



# MID-IOWA GROWTH PARTNERSHIP CAREER AUDIT REPORT



## Contents

INTRODUCTION .....	2
<i>Organization of Report</i> .....	2
<i>Educational Levels</i> .....	3
EXECUTIVE SUMMARY .....	4
WORKFORCE MODEL AND METHODOLOGY .....	8
<i>O*NET</i> .....	8
<i>Understanding KSAs</i> .....	9
<i>Occupation Selection</i> .....	10
<i>Occupation Competency Radar Charts</i> .....	11
<i>Usefulness of Data</i> .....	13
CHAPTER 1: INDUSTRY GROUP PROFILES .....	14
FOOD PROCESSING .....	14
<i>Food Production Workers</i> .....	16
<i>Agricultural Workers</i> .....	17
TRANSPORTATION, DISTRIBUTION, AND LOGISTICS.....	19
<i>Truck Drivers &amp; Mechanics</i> .....	21
<i>Administrative &amp; Clerical Workers</i> .....	22
ENERGY & NATURAL RESOURCE PRODUCTION .....	24
<i>Extraction &amp; Distribution Workers</i> .....	26
<i>Management &amp; Engineering Workers</i> .....	27
BUSINESS & PROFESSIONAL SERVICES .....	29
<i>Miscellaneous Business Workers</i> .....	32
<i>Computer-Based Workers</i> .....	33
<i>Management Workers</i> .....	35
BIOTECHNOLOGY.....	37
<i>Scientific Technicians &amp; Operators</i> .....	38
<i>Scientists</i> .....	40
METAL AND MACHINERY MANUFACTURING .....	41
<i>Production Workers</i> .....	44
<i>Machinery Workers</i> .....	45
<i>Engineers &amp; Drafters</i> .....	46
CHAPTER 2: EDUCATIONAL GAP ANALYSIS DATA.....	48
<i>Summary of Educational Gap Analysis Data</i> .....	48
<i>A Note on the Data</i> .....	50
APPENDIX A: OTHER KEY OCCUPATIONS.....	57
APPENDIX B: O*NET COMPETENCY DEFINITIONS .....	59

# INTRODUCTION

This career audit builds upon the work that EMSI and the MIGP leadership group has conducted so far in pinpointing the economic assets of the MIGP region and identifying target industries for future investment and growth. The next step in this process is to discuss which occupations are most essential to the focus industry groups and therefore to the economic success of the region.

In the world of workforce development there has been much talk in recent years on the topic of workforce preparedness, specifically regarding knowledge, skills, and abilities (KSAs). Every workforce investment board wants to know which types of KSAs are most important to their region, and which KSAs are required for individuals to further their careers.

One of the biggest hurdles in the development of this understanding has been finding a common KSAs language that can be shared between professionals in different industries. For example, one major manufacturing business might be seeking to hire a group of individuals who are proficient with specific equipment such as routers and table saws, whereas another major business might be only interested in workers who can operate die-cutting machinery. If the local community college or workforce development group wants to efficiently assist both of these businesses, it must determine what skills are common to each position. However, this is not easily determined. To make the problem more perplexing, the common language that does exist has been used so often and in so many different contexts that it has become imprecise. Terms such as “maintains a good attendance record,” “good communications skills,” “possess mechanical aptitude,” are not easy to quantify, often mean different things in different contexts, and are often perceived differently from the perspective of the employer and the perspective of the potential employee.

Though issues such as these will always present a struggle in the workforce development industry, EMSI has developed a method of utilizing O\*NET data, published by the Department of Labor’s Employment and Training Administration, that helps make KSA data easier to translate across different occupations and industries. In this method of presentation, the data are grouped according to occupations with similar KSAs in similar industries. The goal of this method is to display the unique qualifications that are required for each industry group, and also provide some understanding of potential career transitions and pathways.

## Organization of Report

The main report is organized into an introduction, two chapters, and several appendices. The introduction contains a description of EMSI’s workforce model and methodology. The O\*NET database is unfamiliar to many people, so it is necessary at the outset to explain where it comes from, how it approximates the various aptitudes of a region’s workforce, and how it is used in this report. Chapter 1 provides an outline of the labor market data and KSA information related to the critical occupations selected from each of the target industry groups. Chapter 2 contains information on the educational

programs in the region that are training workers for the target occupations taken from Chapter 1. The appendices contain information that is relevant to the report but of a lower priority than that which is contained in the body of the report. This includes Appendix A: Other Key Occupations and Appendix B: O\*NET Competency Definitions.

## Educational Levels

The US Census Bureau has determined the average educational level for workers at their initial hiring. It is necessary to address these data up front because these educational levels are referenced often throughout the report. The key below indicates how these average educational levels are translated into the abbreviations contained in the report.

**Table A.1- Educational Level Key**

Average Educational Level	Abbreviation
Short-term on-the-job training	ST OJT
Moderate-term on-the-job training	MT OJT
Long-term on-the-job training	LT OJT
Work experience in a related field	Exp. in field
Postsecondary vocational award	PSV Award
Associate's degree	Associate's
Bachelor's degree	Bachelor's
Master's degree	Master's
Doctoral degree	Doctoral
Degree plus work experience*	Deg. + exp.
First professional degree	Prof.

*\*Note: Degree plus work experience requires some form of college degree between an associate's and a postgraduate degree, in addition to some on-the-job experience.*

## EXECUTIVE SUMMARY

Like much of the United States, the Mid-Iowa region is in the midst of a critical phase of economic adjustment. This region has a distinct advantage in that the Mid-Iowa Growth Partnership is proactively addressing some of the economic issues that many areas of the country have yet to confront. The issues that this report—and the others published by EMSI in recent months—is designed to address include the following: the loss of manufacturing jobs that are critical to the economic base of the region; the aging of the workforce; the uncertain future of staple industries such as agriculture and certain types of manufacturing; and the growing need for workers in “middle-skill” positions (*i.e.*, jobs that require more than secondary school but less than a bachelor's degree). Beginning with the Regional Asset Map, the goal has been to identify the key strengths that regional leaders can utilize to encourage economic development. In the Focus Industry Group Analysis, these strengths were translated into six specific industry groups in which the MIGP region has a distinct competitive advantage. And finally, with the Career Audit report, regional leaders will have the first component of a strategy for educating and training workers for the right kind of jobs to ensure the long-term success of the targeted industries.

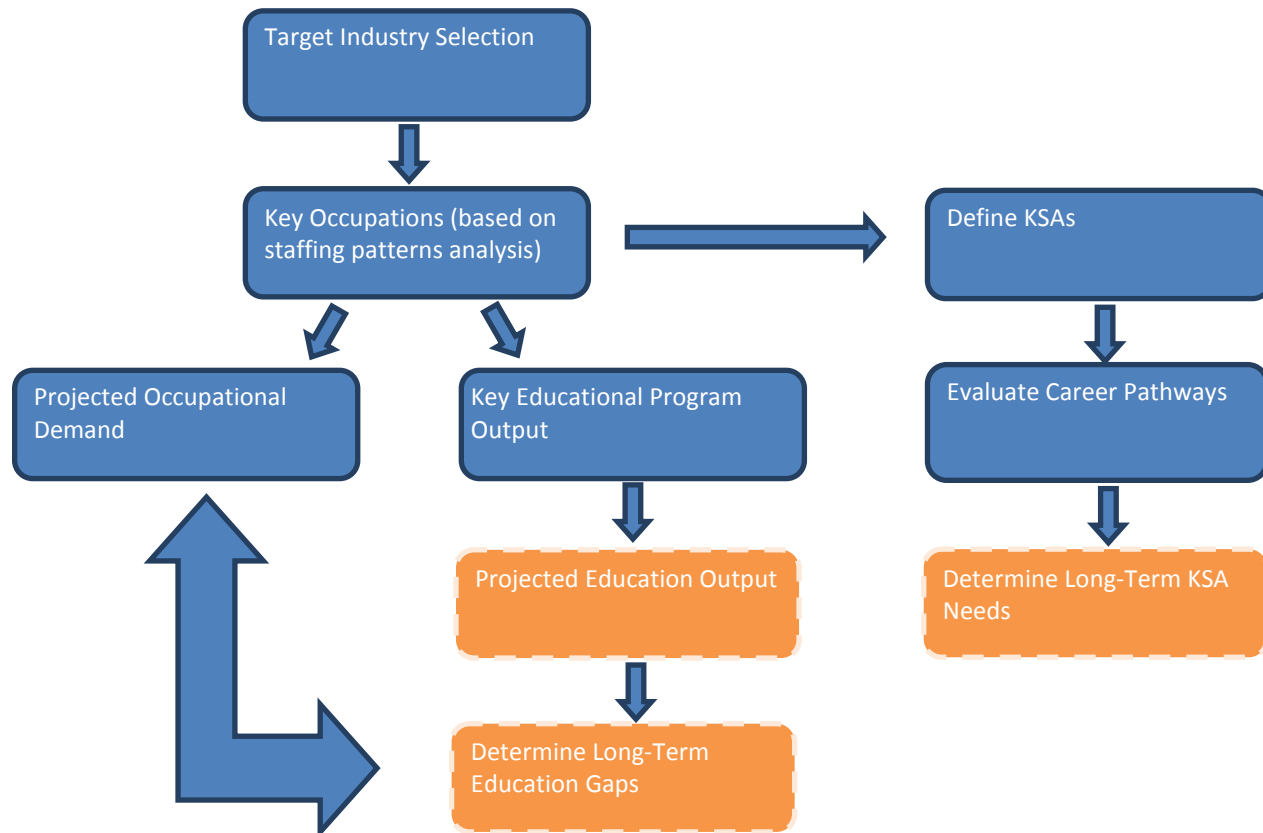
The main goals of this analysis are as follows:

- Identify key occupations in the MIGP region (based on the previous targeted industry reports, staffing patterns, and feedback received from the leadership group);
- Identify and characterize critical competencies, or KSAs, for the area;
- Begin to develop and characterize career pathways for key target occupations;
- Conduct a brief skill gap analysis of the MIGP region's workforce;
- Tie understanding of in-demand competencies back to education, workforce, and the talent development system.

Corresponding to these goals, the following are some additional intended outcomes for this project:

- Identify curriculum components that can be developed for educational planning; and
- Better assess worker competencies and provide career guidance to workers in the region.

To achieve these goals, EMSI used a distinct process of deriving key occupations and key competencies based on the target industries that have been identified. An illustration of this process is contained in Figure A.1 below.

**Figure A.1- Career Audit Workflow & Final Goals**

The blue boxes correspond to the aforementioned goals. The orange boxes also correspond to the goals and outcomes, but they are distinct in that unlike the other steps in this process, these steps will remain a “work in progress” as long as MIGP is active and dealing with new situations and circumstances. In other words, the educational and skills data contained in the body of this report are based on what’s happening in the region at this time. As time progresses, the need for graduates and competencies will continue to change, especially with the implementation of the MIGP Regional Innovation Plan.

In order for the region to remain economically viable, it must have an economic development strategy that is both reasonable and innovative. There is no single industry group that offers guaranteed success, but each of the industries mentioned in this report have their own particular strengths that make them worthy of inclusion in the region’s economic development strategy. Information on their various strengths, weaknesses, and labor requirements is thoroughly outlined in the Target Industry Report, which can be accessed via the MIGP Collaborative Workspace (under “data reports”). For reference, these industry groups and some of the economic data associated with each are listed in Table A.2 below.

**Table A.2: Overview of Mid-Iowa's Target Industry Groups**

Sector	2010 Jobs	'02-'10 Growth	'02-'10 % Growth	'10-'15 Growth*	'10-'15 % Growth*	Median Earnings Per Worker	2010 LQ
Agriculture & Food Processing	15,377	1,400	10.0%	546	3.6%	\$49,234	6.89
Transportation, Distribution & Logistics	4,395	409	10.3%	506	11.5%	\$45,919	1.61
Energy & Natural Resources	2,274	327	16.8%	206	9.1%	\$55,950	1.31
Business & Professional Services	7,914	757	10.6%	977	12.3%	\$33,572	0.58
Biotechnology	981	(48)	(4.7%)	7	0.7%	\$74,095	2.15
Metals & Advanced Machinery Manufacturing	4,432	(1,065)	(19.4%)	(490)	(11.1%)	\$48,664	3.04
<b>Regional Average</b>	<b>n/a</b>	<b>n/a</b>	<b>1.0%</b>	<b>4,428</b>	<b>5.2%</b>	<b>\$37,180</b>	<b>n/a</b>

Source: EMSI Complete Employment, 3rd Quarter 2010

\* Indicates that this number is an estimate based on economic projections created by the Iowa Department of Workforce Development and adjusted by EMSI.

Each industry group requires its own unique set of professionals—from production workers and clerks to highly specialized scientists and engineers—and each of these workers possess their own unique profile of knowledge, skills, and abilities. These data are thoroughly outlined in the Focus Industry Group Profiles section of the report. However, to provide a broader view of the competency needs of the region, Table A.3 below displays which competencies most commonly occur among all of the occupations analyzed in this report. This table is effectively a list of skills that the workforce and education systems should focus on developing among students to prepare them for the critical, high-growth jobs in the MIGP region.

**Table A.3: High-Demand Knowledge, Skills & Abilities among All Focus Group Occupations**

Knowledge	Skills	Abilities
Mathematics	Reading Comprehension	Oral Expression
English Language	Active Learning	Oral Comprehension
Education and Training	Coordination	Near Vision
Mechanical	Active Listening	Written Comprehension
Customer and Personal Service	Critical Thinking	

Table A.3 verifies what has been regularly emphasized by government agencies and educational researchers alike—the most integral educational needs of the 21st century are related to mathematics, knowledge of the English language, interpersonal skills such as customer and personal service and active listening, the ability to learn on your own (reading comprehension and critical thinking), and the ability to share knowledge with others (education and training).

In order to ensure that these knowledge, skills, and abilities are thoroughly embedded in the region’s workforce, K-12 educators, workforce development offices, and regional colleges need to collaborate to train these workers. The KSAs listed in Table A.3 are of universal importance, but it should not be forgotten that each industry group has its own unique labor needs. For instance, biotechnology requires middle-skill scientific specialists such as chemical technicians and biological technicians. Alternatively, the transportation, distribution, and logistics industry group requires a large number of truck drivers and a steady supply of transportation managers and logisticians. For a summary of the educational programs that either do not exist or which do exist but may be needed to educate more students, see Table 1.4 below.<sup>1</sup>

**Table A.4: Educational Programs Required to Serve Target Industry Groups**

Target Industry Group	Recommended Programs
Agriculture & Food Processing	~Agricultural managers, and supervisors
Transportation, Distribution & Logistics	Truck drivers
Energy & Natural Resource Production	Electrical power-line installers, Operating engineers, ~various machine operators
Business & Professional Services	~Graphic designers,
Biotechnology	Inspectors, testers, sorters, samplers, and weighers, ~Chemists
Metals & Advanced Machinery Manufacturing	Mechanical engineering technicians

The region has an abundance of colleges either within or just outside of its boundaries, giving businesses in the MIGP area access to recent college graduates. The key question for nearly every industry group is whether the region is capable of attracting an adequate number of workers from nearby educational institutions to fill the job openings that are will continue to become available.

In conclusion, the Mid-Iowa region has clear assets that can be leveraged to cope with the economic obstacles that it faces now and into the future. Successfully maintaining the region’s economic power will require assistance from every corner—private industry, education, workforce development, economic development, and all other organizations in the region.

