LEGISLATIVE REPORT ON THE SKILLS FOR JOBS ACT

JANUARY 2015

1560 Broadway, Suite 1600 • Denver, Colorado 80204 • (303) 866-2723
LT. GOVERNOR JOSEPH GARCIA, EXECUTIVE DIRECTOR

Contents

Executive Summary 4

Introduction 5

National Trends 6

Colorado's Supply and Demand for Educated and Trained Workers 6

Colorado's Top Jobs: Supply and Demand 11

Occupational Demand by Credential Level 17

- Mid-level 17
- Bachelor's and Graduate Level 18

Two and Four Year Public Institution Profiles 19

Recommendations 23

References 27

Appendix A: Colorado's Top Jobs List 28

Appendix B: Technical Information 33

- Calculations 33
- Limitations 33
- Estimates for Potential Gap Occupations 35

Appendix C: Public Two and Four Year Postsecondary Institutions in Colorado 37

This report was prepared by the Colorado Department of Higher Education (DHE) pursuant to the requirements of §23-1-130 Colorado Revised Statutes.

For more information please contact:

Dr. Lauren Victor, Talent Development Research and Policy Analyst with the Colorado Department of Higher Education and Colorado Workforce Development Council, at 303-866-2363 or by email at lauren.victor@dhe.state.co.us

Executive Summary

In accordance with 23-1-130 C.R.S., the Skills for Jobs report was prepared by the Colorado Department of Higher Education. This report explores the state's anticipated workforce needs and the number of postsecondary credentials that are being issued, identifying any workforce needs that may not be met by education and training programs.

Colorado has a highly educated workforce and experts project that more jobs will continue to demand some level of postsecondary education (Carnevale, Smith & Strohl, 2013). The state unemployment rate is also considerably lower for people who have a postsecondary credential than for those who have a high school degree or less. This gap has continued to widen over the past decade.

In 2013, public institutions in Colorado awarded 52,715 certificates and degrees, a 6.0 percent increase from the year prior. Over five years, postsecondary completions have seen an average annual growth rate of 5.8 percent. Looking at completion figures from both public and private postsecondary institutions, if the number of credentials awarded continues to increase, we are on a trajectory to meet the CCHE Master Plan targets for awards granted in Colorado.

In alignment with the Talent Pipeline report, we have isolated a selection of jobs with high projected growth rates and openings, while offering a sustainable living wage. While not exhaustive of occupations that offer opportunities for Coloradans, it provides a glimpse into promising industries in our state overall and can help guide our efforts in developing our state's workforce talent in various sectors. Jobs on this list are concentrated in construction/extraction, healthcare, finance and information technology (IT) occupation clusters. See complete list in Appendix A. While not exhaustive of all skills gaps, when analyzing related completions to average annual openings by occupation group, data show that we are potentially not meeting job openings for a number of skilled trades, mid-level and bachelor's level IT, bachelor's level finance, and graduate/professional level healthcare positions.

Recommendations include continuing efforts to,

- Use and improve state data sets and data alignment across agencies so as to better understand aggregate trends and use data to address policy questions;
- Develop effective career pathways, prioritizing a focus on fields in high demand and offer good employment opportunities for Coloradans;
- Closely examine and address supply-demand relationships in areas such as healthcare, IT and skilled trades;
- Build strong industry-institution partnerships;
- Find ways to increase postsecondary success for our fastest growing demographic groups; and
- Provide students and families with the tools and knowledge to make informed educational decisions.

Introduction

As Colorado continues to grow and evolve, it is important for our state to have a nuanced understanding of economic and educational forces, and to be able to develop the educational and training opportunities that meet the needs of individual workers and the demands of the economy. In light of the Great Recession, the increasing cost of postsecondary education for the consumer, and a decade of wage stagnation for the majority of workers, the public and policy makers alike want to make informed decisions regarding the roles of postsecondary training and education in their lives and communities. While this report relies on recent postsecondary education and workforce patterns, it also ties in labor market projections to estimate where we may or may not be meeting industry demand for educated and trained workers. In turn, we hope this report sheds light as to where our anticipated high demand and high growth fields are, and whether credentials are being awarded that align with the economic needs of our state.

Pursuant to statute (23-1-130 C.R.S.), the Colorado Department of Higher Education (DHE) is required to submit a report concerning the state workforce need projections and credential production. In fulfillment of this requirement, this report identifies trends in the state's anticipated workforce needs and the number of degrees, certificates, and other credentials that have been or are expected to be produced. This report will be submitted to the Education Committees of the Senate and House of Representatives, the Economic and Business Development Committee of the House of Representatives, the Business, Labor, and Technology Committee of the Senate, and the Governor. Additionally, it will be sent to every public postsecondary governing board and be made available through the Department of Education to the state's public, private, and charter schools and districts, as well as be publicly available on the DHE website.

This report covers the following:

- Outlines national trends regarding postsecondary education and workforce needs, alongside Colorado-specific facts and figures;
- Assesses the state's anticipated workforce needs and the number of degrees, certificates, and other credentials that institutions issue; and
- Identifies workforce needs, at the macro level, which may or may not be met through postsecondary educational offerings in Colorado.

Certainly, a report such as this has its limitations in scope. While we do orient this report as a statewide analysis, we recognize that unique regional trends exist. As part of our state's efforts to provide relevant information to interested stakeholders, we would like to recognize two other informational tools that are also available on related topics. The Colorado Workforce Development Council, in collaboration with the Colorado Department of Higher Education, the Colorado Department of Labor and Employment, the Colorado Department of Education, the Office of Economic

Development and International Trade, the Office of State Planning and Budgeting and the State Demography Office at the Department of Local Affairs, recently released the Talent Pipeline report. Forthcoming is the updated College Measures report and website, which provides the public with median earnings trends in Colorado for postsecondary completers one, five and ten years following graduation.

National Trends

In recent years there has been a nationwide surge of research, reports and media attention surrounding postsecondary education and employment, as both the educational and economic landscapes of our country have shifted considerably in recent history. Nationwide, it has been projected that by 2020, 65 percent of all jobs will require postsecondary education (Carnevale, Smith & Strohl, 2013). Colorado's projected workforce requirements even exceed the national average with 74 percent of all jobs requiring some level of postsecondary education/training by 2020. By these numbers, Colorado ranks third nationally in terms of our anticipated postsecondary training needs (Carnevale et al., 2013).

The national and Colorado-based conversations on workforce readiness and fulfilling employers' workforce needs have begun to shift perspectives on long held assumptions and biases toward different kinds of postsecondary education, and the alignment of pathways to supporting the success of youth and adults alike. According to research from Georgetown University's Center on Education and the Workforce on nationwide trends, when the projected postsecondary credential requirements for jobs in 2020 are more specifically defined, 36 percent of jobs will demand a baccalaureate degree or higher (or 42 percent of jobs in Colorado), while 30 percent will require a lesser degree of postsecondary training akin to an associate's degree or certificate award (or 32 percent for Colorado) (Carnevale et al., 2013).

Ultimately, at the individual and state level, we all benefit from a well-educated workforce. Education supports an individual's employability and economic security. That individual can then afford to engage in the local economy through purchasing goods and services and paying taxes. Furthermore, during economic downturns, those with lower levels of educational attainment experience the most significant declines in employment and greater wage deterioration (Grusky, Red Bird, Rodrigues & Wimer, 2013), indicating one such way that a postsecondary education can often serve as an economic shield.

Colorado's Supply and Demand for Educated and Trained Workers

Colorado's economy is one of the strongest in the nation, with an unemployment rate of 4.0 percent as of December 2014 (Colorado Department of Labor and Employment, 2015). The last time the state's unemployment rate was this low was October 2007. Data show that unemployment rates are considerably lower for people with a

postsecondary credential as compared to those without any postsecondary educational experience (Current Population Survey, 2014). Unemployment in 2014 in Colorado hovers at 4.4 percent for people with some college or an associate's degree and at 3.1 percent for an adult with a bachelor's degree or higher—lower than the unemployment rate for high school graduates (4.7 percent) and for those with less than a high school education (8.9 percent). Average earnings continue to be higher for those with higher levels of education (U.S. Census Bureau, 2013).

Table 1: Colorado Unemployment and Earnings by Education Level

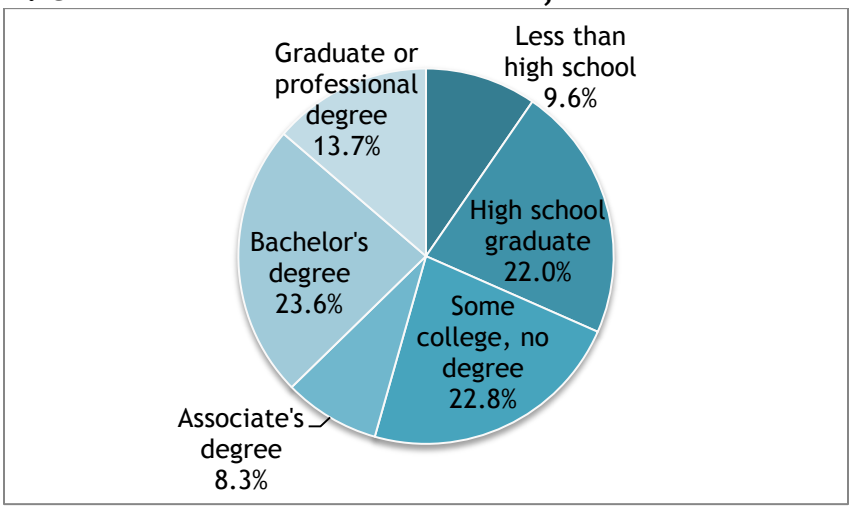
Educational Attainment	Unemployment Rate	Median Earnings ($)
Less than high school graduate	8.9%	21,624
High School graduate	4.7%	30,011
Some college or associate's degree	4.4%	33,594
Bachelor's degree	3.1%	46,891
Graduate or professional degree		61,730

Source: U.S. Census Bureau, 2013 American Community Survey, 1-year estimates; Current Population Survey, 2014

In addition, Colorado has a workforce with one of the highest proportions of non-routine analytical and interpersonal skills—that is, skills such as critical thinking, social perceptiveness and creativity that are engaged in by educated and highly adept workers. Economies with high proportions of workers who typically use high-level analytical and interpersonal skills are positioned for better performance in the present and future as technologies evolve (Colorado Office of State Planning and Budgeting, 2014). Maintaining a high share of workers with these types of non-routine skills will help sustain Colorado's economic performance.

Overall, Colorado has a highly educated population relative to the rest of the nation, with 68 percent of adults having some college experience or a postsecondary credential and nearly 46 percent holding an associate's degree or higher (Figure 1), yet we also have an economy that demands a highly educated workforce. Experts project that by 2020, 74 percent of jobs in Colorado will require some level of postsecondary education or training (Carnevale et al., 2013) (see Table 2). The Colorado Department of Higher Education has also been targeting a 66 percent postsecondary certificate or degree attainment level for Coloradans ages 25 to 34 by 2025 (for more information, see the Colorado Commission on Higher Education Master Plan).

