critical information needed for better decision making while committing to the strongest possible standards of data privacy and protection of personal information.*
- *The skills outlined by industry, workforce, education, higher education, and economic development are similar. An alignment of skills terms and definitions would more clearly communicate the intersections and expectations for successful employment in Colorado.*
- *Continue to utilize the career pathways model to align education, training and work based learning so students and potential employees have a clear picture of what education and experience is necessary and the steps to pursue a specific career for top jobs.*
- *Create a collaborative structure to support and incentivize career exposure and work based learning, such as job shadowing, internships, on-the-job training and apprenticeship, throughout the talent development system, simplifying access for individuals and employers.*
- *Work with industry to create marketing and outreach campaigns so Coloradans have a better understanding and appreciation of good careers and the multiple pathways into them.*
- *Develop policies that support expansion of services to underserved populations to ensure access to career pathways to employment (e.g., underserved minorities, veterans, youth, long-term unemployed, ex-offenders), including education, training, work exposure and experience, as well as wraparound services need for success.*
- *Lastly, we recommend the alignment work between state agencies that occurred in the preparation and development of this report continue so as to best coordinate state efforts and our talent pipeline. Through this collaboration agencies will jointly prioritize the work, addressing issues over time, with current and new resources.*

APPENDIX A: COMPLETE LIST OF TOP JOBS

This list was created using Colorado LMI ten year (2013 to 2023) projections for the state. Occupations made this list by having a median wage at or above a sustainable living wage ($17.88 an hour) for a family of three in Colorado (pulled from livingwage.mit.edu), above average projected growth for all occupations (at the time of this report, 23.74 percent), and at or above 40 annual average openings.

Occupation Code	Occupation	Median Annual Wage	Total Percent Change	Total Annual Average Openings	Entry Education Level	Additional Training Level
11-1021	General and Operations Managers	$100,444	26.79	1,906	Bachelor's degree	None
11-2021	Marketing Managers	$128,515	25.96	123	Bachelor's degree	None
11-3021	Computer and Information Systems Managers	$132,917	28.13	267	Bachelor's degree	None
11-3031	Financial Managers	$127,375	28.20	270	Bachelor's degree	None
11-3121	Human Resources Managers	$117,739	35.06	89	Bachelor's degree	None
11-9021	Construction Managers	$85,377	27.26	413	Bachelor's degree	Moderate-term on-the-job training
11-9031	Education Administrators, Preschool and Childcare Center/Program	$44,133	29.64	42	Bachelor's degree	None
11-9033	Education Administrators, Postsecondary	$78,874	24.21	122	Master's degree	None
11-9111	Medical and Health Services Managers	$98,109	31.84	219	Bachelor's degree	None
11-9141	Property, Real Estate, and Community Association Managers	$67,334	30.07	177	High school diploma or equivalent	None
11-9151	Social and Community Service Managers	$65,387	25.18	71	Bachelor's degree	None
13-1022	Wholesale and Retail Buyers, Except Farm Products	$44,321	24.36	93	High school diploma or equivalent	Long-term on-the-job training
13-1051	Cost Estimators	$58,343	42.61	403	Bachelor's degree	None
13-1081	Logisticians	$71,851	46.83	158	Bachelor's degree	None
13-1111	Management Analysts	$75,025	36.31	575	Bachelor's degree	None
13-1121	Meeting, Convention, and Event Planners	$41,492	39.36	167	Bachelor's degree	None
13-1151	Training and Development Specialists	$59,984	29.36	243	Bachelor's degree	None
13-2011	Accountants and Auditors	$65,393	30.04	2,116	Bachelor's degree	None
13-2041	Credit Analysts	$59,466	32.92	74	Bachelor's degree	None
13-2051	Financial Analysts	$73,125	30.69	233	Bachelor's degree	None
13-2052	Personal Financial Advisors	$70,637	27.74	159	Bachelor's degree	None