<sup>1</sup> Note that the “~” symbol indicates that the program may or may not be necessary, dependent on various factors such as how many students migrate to the area from Iowa State University, and how many students need to be trained via on-the-job training rather than formal collegiate training.

# WORKFORCE MODEL AND METHODOLOGY

## O\*NET

In order to develop competency profiles, EMSI used the O\*NET database. The central goal of utilizing O\*NET data is to identify key competencies that are in demand among key occupations in the region. This allows occupations to be grouped according to common competencies, provides direction for career pathway possibilities, and indicates which competencies are important to each industry group.

The O\*NET project is a source of occupational data and information developed by the U.S. Department of Labor's Employment and Training Administration. The system provides both qualitative and quantitative descriptions of over 800 occupation classifications. The information collected is based on real-world data and collected through ongoing surveys of an occupation's worker population and occupation experts.

To develop a competency model, EMSI utilized a specific portion of the O\*NET system called the O\*NET Content Model (<http://www.onetcenter.org/content.html>). The Content Model provides a framework for quantifying the various KSAs that are required to perform occupational duties and for presenting the information in a standardized fashion. The group of knowledge competencies contains 33 separate sub-categories, each of which comprises an "organized set of principles and facts" that can be applied in numerous ways by different individuals in different occupations. For instance, the knowledge category includes components such as engineering, management, and geography. The group of skill competencies contains 35 separate sub-categories, which are "developed capacities that facilitate learning," including basic skills, social skills, and technical skills. The group of ability competencies contains 52 sub-categories, all of which are "enduring attributes ... that influence performance." Of the sub-headings within the abilities category, EMSI utilized only cognitive abilities and physical abilities in this study because a number of the other ability categories refer to attributes that are not easily trainable or correctable.

In order to maintain consistency with the O\*NET database, competency titles shown in this report are the same as they appear on the O\*NET website. At first glance, some of these titles may seem a bit cumbersome and nondescript. For instance, one of the knowledge competencies is "engineering and technology," which could lead numerous questions such as whether this refers to the ability to understand technology or the ability to utilize the technology, and furthermore what exactly the connection is between engineering and technology. Some types of engineering are very high-tech and other types are not. It is not until we examine the description of this competency that these questions are answered. Knowledge of engineering and technology is defined as "knowledge of the practical application of engineering science and technology" specifically in reference to the "production of various goods and services." EMSI does not attempt to address all of these questions, but for reference, Appendix B includes a full list of all of the competencies referred to throughout the report.

## Understanding KSAs

Understanding KSA types and their function in describing an occupation can be somewhat challenging. To put KSAs in context, the following analogy of the Frisbee-catching dog is helpful:

When thinking of the competencies that a dog must possess in order to effectively execute the catching of a Frisbee, three main components can be assessed. The ability components (and requirements) to perform this activity would relate to leg strength, leg length, peripheral vision, ability to jump, and so on. Skill components would be how high to jump, when to jump, and when to catch the Frisbee. Knowledge components would include teaching the dog that a Frisbee is an item to chase, retrieve, and bring back to the pet's owner. Combining KSAs gets one to the notion of overall competency—what aptitudes are required for somebody to perform a particular task well.<sup>2</sup>

The KSA structure is different for each occupation. Workers in some occupations must excel in multiple competency categories; in other occupations, they must excel in just a few competency categories. But all workers should have just the right blend of knowledge, skills, and abilities to perform their occupational duties. O\*NET has a built-in scale for determining the level of any competency value in verbal terms. All competencies with a level score under 25 are labeled “Basic.” Those with a score between 25 and 49 are considered “Intermediate,” and those with a score above 50 are thought to be “Advanced.” Appendix B provides benchmark descriptions for KSA values. These values are further described on the O\*NET website ([http://online.onetcenter.org/help/online/browse\\_desc](http://online.onetcenter.org/help/online/browse_desc)).

For this analysis, EMSI used a proprietary “compatibility index” that is rooted in O\*NET data to determine career pathway potential. In some cases, compatibility is fairly easy to identify, but in other cases it is not. For instance, it is not difficult to recognize that elementary school teachers and high school teachers are highly compatible occupations. Each occupation requires advanced skills in areas such as education, oral expression, and social perceptiveness. However, in other cases, the compatibility index is able to identify potential career pathways that are not as intuitive. For instance, an elementary school teacher occupation is highly compatible with an employment interviewer. Though seemingly very different occupations, they have very similar KSA attributes, including high marks in clerical knowledge, active listening skills, and a number of other categories.

The O\*NET system and the compatibility index helped to identify shared KSAs. The logic behind this analysis is that when we understand the key attributes that make up occupations and know which occupations are most productive in key target industries, we can begin to see which KSAs drive the most productive aspects of the target industries and regional economy. When properly used, these data will help the regional workforce to become better trained and therefore more competitive on a national and global scale.

---

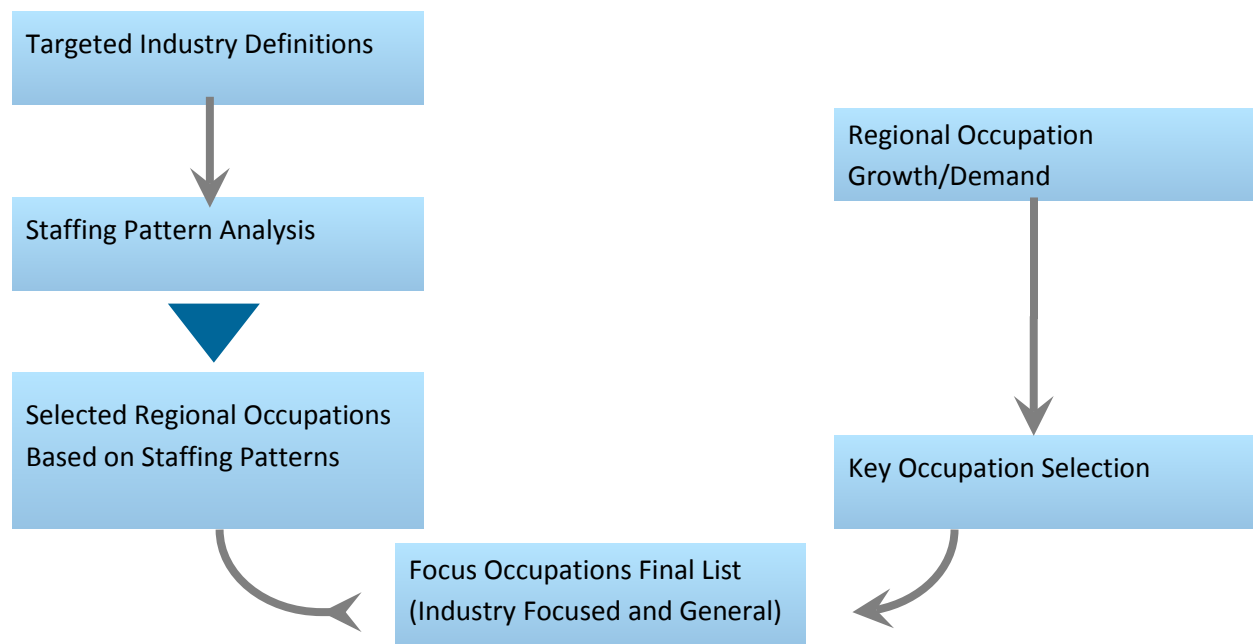
<sup>2</sup> Analogy taken from Regional Workforce Alliance, *Competency Study Report: Quick Hit* (May 22, 2009).

## Occupation Selection

EMSI used a multi-level approach to identify key occupations in the region. The approach evaluates several components of occupations, including industry staffing patterns, occupational concentration, projected growth, projected replacement jobs, and average educational attainment. Figure I.2 illustrates the “two-tiered” approach utilized by EMSI. Beginning on the left, we focus on occupations that compose the key target industries. These occupations are defined through a method developed by the Bureau of Labor Statistics called occupational staffing patterns by industry, which use survey information to develop occupational profiles for industries.

The right-hand side of Figure A.2 indicates that a separate approach is used to identify occupations that are integral to the economy but that may not be noticeable in industry-level data. These types of occupations are often found in nearly every industry category (*e.g.*, bookkeepers and auditors), or not identified due to overarching industry classifications such as state and local government (*e.g.*, secondary education teachers and EMTs). This group of occupations is addressed in Appendix A: Other Key Occupations.

**Figure A.2 — Occupational Selection Process**



## Occupation Competency Radar Charts

In the report, EMSI sought to display the KSA data in graphical format that is both comprehensive and understandable. To achieve this we used a form of graph called a radar chart. Figure A.3 contains an example radar chart from the biotechnology industry group. The radar charts display the top 15 KSAs or, more specifically, the top 5 knowledge categories, the top 5 skill categories, and the top 5 ability categories for each group of occupations.

The relevance of these competencies was determined based on the highest average scores for the entire group. The idea behind this methodology is that each specific industry requires workers with a unique blend of competencies, which are identifiable through averaging the competencies scores of the occupations that are most essential to that industry.

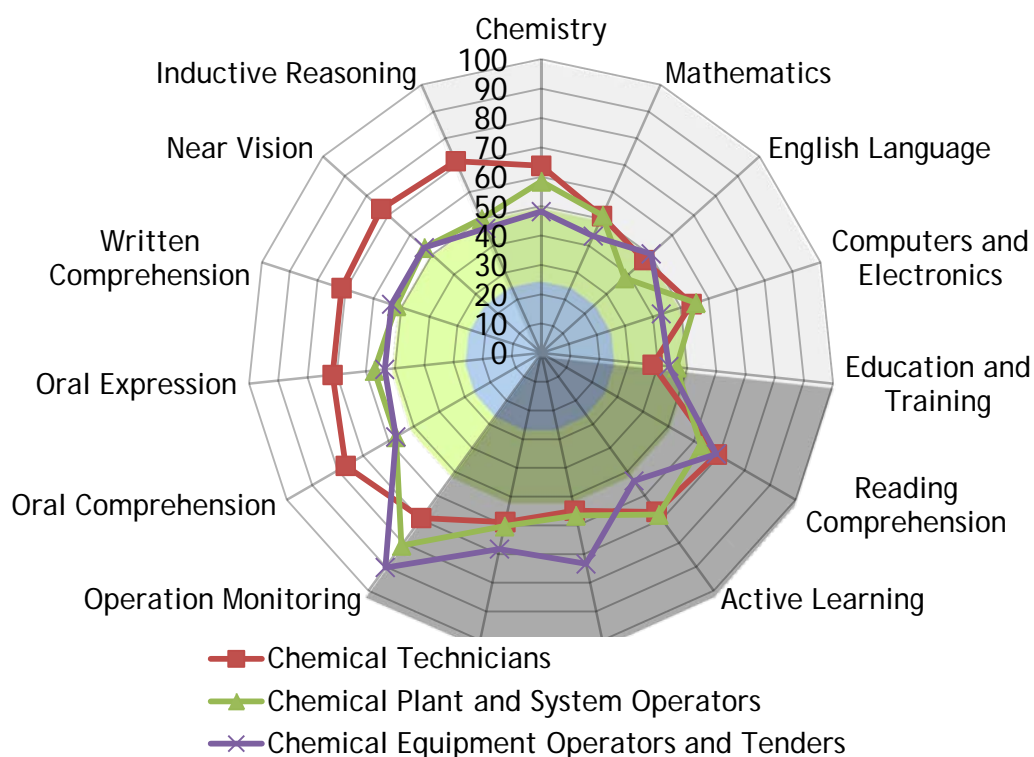
Each radar chart contains a specific sub-group of occupations for the industry group that further define the responsibilities of these workers within the industry. For instance, within the metal and advanced machinery manufacturing industry group, there are separate radar charts for the sub-groups of engineers and drafters; production workers; and machinery workers. Categorizing the occupations into these sub-groups allows for a more precise view of the type and level of KSAs that are required for these areas of expertise. In some cases, this type of display also lends itself to the demonstration of career pathway opportunities where they exist.

Career pathway opportunities are apparent when a number of factors come together in just the right way. First, the occupations must share a similar “shape,” indicating a similarity in skills. Yet there should also be a noticeable disparity in certain competencies, which indicates that workers at the beginning of the pathway must increase their aptitude in certain categories in order to “move forward” on that career path. Second, the associated labor market data must indicate that the worker would be advancing in earnings and educational/training level.<sup>3</sup> Where career pathway potential does exist we have also included a “compatibility score”—a measure of similarity in the KSAs among the two selected occupations. Since this combination of factors does not exist with every group of occupations, we have not included a compatibility score alongside every radar chart.

The example chart below, Figure A.3, is from the biotechnology industry group and refers specifically to the occupational sub-group of scientific technicians and operators. Knowledge competencies occupy the upper right hand areas of the radar chart, while skills are found in the lower right portion and abilities on the left-hand portion of the chart. The shaded areas in the center of the chart indicate specific levels of competencies. Competencies are considered “intermediate” at a level measured between 25 and 50. Measurements greater than 50 are considered “advanced” competencies.

---

<sup>3</sup> In certain cases we allow for lateral movements in either average earnings or educational/training level if that step in the career path could serve as the intermediate step toward a better opportunity further along that career pathway.

**Figure A.3- Radar Chart for Biotechnology/Scientific Technicians & Operators**

This graph shows that chemical plant and system operators, chemical equipment operators, and chemical technicians all share very similar knowledge, skills, and abilities. Workers in each of these categories must have above-average aptitude in competencies such as chemistry, mathematics, and reading comprehension. The only significant differences in the competency structure are in the abilities categories, such as oral comprehension, written comprehension, and inductive reasoning.

**Table A.5—Labor Market Data for Biotechnology/Scientific Technicians & Operators**

Data Category	Chemical plant and system operators	Chemical equipment operators and tenders	Chemical technicians
2010 Jobs	93	163	47
2015 Jobs	104	170	47
Current Median Hourly Earnings	\$19.81	\$20.01	\$21.00
Annual Openings	4	3	1
Compatibility	n/a	94	87
Educational Level	LT OJT	MT OJT	Associate's

The associated labor market data contained in Table A.5 indicate that progression from a chemical plant system operator to a chemical equipment operator and ultimately to a chemical technician would bring an increase in hourly earnings (from \$19.81 to \$21) and in average educational level (from short-term on-the-job training to an associate's degree). As such, this occupational progression can be considered a legitimate career pathway for chemical plant and systems operators.

## Usefulness of Data

The radar charts in this study have been designed to highlight the KSAs that are essential to the success of each key occupational group, which in turn are essential to the success of the industry groups. The most practical use of this information is for local workforce development agencies, as it allows them to assess which KSAs are most important to each industry group and determine how best to allocate Workforce Investment Act funds. Another very beneficial use of the radar charts is for curriculum development, particularly at the postsecondary level. As the tasks performed by America's workers become increasingly specialized, the education and training needs of the future workforce need to become increasingly customized to the particular needs of America's businesses. When education providers are aware of the specific aptitudes of these occupations, they can customize curricula to maximize the success of their students.

## CHAPTER 1: INDUSTRY GROUP PROFILES

The rest of the report will focus on the key occupations within each target industry group. Each of the Industry Profiles contains the following information: a table containing the specific industries within the target industry groups by 6-digit NAICS codes<sup>4</sup>, a table containing basic labor market information for the key occupations, a table summarizing the top 15 KSA competencies for each industry group, and a series of radar charts and tables outlining the KSAs for each of the occupational sub-groups.