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



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

Table 2: Georgetown Projected Annual Job Openings Distribution by Education Level in Colorado

Education Level Required for Occupation	Percentage Distribution of Job Openings	Annual Avg. Openings
Less than HS	7%	6,700
HS Degree	20%	20,100
Some College/No Degree	23%	22,600
Associate's Degree	9%	8,400
Bachelor's Degree	29%	28,200
Master's or better	13%	12,400

Source: Carnevale et al., 2013

While Colorado's adult population overall has a high educational attainment level, there are significant disparities in educational attainment levels by race/ethnicity. Exemplifying this gap is the difference in educational attainment for our Hispanic and non-Hispanic white population in Colorado: 19 percent of Hispanic adults have a college degree whereas 52 percent of non-Hispanic white adults have a degree (U.S. Census Bureau, 2013). 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) (State Demography Office, 2013). Thus our state's diversifying racial/ethnic composition will also mean more layers of support will likely be needed for students, especially those from underserved populations who tend to have lower educational attainment rates, in order to achieve higher levels of academic success. These factors may impact the long-term sustainability of our educated workforce, and thus the development of our state economy.

One variable that complicates analysis of a state's workforce supply are interstate migration patterns. On average, three-quarters of Colorado residents graduating from a public postsecondary institution are found in our workforce within the year

following graduation. However, entry into our state's workforce varies based on residency status, program major and degree level. Some graduates will continue their education and delay entry into the workforce, some will pursue opportunities out-of-state, some will leave and then return to the state for employment years later. Typically, people with higher levels of education tend to have higher levels of geographic mobility, so while we may lose a portion of our educated Coloradans to out-of-state opportunities, our state still attracts a large share of highly educated people. While we have consistently been able to attract qualified talent from outside of Colorado, we must also anticipate an increase in interstate and global competition for these workers as older skilled workers continue to retire in large numbers. See the Talent Pipeline Report for additional analysis of related demographic information.

Our country's current rate of producing college-educated workers increases by one percent annually; in order to meet projected demand, experts deem that our country must increase this rate to 2.6 percent annually (Carnevale & Rose, 2011). In 2013, public institutions in Colorado awarded 52,715 certificates and degrees, a 6.0 percent increase from the year prior. Maintaining this trajectory will help us meet our state's educational attainment goals.

Table 3: Postsecondary Institution Degrees Awarded (2013)

Credential Type	Public		Private
	Growth rate from year prior	AY 2012-13	AY 2012-13
Total	6.0%	52,715	32,388
Certificates	8.9%	10,136	9,254
Associate	11.7%	8,728	4,065
Bachelor	3.6%	24,766	9,753
Graduate	4.3%	9,085	9,316

Source: Colorado Department of Higher Education SURDS; IPEDS

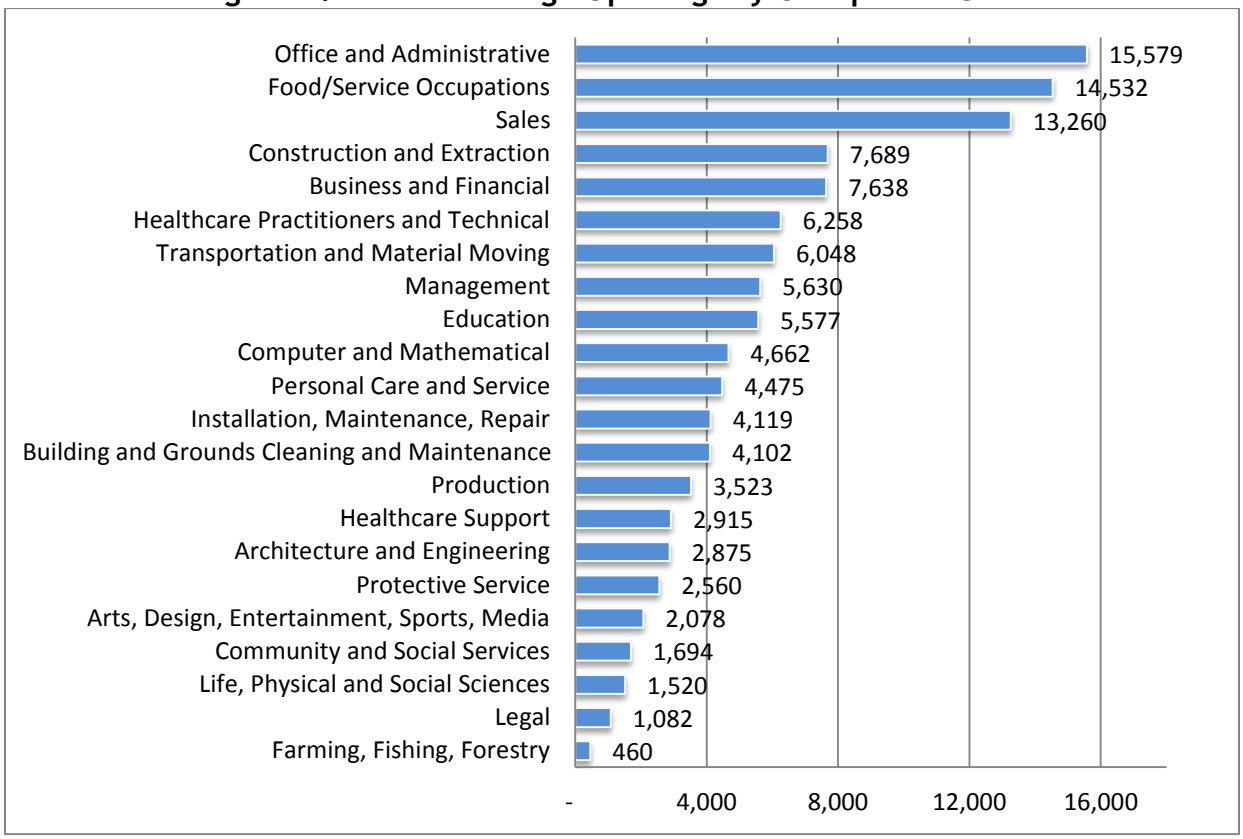
As more jobs are expected to require higher levels of education in the years to come, analysts estimate that Colorado will need to increase postsecondary credential production by about two percent or about 1,000 additional degrees/credentials annually. Per the CCHE Master Plan degree and certificate production goals for both public and private postsecondary institution awards combined, we are on track to meet those goals as long as we continue to increase completions. This will require us to continue to provide services that support student and worker access to and success with educational and training opportunities.

Colorado is working to ensure we are training Coloradans for the jobs of today and tomorrow through the development of industry-led career pathways. 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.

Despite potential challenges we may face in terms of future degree production, we do have one of the most highly educated workforces in the country, and an economy that continues to attract an educated workforce and motivates many to acquire additional education. As we increase our credential production, it is also important to look beneath the surface of degree levels awarded and examine the structural nuances of our degrees and credentials earned to assess if we have any gaps in certain areas of training. Colorado's ten year labor market projections estimate just over 118,000 average annual openings due to replacement of workers and economic growth; Figure 2 depicts where annual openings are dispersed by occupation group. In the following sections we provide additional analysis related to high growth occupations and credential completions alongside projected openings for occupation groups. A complete list of occupation groups can be found here.

Figure 2: Annual Average Openings by Occupation Cluster



Source: Colorado Labor Market Information

Colorado's Top Jobs: Supply and Demand

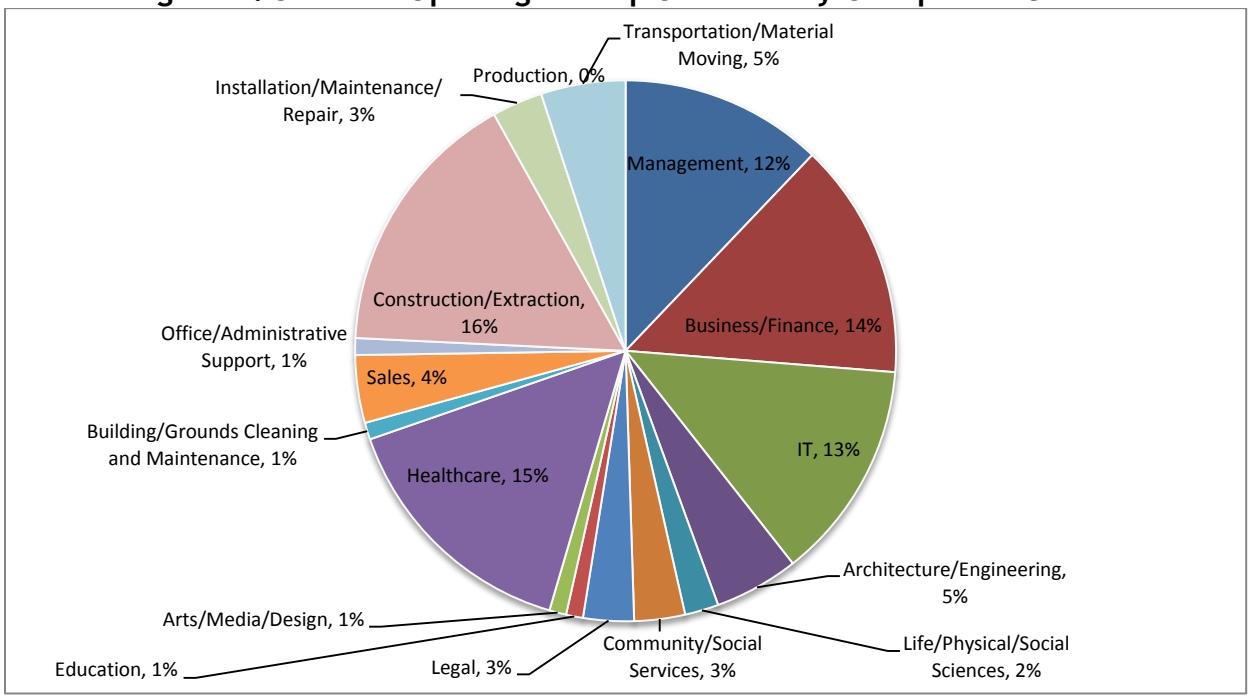
This report uses labor market data from Colorado's Office of Labor Market Information to identify jobs that meet three criteria: projected high openings, above average growth rates and typically offering a living wage for the average family size. This is not an exhaustive list of occupations that offer opportunities for Coloradans; rather, it offers a glimpse into some promising industries in our state overall and can thereby help guide our efforts in developing our state's workforce talent in various sectors. One such approach is through the use of sector strategies, which are being implemented and are emerging in use across the state. A sector partnership is an industry-specific regional partnership led by business in partnership with economic development, education and workforce development. Through sector partnerships, the development of career pathways is a natural progression. 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.

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. We've delineated the occupations by typical education requirements for entry. The first table shows mid-level occupations that are classified as requiring some college, an associate's degree or extensive postsecondary training for employment; the second table shows occupations that typically require a bachelor's or graduate degree for employment. The complete list of top jobs can be found in Appendix A.