Occupation Code	Occupation	Median Annual Wage	Total Percent Change	Total Annual Average Openings	Entry Education Level	Additional Training Level
13-2082	Tax Preparers	$44,913	24.59	93	High school diploma or equivalent	Moderate-term on-the-job training
15-1121	Computer Systems Analysts	$84,779	39.31	623	Bachelor's degree	None
15-1122	Information Security Analysts	$83,140	59.29	116	Bachelor's degree	None
15-1132	Software Developers, Applications	$92,975	36.61	1,118	Bachelor's degree	None
15-1133	Software Developers, Systems Software	$100,404	40.93	611	Bachelor's degree	None
15-1134	Web Developers	$64,572	37.32	195	Associate's degree	None
15-1141	Database Administrators	$93,541	29.18	123	Bachelor's degree	None
15-1142	Network and Computer Systems Administrators	$77,122	25.51	435	Bachelor's degree	None
15-1143	Computer Network Architects	$98,215	24.79	157	Bachelor's degree	None
15-1151	Computer User Support Specialists	$50,782	33.79	636	Some college, no degree	Moderate-term on-the-job training
15-2031	Operations Research Analysts	$85,644	42.89	52	Bachelor's degree	None
17-1011	Architects, Except Landscape and Naval	$70,192	32.78	183	Bachelor's degree	Internship/residency
17-1012	Landscape Architects	$69,456	26.19	47	Bachelor's degree	Internship/residency
17-1022	Surveyors	$58,866	25.72	52	Bachelor's degree	None
17-2051	Civil Engineers	$79,854	32.56	386	Bachelor's degree	None
17-2061	Computer Hardware Engineers	$101,896	28.68	203	Bachelor's degree	None
17-2071	Electrical Engineers	$87,000	26.85	183	Bachelor's degree	None
17-2081	Environmental Engineers	$81,100	40.95	172	Bachelor's degree	None
17-2171	Petroleum Engineers	$130,961	73.49	172	Bachelor's degree	None
17-3012	Electrical and Electronics Drafters	$59,951	35.70	40	Associate's degree	None
17-3031	Surveying and Mapping Technicians	$48,888	28.90	78	High school diploma or equivalent	Moderate-term on-the-job training
19-2021	Atmospheric and Space Scientists	$92,484	31.55	103	Bachelor's degree	None
19-2041	Environmental Scientists and Specialists, Including Health	$73,586	29.22	183	Bachelor's degree	None
19-2042	Geoscientists, Except Hydrologists and Geographers	$100,296	43.65	191	Bachelor's degree	None
19-4031	Chemical Technicians	$43,559	33.02	43	Associate's degree	Moderate-term on-the-job training
19-4041	Geological and Petroleum Technicians	$56,455	52.49	54	Associate's degree	Moderate-term on-the-job training
19-4091	Environmental Science and Protection Technicians, Including Health	$45,191	39.42	88	Associate's degree	None

Occupation Code	Occupation	Median Annual Wage	Total Percent Change	Total Annual Average Openings	Entry Education Level	Additional Training Level
21-1011	Substance Abuse and Behavioral Disorder Counselors	$39,094	32.95	85	High school diploma or equivalent	Moderate-term on-the-job training
21-1014	Mental Health Counselors	$40,048	32.17	209	Master's degree	Internship/residency
21-1021	Child, Family, and School Social Workers	$42,026	24.72	268	Bachelor's degree	None
21-1022	Healthcare Social Workers	$50,401	33.73	119	Master's degree	None
21-1023	Mental Health and Substance Abuse Social Workers	$39,620	28.36	95	Bachelor's degree	None
21-1091	Health Educators	$52,694	29.67	43	Bachelor's degree	None
23-1011	Lawyers	$115,367	24.61	649	Doctoral or professional degree	None
23-2011	Paralegals and Legal Assistants	$50,513	32.85	269	Associate's degree	None
25-1071	Health Specialties Teachers, Postsecondary	$107,224	47.36	253	Doctoral or professional degree	None
25-1072	Nursing Instructors and Teachers, Postsecondary	$59,817	46.68	53	Doctoral or professional degree	None
25-1121	Art, Drama, and Music Teachers, Postsecondary	$51,939	25.05	81	Doctoral or professional degree	None
27-1025	Interior Designers	$44,127	30.19	85	Bachelor's degree	None
27-3042	Technical Writers	$65,659	28.46	88	Bachelor's degree	Short-term on-the-job training
27-3091	Interpreters and Translators	$47,642	69.75	122	Bachelor's degree	Short-term on-the-job training
27-4011	Audio and Video Equipment Technicians	$47,188	26.77	57	Postsecondary non-degree award	Short-term on-the-job training
29-1031	Dietitians and Nutritionists	$54,622	30.40	47	Bachelor's degree	Internship/residency
29-1051	Pharmacists	$119,883	27.52	226	Doctoral or professional degree	None
29-1067	Surgeons	$187,369	24.12	53	Doctoral or professional degree	Internship/residency
29-1071	Physician Assistants	$89,379	42.09	126	Master's degree	None
29-1122	Occupational Therapists	$76,746	33.64	129	Master's degree	None
29-1123	Physical Therapists	$72,824	40.19	313	Doctoral or professional degree	None
29-1126	Respiratory Therapists	$57,112	32.08	77	Associate's degree	None
29-1129	Therapists, All Other	$58,984	29.35	54	Bachelor's degree	None
29-1131	Veterinarians	$78,124	26.06	127	Doctoral or professional degree	None
29-1141	Registered Nurses	$68,083	30.79	2,172	Associate's degree	None
29-1171	Nurse Practitioners	$95,250	37.75	124	Master's degree	None
29-2021	Dental Hygienists	$80,793	29.74	224	Associate's degree	None
29-2032	Diagnostic Medical Sonographers	$75,912	56.39	58	Associate's degree	None
29-2034	Radiologic Technologists and Technicians	$57,932	29.92	137	Associate's degree	None