### FOOD PROCESSING

The food processing industry group is defined by the following North American Industry Classification System (NAICS) codes, which are shown in two columns.

**Table 1.1— Food Processing Industries**

NAICS Code	Description	NAICS Code	Description
11A000	Crop and animal production	311999	All Other Miscellaneous Food Manufacturing
115112	Soil Preparation, Planting, and Cultivating	322212	Folding Paperboard Box Manufacturing
115113	Crop Harvesting, Primarily by Machine	325311	Nitrogenous Fertilizer Manufacturing
115114	Postharvest Crop Activities (except Cotton Ginning)	325314	Fertilizer (Mixing Only) Manufacturing
115115	Farm Labor Contractors and Crew Leaders	333111	Farm Machinery and Equipment Manufacturing
115116	Farm Management Services	333294	Food Product Machinery Manufacturing
115210	Support Activities for Animal Production	423820	Farm and Garden Machinery and Equipment Merchant Wholesalers
311111	Dog and Cat Food Manufacturing	424470	Meat and Meat Product Merchant Wholesalers
311119	Other Animal Food Manufacturing	424490	Other Grocery and Related Products Merchant Wholesalers
311221	Wet Corn Milling	424510	Grain and Field Bean Merchant Wholesalers
311222	Soybean Processing	424520	Livestock Merchant Wholesalers
311412	Frozen Specialty Food Manufacturing	424910	Farm Supplies Merchant Wholesalers

<sup>4</sup> More detailed information about each of these industries has been posted on the MIGP Collaborative Workspace under Data Reports.

311612	Meat Processed from Carcasses	493120	Refrigerated Warehousing and Storage
311811	Retail Bakeries	493130	Farm Product Warehousing and Storage
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing		

The targeted industry group employed an estimated 15,377 workers in the third quarter 2010. A large majority of these workers are employed in crop and animal production (11A000); farm supplies merchant wholesalers (424910); and grain and field bean merchant wholesalers (311225). Analysis of the target industry group's staffing patterns identified 10 key occupations, which comprise 15% of the industry group's employment. Farm, ranch, and other agricultural managers is the largest of the key occupations, with more than 1,500 jobs in the MIGP region in 2010.

**Table 1.2 – Food Processing Key Occupations**

SOC Code	Description	2010 Jobs	2015 Jobs	Change	% Change	% of Industry	Current Hourly Earnings	Ed. Level
11-9011	Farm, ranch, and other agricultural managers	1,564	1,643	79	5%	12%	\$19.61	Deg. + exp.
45-1099	Supervisors, farming, fishing, and forestry workers	97	117	20	21%	1%	\$23.14	Exp. in field
51-9111	Packaging and filling machine operators and tenders*	167	177	10	6%	1%	\$18.68	ST OJT
19-1012	Food scientists and technologists	29	34	5	17%	0%	\$28.19	Bach.
51-3092	Food batchmakers*	45	50	5	11%	0%	\$14.04	ST OJT
51-9023	Mixing and blending machine setters, operators, and tenders*	63	68	5	8%	0%	\$15.86	MT OJT
19-1031	Conservation scientists	31	35	4	13%	0%	\$16.01	Bach.
19-4011	Agricultural and food science technicians	48	52	4	8%	0%	\$14.67	Assoc.
45-2011	Agricultural inspectors*	24	28	4	17%	0%	\$19.00	Exp. in field

49-3041	Farm equipment mechanics	254	238	(16)	(6%)	2%	\$17.63	PSV Award
* indicates that the occupation is not represented in the radar charts to follow.								

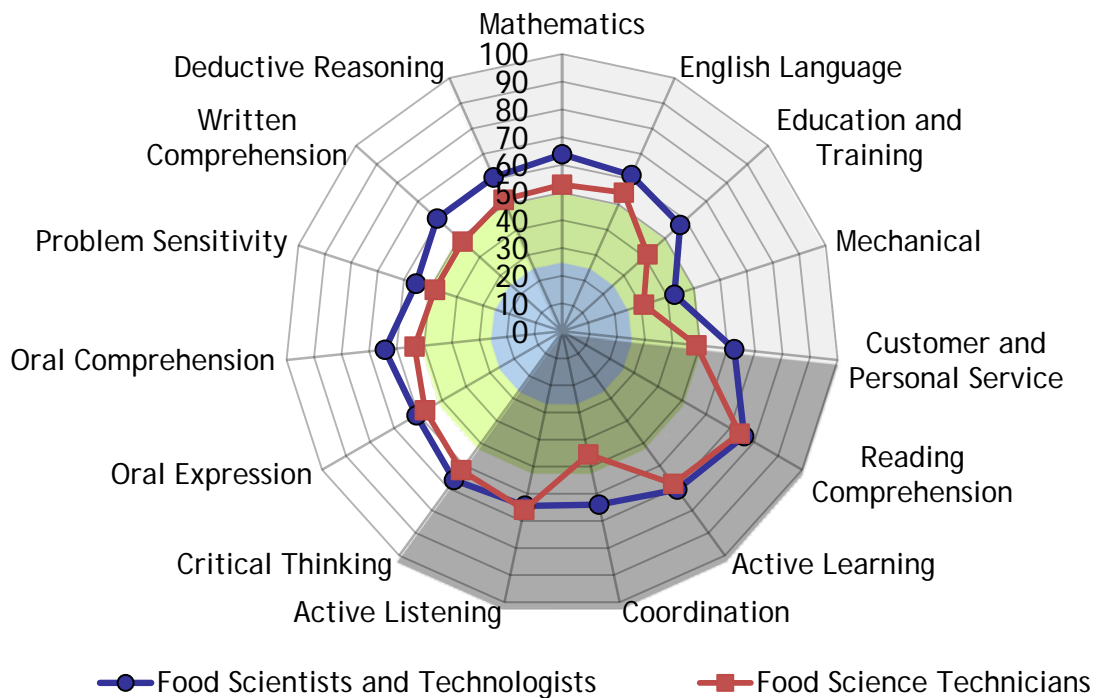
**Table 1.3 – Top 15 Competency Categories for Food Processing**

Knowledge	Skills	Abilities
Mathematics	Reading Comprehension	Oral Expression
English Language	Active Learning	Oral Comprehension
Education and Training	Coordination	Problem Sensitivity
Mechanical	Active Listening	Written Comprehension
Customer and Personal Service	Critical Thinking	Deductive Reasoning

Table 1.3 shows the top five competencies from each KSA category. Specific key in-demand competencies in the food processing targeted industry group include the following: mathematics and mechanical knowledge; reading comprehension; active learning and active listening skills; oral expression; and oral comprehension and problem sensitivity abilities.

## Food Production Workers

**Figure 1.1: Radar Chart for Food Production Workers**





**Table 1.5 – Labor Market Data for Agricultural Workers**

Data Category	Farm equipment mechanics	Farm, ranch, and other agricultural managers	Supervisors, farming, fishing, and forestry workers	Conservation scientists
2010 Jobs	270	1,566	129	50
2015 Jobs	255	1,645	150	55
Current Median Hourly Earnings	\$17.63	\$19.61	\$23.14	\$16.01
Annual Openings	9	49	7	2
Educational Level	PSV Award	Degree + exp.	Exp. in field	Bachelor's

No compatibility data are shown for this group because it does not lend itself to career pathway recommendations. These occupations are similar in that they are all vital to the agricultural production industries and they all require a level of education beyond on-the-job training. As the radar chart indicates, these workers must be highly knowledgeable in fields such as mathematics and English language. Additionally, they must maintain above-average competency in skill and ability areas such as customer and personal service and critical thinking. This illustrates that agricultural workers need to be highly intelligent and possess specialized skills, particularly in management positions. Though the earnings for many agricultural workers are fairly low, each of these occupations offers satisfactory-to-above-average earnings. Therefore, these job positions are not just critical to the success of agriculture in the region, but they also offer an opportunity for low-skill workers to move into family sustaining wage positions, within an industry with which they are already familiar.

## TRANSPORTATION, DISTRIBUTION, AND LOGISTICS

The transportation, distribution, and logistics (TDL) industry group is defined by the following North American Industry Classification System (NAICS) codes, which are shown in two columns.

**Table 2.1— TDL Industries**

NAICS Code	Description	NAICS Code	Description
482110	Rail transportation	488490	Other Support Activities for Road Transportation
484110	General Freight Trucking, Local	488510	Freight Transportation Arrangement
484121	General Freight Trucking, Long-Distance, Truckload	491110	Postal Service
484122	General Freight Trucking, Long-Distance, Less Than Truckload	493110	General Warehousing and Storage
484210	Used Household and Office Goods Moving	493120	Refrigerated Warehousing and Storage
484220	Specialized Freight (except Used Goods) Trucking, Local	493130	Farm Product Warehousing and Storage
484230	Specialized Freight (except Used Goods) Trucking, Long-Distance	541614	Process, Physical Distribution, and Logistics Consulting Services
488190	Other Support Activities for Air Transportation		

The targeted industry group employed roughly 4,400 workers in the third quarter 2010. A large majority of these workers are employed in general freight trucking, long-distance, truckload (484121); general freight trucking, long-distance, truckload (484230); and postal service (491110). Analysis of the target industry group's staffing patterns identified 10 key occupations, which comprise roughly 71% of the industry group's employment. Truck drivers, heavy and tractor-trailer is the largest of the key occupations, with more than 1,800 jobs in the region in 2010.

**Table 2.2— TDL Key Occupations**

SOC Code	Description	2010 Jobs	2015 Jobs	Change	% Change	% of Industry	Current Hourly Earnings	Ed. Level
53-3032	Truck drivers, heavy and tractor-trailer	1,849	2,120	271	15%	45%	\$17.19	MT OJT
53-3033	Truck drivers, light or delivery services*	416	472	56	13%	10%	\$14.62	ST OJT
53-3031	Driver/sales workers*	340	390	50	15%	8%	\$16.20	ST OJT
49-3031	Bus and truck mechanics and diesel engine specialists	89	97	8	9%	2%	\$16.09	PSV Award
53-7051	Industrial truck and tractor operators	64	72	8	13%	2%	\$14.29	ST OJT
53-1031	First-line supervisors/managers of transportation and material-moving machine and vehicle operators	54	58	4	7%	1%	\$21.83	Exp. in field
11-3071	Transportation, storage, and distribution managers	17	19	2	12%	0%	\$26.80	Exp. in field
43-5032	Dispatchers, except police, fire, and ambulance	56	58	2	4%	1%	\$17.65	MT OJT
53-4019	Locomotive engineers and operators*	48	50	2	4%	1%	\$25.70	MT OJT
53-4031	Railroad conductors and yardmasters*	49	51	2	4%	1%	\$24.58	MT OJT
<i>* indicates that the occupation is not represented in the radar charts to follow.</i>								

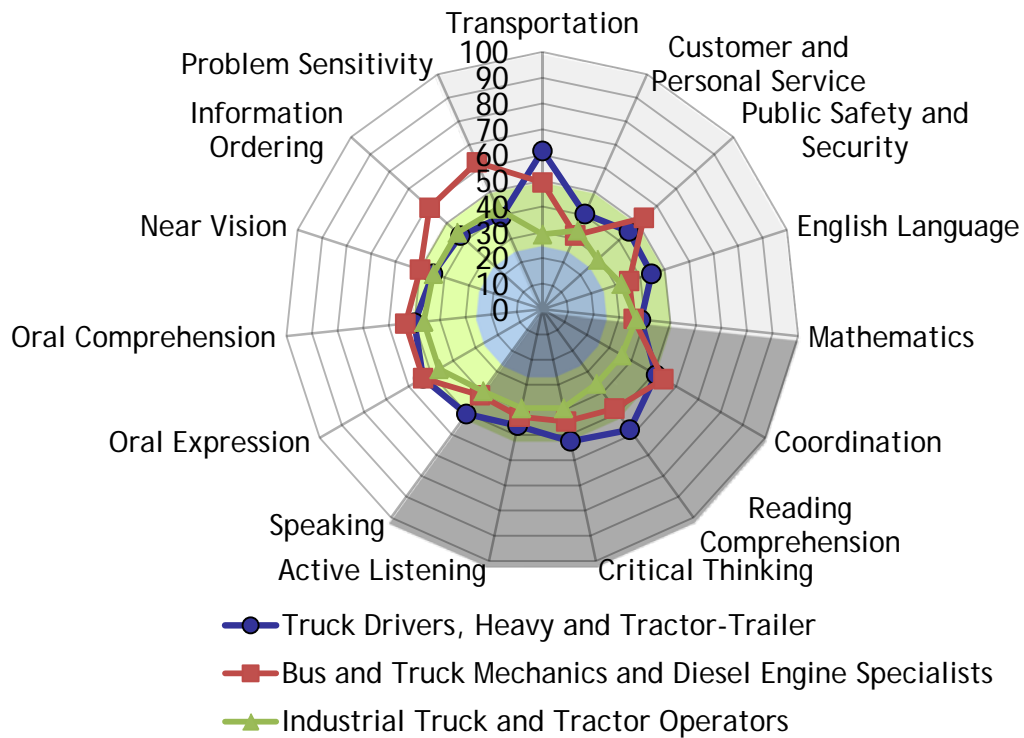
Table 2.3 shows the top five competencies from each KSA category. Specific key in-demand competencies in transportation, distribution and logistics include transportation knowledge (*e.g.* knowing the principles and methods for moving people/goods and relative costs and benefits) and public safety and security knowledge; coordination skills; and oral expression and problem sensitivity abilities.