This table includes related completions (per 2013 Integrated Postsecondary Education Data System data) alongside projected annual openings by occupation, when available, as some occupations do not have specific educational/training pathways or some completion types are not recorded in the IPEDS data set (such as some apprenticeships or industry certificates). Completion figures do not account for completers who may already be participating in the workforce or new or emerging industries/occupations that one cannot account for. While regional differences do exist, for the purposes of this report we focus on a statewide perspective. In instances where completions may appear to lag or match average openings, further examination of a potential supply-demand gap is recommended to better understand talent development strategies that should be implemented.

Based on current Colorado labor market data, occupations on this list are highly concentrated in construction and extraction, healthcare, business and finance, and information technology (Figure 5). Eighty-one percent of job openings on this list are for occupations that typically require some level of postsecondary education for entry, whether it is an apprenticeship or college credential.

Figure 3: Share of Openings in Top Jobs List by Occupation Cluster



For the purposes of this report, we expanded our definition of STEM occupations beyond that of the more limited occupation codes for computer, math, engineering and science professionals to align with the Brookings Institution definition, which is based on actual skill levels in the areas of science, technology/computers, engineering and/or mathematics as typically required to perform an occupation.[1] Fifty-five percent of the jobs on this list are considered STEM per the Brookings Institution definition of STEM occupations. STEM jobs that are represented on this list are highly concentrated in IT, healthcare and finance occupations (Figure 6).

[1] Brookings has conducted analysis of all occupations using O*NET skills scores, and has defined STEM occupations as those that require above average skill/knowledge levels in science, technology, engineering and/or mathematics areas. This definition thus includes not only occupations in the science, computer, math and engineering job clusters, but includes jobs in other fields such as healthcare, skilled trades and finance occupations.

Figure 4: Top Jobs: Number of Annual STEM Job Openings by Occupation Cluster

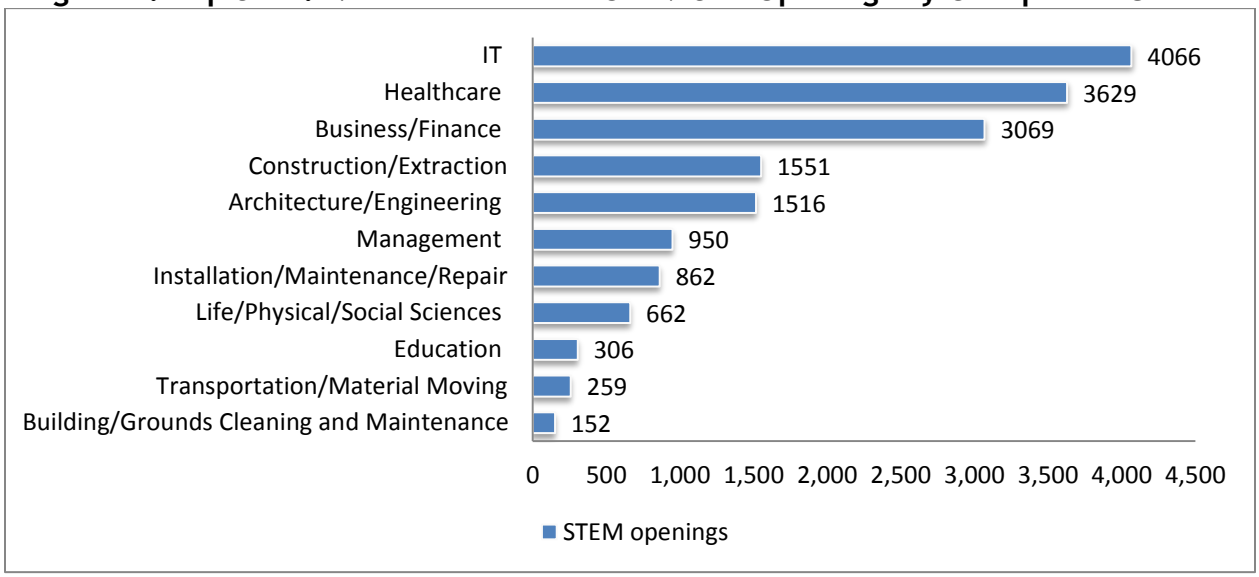


Table 4: Mid-Level Top Jobs

Occupation Code	Occupation	Median Annual Wage	Total Percent Change	Total Annual Average Openings	Related Completions (2013)	Entry Education Level	Training Level
13-1022	Wholesale and Retail Buyers, Except Farm Products	$44,321	24.36	93	N/A	High school diploma or equivalent	Long-term on-the-job training
15-1134	Web Developers	$64,572	37.32	195	*	Associate's degree	None
17-3012	Electrical and Electronics Drafters	$59,951	35.70	40	*	Associate's degree	None
19-4031	Chemical Technicians	$43,559	33.02	43	N/A	Associate's degree	Moderate-term on-the-job training
19-4041	Geological and Petroleum Technicians	$56,455	52.49	54	4	Associate's degree	Moderate-term on-the-job training
19-4091	Environmental Science and Protection Technicians, Including Health	$45,191	39.42	88	94	Associate's degree	None
23-2011	Paralegals and Legal Assistants	$50,513	32.85	269	243	Associate's degree	None
27-4011	Audio and Video Equipment Technicians	$47,188	26.77	57	22	Postsecondary non-degree award	Short-term on-the-job training
29-1126	Respiratory Therapists	$57,112	32.08	77	91	Associate's degree	None
29-1141	Registered Nurses	$68,083	30.79	2,172	2,447	Associate's degree	None
29-2021	Dental Hygienists	$80,793	29.74	224	94	Associate's degree	None
29-2032	Diagnostic Medical Sonographers	$75,912	56.39	58	25	Associate's degree	None
29-2034	Radiologic Technologists and Technicians	$57,932	29.92	137	263	Associate's degree	None
29-2055	Surgical Technologists	$49,551	39.85	85	90	Postsecondary non-degree	None

						award	
29-2061	Licensed Practical and Licensed Vocational Nurses	$44,996	28.58	310	338	Postsecondary non-degree award	None
29-2071	Medical Records and Health Information Technicians	$42,269	30.52	138	231	Postsecondary non-degree award	None
31-2021	Physical Therapist Assistants	$48,157	41.44	54	94	Associate's degree	None
47-2021	Brickmasons and Blockmasons	$44,454	60.85	86	N/A	High school diploma or equivalent	Apprenticeship
47-2031	Carpenters	$39,094	36.40	862	50[a]	High school diploma or equivalent	Apprenticeship
47-2044	Tile and Marble Setters	$37,361	32.21	40	N/A	Less than high school	Long-term on-the-job training
47-2111	Electricians	$48,043	42.30	909	637[a]	High school diploma or equivalent	Apprenticeship
47-2121	Glaziers	$42,952	38.16	83	N/A	High school diploma or equivalent	Apprenticeship
47-2211	Sheet Metal Workers	$43,316	36.48	143	99 [a]	High school diploma or equivalent	Apprenticeship
47-2221	Structural Iron and Steel Workers	$39,674	40.09	63	N/A	High school diploma or equivalent	Apprenticeship
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	$47,841	25.27	148	N/A	High school diploma or equivalent	Long-term on-the-job training
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	$46,158	39.49	261	356 [a]	Postsecondary non-degree award	Long-term on-the-job training
49-9041	Industrial Machinery Mechanics	$50,591	38.48	366	N/A	High school diploma or equivalent	Long-term on-the-job training
49-9062	Medical Equipment Repairers	$43,592	38.86	87	40	Associate's degree	Moderate-term on-the-job training
53-3032	Heavy and Tractor-Trailer Truck Drivers	$42,078	32.27	1,202	N/A	Postsecondary non-degree award	Short-term on-the-job training

[a] Designates completions at community or technical colleges and is not necessarily comprehensive of all related training (i.e., other apprenticeship completions).
* Indicates an inadequate number of shared completions across multiple occupations
(N/A) Indicates specific programs do not crosswalk to this SOC, it is difficult to ascertain which completers would enter this occupation, or there are no related programs at an institution.

Table 5: Bachelor's and Graduate Degree Level Top Jobs

Occupation Code	Occupation	Median Annual Wage	Total Percent Change	Total Annual Average Openings	Related Completions (2013)	Entry Education Level	Training Level
11-1021	General and Operations Managers	$100,444	26.79	1,906	N/A	Bachelor's degree	None
11-2021	Marketing Managers	$128,515	25.96	123	N/A	Bachelor's degree	None
11-3021	Computer and Information Systems Managers	$132,917	28.13	267	N/A	Bachelor's degree	None

11-3031	Financial Managers	$127,375	28.20	270	N/A	Bachelor's degree	None
11-3121	Human Resources Managers	$117,739	35.06	89	N/A	Bachelor's degree	None
11-9021	Construction Managers	$85,377	27.26	413	N/A	Bachelor's degree	Moderate-term on-the-job training
11-9031	Education Administrators, Preschool and Childcare Center/Program	$44,133	29.64	42	N/A	Bachelor's degree	None
11-9033	Education Administrators, Postsecondary	$78,874	24.21	122	N/A	Master's degree	None
11-9111	Medical and Health Services Managers	$98,109	31.84	219	N/A	Bachelor's degree	None
11-9151	Social and Community Service Managers	$65,387	25.18	71	N/A	Bachelor's degree	None
13-1051	Cost Estimators	$58,343	42.61	403	N/A	Bachelor's degree	None
13-1081	Logisticians	$71,851	46.83	158	N/A	Bachelor's degree	None
13-1111	Management Analysts	$75,025	36.31	575	N/A	Bachelor's degree	None
13-1121	Meeting, Convention, and Event Planners	$41,492	39.36	167	N/A	Bachelor's degree	None
13-1151	Training and Development Specialists	$59,984	29.36	243	N/A	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
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
15-1141	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
15-2031	Operations Research Analysts	$85,644	42.89	52	165	Bachelor's degree	None
17-1011	Architects, Except Landscape and Naval	$70,192	32.78	183	N/A	Bachelor's degree	Internship/residency
17-1012	Landscape Architects	$69,456	26.19	47	52	Bachelor's degree	Internship/residency
17-1022	Surveyors	$58,866	25.72	52	N/A	Bachelor's degree	None
17-2051	Civil Engineers	$79,854	32.56	386	475	Bachelor's degree	None
17-2061	Computer Hardware Engineers	$101,896	28.68	203	82	Bachelor's degree	None
17-2071	Electrical Engineers	$87,000	26.85	183	186	Bachelor's degree	None
17-2081	Environmental Engineers	$81,100	40.95	172	118	Bachelor's degree	None