Occupation Code	Occupation	Median Annual Wage	Total Percent Change	Total Annual Average Openings	Entry Education Level	Additional Training Level
29-2055	Surgical Technologists	$49,551	39.85	85	Postsecondary non-degree award	None
29-2061	Licensed Practical and Licensed Vocational Nurses	$44,996	28.58	310	Postsecondary non-degree award	None
29-2071	Medical Records and Health Information Technicians	$42,269	30.52	138	Postsecondary non-degree award	None
29-2099	Health Technologists and Technicians, All Other	$37,305	32.92	98	High school diploma or equivalent	None
29-9011	Occupational Health and Safety Specialists	$73,914	26.64	71	Bachelor's degree	Short-term on-the-job training
31-2021	Physical Therapist Assistants	$48,157	41.44	54	Associate's degree	None
37-1012	First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	$46,593	24.70	152	High school diploma or equivalent	None
41-3099	Sales Representatives, Services, All Other	$50,658	27.71	1,053	High school diploma or equivalent	Short-term on-the-job training
41-9021	Real Estate Brokers	$43,942	25.58	111	High school diploma or equivalent	None
43-3051	Payroll and Timekeeping Clerks	$42,135	28.79	124	High school diploma or equivalent	Moderate-term on-the-job training
43-5032	Dispatchers, Except Police, Fire, and Ambulance	$40,384	26.14	156	High school diploma or equivalent	Moderate-term on-the-job training
47-1011	First-Line Supervisors of Construction Trades and Extraction Work	$63,568	40.99	671	High school diploma or equivalent	None
47-2021	Brickmasons and Blockmasons	$44,454	60.85	86	High school diploma or equivalent	Apprenticeship
47-2031	Carpenters	$39,094	36.40	862	High school diploma or equivalent	Apprenticeship
47-2044	Tile and Marble Setters	$37,361	32.21	40	Less than high school	Long-term on-the-job training
47-2071	Paving, Surfacing, and Tamping Equipment Operators	$38,490	37.70	83	High school diploma or equivalent	Moderate-term on-the-job training
47-2073	Operating Engineers and Other Construction Equipment Operators	$42,349	37.72	483	High school diploma or equivalent	Moderate-term on-the-job training
47-2111	Electricians	$48,043	42.30	909	High school diploma or equivalent	Apprenticeship
47-2121	Glaziers	$42,952	38.16	83	High school diploma or equivalent	Apprenticeship
47-2152	Plumbers, Pipefitters, and Steamfitters	$48,049	42.38	483	Less than high school	Moderate-term on-the-job training
47-2181	Roofers	$37,405	29.40	185	Less than high school	Moderate-term on-the-job training

Occupation Code	Occupation	Median Annual Wage	Total Percent Change	Total Annual Average Openings	Entry Education Level	Additional Training Level
47-2211	Sheet Metal Workers	$43,316	36.48	143	High school diploma or equivalent	Apprenticeship
47-2221	Structural Iron and Steel Workers	$39,674	40.09	63	High school diploma or equivalent	Apprenticeship
47-4099	Construction and Related Workers, All Other	$37,276	37.38	48	High school diploma or equivalent	Moderate-term on-the-job training
47-5011	Derrick Operators, Oil and Gas	$49,693	52.18	66	Less than high school	Short-term on-the-job training
47-5012	Rotary Drill Operators, Oil and Gas	$55,577	52.04	84	Less than high school	Moderate-term on-the-job training
47-5013	Service Unit Operators, Oil, Gas, and Mining	$43,450	56.56	353	Less than high school	Moderate-term on-the-job training
47-5071	Roustabouts, Oil and Gas	$37,075	52.95	252	Less than high school	Moderate-term on-the-job training
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	$47,841	25.27	148	High school diploma or equivalent	Long-term on-the-job training
49-9021	Heating, Air Condition-ing, and Refrigeration Mechanics and Installers	$46,158	39.49	261	Postsecondary non-degree award-7	Long-term on-the-job training
49-9041	Industrial Machinery Mechanics	$50,591	38.48	366	High school diploma or equivalent	Long-term on-the-job training
49-9062	Medical Equipment Repairers	$43,592	38.86	87	Associate's degree	Moderate-term on-the-job training
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	$40,211	27.28	59	High school diploma or equivalent	Moderate-term on-the-job training
51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	$51,822	28.97	57	High school diploma or equivalent	Moderate-term on-the-job training
53-2011	Airline Pilots, Copilots, and Flight Engineers	$106,168	37.45	182	Bachelor's degree	Moderate-term on-the-job training
53-2031	Flight Attendants	$38,643	38.55	134	High school diploma or equivalent	Moderate-term on-the-job training
53-3032	Heavy and Tractor-Trailer Truck Drivers	$42,078	32.27	1,202	Postsecondary non-degree award	Short-term on-the-job training
53-7021	Crane and Tower Operators	$55,283	52.53	50	High school diploma or equivalent	Moderate-term on-the-job training
53-7073	Wellhead Pumpers	$53,161	60.83	77	Less than high school	Moderate-term on-the-job training