**Table 2.3 – Top 15 Competency Categories for TDL**

Knowledge	Skills	Abilities
Transportation	Coordination	Oral Expression
Customer and Personal Service	Reading Comprehension	Oral Comprehension
Public Safety and Security	Critical Thinking	Problem Sensitivity
English Language	Active Listening	Written Comprehension
Mathematics	Speaking	Deductive Reasoning

## Truck Drivers & Mechanics

**Figure 2.1: Radar Chart for Truck Drivers & Mechanics**



**Table 2.4 – Labor Market Data for Truck Drivers & Mechanics**

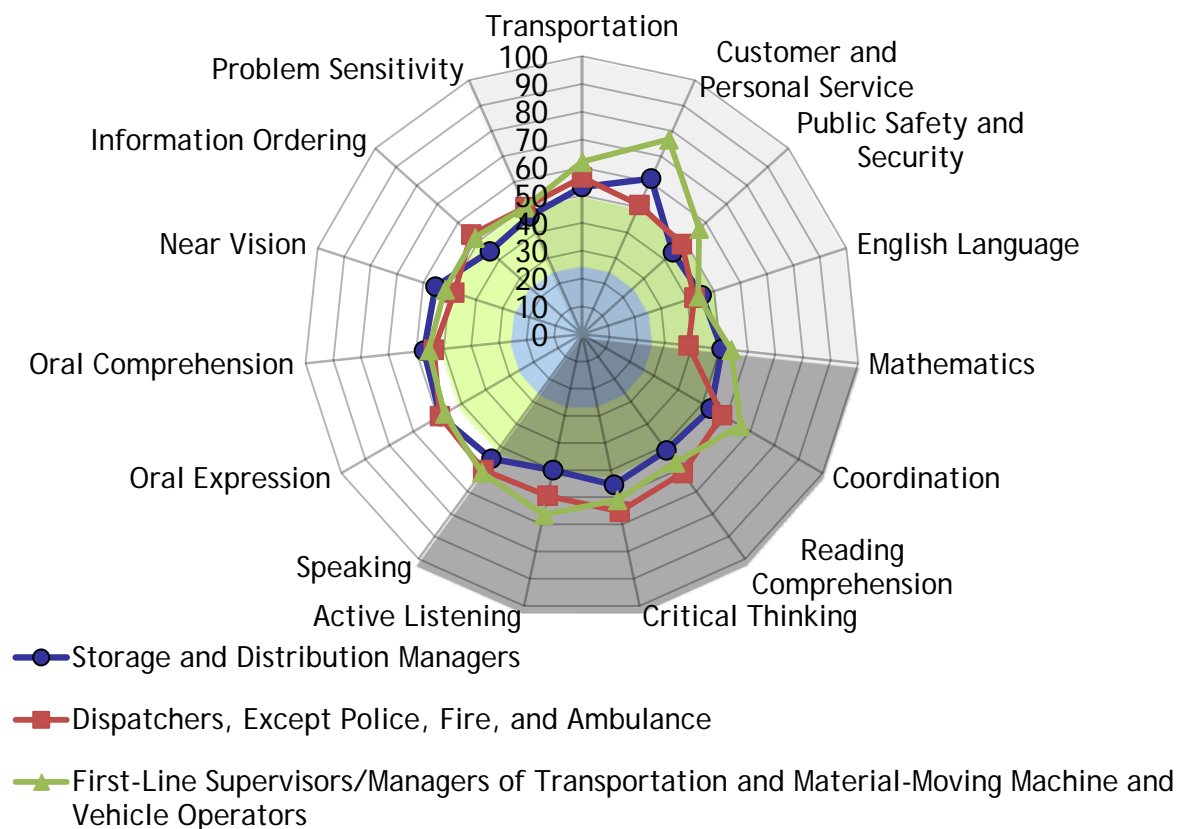
Data Category	Industrial truck and tractor operators	Bus and truck mechanics and diesel engine specialists	Truck drivers, heavy and tractor-trailer
2010 Jobs	322	241	2,642
2015 Jobs	322	253	2,946
Current Median Hourly Earnings	\$14.29	\$16.09	\$17.19
Annual Openings	11	8	109
Compatibility	n/a	79	88
Educational Level	ST OJT	PSV award	MT OJT

This industry group is composed primarily of occupations that require on-the-job training and experience. It is heavily staffed by workers such as industrial truck and tractor operators, who typically require short-term on-the-job training. Part of the goal in this analysis is to offer career advancement

opportunities to workers in these low-skilled and low-paid positions. The radar chart displays one potential career pathway, which moves industrial truck and tractor operators to bus and truck mechanics and diesel engine specialists and, finally, to truck drivers, heavy and tractor-trailer. This career pathway is associated with advancement in transportation knowledge and reading comprehension, among other competencies, and an increase in earnings from \$14.29 per hour to an average of \$17.19 per hour. Although this particular graph uses industrial truck and tractor operators as the base occupation, other positions in the transportation, distribution and logistics industry group (e.g., truck drivers, light or delivery services and others displayed in Table 2.2) have a very similar KSA profile and therefore have the same opportunities for advancement.

## Administrative & Clerical Workers

**Figure 2.2: Radar Chart for Administrative & Clerical Workers**



**Table 2.5 – Labor Market Data for Administrative & Clerical Workers**

Data Category	Dispatchers, except police, fire, and ambulance	First-line supervisors/managers of transportation and material-moving machine and vehicle operators	Transportation, storage, and distribution managers
2010 Jobs	94	131	33
2015 Jobs	97	134	34
Current Median Hourly Earnings	\$17.65	\$21.83	\$26.80
Annual Openings	3	3	1
Compatibility	n/a	85	94
Educational Level	MT OJT	Exp. in field	Exp. in field

Table 2.5 and Figure 2.2 summarize the KSA data for a few of the handful of highly skilled and well-compensated workers in the TDL industry group. These workers are all at least above average in critical KSA categories such as transportation and public safety and security. The recommended career pathway calls for an upgrade in competencies such as customer and personal service and mathematics, and it is associated with a considerable upgrade in earnings (from an average of \$17.65 per hour to an average of \$26.80 per hour). Although this particular graph uses dispatchers as the base occupation, other positions in the transportation, distribution, and logistics industry group (*e.g.*, truck drivers) have a very similar KSA profile and therefore have the same opportunities for advancement. It should also be mentioned that, in some cases, employers prefer transportation, storage and distribution managers to have either an associate's or a bachelor's degree in logistics or material management.

## ENERGY & NATURAL RESOURCE PRODUCTION

The energy and natural resource production industry group is defined by the following North American Industry Classification System (NAICS) codes, which are shown in two columns.

**Table 3.1— Energy & Natural Resource Production Industries**

NAICS Code	Description	NAICS Code	Description
211111	Crude Petroleum and Natural Gas Extraction	327390	Other Concrete Product Manufacturing
212312	Crushed and Broken Limestone Mining and Quarrying	327420	Gypsum Product Manufacturing
212319	Other Crushed and Broken Stone Mining and Quarrying	335311	Power, Distribution, and Specialty Transformer Manufacturing
212321	Construction Sand and Gravel Mining	424710	Petroleum Bulk Stations and Terminals
221112	Fossil Fuel Electric Power Generation	424720	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)
221122	Electric Power Distribution	454311	Heating Oil Dealers
221210	Natural Gas Distribution	454312	Liquefied Petroleum Gas (Bottled Gas) Dealers
237110	Water and Sewer Line and Related Structures Construction	541330	Engineering Services
237130	Power and Communication Line and Related Structures Construction	541380	Testing Laboratories
237990	Other Heavy and Civil Engineering Construction	541620	Environmental Consulting Services
327320	Ready-Mix Concrete Manufacturing	541690	Other Scientific and Technical Consulting Services

The targeted industry group employed an estimated 2,275 workers in the third quarter 2010. The largest sub-industries in this group are gypsum product manufacturing (327420); and electric power distribution (221122). Analysis of the target industry group's staffing patterns identified eight key occupations, which comprise 29% of the industry group's employment. Electrical power-line installers and repairers is the largest of the key occupations, with an estimated 101 jobs in 2010.

**Table 3.2 — Energy & Natural Resources Key Occupations**

SOC Code	Description	2010 Jobs	2015 Jobs	Change	% Change	% of Industry	Current Hourly Earnings	Ed. Level
13-1111	Management analysts	48	63	15	31%	3%	\$13.18	Deg. + exp.
47-2073	Operating engineers and other construction equipment operators	57	60	3	5%	3%	\$17.33	MT OJT
17-2051	Civil engineers	14	15	1	7%	1%	\$29.93	Bach.
51-8013	Power plant operators	10	10	0	0%	1%	\$20.43	LT OJT
53-7032	Excavating and loading machine and dragline operators	57	57	0	0%	3%	\$15.98	MT OJT
49-9051	Electrical power-line installers and repairers	101	98	(3)	(3%)	6%	\$23.88	LT OJT
51-9195	Molders, shapers, and casters, except metal and plastic*	31	25	(6)	(19%)	2%	\$16.85	MT OJT
51-9021	Crushing, grinding, and polishing machine setters, operators, and tenders*	46	36	(10)	(22%)	3%	\$15.34	MT OJT
<i>* indicates that the occupation is not represented in the radar charts to follow.</i>								

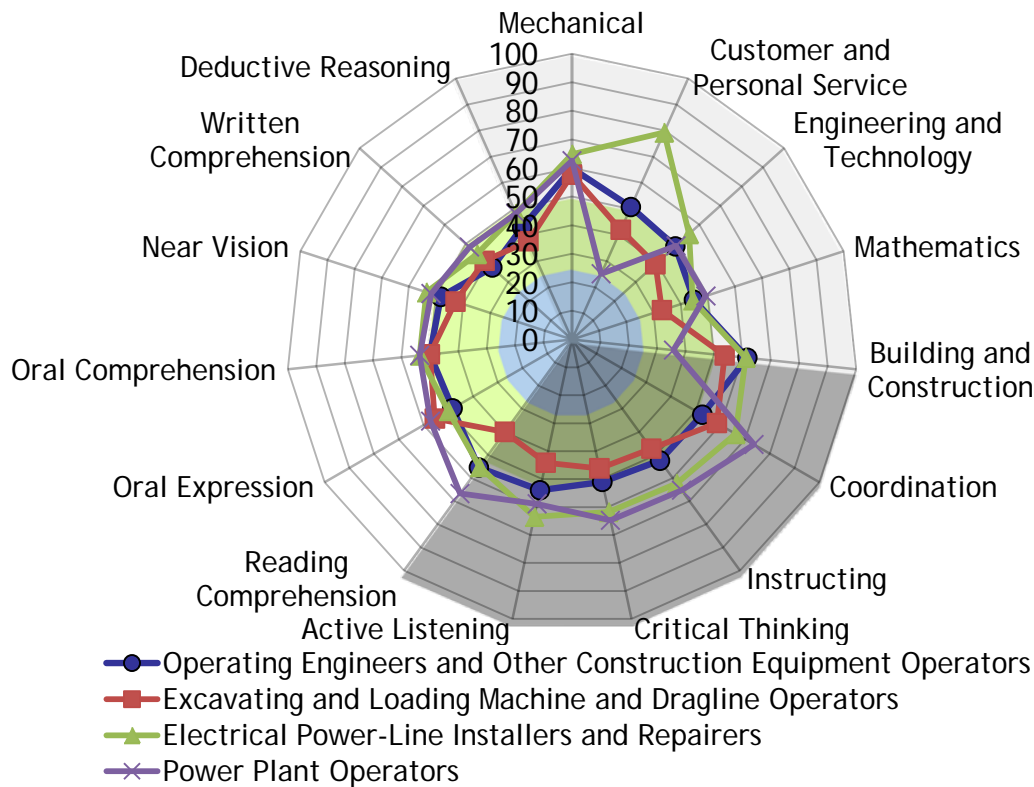
Table 3.3 shows the top five competencies from each KSA category. Specific key in-demand competencies in the energy and natural resource targeted industry group include the following: mechanical, engineering and technology, and mathematics knowledge; instructing, and critical thinking skills; and abilities in the categories of oral expression, problem sensitivity, and deductive reasoning.

**Table 3.3 – Top 15 Competency Categories for Energy & Natural Resource Production**

Knowledge	Skills	Abilities
Mechanical	Coordination	Oral Expression
Customer and Personal Service	Instructing	Oral Comprehension
Engineering and Technology	Critical Thinking	Problem Sensitivity
Mathematics	Active Listening	Written Comprehension
Building and Construction	Reading Comprehension	Deductive Reasoning

## Extraction & Distribution Workers

**Figure 3.1: Radar Chart for Extraction & Distribution Workers**



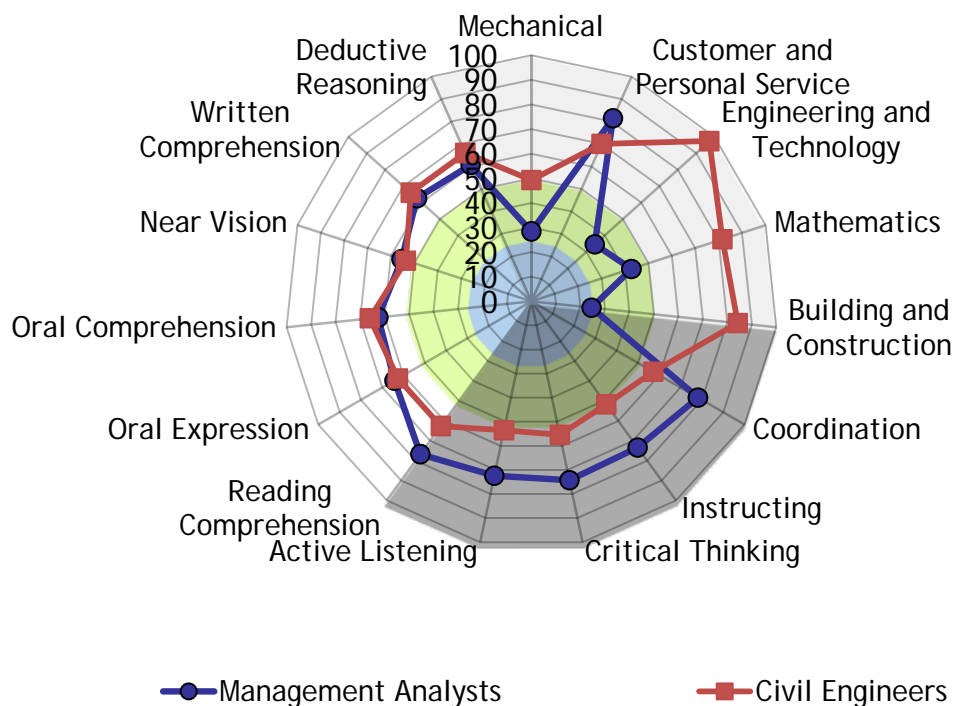
**Table 3.4 – Labor Market Data for Extraction & Distribution Workers**

Data Category	Excavating and loading machine and dragline operators	Operating engineers and other construction equipment operators	Power plant operators	Electrical power-line installers and repairers
2010 Jobs	125	256	13	142
2015 Jobs	131	280	13	144
Current Median Hourly Earnings	\$15.98	\$17.33	\$20.43	\$23.88
Annual Openings	5	9	1	7
Compatibility	n/a	9	91	91
Educational Level	MT OJT	MT OJT	LT OJT	LT OJT

Energy and natural resource production has some of the highest-paying jobs in the region, and is one of the few industries where workers without college degrees can bring home higher-than-average pay. The relatively low educational levels are reflected in the radar chart above, where very few of the KSA scores extend beyond 50 (the marker for “advanced” competency for each category). The few areas in which these workers have some expertise are mostly among skill competencies such as building and construction and coordinating. The career pathway displayed here exhibits how an excavating and loading machine and dragline operator might advance to a position as an electrical power-line installer and repairer. There are only a few big competency jumps—in customer and personal service and engineering & technology—to make this transition. Since these occupations rarely require advanced college education, the training that brings workers along this pathway would likely occur via on-the-job training or a specialized workforce development program.

## Management & Engineering Workers

**Figure 3.2: Radar Chart for Management & Engineering Workers**



**Table 3.5 – Labor Market Data for Extraction & Distribution Workers**

Data Category	Management analysts	Civil engineers
2010 Jobs	193	61
2015 Jobs	243	66
Current Median Hourly Earnings	\$13.18 <sup>5</sup>	\$29.93
Annual Openings	13	2
Educational Level	Deg. + exp.	Bachelor's

No compatibility data are shown for this group because it does not lend itself to career pathway recommendations. These occupations are similar only in that they both require high levels of knowledge and experience and they are integral to the successes of this industry group. Management analysts excel much more in the skills categories than in the knowledge categories displayed here. The expertise that they bring to this industry includes skills such as coordinating and critical thinking. Civil engineers are typically designers of large-scale construction projects, so not surprisingly they excel in engineering and technology and mathematics. Both of these occupation require a good deal of postsecondary education, so there is relatively few opportunities for the production and operating workers shown in Table 3.2 to move into these positions without going to college for an extended period of time.

---

<sup>5</sup> The median hourly earnings for this occupation are unusually low for an occupation that typically requires a degree plus work experience. The reasons for this are that many of these individuals hold an associate's degree rather than a bachelor's degree, and that many of these individuals appear to only work part-time in management analyst positions, particularly in the consulting services industries.