17-2171	Petroleum Engineers	$130,961	73.49	172	150	Bachelor's degree	None
19-2021	Atmospheric and Space Scientists	$92,484	31.55	103	56	Bachelor's degree	None
19-2041	Environmental Scientists and Specialists, Including Health	$73,586	29.22	183	150	Bachelor's degree	None
19-2042	Geoscientists, Except Hydrologists and Geographers	$100,296	43.65	191	220	Bachelor's degree	None
21-1014	Mental Health Counselors	$40,048	32.17	209	N/A	Master's degree	Internship/residency
21-1021	Child, Family, and School Social Workers	$42,026	24.72	268	538	Bachelor's degree	None
21-1022	Healthcare Social Workers	$50,401	33.73	119	N/A	Master's degree	None
21-1023	Mental Health and Substance Abuse Social Workers	$39,620	28.36	95	N/A	Bachelor's degree	None
21-1091	Health Educators	$52,694	29.67	43	N/A	Bachelor's degree	None
23-1011	Lawyers	$115,367	24.61	649	523	Doctoral or professional degree	None
25-1071	Health Specialties Teachers, Postsecondary	$107,224	47.36	253	N/A	Doctoral or professional degree	None
25-1072	Nursing Instructors and Teachers, Postsecondary	$59,817	46.68	53	N/A	Doctoral or professional degree	None
25-1121	Art, Drama, and Music Teachers, Postsecondary	$51,939	25.05	81	N/A	Doctoral or professional degree	None
27-1025	Interior Designers	$44,127	30.19	85	165	Bachelor's degree	None
27-3042	Technical Writers	$65,659	28.46	88	N/A	Bachelor's degree	Short-term on-the-job training
27-3091	Interpreters and Translators	$47,642	69.75	122	N/A	Bachelor's degree	Short-term on-the-job training
29-1031	Dietitians and Nutritionists	$54,622	30.40	47	235	Bachelor's degree	Internship/residency
29-1051	Pharmacists	$119,883	27.52	226	246	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	72	Master's degree	None
29-1122	Occupational Therapists	$76,746	33.64	129	34	Master's degree	None
29-1123	Physical Therapists	$72,824	40.19	313	225	Doctoral or professional degree	None
29-1129	Therapists, All Other	$58,984	29.35	54	N/A	Bachelor's degree	None
29-1131	Veterinarians	$78,124	26.06	127		Doctoral or	None

					156	professional degree	
29-1171	Nurse Practitioners	$95,250	37.75	124	91	Master's degree	None
29-9011	Occupational Health and Safety Specialists	$73,914	26.64	71	N/A	Bachelor's degree	Short-term on-the-job training
53-2011	Airline Pilots, Copilots, and Flight Engineers	$106,168	37.45	182	77	Bachelor's degree	Moderate-term on-the-job training

* Indicates an inadequate number of shared completions across multiple occupations
(N/A) Indicates specific programs do not crosswalk to this SOC, it is difficult to ascertain which completers would enter this occupation or there are no related programs at an institution.

Occupational Demand by Credential Level

This section presents an overview of where potential gaps exist in certain occupation areas by credential level based on a snapshot of current completion levels alongside current projected openings. Projections of job openings are certainly not a guarantee that such demand will arise, but we are using them in this report to help guide our attention in prioritizing further exploration of various fields. Here we examine projected openings for occupation clusters as defined by Standard Occupational Codes (SOC) by level of postsecondary education. We use three education levels: *mid-level* (e.g., certificates, associate's degrees), *bachelor's level* and *graduate level*. Limitations to this analysis are outlined in Appendix B, along with additional information and data tables.

Mid-level

Mid-level completions correspond to jobs that typically require more than a high school education, but less than a bachelor's degree (such as associate's degrees or certificates and credentials acquired at community and technical colleges). Fields with notable gaps are consistent with last year's findings. While there may be unique discrepancies in supply and demand at individual occupation levels, there appear to be inadequate completions for *computer-related* occupations (e.g., computer user support specialists, web developers), [2] various *skilled trades* (e.g., industrial machinery mechanics) and *science technicians* (e.g., geological and petroleum technicians), in particular.

[2] For IT occupations, additional analysis of specific technical skills that are in high demand by industry is also important. Some coding languages are currently seen in job postings at higher rates than others, and these languages change, as well.

Per the Brookings Institution definition of STEM occupations, all of the computer-related and 97 percent of science technician openings are for STEM jobs. For job openings in the construction/extraction, and installation, maintenance and repair occupation groups, STEM job openings hover around 50 percent of jobs in these categories. Three percent of jobs included in the mid-level transportation and material moving jobs are defined as STEM.

Production occupations (such as plant operators and machinists) have particularly high aged workforces, so it is important to train the next generation of skilled workers. In September 2012, the U.S. Department of Labor awarded a $25 million grant to a consortium of Colorado community colleges to develop advanced manufacturing programs; in addition, HB 13-1165 was passed in 2013, authorizing the creation of Manufacturing Career Pathways. There are currently five active manufacturing sector partnerships and statewide organizations, such as Manufacturer's Edge and the Colorado Advanced Manufacturing Alliance, that are collaborating around a variety of resources to build out regional and statewide career pathways.

Bachelor's and Graduate Level

At the baccalaureate and graduate level there are a number of occupation groups that showed potential insufficient completions to related industry demand. Because the highly educated workforce is quite mobile, many of these graduates have the option to pursue opportunities in other states. Consistent with last year's findings, data show we are likely not producing enough graduates trained to enter *financial* occupations (e.g., accountants, financial analysts), *computer-related* occupations (e.g., programmers, computer systems analysts) or *healthcare* occupations (e.g., physicians, occupational therapists). Certain areas of specialization for *K-12 educators* (e.g., math, special education) continue to be in high demand and rural districts continue to report challenges in retaining a teaching workforce; the Colorado Department of Education and DHE have targeted initiatives in place to develop a stronger educator pipeline to the rural areas in the state.

While data show that overall engineering degree completions meet projected job openings, engineers in particular are often recruited out-of-state, and this may impact how many graduates we are able to retain in-state. Occupation groups that we may risk maintaining current graduate-level educational attainment levels of workers include financial and IT workers. Of additional note, many of these occupation areas—such as finance, engineering, architecture and skilled healthcare practitioners—are occupation clusters that tend to be more skewed to older age workers. This is important to consider as we plan and implement talent development strategies, especially as we continue to gain distance from the last recession, and as baby boomers continue to retire.

Examination of potential deficits in completions for the graduate/professional level group of healthcare practitioners is complicated by the fact that many of these jobs

could require upwards of ten years of schooling, and the healthcare industry will continue to evolve in staffing structures as practices and technology change. However, there are also many variables that impact these completion figures for physicians in particular, such as the limited number of residency positions nationwide and current funding structures. This is then compounded by the impending baby boomer population that will face increasing healthcare needs, as well as by that of the potential increase in practitioner demand as a result of more insured patients under the Affordable Care Act. Colorado is currently participating in a National Governor's Association policy academy to support mechanisms for the more targeted development of our state's healthcare workforce, and there are nine active or emerging healthcare sector partnerships and most have identified workforce as a critical issue on which to focus.

Per the Brookings definition of STEM occupations, the majority of job openings in these occupation groups (finance, IT, healthcare, air transportation) with potential supply-demand gaps are considered STEM occupations. Eighty-six percent of bachelor's level finance occupations and 87 percent of graduate level healthcare occupations are defined as STEM. All bachelor's level computer-related and air transportation occupations are defined as STEM. While national conversation circles around low representation of females employed in computer science occupations, women also complete related computer and information technology degrees at far lower numbers than men. Of the 2013 computer/IT degrees awarded, 18 percent were earned by females; relatedly, 26 percent of workers in a computer-related STEM occupation are female. Similar gender ratios can be found for completions for aviation programs (15 percent female graduates).

Two and Four Year Public Institution Profiles

Per additional evaluation as proposed by the Colorado Commission on Higher Education Master Plan, this report also includes the roles and missions, locations and service areas of public colleges and universities. Colorado is a state with diverse regions and regional economies and, as such, many Colorado state agencies use a common planning and management regional guideline, dividing the state into 14 regions. The first map below (Figure 7) orients us to main and satellite campus locations of two and four year institutions overlaying Colorado's planning and management regions. The second map (Figure 8) shows sector partnerships by region, demonstrating where current and emerging industries exist across our state. Alongside supply-demand analysis, these maps provide a reference for potential institution-industry partnerships by regional need. Appendix C includes a table outlining each institution's location, role and mission. While of course there is inter-regional activity, whether it be economic, educational or otherwise, all of our regions have one or more public postsecondary institutions that can play a role in serving region-specific demands. Seven regions have both community college and four year institution campuses (regions 2, 3, 4, 7, 8, 9, 11), one region has only a four year

institution (region 10) and five regions have only main and/or satellite community college campuses (regions 1, 5, 6, 12, 13, 14).

Figure 5: Map of Colorado Public Colleges and Universities and Regional Designations