APPENDIX B: O*NET SKILLS SCORES BY KEY INDUSTRY NETWORK

Our O*NET skill scores are based on the staffing pattern for each Key Industry Network (KIN). By KIN, we then isolated the skilled occupations that had the highest concentration of workers, a total number that comprised at least half of the workers in the KIN. Based on the skills scores for these select occupations, we then established one score for each skill in each KIN. Below are the top ten ranked scores for each key industry; scores that exceed the average score for all occupations is denoted with an asterisk.

Advanced Manufacturing

1. Critical thinking 61.3
2. Reading comprehension 60.3
3. Active listening 59.9
4. Speaking 58.0
5. Monitoring* 57.8
6. Complex problem solving* 55.3
7. Judgment and decision making 54.9
8. Time management 52.3
9. Coordination 52.1
10. Writing 50.0

Aerospace

1. Critical thinking* 68.3
2. Reading comprehension* 67.3
3. Active listening* 65.6
4. Speaking 63.0
5. Complex problem solving* 62.7
6. Judgment and decision making* 60.7
7. Monitoring* 58.3
8. Writing* 57.9
9. Active learning* 54.9
10. Coordination* 54.9

Bioscience

1. Reading comprehension* 65.8
2. Critical thinking* 65.3
3. Active listening 65.1
4. Speaking 62.0
5. Complex problem solving* 59.1
6. Judgment and decision making* 58.5
7. Monitoring 57.6
8. Writing* 57.3
9. Active learning* 54.1
10. Time management* 53.5

Creative Industries

1. Active listening* 67.5
2. Reading comprehension* 65.5
3. Speaking* 64.4
4. Critical thinking* 64.0
5. Judgment and decision making* 58.2
6. Writing* 57.9
7. Complex problem solving* 57.8
8. Monitoring 56.6
9. Time management* 54.9
10. Coordination* 54.9

Defense & Homeland Security

No available data

Electronics

1. Reading comprehension* 68.4
2. Critical thinking* 66.5
3. Active listening* 66.1
4. Speaking* 63.8
5. Complex problem solving* 61.3
6. Judgment and decision making* 60.1
7. Writing* 58.8
8. Monitoring 57.0
9. Time management* 54.7
10. Coordination* 54.6

Energy & Natural Resources

1. Critical thinking 61.2
2. Active listening 59.3
3. Monitoring 57.6
4. Speaking 57.5
5. Reading comprehension 56.2
6. Judgment and decision making 55.7
7. Operation monitoring* 54.9
8. Complex problem solving 54.2
9. Coordination 53.3
10. Time management 53.0

Financial Services

1. Active listening* 72.6
2. Speaking* 71.3
3. Reading comprehension* 68.6
4. Critical thinking* 67.6
5. Writing* 63.6
6. Judgment and decision making* 62.6
7. Complex problem solving* 59.2
8. Social perceptiveness* 59.0
9. Time management* 56.9
10. Active learning* 55.4

APPENDIX B: O*NET SKILLS SCORES BY KEY INDUSTRY NETWORK

Food & Agriculture

1. Active listening 55.8
2. Critical thinking 55.6
3. Speaking 54.8
4. Operation monitoring* 53.9
5. Monitoring 53.6
6. Coordination 52.9
7. Operation and control* 51.4
8. Time management 50.1
9. Judgment and decision making 50.0