## BUSINESS & PROFESSIONAL SERVICES

The business and professional services industry group is defined by the following North American Industry Classification System (NAICS) codes, which are shown in two columns.

**Table 4.1— Business & Professional Services Industries**

NAICS Code	Description	NAICS Code	Description
492110	Couriers and Express Delivery Services	541410	Interior Design Services
492210	Local Messengers and Local Delivery	541430	Graphic Design Services
511120	Periodical Publishers	541511	Custom Computer Programming Services
511140	Directory and Mailing List Publishers	541512	Computer Systems Design Services
517110	Wired Telecommunications Carriers	541611	Administrative Management and General Management Consulting Services
517210	Wireless Telecommunications Carriers (except Satellite)	541613	Marketing Consulting Services
517911	Telecommunications Resellers	541614	Process, Physical Distribution, and Logistics Consulting Services
518210	Data Processing, Hosting, and Related Services	541618	Other Management Consulting Services
522120	Savings Institutions	541690	Other Scientific and Technical Consulting Services
522130	Credit Unions	541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)
522190	Other Depository Credit Intermediation	541720	Research and Development in the Social Sciences and Humanities
522291	Consumer Lending	541810	Advertising Agencies
522292	Real Estate Credit	541820	Public Relations Agencies
522298	All Other Nondepository Credit Intermediation	541870	Advertising Material Distribution Services
522390	Other Activities Related to Credit Intermediation	541890	Other Services Related to Advertising
523110	Investment Banking and Securities Dealing	541921	Photography Studios, Portrait
523120	Securities Brokerage	541990	All Other Professional, Scientific, and Technical Services

523140	Commodity Contracts Brokerage	551114	Corporate, Subsidiary, and Regional Managing Offices
523910	Miscellaneous Intermediation	561110	Office Administrative Services
523920	Portfolio Management	561210	Facilities Support Services
523930	Investment Advice	561320	Temporary Help Services
524126	Direct Property and Casualty Insurance Carriers	561330	Professional Employer Organizations
524210	Insurance Agencies and Brokerages	561410	Document Preparation Services
524291	Claims Adjusting	561422	Telemarketing Bureaus and Other Contact Centers
524292	Third Party Administration of Insurance and Pension Funds	561492	Court Reporting and Stenotype Services
524298	All Other Insurance Related Activities	561499	All Other Business Support Services
531190	Lessors of Other Real Estate Property	561612	Security Guards and Patrol Services
541110	Offices of Lawyers	561720	Janitorial Services
541191	Title Abstract and Settlement Offices	561740	Carpet and Upholstery Cleaning Services
541211	Offices of Certified Public Accountants	561790	Other Services to Buildings and Dwellings
541213	Tax Preparation Services	561990	All Other Support Services
541219	Other Accounting Services	562111	Solid Waste Collection
541330	Engineering Services	562119	Other Waste Collection

The targeted industry group employed an estimated 7,914 workers in the third quarter 2010. The largest sub-industries in this group—insurance agencies and brokerages (524210); janitorial services (561720); and corporate, subsidiary, and regional managing offices (551114)—make up nearly 25% of the group’s employment. Analysis of the target industry group’s staffing patterns identified 15 key occupations, which comprise 19% of the industry group’s employment. Accountants and auditors is the largest of the key occupations, with an estimated 259 jobs in 2010.

**Table 4.2 – Business & Professional Services Key Occupations**

SOC Code	Description	2010 Jobs	2015 Jobs	Change	% Change	% of Industry	Current Hourly Earnings	Ed. Level
41-1012	First-line supervisors/managers of non-retail sales workers	133	164	31	23%	2%	\$18.17	Exp. in field
13-2011	Accountants and auditors	259	288	29	11%	3%	\$16.59	Bach.
11-3031	Financial managers	123	151	28	23%	1%	\$26.58	Deg. + exp.
43-3031	Bookkeeping, accounting, and auditing clerks	243	264	21	9%	3%	\$13.31	MT OJT
15-1081	Network systems and data communications analysts	43	56	13	30%	1%	\$13.92	Bach.
43-6011	Executive secretaries and administrative assistants	97	109	12	12%	1%	\$14.17	MT OJT
43-6014	Secretaries, except legal, medical, and executive	188	197	9	5%	2%	\$11.85	MT OJT
11-1021	General and operations managers	81	89	8	10%	1%	\$31.77	Deg. + exp.
27-1024	Graphic designers*	45	52	7	16%	1%	\$12.99	Bach.
41-3011	Advertising sales agents	72	79	7	10%	1%	\$17.31	MT OJT
43-1011	First-line supervisors/managers of office and administrative support workers	82	89	7	9%	1%	\$18.46	Exp. in field
11-2021	Marketing managers	28	32	4	14%	0%	\$24.99	Deg. + exp.
15-1021	Computer programmers	46	50	4	9%	1%	\$22.46	Bach.
15-1041	Computer support specialists	33	37	4	12%	0%	\$16.51	Assoc.
13-2072	Loan officers*	68	67	(1)	(1%)	1%	\$24.65	Bach.
<i>* indicates that the occupation is not represented in the radar charts to follow.</i>								

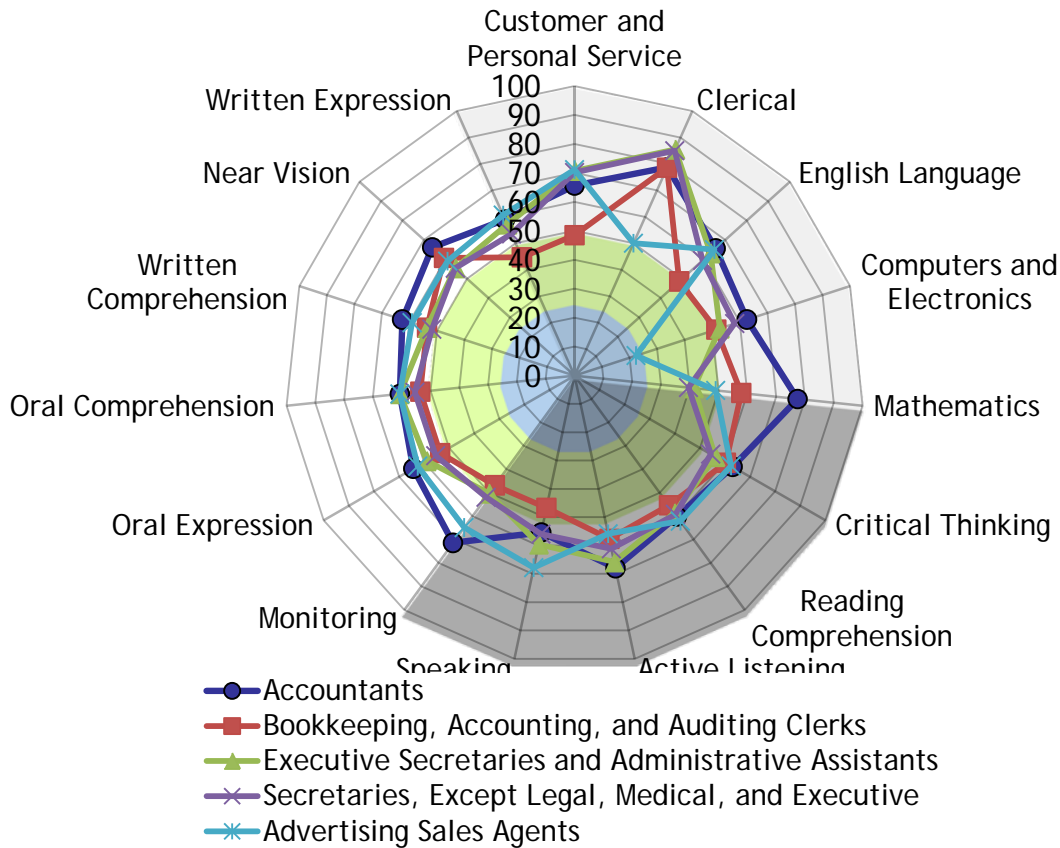
Table 4.3 shows the top five competencies from each KSA category. Specific key in-demand competencies in business and professional services include the following: customer and personal service, as well as computer and electronics knowledge; skills in critical thinking and reading comprehension; and abilities such as written expression; oral comprehension, and written comprehension.

**Table 4.3 – Top 15 Competency Categories for Business & Professional Services**

Knowledge	Skills	Abilities
Customer and Personal Service	Critical Thinking	Oral Expression
Clerical	Reading Comprehension	Oral Comprehension
English Language	Active Listening	Written Comprehension
Computers and Electronics	Speaking	Near Vision
Mathematics	Monitoring	Written Expression

## Miscellaneous Business Workers

**Figure 4.1: Radar Chart for Miscellaneous Business Workers**





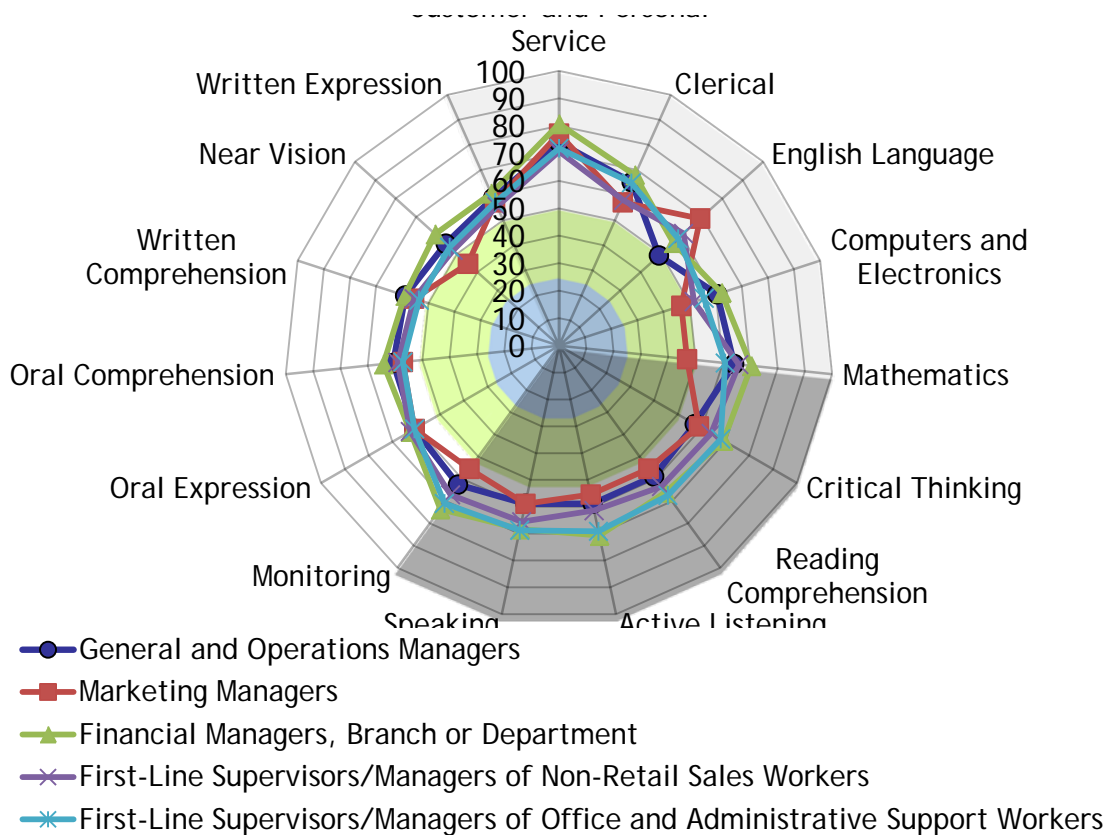
**Table 4.5 – Labor Market Data for Computer Based Workers**

Data Category	Computer support specialists	Network systems and data communications analysts	Computer programmers
2010 Jobs	94	57	86
2015 Jobs	98	71	89
Current Median Hourly Earnings	\$16.51	\$13.92	\$22.46
Annual Openings	3	4	2
Compatibility	n/a	83	89
Educational Level	Associate's	Bachelor's	Bachelor's

Although there are not many computer and information workers in the MIGP region, they are key to the operation of various businesses and professional services industries as well as the manufacturing and TDL industries. The above radar chart indicates that these workers excel in knowledge categories such as electronics, and mathematics and computers; and other competencies such as critical thinking, and reading comprehension. The career pathway suggested in Table 4.5 and Figure 4.2 is designed to assist computer support specialists, a job requiring an associate's degree and paying an average of \$16.51 per hour, into higher-paying positions such as network systems and data communications analysts and computer programmers. Computer support specialists actually have a higher median hourly earnings level than the next occupation on this list, network systems and data communications analysts, indicating that it is likely that many of the higher-paid computer support specialists hold bachelor's degrees. Therefore, remaining in the computer support specialists occupation and upgrading from an associate's degree to a bachelor's degree also represents a legitimate career pathway.

## Management Workers

**Figure 4.3: Radar Chart for Management Workers**



**Table 4.6 – Labor Market Data for Management Workers**

Data Category	First-line supervisors/managers of non-retail sales workers	First-line supervisors/managers of office and administrative support workers	Marketing managers	Financial managers	General and operations managers
2010 Jobs	489	348	73	262	472
2015 Jobs	539	367	76	294	482
Current Median Hourly Earnings	\$18.17	\$18.46	\$24.99	\$26.58	\$31.77
Annual Openings	20	12	3	11	16
Educational Level	Exp. in field	Exp. in field	Degree + exp.	Degree + exp.	Degree + exp.

---

No compatibility data is shown for this group because it does not lend itself to career pathway recommendations. Though these occupations are highly compatible, they are each involved in distinctively different types of business operations. The greatest similarities in these occupations is in their very similar KSA profiles and the fact that they are each integral to their respective industries. This group of management workers is notable for their well-rounded set of knowledge, skills, and abilities. They are considered “advanced” in all 15 KSAs in the chart, but are particularly knowledgeable in the categories of customer and personal service, and clerical. These data illustrate the fact that individuals that are well-rounded and oriented toward business skills are very important to the success of the business and professional services sector in the MIGP region.

## BIOTECHNOLOGY

The biotechnology industry group is defined by the following North American Industry Classification System (NAICS) codes, which are shown in two columns.

**Table 5.1— Biotechnology Industries**

NAICS Code	Description	NAICS Code	Description
325412	Pharmaceutical Preparation Manufacturing	541690	Other Scientific and Technical Consulting Services
325414	Biological Product (except Diagnostic) Manufacturing	541711	Research and Development in Biotechnology
423450	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers		

The targeted industry group employed an estimated 981 workers in the third quarter 2010. A large majority of these workers are employed in biological product (except diagnostic) manufacturing (325414) and pharmaceutical preparation manufacturing (325412). Analysis of the target industry group's staffing patterns identified eight key occupations, which comprise 28% of the industry group's employment. Chemical equipment operators and tenders is the largest of the key occupations, with an estimated 141 jobs in the MIGP region in 2010.

**Table 5.2 – Biotechnology Key Occupations**

SOC Code	Description	2010 Jobs	2015 Jobs	Change	% Change	% of Industry	Current Hourly Earnings	Ed. Level
51-8091	Chemical plant and system operators	72	85	13	18%	5%	\$19.81	LT OJT
51-9011	Chemical equipment operators and tenders	141	151	10	7%	10%	\$20.01	MT OJT
51-8092	Gas plant operators*	19	24	5	26%	1%	\$20.32	LT OJT
19-1042	Medical scientists, except epidemiologists	25	26	1	4%	2%	\$31.65	Doc.
19-4031	Chemical technicians	36	37	1	3%	3%	\$21.00	Assoc.
19-2031	Chemists	26	25	(1)	(4%)	2%	\$26.42	Bach.
19-4021	Biological technicians	29	28	(1)	(3%)	2%	\$20.29	Assoc.
51-9061	Inspectors, testers, sorters, samplers, and weighers*	40	39	(1)	(3%)	3%	\$15.31	MT OJT
* indicates that the occupation is not represented in the radar charts to follow.								