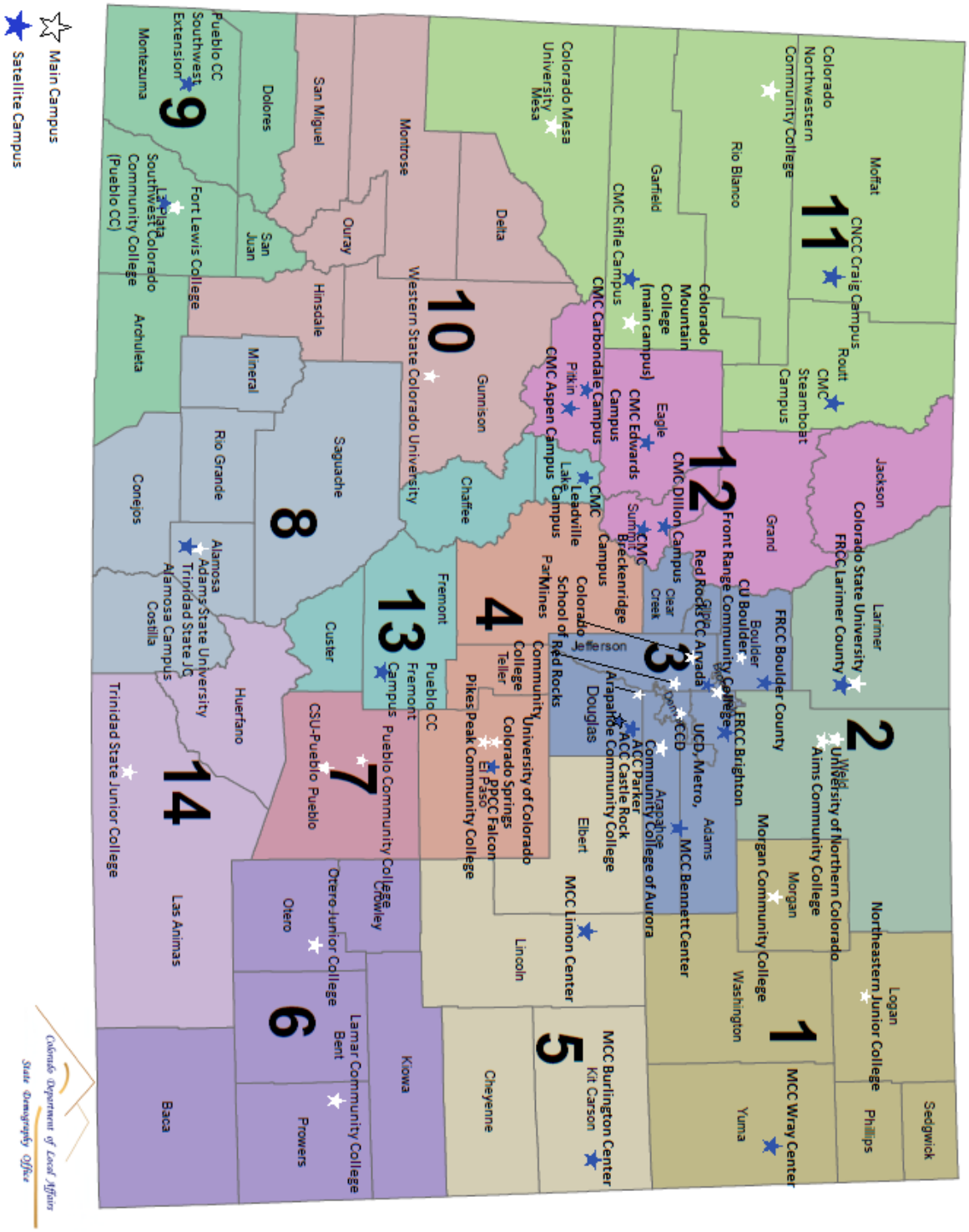
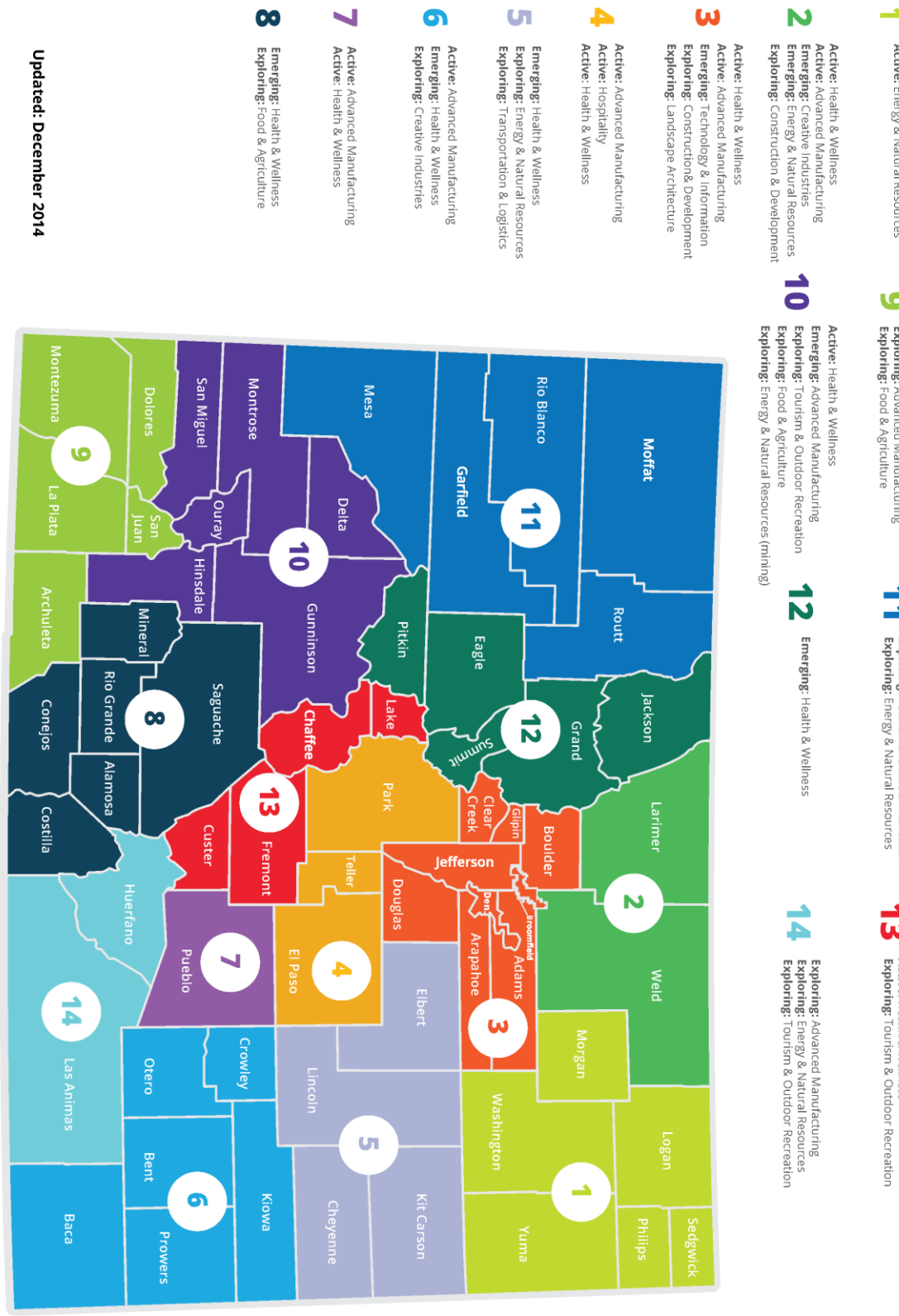


Figure 6: Map of Sector Partnerships by Region



Recommendations

The state of Colorado has an interest and commitment to educating its residents for meaningful and instrumental roles in its burgeoning economy. While this report looks toward the future and, based on current data and information, makes inferences regarding prospects for Colorado, there is certainly room for a change of course in this fast evolving world. We conclude this report with various recommendations of issues and concerns that should be in our line of sight as we participate in, design and develop our state's economies and educational networks.

In considering means to implement these recommendations it is important to consider the work Colorado has done over the last four years toward alignment of education, workforce development and economic development to meet industry needs. According to Executive Order B2010-012, the Colorado Workforce Development Council (CWDC) is responsible for ensuring effective alignment of workforce development, education and economic development initiatives related to talent development for Colorado's businesses.

The Colorado Blueprint laid the foundation for an aggressive economic development plan for the State of Colorado, including Core Objective V, Educate and Train the Workforce of the Future, which is led by the Colorado Workforce Development Council (CWDC), the state's Workforce Investment Board. This is a collaborative approach of many partners including (but not limited to) CDHE, Colorado Department of Education, Colorado Department of Labor & Employment, Colorado Department of Human Services, Colorado Department of Corrections, Colorado Community College System and Career & Technical Education, and the Office of Economic Development and International Trade, as well as local and regional partners of each of these state agencies. Through this structure, CWDC is convening leaders and subject matter experts to develop aligned solutions, leverage resources and utilize data and industry input to ensure effective outcomes.

Analysis should be based on state-level or regional data rather than national-level data when available

Coloradans, in general, are better educated than people from other states, but that does not mean we are better prepared to meet our specific workforce needs. The job openings that need to be filled in Colorado both now and in the next decade are more likely to require postsecondary credentials than in most other states. We must focus on Colorado-specific data or we are at risk of failing to plan adequately, potentially producing an excess of graduates with certain skills and a shortage of graduates with much needed skills.

Strengthen data sharing relationships between Colorado's Department of Labor and Employment, Department of Education and Department of Higher Education

Each of the Colorado Departments, Labor and Employment, Education and Higher Education, gather and store vast quantities of data that would facilitate greater planning and coordination among institutions and employers so that workforce needs will be met and graduates will have full employment opportunities. Current information may need to be supplemented, however, with more detail about specific regional market needs and important distinctions within broad occupation categories. These agencies have been and continue to work toward connecting K-12, postsecondary education and labor data to better understand aggregate trends and address policy questions and measure effectiveness of initiatives.

Develop effective career pathways

While we are producing postsecondary graduates, we still are not graduating enough in certain program areas that meet the demands of our state's economy. Research has shown that countries with higher levels of educational attainment offer diverse pathways, as well as connect employers to the educational process to prepare students for certain careers (Symonds, Schwartz & Ferguson, 2011). Our state does have various industry-led career pathways in place and is planning to formally implement more. It is important to highlight the significance of this work and the essential continued support of it if we are to educate Coloradans and support their success in our state. As our state develops various career pathway tracks, we should bear in mind that places for entry and re-entry can be helpful for those who initially enter a field at a lower educational level and later desire to obtain additional credentials to enhance career opportunities (such as, one may have an accounting technician credential, but eventually pursues a bachelor's degree in finance/business, or a licensed vocational/practical nurse completed a one or two year program initially, but eventually pursues a registered nursing degree, etc.).

In addition to the creation of specific career paths in demand by industry, focus should be put on the current effort of state and local partners that are working to create a statewide tapestry of career pathways including all high demand occupations and opportunities for all Coloradans. This statewide Career Pathway System is currently receiving technical assistance from the U.S. Department of Adult and Vocational Education and has potential for integrating the various career paths, as well as the work of all education and workforce development partners.

Continue to closely examine and address the supply-demand relationships in high growth/high demand areas such as healthcare, IT, skilled trades and finance

This report has highlighted various areas where there may be gaps in the supply of graduates that correlate with specific occupations or occupation clusters. Various types of healthcare practitioners, IT professionals, financial specialists and skilled

trades workers have appeared in both the list of jobs with projected high growth rates and openings, as well as in general fields with potential supply-demand gaps.

Currently, Colorado has five active healthcare sector partnerships, five active manufacturing sector partnerships and additional emerging partnerships in progress. For instance, existing sector partnerships (industry-specific regional partnerships) are addressing the supply-demand relationship and acute healthcare workforce shortages in the state. The Greater Metro Denver Healthcare Partnership serves as a pilot for the creation of Career Pathway templates in building out a statewide Career Pathway System. An overview of this strategic alliance can be found here: http://www.youtube.com/user/DenHealthPartnership

Continue to build strong industry-institution partnerships

When we look globally to best practices in cultivating an educated workforce that fulfill economic demand, strong industry-institution partnerships and earn-and-learn models continue to stand out as effective strategies for many kinds of career pathways. Often, we think of these models as connected to the skilled trades, and as we develop additional programs in advanced manufacturing, we should be aware of educational models that encourage completion rates and smooth transitions into employment. It is worthwhile to look towards innovative and adaptable business concepts that are particularly oriented towards real world skills that specific employers and fields want.

Colorado is recognized nationally as a leader in bringing industry together with education, workforce development and economic development to address these issues. Colorado's Sector Strategies, which support regional Sector Partnerships (see map on page 22), integrate the work of economic development and the needs of industry with education and workforce partners and efforts. The resulting outcomes are comprehensive career pathways that include all levels of education, training, applied learning, connections to work experience opportunities and placement in jobs.

Find ways to increase postsecondary success for Colorado's fastest growing demographic groups

As Colorado faces an increasing demand for well-educated and credentialed graduates of postsecondary institutions to meet the workforce demands of the future, it also faces a rapidly changing demographic in its K-12 primary and secondary pipeline. An increasing percentage of those students are members of minority groups and face other risk factors, such as being low-income and coming from families where they will be the first to pursue higher education. In the past, those groups have not found postsecondary success at the same rate as their white peers. Colorado will not meet the workforce needs of the future unless it can improve the rate at which members of those underserved groups graduate from high school are ready to enroll in college-level classes, enroll in and persist through certificate or degree completion, and enter

the workforce. For that to happen, Colorado must be prepared to invest resources not only into high quality academic programs, but also toward financial aid, controlling college costs so as to maintain reasonable tuition and fees and providing academic support systems to help students successfully complete their chosen programs of study.