Health & Wellness

1. Active listening* 74.0
2. Speaking* 72.1
3. Critical thinking* 68.3
4. Reading comprehension* 68.2
5. Social perceptiveness* 68.0
6. Service orientation* 65.6
7. Monitoring* 64.0
8. Judgment and decision making* 61.6
9. Writing* 61.4
10. Active learning* 59.1

Infrastructure Engineering

1. Critical thinking* 64.4
2. Active listening 62.7
3. Reading comprehension* 62.0
4. Speaking 60.1
5. Judgment and decision making* 57.1
6. Complex problem solving* 57.1
7. Monitoring 56.6
8. Coordination* 55.1
9. Time management* 64.3
10. Active learning* 52.7

Technology & Information

1. Critical thinking* 67.6
2. Reading comprehension* 66.7
3. Active listening 65.1
4. Speaking 61.7
5. Complex problem solving* 61.6
6. Judgment and decision making* 58.6
7. Writing* 56.7
8. Monitoring 56.2
9. Systems analysis* 55.5
10. Active learning* 54.6

Tourism & Outdoor Recreation

1. Speaking* 69.6
2. Active listening* 67.9
3. Social perceptiveness* 63.2
4. Service orientation* 62.7
5. Coordination* 60.5
6. Critical thinking 60.3
7. Monitoring* 60.1
8. Reading comprehension 57.4
9. Judgment and decision making 56.7
10. Time management* 55.6

Transportation & Logistics

1. Speaking 62.3
2. Active listening 62.1
3. Critical thinking 59.3
4. Reading comprehension 58.1
5. Monitoring 57.4
6. Coordination* 54.7
7. Social perceptiveness 54.5
8. Time management* 54.1
9. Judgment and decision making 53.5
10. Complex problem solving 52.6

Basic Skills

Developed capacities that facilitate learning or the more rapid acquisition of knowledge

- Active Learning — Understanding the implications of new information for both current and future problem-solving and decision-making.
- Active Listening — Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
- Critical Thinking — Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.
- Learning Strategies — Selecting and using training/instructional methods and procedures appropriate for the situation when learning or teaching new things.
- Mathematics — Using mathematics to solve problems.
- Monitoring — Monitoring/Assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.
- Reading Comprehension — Understanding written sentences and paragraphs in work related documents.
- Science — Using scientific rules and methods to solve problems.
- Speaking — Talking to others to convey information effectively.
- Writing — Communicating effectively in writing as appropriate for the needs of the audience.

Complex Problem Solving Skills

Developed capacities used to solve novel, ill-defined problems in complex, real-world settings

- Complex Problem Solving — Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.

Resource Management Skills

Developed capacities used to allocate resources efficiently

- Management of Financial Resources — Determining how money will be spent to get the work done, and accounting for these expenditures.
- Management of Material Resources — Obtaining and seeing to the appropriate use of equipment, facilities, and materials needed to do certain work.
- Management of Personnel Resources — Motivating, developing, and directing people as they work, identifying the best people for the job.
- Time Management — Managing one's own time and the time of others.

Social Skills

Developed capacities used to work with people to achieve goals

- Coordination — Adjusting actions in relation to others' actions.
- Instructing — Teaching others how to do something.
- Negotiation — Bringing others together and trying to reconcile differences.
- Persuasion — Persuading others to change their minds or behavior.
- Service Orientation — Actively looking for ways to help people.
- Social Perceptiveness — Being aware of others' reactions and understanding why they react as they do.

Systems Skills

Developed capacities used to understand, monitor, and improve socio-technical systems

- Judgment and Decision Making — Considering the relative costs and benefits of potential actions to choose the most appropriate one.
- Systems Analysis — Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.
- Systems Evaluation — Identifying measures or indicators of system performance and the actions needed to improve or correct performance, relative to the goals of the system.

Technical Skills

Developed capacities used to design, set-up, operate, and correct malfunctions involving application of machines or technological systems

- Equipment Maintenance — Performing routine maintenance on equipment and determining when and what kind of maintenance is needed.
- Equipment Selection — Determining the kind of tools and equipment needed to do a job.
- Installation — Installing equipment, machines, wiring, or programs to meet specifications.
- Operation and Control — Controlling operations of equipment or systems.
- Operation Monitoring — Watching gauges, dials, or other indicators to make sure a machine is working properly.
- Operations Analysis — Analyzing needs and product requirements to create a design.
- Programming — Writing computer programs for various purposes.
- Quality Control Analysis — Conducting tests and inspections of products, services, or processes to evaluate quality or performance.
- Repairing — Repairing machines or systems using the needed tools.
- Technology Design — Generating or adapting equipment and technology to serve user needs.
- Troubleshooting — Determining causes of operating errors and deciding what to do about it.