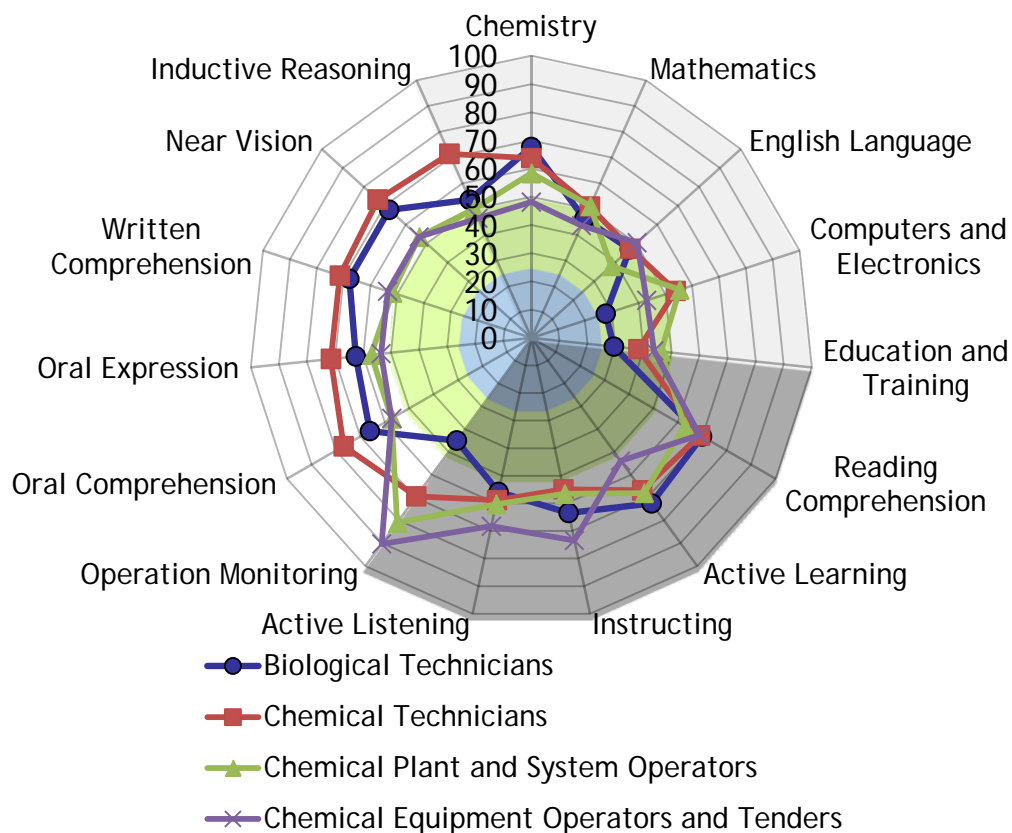
Table 5.3 shows the top five competencies from each KSA category. Specific key in-demand competencies in the biotechnology industry group include significant knowledge in chemistry and mathematics; reading comprehension and instructing skills; and oral comprehension, written comprehension, and problem sensitivity abilities.

**Table 5.3 – Top 15 Competency Categories for Biotechnology**

Knowledge	Skills	Abilities
Chemistry	Reading Comprehension	Oral Comprehension
Mathematics	Active Learning	Oral Expression
English Language	Instructing	Problem Sensitivity
Computers and Electronics	Active Listening	Written Comprehension
Education and Training	Operation Monitoring	Deductive Reasoning

## Scientific Technicians & Operators

**Figure 5.1: Radar Chart for Scientific Technicians & Operators**



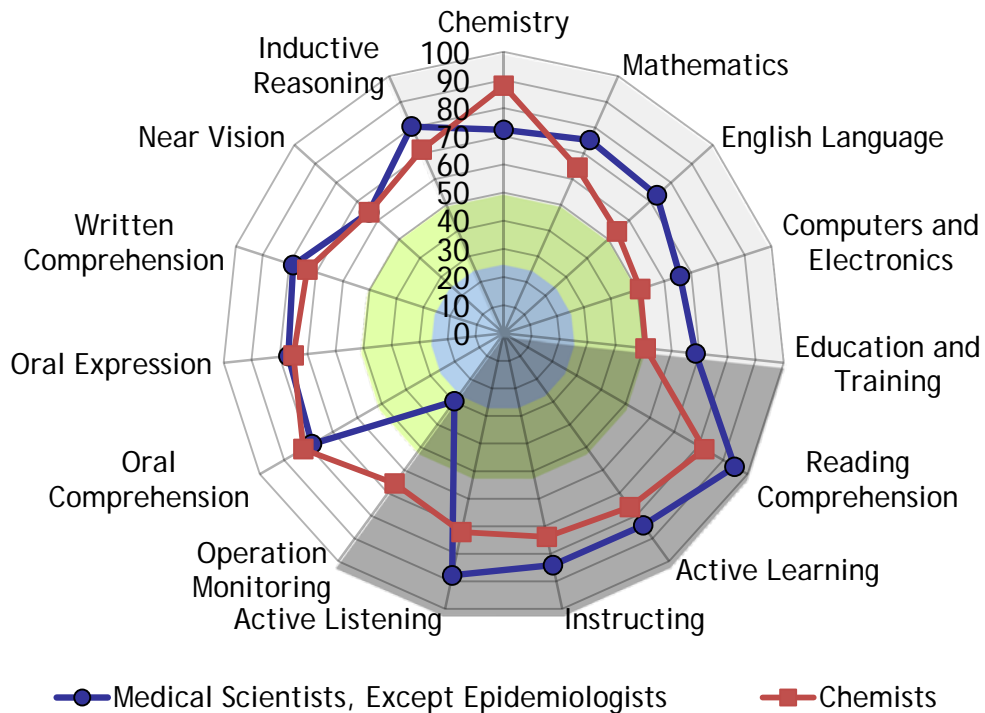
**Table 5.4 – Labor Market Data for Scientific Technicians & Operators**

Data Category	Chemical plant and system operators	Chemical equipment operators and tenders	Biological technicians	Chemical technicians
2010 Jobs	93	163	47	47
2015 Jobs	104	170	47	47
Current Median Hourly Earnings	\$19.81	\$20.01	\$20.29	\$21.00
Annual Openings	4	3	2	1
Compatibility	n/a	94	91	92
Educational Level	LT OJT	MT OJT	Associate's	Associate's

The occupations shown in Table 5.4 illustrate the types of jobs that are required for the production of biotechnology products. These workers are effectively the manufacturing and production workers for this industry, but these jobs pay a considerably higher wage than manufacturing positions in other industries (*e.g.*, food production and metal manufacturing). Not surprisingly, they also require a slightly higher degree of expertise in areas such as chemistry and operations monitoring, and often require a college degree or certification. The career pathway illustrated in the graph and table shows that individuals at the level of chemical plant and system operators who aspire to higher-paying jobs can focus on upgrading, among other competencies, oral comprehension and inductive reasoning. The occupations at the end of this pathway, namely biological technicians and chemical technicians, have a good deal of the KSAs required to move into one of the positions shown in Table 5.2, which includes chemists and medical scientists.

## Scientists

**Figure 5.2: Radar Chart for Scientists**



**Table 5.5 – Labor Market Data for Scientists**

Data Category	Chemists	Medical scientists, except epidemiologists
2010 Jobs	32	33
2015 Jobs	32	35
Current Median Hourly Earnings	\$26.42	\$31.65
Annual Openings	1	1
Educational Level	Bachelor's	Doctoral degree

No compatibility data is shown for this group because it does not lend itself to career pathway recommendations. These occupations are tied together according to their significance to the biotechnology industry group and their unusually high educational level requirements. Though there are only 32 chemists and 33 medical scientists in the region, they play a key role in developing products and procedures for the biotechnology industry. It doesn't seem necessary to offer postsecondary programs to train these workers in the region, but the MIGP region needs to maintain some method for attracting these critical workers into the area.

## METAL AND MACHINERY MANUFACTURING

The metal and machinery manufacturing industry group is defined by the following North American Industry Classification System (NAICS) codes, which are shown in two columns.

**Table 6.1— Metal & Machinery Manufacturing Industries**

NAICS Code	Description	NAICS Code	Description
331511	Iron Foundries	335212	Household Vacuum Cleaner Manufacturing
332312	Fabricated Structural Metal Manufacturing	335224	Household Laundry Equipment Manufacturing
332322	Sheet Metal Work Manufacturing	335311	Power, Distribution, and Specialty Transformer Manufacturing
332323	Ornamental and Architectural Metal Work Manufacturing	336211	Motor Vehicle Body Manufacturing
332431	Metal Can Manufacturing	336212	Truck Trailer Manufacturing
332439	Other Metal Container Manufacturing	336213	Motor Home Manufacturing
332710	Machine Shops	336214	Travel Trailer and Camper Manufacturing
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	336312	Gasoline Engine and Engine Parts Manufacturing
333111	Farm Machinery and Equipment Manufacturing	336350	Motor Vehicle Transmission and Power Train Parts Manufacturing
333120	Construction Machinery Manufacturing	336399	All Other Motor Vehicle Parts Manufacturing
333294	Food Product Machinery Manufacturing	336612	Boat Building
333319	Other Commercial and Service Industry Machinery Manufacturing	336991	Motorcycle, Bicycle, and Parts Manufacturing
333512	Machine Tool (Metal Cutting Types) Manufacturing	339991	Gasket, Packing, and Sealing Device Manufacturing
333911	Pump and Pumping Equipment Manufacturing	423120	Motor Vehicle Supplies and New Parts Merchant Wholesalers
333922	Conveyor and Conveying Equipment Manufacturing	423140	Motor Vehicle Parts (Used) Merchant Wholesalers
333923	Overhead Traveling Crane, Hoist, and Monorail System Manufacturing	423510	Metal Service Centers and Other Metal Merchant Wholesalers

333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing	423810	Construction and Mining (except Oil Well) Machinery and Equipment Merchant Wholesalers
333995	Fluid Power Cylinder and Actuator Manufacturing	423830	Industrial Machinery and Equipment Merchant Wholesalers
333999	All Other Miscellaneous General Purpose Machinery Manufacturing	493110	General Warehousing and Storage
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	532490	Other Commercial and Industrial Machinery and Equipment Rental and Leasing

The targeted industry group employed roughly 4,400 workers in the third quarter 2010. These jobs are found mostly in household laundry equipment manufacturing (335224); farm machinery and equipment manufacturing (333111); gasoline engine and engine parts manufacturing (336312); and other metal container manufacturing (332439). Analysis of the target industry group's staffing patterns identified 14 key occupations, which comprise about 47% of the industry group's employment. Welders and machinists occupy the largest portion of the key occupations.

The projections for growth in Table 6.2 as well as the annual openings displayed in Tables 6.4 through 6.6 were not created with consideration of the closing of the Electrolux plant. These figures were not adjusted because it is difficult to determine how many jobs will be lost due to this plant closure and exactly what occupations will be affected. Each of these occupations will continue to present some job openings over the next few years, though these openings will likely be slightly lower than what is displayed in these tables.

**Table 6.2 – Metal & Machinery Manufacturing Key Occupations**

SOC Code	Description	2010 Jobs	2015 Jobs	Change	% Change	% of Industry	Current Hourly Earnings	Ed. Level
51-4121	Welders, cutters, solderers, and brazers	359	371	12	3%	8%	\$15.60	LT OJT
51-2041	Structural metal fabricators and fitters	71	75	4	6%	2%	\$14.26	MT OJT
51-4011	Computer-controlled machine tool operators, metal and plastic	83	86	3	4%	2%	\$14.87	MT OJT
49-9041	Industrial machinery mechanics	72	73	1	1%	2%	\$19.12	LT OJT
51-4041	Machinists	166	167	1	1%	4%	\$15.95	LT OJT
17-3013	Mechanical drafters	26	25	(1)	(4%)	1%	\$19.22	PSV Award

17-2112	Industrial engineers	41	39	(2)	(5%)	1%	\$30.97	Bach.
51-4111	Tool and die makers	27	25	(2)	(7%)	1%	\$18.83	LT OJT
17-3027	Mechanical engineering technicians	26	21	(5)	(19%)	1%	\$19.99	Assoc.
17-2141	Mechanical engineers	57	51	(6)	(11%)	1%	\$26.98	Bach.
51-4081	Multiple machine tool setters, operators, and tenders, metal and plastic*	68	61	(7)	(10%)	2%	\$15.99	MT OJT
51-4031	Cutting, punching, and press machine setters, operators, and tenders, metal and plastic*	149	130	(19)	(13%)	3%	\$13.61	MT OJT
51-4199	Metal workers and plastic workers, all other*	162	97	(65)	(40%)	4%	\$14.34	MT OJT

\* indicates that the occupation is not represented in the radar charts to follow.

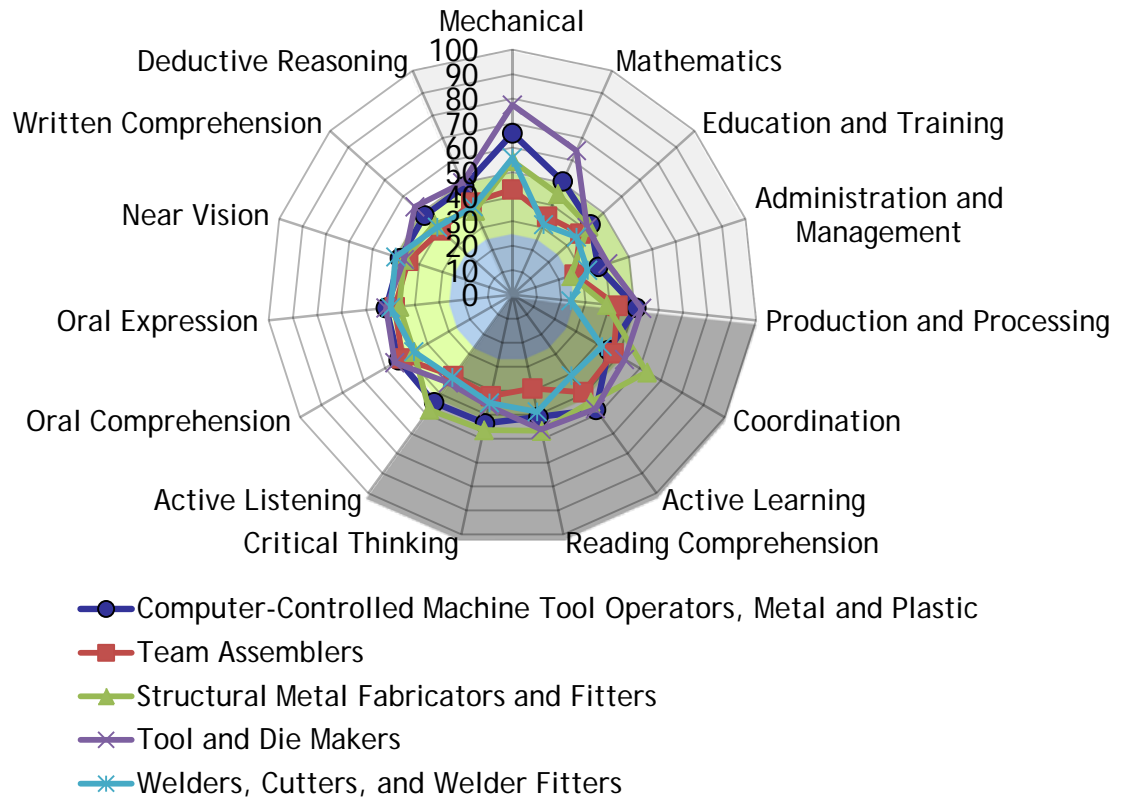
Table 6.3 shows the top five competencies from each KSA category. Specific key in-demand competencies in metal and machinery manufacturing include the following: mechanical, mathematics and production, and processing knowledge; coordination, active learning, and critical thinking skills; and oral comprehension, written comprehension, problem sensitivity, and deductive reasoning abilities.