Provide students and families with the tools and knowledge to make informed decisions

It is crucial to provide students and their families with the tools and information to support them through their decision-making processes regarding postsecondary education. By providing accessible information regarding completion rates, the job market, unemployment rates and the like to interested stakeholders, there is the opportunity for completions and economic demands to better align. Ultimately, if we can help students and jobseekers know where opportunities likely exist, then we can help them spend their education dollars wisely.

Conclusion

Overall, whether or not we are "meeting the numbers" is less of an issue than whether our institutions are able to maintain the momentum to provide a high quality education for all students. It is critical that our colleges and universities across Colorado focus on delivering high-quality graduates so that Colorado employers continue to respect and seek out the credentials of Colorado-educated graduates. Further developing partnerships between Colorado's postsecondary institutions and Colorado's employers is critical to the advancement of our state's economy.

References

Berger, N. and Fisher, P. (2013). *A well-educated workforce is key to state prosperity*. Washington, D.C.: Economic Analysis and Research Network. Retrieved from http://www.epi.org/publication/states-education-productivity-growth-foundations/

Carnevale, A. P., Jayasundera, T. and Cheah, B. (2012). *The college advantage: Weathering the economic storm*. Washington D.C.: Center on Education and the Workforce, Georgetown University. Retrieved from http://cew.georgetown.edu/collegeadvantage/

Carnevale, A. P., and Rose, S. J. (2011). *The undereducated American*. Washington, D.C.: Center on Education and the Workforce, Georgetown University. Retrieved from http://cew.georgetown.edu/undereducated/

Carnevale, A. P., Smith, N. and Strohl, J. (2013). *Recovery: Job growth and education requirements through 2020*. Washington, D.C.: Center on Education and the Workforce, Georgetown University. Retrieved from http://cew.georgetown.edu/recovery2020/

Colorado Office of State Planning and Budgeting. (September 2014). *The Colorado economic outlook*.

Grusky, D. B., Red Bird, B., Rodriguez, N. and Wimer, C. (2013). *How much protection does a college degree afford? The impact of the recession on recent college graduates*. Washington, D.C.: The Pew Charitable Trusts. Retrieved from http://www.pewstates.org/uploadedFiles/PCS_Assets/2013/Pew_college_grads_recession_report.pdf

Science, Technology, Engineering, and Mathematics Education: *Assessing the relationship between education and the workforce*. GAO-14-374. Washington, D.C.: May, 2014.

Symonds, W. C., Schwartz, R. and Ferguson, R. F. (2011). *Pathways to prosperity: Meeting the challenge of preparing young Americans for the 21st century*. Cambridge, MA: Pathways to Prosperity Project, Harvard University Graduate School of Education.

Appendix A: Colorado's Top Jobs List

Occupation Code	Occupation	Median Annual Wage	Total Percent Change 2013-2023	Total Annual Average Openings	Related Completions (2013)	Entry Education Level	Additional Training Level
11-1021	General and Operations Managers	$100,444	26.79	1,906	N/A	Bachelor's degree	None
11-2021	Marketing Managers	$128,515	25.96	123	N/A	Bachelor's degree	None
11-3021	Computer and Information Systems Managers	$132,917	28.13	267	N/A	Bachelor's degree	None
11-3031	Financial Managers	$127,375	28.2	270	N/A	Bachelor's degree	None
11-3121	Human Resources Managers	$117,739	35.06	89	N/A	Bachelor's degree	None
11-9021	Construction Managers	$85,377	27.26	413	N/A	Bachelor's degree	Moderate-term on-the-job training
11-9031	Education Administrators, Preschool and Childcare Center/Program	$44,133	29.64	42	N/A	Bachelor's degree	None
11-9033	Education Administrators, Postsecondary	$78,874	24.21	122	N/A	Master's degree	None
11-9111	Medical and Health Services Managers	$98,109	31.84	219	N/A	Bachelor's degree	None
11-9141	Property, Real Estate, and Community Association Managers	$67,334	30.07	177	N/A	High school diploma or equivalent	None
11-9151	Social and Community Service Managers	$65,387	25.18	71	N/A	Bachelor's degree	None
13-1022	Wholesale and Retail Buyers, Except Farm Products	$44,321	24.36	93	N/A	High school diploma or equivalent	Long-term on-the-job training
13-1051	Cost Estimators	$58,343	42.61	403	N/A	Bachelor's degree	None
13-1081	Logisticians	$71,851	46.83	158	N/A	Bachelor's degree	None
13-1111	Management Analysts	$75,025	36.31	575	N/A	Bachelor's degree	None
13-1121	Meeting, Convention, and Event Planners	$41,492	39.36	167	N/A	Bachelor's degree	None
13-1151	Training and Development Specialists	$59,984	29.36	243	N/A	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
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	$77,122	25.51	435	*	Bachelor's degree	None

	Administrators						
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	165	Bachelor's degree	None
17-1011	Architects, Except Landscape and Naval	$70,192	32.78	183	N/A	Bachelor's degree	Internship/ residency
17-1012	Landscape Architects	$69,456	26.19	47	52	Bachelor's degree	Internship/ residency
17-1022	Surveyors	$58,866	25.72	52	7	Bachelor's degree	None
17-2051	Civil Engineers	$79,854	32.56	386	475	Bachelor's degree	None
17-2061	Computer Hardware Engineers	$101,896	28.68	203	82	Bachelor's degree	None
17-2071	Electrical Engineers	$87,000	26.85	183	186	Bachelor's degree	None
17-2081	Environmental Engineers	$81,100	40.95	172	118	Bachelor's degree	None
17-2171	Petroleum Engineers	$130,961	73.49	172	150	Bachelor's degree	None
17-3012	Electrical and Electronics Drafters	$59,951	35.7	40	*	Associate's degree	None
17-3031	Surveying and Mapping Technicians	$48,888	28.9	78	85	High school diploma or equivalent	Moderate-term on-the-job training
19-2021	Atmospheric and Space Scientists	$92,484	31.55	103	56	Bachelor's degree	None
19-2041	Environmental Scientists and Specialists, Including Health	$73,586	29.22	183	150	Bachelor's degree	None
19-2042	Geoscientists, Except Hydrologists and Geographers	$100,296	43.65	191	220	Bachelor's degree	None
19-4031	Chemical Technicians	$43,559	33.02	43	N/A	Associate's degree	Moderate-term on-the-job training
19-4041	Geological and Petroleum Technicians	$56,455	52.49	54	4	Associate's degree	Moderate-term on-the-job training
19-4091	Environmental Science and Protection Technicians, Including Health	$45,191	39.42	88	94	Associate's degree	None
21-1011	Substance Abuse and Behavioral Disorder Counselors	$39,094	32.95	85	N/A	High school diploma or equivalent	Moderate-term on-the-job training
21-1014	Mental Health Counselors	$40,048	32.17	209	N/A	Master's degree	Internship/ residency
21-1021	Child, Family, and School Social Workers	$42,026	24.72	268	538	Bachelor's degree	None
21-1022	Healthcare Social Workers	$50,401	33.73	119	N/A	Master's degree	None
21-1023	Mental Health and Substance Abuse Social Workers	$39,620	28.36	95	N/A	Bachelor's degree	None
21-1091	Health Educators	$52,694	29.67	43	N/A	Bachelor's degree	None
23-1011	Lawyers	$115,367	24.61	649	523	Doctoral or professional degree	None
23-2011	Paralegals and Legal Assistants	$50,513	32.85	269	243	Associate's degree	None
25-1071	Health Specialties Teachers, Postsecondary	$107,224	47.36	253	N/A	Doctoral or professional degree	None
25-1072	Nursing Instructors and Teachers, Postsecondary	$59,817	46.68	53	N/A	Doctoral or professional degree	None

25-1121	Art, Drama, and Music Teachers, Postsecondary	$51,939	25.05	81	N/A	Doctoral or professional degree	None
27-1025	Interior Designers	$44,127	30.19	85	165	Bachelor's degree	None
27-3042	Technical Writers	$65,659	28.46	88	N/A	Bachelor's degree	Short-term on-the-job training
27-3091	Interpreters and Translators	$47,642	69.75	122	N/A	Bachelor's degree	Short-term on-the-job training
27-4011	Audio and Video Equipment Technicians	$47,188	26.77	57	22	Postsecondary non-degree award	Short-term on-the-job training
29-1031	Dietitians and Nutritionists	$54,622	30.4	47	235	Bachelor's degree	Internship/ residency
29-1051	Pharmacists	$119,883	27.52	226	246	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	72	Master's degree	None
29-1122	Occupational Therapists	$76,746	33.64	129	34	Master's degree	None
29-1123	Physical Therapists	$72,824	40.19	313	225	Doctoral or professional degree	None
29-1126	Respiratory Therapists	$57,112	32.08	77	91	Associate's degree	None
29-1129	Therapists, All Other	$58,984	29.35	54	N/A	Bachelor's degree	None
29-1131	Veterinarians	$78,124	26.06	127	156	Doctoral or professional degree	None
29-1141	Registered Nurses	$68,083	30.79	2,172	2,447	Associate's degree	None
29-1171	Nurse Practitioners	$95,250	37.75	124	91	Master's degree	None
29-2021	Dental Hygienists	$80,793	29.74	224	94	Associate's degree	None
29-2032	Diagnostic Medical Sonographers	$75,912	56.39	58	25	Associate's degree	None
29-2034	Radiologic Technologists and Technicians	$57,932	29.92	137	263	Associate's degree	None
29-2055	Surgical Technologists	$49,551	39.85	85	90	Postsecondary non-degree award	None
29-2061	Licensed Practical and Licensed Vocational Nurses	$44,996	28.58	310	338	Postsecondary non-degree award	None
29-2071	Medical Records and Health Information Technicians	$42,269	30.52	138	231	Postsecondary non-degree award	None
29-2099	Health Technologists and Technicians, All Other	$37,305	32.92	98	N/A	High school diploma or equivalent	None
29-9011	Occupational Health and Safety Specialists	$73,914	26.64	71	N/A	Bachelor's degree	Short-term on-the-job training
31-2021	Physical Therapist Assistants	$48,157	41.44	54	94	Associate's degree	None
37-1012	First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	$46,593	24.7	152	N/A	High school diploma or equivalent	None
41-3099	Sales Representatives, Services, All Other	$50,658	27.71	1,053	N/A	High school diploma or equivalent	Short-term on-the-job training
41-9021	Real Estate Brokers	$43,942	25.58	111	70	High school diploma or equivalent	None
43-3051	Payroll and Timekeeping Clerks	$42,135	28.79	124	*	High school diploma or	Moderate-term on-

						equivalent	the-job training
43-5032	Dispatchers, Except Police, Fire, and Ambulance	$40,384	26.14	156	N/A	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	N/A	High school diploma or equivalent	None
47-2021	Brickmasons and Blockmasons	$44,454	60.85	86	N/A	High school diploma or equivalent	Apprentices hip
47-2031	Carpenters	$39,094	36.4	862	50[a]	High school diploma or equivalent	Apprentices hip
47-2044	Tile and Marble Setters	$37,361	32.21	40	N/A	Less than high school	Long-term on-the-job training
47-2071	Paving, Surfacing, and Tamping Equipment Operators	$38,490	37.7	83	13 [a]	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	13 [a]	High school diploma or equivalent	Moderate-term on-the-job training
47-2111	Electricians	$48,043	42.3	909	637 [a]	High school diploma or equivalent	Apprentices hip
47-2121	Glaziers	$42,952	38.16	83	N/A	High school diploma or equivalent	Apprentices hip
47-2152	Plumbers, Pipefitters, and Steamfitters	$48,049	42.38	483	344 [a]	Less than high school	Moderate-term on-the-job training
47-2181	Roofers	$37,405	29.4	185	N/A	Less than high school	Moderate-term on-the-job training
47-2211	Sheet Metal Workers	$43,316	36.48	143	99 [a]	High school diploma or equivalent	Apprentices hip
47-2221	Structural Iron and Steel Workers	$39,674	40.09	63	N/A	High school diploma or equivalent	Apprentices hip
47-4099	Construction and Related Workers, All Other	$37,276	37.38	48	38 [a]	High school diploma or equivalent	Moderate-term on-the-job training
47-5011	Derrick Operators, Oil and Gas	$49,693	52.18	66	N/A	Less than high school	Short-term on-the-job training
47-5012	Rotary Drill Operators, Oil and Gas	$55,577	52.04	84	N/A	Less than high school	Moderate-term on-the-job training
47-5013	Service Unit Operators, Oil, Gas, and Mining	$43,450	56.56	353	N/A	Less than high school	Moderate-term on-the-job training
47-5071	Roustabouts, Oil and Gas	$37,075	52.95	252	N/A	Less than high school	Moderate-term on-the-job training
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	$47,841	25.27	148	N/A	High school diploma or equivalent	Long-term on-the-job training

49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	$46,158	39.49	261	356 [a]	Postsecondary non-degree award	Long-term on-the-job training
49-9041	Industrial Machinery Mechanics	$50,591	38.48	366	N/A	High school diploma or equivalent	Long-term on-the-job training
49-9062	Medical Equipment Repairers	$43,592	38.86	87	40	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	N/A	High school diploma or equivalent	Moderate-term on-the-job training
53-2011	Airline Pilots, Copilots, and Flight Engineers	$106,168	37.45	182	74	Bachelor's degree	Moderate-term on-the-job training
53-2031	Flight Attendants	$38,643	38.55	134	N/A	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	N/A	Postsecondary non-degree award	Short-term on-the-job training
53-7021	Crane and Tower Operators	$55,283	52.53	50	13 [a]	High school diploma or equivalent	Moderate-term on-the-job training
53-7073	Wellhead Pumpers	$53,161	60.83	77	N/A	Less than high school	Moderate-term on-the-job training

[a] Designates completions at community or technical colleges and is not necessarily comprehensive of all related training (i.e., apprenticeship completions).
* Indicates an inadequate number of shared completions across multiple occupations
(N/A) Indicates specific programs do not crosswalk to this SOC, it is difficult to ascertain which completers would enter this occupation or there are no related programs at an institution.

Appendix B: Technical Information

Calculations

To create the Top Jobs list, we isolated occupations from Colorado's Office of Labor Market Information (LMI) 2013 to 2023 projections that met three criteria: above average projected growth (23.74 percent), average annual openings of 40 or above and offers a median hourly wage of $17.88 or higher (meeting the threshold of sustainable living wage averaged across the state). Related completions are from Integrated Postsecondary Educational Data System (IPEDS) and program completions are crosswalked to related occupations based on the National Center for Education Statistics (NCES) SOC-CIP crosswalk.

To develop our analysis of occupational demand by credential level, we had to take into account both the entry education level requirements and the actual educational attainment levels of those employed in the occupation (what we denote as the competitive education level) so as to provide a more accurate present day education level expectation. Colorado LMI projections and BLS data reflecting educational attainment percentages by Standard Occupational Classification (SOC) code were primarily used to reach our figures.

To analyze by credential level demand we first isolated occupations by SOC occupation group and sub-groups. For example, for the SOC major group 13 (business and financial operations occupations), greater specificity in the supply-demand relationship was yielded by conducting analysis separately for the two sub-groups (business operations specialists and financial specialists). Conducting analysis by SOC groups allows us to better account for CIP codes that align with more than one SOC code and to avoid duplicate counts as much as possible.

For each instance, we first isolated occupations by SOC group. We then calculated projected annual openings by typical educational level clusters (mid-level, bachelor's level and graduate level). We then crosswalked SOC codes to the associated CIP codes and established completion figures by credential/degree level. This provides the supply (or completions) by credential level, as well as the projection by entry education level. To establish the competitive education figures, we calculated education attainment levels by percent for the group of SOC codes being analyzed and then translated the SOC group's total annual openings into absolute numbers by education level based on these education attainment percentages.

Limitations

In reviewing the tables and figures in this report, these limitations should be considered:

- While data depict program completions as they are aligned to occupation codes by the National Center for Education Statistics (NCES) crosswalk, not all completers enter into the specific occupation to which the education program typically aligns, and some occupation codes simply do not seamlessly feed into a specific program code, or feed into multiple program codes. When possible, we try to avoid or we acknowledge such redundancy. Completions are only inclusive of institutions that report to the Integrated Postsecondary Educational Data System (IPEDS); there are a number of private occupational schools or apprenticeship programs that are not recorded in this data collection.
- This section examines general trends within large occupation clusters and there may be deficits or excesses in completions for individual occupations within larger occupation groups. The list of top jobs focuses on supply and demand for a number of individual occupations.
- Some completions do not enter Colorado's workforce immediately following graduation for various reasons, such as continuing education or pursuing opportunities out-of-state. Some completions are already members of the workforce and are perhaps pursuing an additional credential for professional development, to increase compensation potential and the like. This analysis does not isolate the exchange of workers across state and country borders, both with our Colorado-educated workers leaving the state and out-of-state educated workers entering Colorado. We do not account for the number of existing residents with specific skill sets/training levels who are currently available to fill openings and are seeking work in Colorado.
- Currently we are unable to produce a quality projection of anticipated postsecondary credential completions through 2020.
- This type of analysis tends to focus on technical-oriented degrees and occupations, as it is difficult to directly link a specific occupation with a liberal arts completer (who would also presumably embody a number of skill sets in high demand by employers such as critical thinking, speaking and writing skills).
- We can only base projections upon what we know today, accounting for occupations and industries that exist today. Projections are derived from algorithms that are based on current regional growth patterns. As exemplified by our most recent recession, our economic trajectory can shift dramatically and surprisingly in a short period of time, tossing aside any number of economic projections and models that are out there. Furthermore, without a crystal ball, we cannot account for new or emerging industries and occupations. Certainly we don't know the full extent of growth in areas such as big data or the potential renaissance of American manufacturing or whatever next great idea that is down the pike.
- Analysis in this report is state-wide. Individual regions may experience unique supply-demand relationships.

Estimates for Potential Gap Occupations

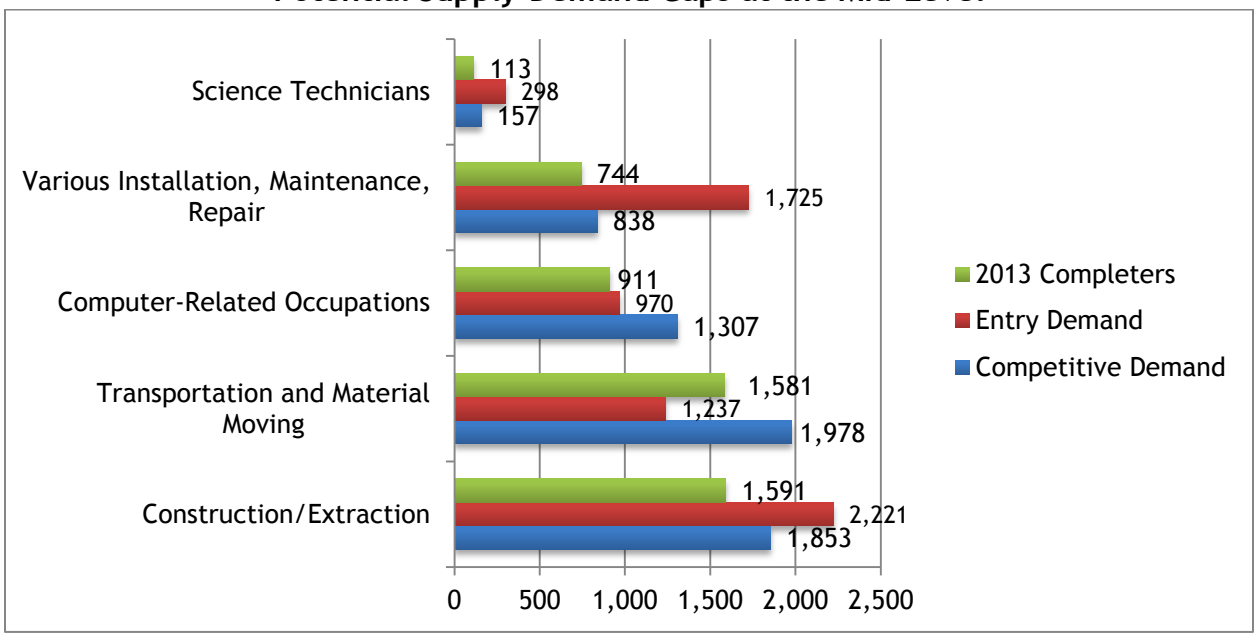
There are two ways by which we analyze the demand by credential level:

- By education requirements assigned to occupations as typically categorized by the Bureau of Labor Statistics (BLS), which are described as *entry education levels*. This is represented by the red bars in the following graphs.

- By the actual education attainment percentage rates of people employed in these occupations, per ACS data. This, in a sense, shows the *competitive level* of education currently experienced in each occupation. This is represented by the blue bars in the following graphs.

It is especially helpful to consider credential-level supply and demand from both of these angles in our current economy, especially when many employers are hiring candidates with higher levels of education for certain positions than prior to the recession. Essentially, for some occupations, the BLS education level designation presents as an entry level requirement, and may differ from the educational attainment level rates of people current employed in that occupation.