**Table 6.3 – Top 15 Competency Categories for Metal & Machinery Manufacturing**

Knowledge	Skills	Abilities
Mechanical	Coordination	Oral Comprehension
Mathematics	Active Learning	Oral Expression
Education and Training	Reading Comprehension	Problem Sensitivity
Administration and Management	Critical Thinking	Written Comprehension
Production and Processing	Active Listening	Deductive Reasoning

## Production Workers

**Figure 6.1: Radar Chart for Production Workers**



**Table 6.4 – Labor Market Data for Production Workers**

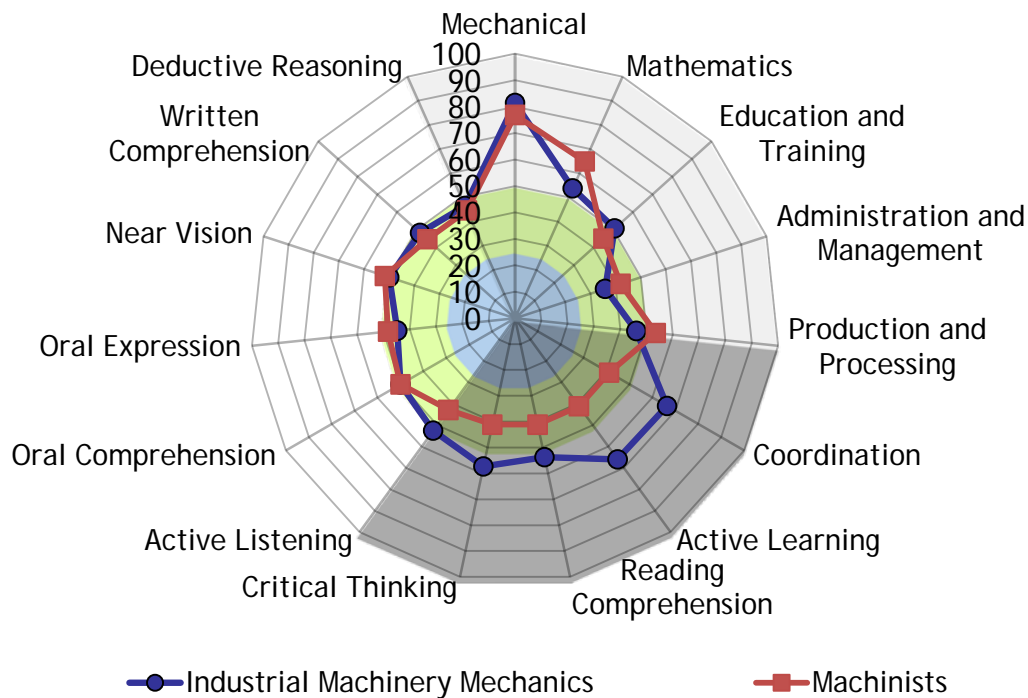
Data Category	Team assemblers	Computer-controlled machine tool operators, metal and plastic	Structural metal fabricators and fitters	Welders, cutters, solderers, and brazers	Tool and die makers
2010 Jobs	913	92	79	489	32
2015 Jobs	793	95	84	508	30
Current Median Hourly Earnings	\$13.35	\$14.87	\$14.26	\$15.60	\$18.83
Annual Openings	29	4	3	21	1
Compatibility	n/a	89	89	92	89
Educational Level	MT OJT	MT OJT	MT OJT	LT OJT	LT OJT

The production category is comprised of low-skilled occupations, except for certain areas where each occupation exceeds average. For instance, tool and die makers are very knowledgeable in the mechanical and mathematics categories, but average in all other regards. Structural metal fabricators exceed the group in coordinating and critical thinking. Despite these slight differences, the potential for career transitions across all these occupations to higher-paying occupations is strong. Team assemblers, for example, might have the potential to become computer-controlled machine tool operators after a few months of on-the-job training.

It should be mentioned that the average earnings shown in Table 6.4 are a poor reflection of how well more-experienced, highly skilled workers are compensated. Journeyman welders or journeyman tool and die makers, for example, can in some cases earn two to three times as much as the average wages shown here. The career pathway for this group of occupations therefore could end with one of several occupations, including those mentioned and others that are shown in the preceding table under the mechanical workers category. Though postsecondary education is not the typical path taken by workers in these professions, many community colleges have found it beneficial to offer an associate's or certificate course in fields such as welding and computer-controlled machinery operation.

## Machinery Workers

**Figure 6.2: Radar Chart for Machinery Workers**





**Table 6.6 – Labor Market Data for Engineers & Drafters**

Data Category	Mechanical drafters	Mechanical engineers	Industrial engineers
2010 Jobs	34	76	79
2015 Jobs	33	71	81
Current Median Hourly Earnings	\$19.22	\$26.98	\$30.97
Annual Openings	1	3	3
Compatibility	n/a	88	85
Educational Level	PSV Award	Bachelor's	Bachelor's

Though not many of them are employed in the region, drafters and engineers are essential to the success of metal and machinery manufacturing industries. These workers are strong in mechanics, production and processing, and active listening, among other competencies. The proposed career pathway shown here illustrates that advancing from a mechanical drafter to mechanical or industrial engineer requires special attention to knowledge categories such as mechanical, administration and management, and production and processing. Though it does not seem feasible to train engineers at colleges within the region, the MIGP should explore ways to ensure engineers are accessible to businesses when they are needed.

## CHAPTER 2: EDUCATIONAL GAP ANALYSIS DATA

The tables in the following section correspond to each of the preceding targeted occupation sections. They are intended to relate the key occupations to postsecondary training programs within the region in order to determine how comprehensively regional colleges and universities are addressing the demand for workers in the target industries. The educational programs are identified using Classification of Instructional Program (CIP) codes, which are the standard coding system used by most postsecondary institutions. The “occupational linkages” column shows which occupations are associated with the CIP code according to common college-to-work transitions (*e.g.* people who study mechanical engineering usually become mechanical engineers). The average annual openings column contains the sum of the annual openings for the occupations shown in the occupational linkages column. The 2009 regional completions column displays the number of completers or graduates who finished programs at regional schools in the previous academic year. Comparing these two figures will help provide a ballpark estimate for whether regional colleges are providing near the requisite number of completers to fill the number of annual openings.

The CIP codes have been divided into the following two categories: “Career & Technical Education” and “Bachelor’s & Above.” There is also a section indicating the “Key Gaps” according to available data—which displays the educational programs that do not exist in the region but nonetheless seem to be a good fit given the growth projections for related occupations.<sup>6</sup>

### Summary of Educational Gap Analysis Data

There are an abundance of colleges within the MIGP region and just outside of its boundaries, giving businesses in the area access to recent college graduates in many different fields. Iowa Central, Iowa Lakes and Ellsworth College are community colleges in the MIGP area and others are just a short drive away, such as North Iowa Area and Marshalltown. Furthermore, Iowa State University (ISU) and Buena Vista University (BVU) provide the area with bachelor’s- and postgraduate-level educational options.

---

<sup>6</sup> Please keep in mind that there are limitations to this approach. The educational gap analysis should not be seen as a definitive calculation but rather an estimate based on multiple assumptions. This method does not take into account factors such as post-college out-migration and in-migration, workers who live in the area but out-commute, or students whose field of study is significantly different from type of job that they accept, the quality or content of education, or skills that can be obtained through on-the-job training or apprenticeship training. Nevertheless this approach is helpful for high-level analysis of how much educational investment is being put into these industries.

When analyzing the educational data alongside the projected job openings, there is no question in most cases as to whether there are enough graduates in the region to fulfill the demand for workers. The key question is whether the MIGP region is capable of retaining these individuals within the area after they graduate, or in the case of ISU and BVU, whether the region can attract the graduates to the area.

This issue is particularly important for certain high-demand bachelor’s-level occupations that are critical to the focus industry groups, such as accountants and auditors, graphic designers, and mechanical engineers. ISU and BVU produce an adequate number of graduates for the northern Iowa area, but if businesses within the MIGP region are not successful at capturing this talent before they leave the area, they might have difficulty finding qualified workers.

Many of the jobs highlighted in Chapter 1 are in the “middle-skill jobs” category—those that require greater than secondary school education but less than a bachelor’s degree. Some of these jobs typically require an associate’s degree (*e.g.*, biological and chemical technicians, bookkeeping clerks, and mechanical drafters). Others in this category (*e.g.*, welders, and tool and die makers) are more often trained for with on-the-job training, but community colleges can step up to fill this role as well. There is no simple procedure for determining who should take responsibility for the education and training of these occupations. To find the best solution for the region, representatives from colleges, workforce development, and businesses will need to discuss the needs of businesses and capabilities and resources of the various educational institutions.

In analyzing the supply and demand data in Tables 7.3 through 7.8, EMSI generated a short list of occupations for which an apparent educational gap does exist. Providing education and training for the programs listed in Table 7.1 should be considered among the top priorities for supporting the focus industry groups.

**Table 7.1: Educational Programs Required to Serve Target Industry Groups**

Target Industry Group	Recommended Programs
Agriculture & Food Processing	~Agricultural managers, and supervisors
Transportation, Distribution & Logistics	Truck drivers
Energy & Natural Resource Production	Electrical power-line installers, Operating engineers, ~various machine operators
Business & Professional Services	~Graphic designers,
Biotechnology	Inspectors, testers, sorters, samplers, and weighers, ~Chemists
Metals & Advanced Machinery Manufacturing	Mechanical engineering technicians

## A Note on the Data

In consideration of space, the college names have been abbreviated. Table 7.1 below indicates the shortened form of each of the college titles.

**Table 7.2 – Abbreviated College Titles**

Institution	Abbreviation
Buena Vista University	BVU
Ellsworth Community College	ECC
Iowa Central Community College	ICCC
Iowa Lakes Community College	ILCC
Iowa State University	ISU
La James International College	LJIC
Marshalltown Community College	MCC
North Iowa Area Community College	NIACC

To find the program completers for all colleges in the region EMSI utilized data from the Integrated Postsecondary Educational System (IPEDS), which is publicly available through the National Center for Educational Statistics. These data come with certain weaknesses, primarily that numbers are only available for colleges that participate in or are applicants for any federal financial assistance program authorized by the Higher Education Act (HEA). Nevertheless, this system is the best source for collecting data regarding a broad range of educational institutions.

**Table 7.3 – Educational Programs Associated with Food Processing**

CIP Code	Program Name	Occupational Linkages	Avg. Annual Openings	2009 Regional Completions	College(s)
<b>Career &amp; Technical Education</b>					
01.0000	Agriculture, various	Farm, ranch, and other agricultural managers; Supervisors, farming, fishing, and forestry workers	56	149	ICCC; NIACC; ILCC; ECC; MCC
47.0600	Diesel & Motorcycle Mechanics	Farm equipment mechanics	9	36	ICCC
15.0613	Manufacturing Technology/Technician	Packaging and filling machine operators; Food batchmakers; Mixing and blending machine operators	17	1	MCC
<b>Bachelor's &amp; Above</b>					
01.0000	Agriculture, various	Farm, ranch, and other agricultural managers; Supervisors, farming, fishing, and forestry workers	56	152	ISU

01.1000	Food Sciences, various	Food scientists and technologists; Agricultural and food science technicians	6	141	ISU
03.0000	Environmental Science, various	Conservation scientists; Agricultural and food science technicians; Agricultural inspectors	8	25	ISU; BVU
<b>Key Gaps</b>					
none					

The educational programs required to train for the key occupations in the food processing industry are present within the MIGP counties and surrounding region. There options for training low-level workers such as food batchmakers and mixing and blending machine operators are scarce, but these occupations can usually be adequately trained for by businesses that hire the workers. There are numerous agricultural programs available at Iowa State University, but whether enough of these graduates will be attracted to fill the job openings in the MIGP region is a question that should be explored by MIGP.

**Table 7.4 – Educational Programs Associated with TDL**

CIP Code	Program Name	Occupational Linkages	Avg. Annual Openings	2009 Regional Completions	College(s)
<b>Career &amp; Technical Education</b>					
52.1801	Sales, Distribution, and Marketing Operations, General	Transportation, storage, and distribution managers	9	22	ICCC; NIACC; ILCC; ECC; MCC
47.0605	Diesel Mechanics Technology/Technician	Bus and truck mechanics and diesel engine specialists	8	6	ICCC
<b>Bachelor's &amp; Above</b>					
52.0203	Logistics and Materials Management	Transportation, storage, and distribution managers	1	55	ISU
52.0209	Transportation/Transportation Management	Transportation, storage, and distribution managers	1	2	ISU
<b>Key Gaps</b>					
49.0205	Truck and Bus Driver/Commercial Vehicle Operation	Truck drivers, heavy and tractor-trailer; Truck drivers, light or delivery services; Driver/sales workers	156	n/a	n/a

Generally speaking, the educational programs required to train these workers appear to be present in the surrounding area. There are a combination of programs at the career and technical and bachelor's level that can prepare students for employment as transportation, storage & distribution managers and bus and truck mechanics and diesel engine specialists. Many of the other occupations in this group, such

as dispatchers and locomotive engineers, can usually be adequately trained for by the businesses that hire the workers. The major question regarding this group of occupations is whether a collegiate program that trains truck drivers, heavy and tractor trailer would be warranted. Often, truck driver training schools do not allow for use of HEA funds, and therefore their completer data are not captured in this dataset. Before any action is taken to address this apparent shortage of graduates, MIGP and the region's community colleges should determine whether any such regional programs exist that would not be found among the data used in this report.

**Table 7.5 – Educational Programs Associated with Energy & Natural Resource Production**

CIP Code	Program Name	Occupational Linkages	Avg. Annual Openings	2009 Regional Completions	College(s)
<b>Career &amp; Technical Education</b>					
48.0501	Machine Tool Technology/Machinist	Excavating and loading machine and dragline operators; Molders, shapers, and casters, except metal and plastic; Crushing, grinding, and polishing machine setters, operators, and tenders	11	29	ICCC; ILCC; MCC
<b>Bachelor's &amp; Above</b>					
14.0801	Civil Engineering, General	Civil engineers	2	138	ISU
14.3301	Construction Engineering	Civil engineers	2	72	ISU
52.0205	Operations Management and Supervision	Power plant operators	1	41	ISU
<b>Key Gaps</b>					
46.0301	Electrical and Power Transmission Installation/Installer, General	Electrical power-line installers and repairers	7	n/a	n/a
49.0202	Construction/Heavy Equipment/Earthmoving Equipment Operation	Operating engineers and other construction equipment operators	9	n/a	n/a

Many but not all of the educational programs required to train for the key occupations in the energy and natural resource industry group exist within the surrounding region. However, it is uncertain whether the 29 graduates from the region's various machine tool technology programs are enough to fill the region's job openings. This is a complex issue because many of the occupations shown in Table 7.4 are more often trained for on the job rather than through a formal collegiate program, and many businesses prefer this arrangement. Whether the businesses that employ these workers would prefer to train their

own workers or have the task managed by the community college system is a question that can be explored by MIGP. In addition, two more programs are mentioned in the key gaps section of Table 7.4 that would train for electrical power-line installers and repairers and operating engineers. Like many occupations addressed in these tables, workers are often prepared for these jobs through on-the-job training, so a collegiate program may not be necessary.