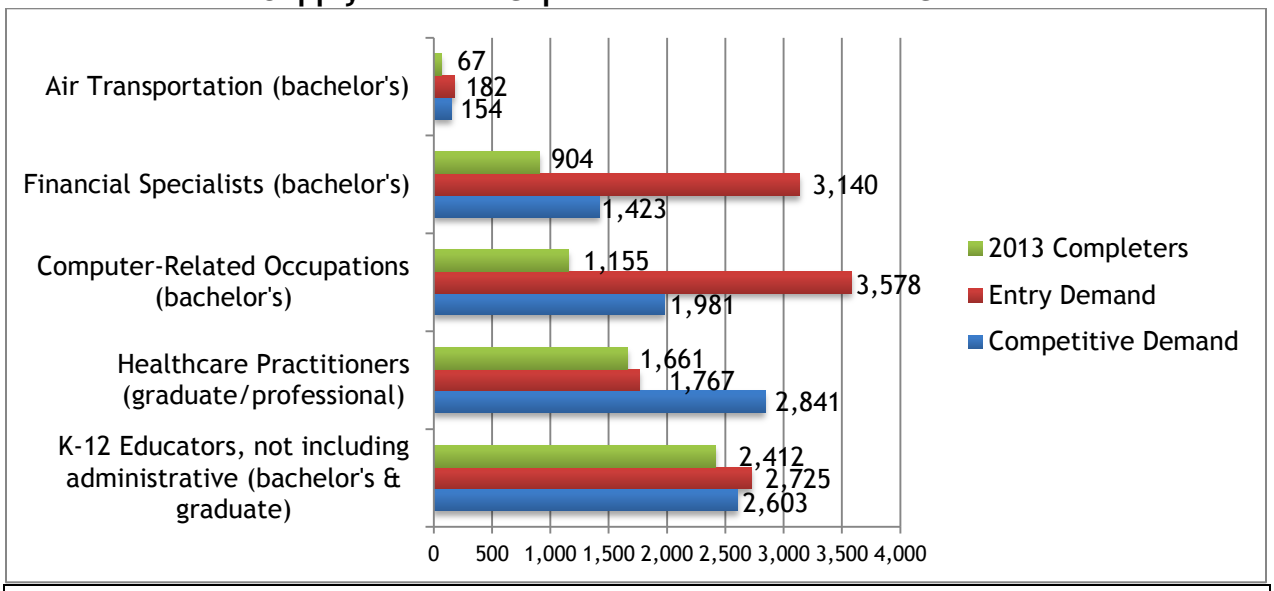
Potential Supply-Demand Gaps at the Mid-Level



Potential Supply-Demand Gaps at the Mid-Level					
Occupation Cluster	*Current Completions (2013)*			*Projected Annual Openings*	
	Public Inst.	*Private Inst.*	*Total Completions*	*Entry Education Level*	*Competitive Education Level*
Science Technicians	113	-	113	298	157
Installation, Maintenance, Repair	360	384	744	1,725	838

Construction/Extraction	1,433	158	1,591	2,221	1,853
Computer-Related	685	226	911	970	1,307
Transportation and Material Moving	1,581	-	1,581	1,237	1,978

Potential Supply-Demand Gaps at the Bachelor's and Graduate Level



Potential Supply-Demand Gaps at the Bachelor's and Graduate Level					
Occupation Cluster	*Current Completions (2013)*			*Projected Annual Openings*	
	Public Inst.	*Private Inst.*	*Total Completions*	*Entry Education Level*	*Competitive Education level*
Air Transportation (bachelor's)	67	0	67	182	154
Financial Specialists (bachelor's)	299	605	904	3,140	1,423
Computer-related (bachelor's)	487	668	1,155	3,578	1,981
Healthcare (graduate/professional level)	1,157	504	1,661	1,767	2,841
K-12 Educators, not including administrative (bachelor's and graduate)	1,966	446	2,412	2,725	2,603

Appendix C: Public Two and Four Year Postsecondary Institutions in Colorado

Institution	Main Campus, Region	Role/Mission
Adams State University	Alamosa, Region 8	General baccalaureate institution with moderately selective admission standards. Offers undergraduate liberal arts and sciences, teacher preparation, and business degree programs, a limited number of master's level programs, and two-year transfer programs with a community college role and mission. Adams State University does not offer vocational education programs. Adams State University has a significant responsibility to provide access to teacher education in rural Colorado, and serves as a regional education provider. In addition, Adams State University offers programs, when feasible, that preserve and promote the unique history and culture of the region.
Aims Community College	Greeley, Region 2	Two-year local district college with three campuses. Offers courses designed to transfer to four year institutions, and career and technical education programs.
Colorado Mesa University	Grand Junction, Region 11	A general baccalaureate and graduate institution with selective admission standards. Colorado Mesa University offers liberal arts and sciences, professional, and technical degree programs and a limited number of graduate programs. Colorado Mesa University also maintains a community college role and mission, including career and technical education programs, and serves as a regional education provider.
Colorado Mountain College	Glenwood Springs, Region 12	Two-year local district college with 11 campuses serving nine counties in north central Colorado: Chaffee, Eagle, Garfield, Grand, Jackson, Lake, Pitkin, Routt and Summit. Offers select Bachelor's degrees to serve the needs of this region.
Colorado State University	Fort Collins, Region 2	Comprehensive graduate research university with selective admission standards offering a comprehensive array of baccalaureate, master's, and doctoral degree programs. Consistent with the tradition of land grant universities, CSU has exclusive authority to offer graduate and undergraduate programs in agriculture, forestry, natural resources, and veterinary medicine. The Colorado commission on higher education, in consultation with the board of governors of the Colorado state university system, shall designate those graduate level programs that are the primary responsibility of Colorado state university. Colorado state university has the responsibility to provide on a statewide basis, utilizing when possible and appropriate the faculty and facilities of other educational institutions, those graduate level programs.
Colorado State University - Pueblo	Pueblo, Region 7	A regional, comprehensive university, with moderately selective admissions standards. The university offers a broad array of baccalaureate programs with a strong professional focus and a firm grounding in the liberal arts and sciences. The university also offers selected master's-level graduate programs.
Colorado School of Mines	Golden, Region 3	A specialized baccalaureate and graduate research institution with high admission standards. Has a unique mission in energy, mineral, and material science and engineering and associated engineering and science fields. It is the primary institution of higher education offering energy, mineral, and material science and mineral engineering degrees at both the graduate and undergraduate levels.

Community College System		
Arapahoe Community College	Littleton, Region 3	The state board for community colleges and occupational education is charged to develop and establish state policy for occupational education and to govern the state system of community colleges. The board is responsible for the establishment of statewide vocational education policy for all the entities which provide that education and coordinates all aspects of vocational education in the state to assure quality programming and efficient delivery of such education. In its role as the governing authority for the state system of community colleges, the board assures a system of two-year program delivery throughout the state coordinated, where appropriate, with the local district colleges. In order to assist the board in carrying out its responsibilities, the general assembly provides for the establishment of local councils to advise the board on the operation of individual community and junior colleges from a local perspective. The function of the two-year college system is to conduct occupational, technical, and community service programs with no term limitations and general education, including college transfer programs with unrestricted admissions. It is further the intent of this article to develop appropriate occupational education and adult education programs in these and other postsecondary educational institutions, to maintain and expand occupational education programs in the elementary and secondary schools of the state permitting local school districts already having vocational schools to continue to operate them, and to develop work study and on-the-job training programs designed to acquaint youth with the world of work and to train and retrain youth and adults for employment. The general assembly intends that state agencies concerned with occupational education in the public schools shall cooperate with the board in planning and implementing occupational education programs, to the end that the state of Colorado has complete and well-balanced occupational and adult education programs available to the people of Colorado at all educational levels.
Colorado Northwestern Community College	Rangely, Region 11	
Community College of Aurora	Aurora, Region 3	
Community College of Denver	Denver, Region 3	
Front Range Community College	Westminster, Region 3	
Lamar Community College	Lamar, Region 6	
Morgan Community College	Fort Morgan, Region 1	
Northeastern Junior College	Sterling, Region 1	
Otero Junior College	La Junta, Region 6	
Pikes Peak Community College	Colorado Springs, Region 4	
Pueblo Community College	Pueblo, Region 7	
Red Rocks Community College	Lakewood, Region 3	
Trinidad State Junior College	Trinidad, Region 14	
Fort Lewis College	Durango, Region 9	A public liberal arts college, with selective admission standards with a historic and continuing commitment to Native American education. Offers professional programs and a limited number of graduate programs to serve regional needs. The center of southwest studies provides a valuable regional, national, and international resource.

Metropolitan State University of Denver	Denver, Region 3	A comprehensive institution with modified open admission standards at the baccalaureate level; except that nontraditional students at the baccalaureate level who are at least twenty years of age shall only have as an admission requirement a high school diploma, a GED high school equivalency certificate, or the equivalent thereof. Metropolitan State University of Denver shall offer a variety of liberal arts and science, technical, and educational programs. The college offers a limited number of professional programs and master's degree programs that address the needs of its urban service area.
University of Colorado Boulder	Boulder, Region 3	A comprehensive graduate research university with selective admission standards. The Boulder campus offers a comprehensive array of undergraduate, master's, and doctoral degree programs, and has exclusive authority to offer graduate programs in law. The Colorado commission on higher education, in consultation with the board of regents, shall designate those graduate level programs that are the primary responsibility of the Boulder campus of the university of Colorado. The university has the responsibility to provide on a statewide basis, utilizing when possible and appropriate the faculty and facilities of other educational institutions, those graduate level programs. The commission includes in its funding recommendations a level of general fund support for these programs.
University of Colorado Colorado Springs	Colorado Springs, Region 4	A comprehensive baccalaureate university with selective admission standards. The Colorado Springs campus offers liberal arts and sciences, business, engineering, health sciences, and teacher preparation undergraduate degree programs, and a selected number of master's and doctoral degree programs.
University of Colorado Denver	Denver, Region 3	An urban comprehensive undergraduate and graduate research university with selective admission standards. The Denver campus offers baccalaureate, master's, and a limited number of doctoral degree programs, emphasizing those that serve the needs of the Denver metropolitan area. The Denver campus has statewide authority to offer graduate programs in public administration and exclusive authority in architecture and planning.
University of Colorado Health Sciences Campus	Aurora, Region 3	Offers specialized baccalaureate, first-professional, master's, and doctoral degree programs in health-related disciplines and professions. Affiliated with the University of Colorado hospital and other health care facilities that offer settings for education, clinical practice, and basic and applied research. Has exclusive authority in medicine, dentistry, pharmacy, and physical therapy.
University of Northern Colorado	Greeley, Region 2	A comprehensive baccalaureate and specialized graduate research university with selective admission standards. The primary institution for undergraduate and graduate degree programs for educational personnel preparation in the state of Colorado. Offers master's and doctoral programs primarily in the field of education. The university has the responsibility to offer on a statewide basis, utilizing where possible and appropriate the faculty and facilities of other educational institutions, those graduate-level programs needed by professional educators and education administrators. As part of its mission as a graduate research university specializing in programs for educational personnel, the university of northern Colorado includes the education innovation institute.

Western State Colorado University	Gunnison, Region 10	A general baccalaureate institution with moderately selective admission standards. Offers undergraduate liberal arts and sciences, teacher preparation, and business degree programs and a limited number of graduate programs. Serves as a regional education provider.