**Table 7.6 – Educational Programs Associated with Business & Professional Services**

CIP Code	Program Name	Occupational Linkages	Avg. Annual Openings	2009 Regional Completions	College(s)
<b>Career &amp; Technical Education</b>					
52.0000	Business; Trade & Entrepreneurship, various	Marketing managers; Advertising sales agents	8	120	ICCC; NIACC; ILCC; ECC; MCC
52.0302	Accounting Technology/Technician and Bookkeeping	Bookkeeping, accounting, and auditing clerks	29	89	ICCC; NIACC; ILCC; ECC; MCC
11.0900	Computer Science; Information; Systems Networking & Telecommunications	Computer support specialists	3	59	ICCC; NIACC; ILCC; ECC; MCC
52.0401	Administrative Assistant and Secretarial Science, General	First-line supervisors/managers of non-retail sales workers; First-line supervisors/managers of office and administrative support workers; Executive secretaries and administrative assistants; Secretaries, except legal, medical, and executive	83	59	ICCC; NIACC; ILCC; ECC; MCC
52.0204	Office Management and Supervision	First-line supervisors/managers of non-retail sales workers; First-line supervisors/managers of office and administrative support workers; Executive secretaries and administrative assistants; Secretaries, except legal, medical, and executive	83	21	ILCC
50.0400	Graphic & Web Design	Graphic designers	5	2	ICCC
<b>Bachelor's &amp; Above</b>					
52.0301	Accounting	Accountants and auditors	17	192	ISU; BVU
52.0800	Banking & Financial Services	Financial managers; Accountants and auditors; Loan officers	33	187	ISU; BVU

52.0000	Business; Trade & Entrepreneurship, various	General and operations managers; Advertising sales agents	21	144	ISU; BVU
52.1401	Marketing/Marketing Management, General	Marketing managers	3	143	ISU; BVU
52.1301	Management Science, General	First-line supervisors/managers of non-retail sales workers; First-line supervisors/managers of office and administrative support workers; Executive secretaries and administrative assistants; General and operations managers	60	122	ISU
52.1201	Management Information Systems, General	First-line supervisors/managers of non-retail sales workers; First-line supervisors/managers of office and administrative support workers; Executive secretaries and administrative assistants; General and operations managers	60	92	ISU; BVU
50.0400	Graphic & Web Design	Graphic designers	5	65	ISU
11.0900	Computer Science; Information; Systems Networking & Telecommunications	Computer programmers; Network systems and data communications analysts	6	63	ISU; BVU
<b>Key Gaps</b>					
none					

There are an abundance of programs associated with the key occupations in the business and professional services industry group. To some degree, every college in the region is addressing the needs of this industry group. Graphic designers is the only occupation where there might not be enough graduates at the career and technical level. This is a complex matter, however, because in addition to the two graduates from Iowa Central, there are also 65 graduates from Iowa State University. But ISU graduates have at least two more years of classroom training and could be competing for different job positions than associate's-level graduates. Whether enough of these graduates will be attracted to fill the job openings in the MIGP region is a question that should be explored by MIGP.

**Table 7.7 – Educational Programs Associated Biotechnology**

CIP Code	Program Name	Occupational Linkages	Avg. Annual Openings	2009 Regional Completions	College(s)
<b>Career &amp; Technical Education</b>					
26.1201	Biotechnology	Chemical technicians; Biological technicians	3	7	ICCC; NIACC; ILCC; ECC
41.0301	Chemical Technology/Technician	Chemical technicians; Biological technicians; Chemical plant and system operators; Chemical equipment operators and tenders	10	3	ICCC
<b>Bachelor's &amp; Above</b>					
n/a	Chemistry & Biochemistry	Chemists	1	74	ISU; BVU
n/a	Toxicology & Biomedical Sciences	Medical scientists, except epidemiologists; Chemists	2	5	ISU
<b>Key Gaps</b>					
15.0702	Quality Control Technology/Technician	Inspectors, testers, sorters, samplers, and weighers	6	n/a	n/a

The key occupations in the biotechnology industry group appear to have the right training programs in place in the surrounding area. The most important occupations include chemical technicians, biological technicians, and chemists, all of which have multiple educational programs within close proximity to the MIGP region. Whether enough chemistry students from Iowa State University will be attracted to fill the job openings in the MIGP region is a question that should be explored by MIGP. Additionally, there is a modest unfulfilled demand for inspectors, testers, sorters, samplers, and weighers. Some community colleges train workers to enter this profession with educational programs in quality control technology, but like many other occupations, businesses may have a preference to train these workers on site.

**Table 7.8 – Educational Programs Associated with Metal & Machinery****Manufacturing**

CIP Code	Program Name	Occupational Linkages	Avg. Annual Openings	2009 Regional Completions	College(s)
<b>Career &amp; Technical Education</b>					
48.0508	Welding Technology/Welder	Welders, cutters, solderers, and brazers	21	62	ICCC; NIACC; ILCC; ECC
48.0501	Machine Tool Technology/Machinist	Structural metal fabricators and fitters; Multiple machine tool setters, operators, and tenders, metal and plastic; Cutting, punching, and press machine setters, operators, and tenders, metal and plastic; Metal workers and plastic workers, all other	14	20	ILCC; ILCC; MCC

48.0507	Tool and Die Technology/Technician	Tool and die makers	1	29	NIACC; MCC
47.0000	Industrial Electronics; Mechanics	Industrial machinery mechanics	7	31	ICCC; MCC
15.1306	Mechanical Drafting and Mechanical Drafting CAD/CADD	Mechanical drafters	4	39	ICCC; ILCC; NAICC; MCC
15.0613	Manufacturing Technology/Technician	Computer controlled machine tool operators; Multiple machine tool operators; Cutting, punching and press machine operators; Metal and plastic workers, all other	15	1	MCC
<b>Bachelor's &amp; Above</b>					
14.3501	Industrial Engineering	Industrial engineers	3	73	ISU
14.1901	Mechanical Engineering	Mechanical engineers	3	227	ISU
<b>Key Gaps</b>					
15.0805	Mechanical Engineering/Mechanical Technology/Technician	Mechanical engineering technicians	1	n/a	n/a

Compared to many other regions, the MIGP region has a relatively large number of educational programs in industrial technologies such as welding and tool and die technology, and machine tool technology. Since the metal and machinery manufacturing industry group is largely composed of workers with these specialized skills, this is a major benefit to the long-term sustainability of these industries. Iowa State University's programs in industrial engineering and mechanical engineering could also serve as an advantage, if the region is able to attract an adequate number of these workers. The only program that appears to be missing from this list is mechanical engineering technology. If such a program were offered, students at two-year colleges could either complete their studies and enter the workforce as technicians or transfer to Iowa State to complete a four-year or master's degree.

## APPENDIX A: OTHER KEY OCCUPATIONS

Though the focus of this report is on fulfilling the occupational needs of the target industry groups, there are other occupations that exist largely outside of these industries that are critical to sustaining the economic viability of the region. Ensuring the long-term availability of workers for these occupations should not be neglected in favor of just those occupations within the target industry groups. Table X.1 contains a list of 17 occupations that do not fit cleanly into the six focus industry groups, but nevertheless are very important for the future of the MIGP region.

No KSA data or educational program completer data are displayed for these occupations because they bear little similarity to one another and offer little potential for career pathway development.

**Table X.1 – Other Key Occupations**

SOC Code	Description	2010 Jobs	2015 Jobs	Change	% Change	% of Industry	Current Hourly Earnings	Ed. Level
31-1012	Nursing aides, orderlies, and attendants	1,474	1,612	138	9%	n/a	\$11.09	PSV Award
29-1111	Registered nurses	1,125	1,220	95	8%	n/a	\$23.49	Assoc.
25-2021	Elementary school teachers, except special education	1,051	1,125	74	7%	n/a	\$26.50	Bach.
11-1011	Chief executives	531	598	67	13%	n/a	\$18.50	Deg. + exp.
47-2031	Carpenters	752	810	58	8%	n/a	\$13.51	LT OJT
47-2111	Electricians	306	347	41	13%	n/a	\$16.89	LT OJT
49-9042	Maintenance and repair workers, general	646	675	29	4%	n/a	\$16.19	MT OJT
25-2031	Secondary school teachers, except special and vocational education	694	721	27	4%	n/a	\$25.61	Bach.
41-4012	Sales representatives, wholesale and manufacturing, except technical and scientific products	791	817	26	3%	n/a	\$24.77	MT OJT
43-1011	First-line supervisors/managers of office and administrative support workers	348	367	19	5%	n/a	\$18.46	Exp. in field

11-9111	Medical and health services managers	169	184	15	9%	n/a	\$27.31	Deg. + exp.
13-1079	Human resources, training, and labor relations specialists, all other	76	88	12	16%	n/a	\$13.80	Bach.
33-3051	Police and sheriff's patrol officers	240	252	12	5%	n/a	\$19.91	LT OJT
49-1011	First-line supervisors/managers of mechanics, installers, and repairers	243	249	6	2%	n/a	\$25.55	Exp. in field
49-3023	Automotive service technicians and mechanics	514	516	2	0%	n/a	\$17.41	PSV Award
11-3051	Industrial production managers	90	89	(1)	(1%)	n/a	\$37.33	Exp. in field
51-1011	First-line supervisors/managers of production and operating workers	430	422	(8)	(2%)	n/a	\$22.52	Exp. in field

## APPENDIX B: O\*NET COMPETENCY DEFINITIONS

Tables X.2 through X.4 provide definitions of the competencies referred to in Chapter 1: Industry Group Profiles. These definitions are taken from the O\*NET resource center:

[http://online.onetcenter.org/help/online/browse\\_desc](http://online.onetcenter.org/help/online/browse_desc).

These definitions also tie the quantitative scores to the medium and high “scale anchors” or specific aptitudes that are required for a worker to receive a score at each level. The O\*NET system contains more competencies than those listed here. We have limited the competencies to the 14 knowledge categories, nine skill categories, and nine ability categories that are referred to within this report.

**Table X.2- Knowledge Competency Definitions and Scale Anchors**

Knowledge	Description	Mid-Anchor Score	Middle Anchor	High Anchor Score	High Anchor
Customer and Personal Service	Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.	29	Process customer dry-cleaning drop off	57	Work as a day care aide supervising 10 children
Education and Training	Knowledge of principles and methods for curriculum and training design, teaching and instruction for individuals and groups, and the measurement of training effects.	57	Lead a quality improvement seminar	86	Design a training program for new employees
English Language	Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.	57	Edit a feature article in a local newspaper	86	Teach a college English class
Mathematics	Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.	57	Analyze data to determine areas with the highest sales	86	Derive a complex mathematical equation
Mechanical	Knowledge of machines and tools, including their designs, uses, repair, and maintenance.	29	Replace the filters in a furnace	57	Replace a valve on a steam pipe
Clerical	Knowledge of administrative and clerical procedures and systems such as word processing, managing files and records, stenography and transcription, designing forms, and other office procedures and terminology.	43	Type 30 words per minute	71	Organize a storage system for company forms

Engineering and Technology	Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.	57	Design a more stable grocery cart	86	Plan for the impact of weather in designing a bridge
Administration and Management	Knowledge of business and management principles involved in strategic planning, resource allocation, human resources modeling, leadership technique, production methods, and coordination of people and resources.	57	Monitor progress of a project to ensure timely completion	86	Manage a \$10 million company
Chemistry	Knowledge of the chemical composition, structure, and properties of substances and of the chemical processes and transformations that they undergo. This includes uses of chemicals and their interactions, danger signs, production techniques, and disposal methods.	57	Use the proper concentration of chlorine to purify a water source	86	Develop a safe commercial cleaner
Computers and Electronics	Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.	43	Use a word processor	86	Create a program to scan computer disks for viruses
Production and Processing	Knowledge of raw materials, production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods.	57	Supervise an appliance assembly line	86	Manage an international shipping company distribution center
Public Safety and Security	Knowledge of relevant equipment, policies, procedures, and strategies to promote effective local, state, or national security operations for the protection of people, data, property, and institutions.	57	Inspect a building site for safety violations	86	Command a military operation

**Table X.3- Skill Competency Definitions and Scale Anchors**

Skill	Description	Mid-Anchor Score	Middle Anchor	High Anchor Score	High Anchor
Reading Comprehension	Understanding written sentences and paragraphs in work related documents.	57	Read a memo from management describing new personnel policies	86	Read a scientific journal article describing surgical procedures
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.	57	Answer inquiries regarding credit references	86	Preside as judge in a complex legal disagreement

Speaking	Talking to others to convey information effectively.	57	Interview applicants to obtain personal and work history	86	Argue a legal case before the Supreme Court
Critical Thinking	Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.	57	Evaluate customer complaints and determine appropriate responses	86	Write legal brief challenging a federal law
Active Learning	Understanding the implications of new information for both current and future problem-solving and decision-making.	57	Determine the impact of new menu changes on a restaurant's purchasing requirements	86	Identify the implications of a new scientific theory for product design
Monitoring	Monitoring/Assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.	57	Monitor a meeting's progress and revise the agenda to ensure that important topics are discussed	86	Review corporate productivity and develop a plan to increase productivity
Coordination	Adjusting actions in relation to others' actions.	57	Work with others to put a new roof on a house	86	Work as director of a consulting project calling for interaction with multiple subcontractors
Instructing	Teaching others how to do something.	57	Instruct a coworker in how to operate a software program	86	Demonstrate surgical procedure to interns in a teaching hospital
Transportation	Knowledge of principles and methods for moving people or goods by air, rail, sea, or road, including the relative costs and benefits.	71	Steer a large freighter through a busy harbor	86	Control air traffic at a busy airport
Building and Construction	Knowledge of materials, methods, and the tools involved in the construction or repair of houses, buildings, or other structures such as highways and roads.	57	Fix a plumbing leak in the ceiling	86	Build a high-rise office tower

Operation Monitoring	Watching gauges, dials, or other indicators to make sure a machine is working properly.	57	Monitor machine functions on an automated production line	86	Monitor and integrate control feedback in a petrochemical processing facility to maintain production flow
----------------------	---	----	---	----	---

**Table X.4- Ability Competency Definitions and Scale Anchors**

Ability	Description	Mid-Anchor Score	Middle Anchor	High Anchor Score	High Anchor
Oral Expression	The ability to communicate information and ideas in speaking so others will understand.	57	Give instructions to a lost motorist	86	Explain advanced principles of genetics to college freshmen
Oral Comprehension	The ability to listen to and understand information and ideas presented through spoken words and sentences.	57	Understand a coach's oral instructions for a sport	86	Understand a lecture on advanced physics
Near Vision	The ability to see details at close range (within a few feet of the observer).	71	Read the fine print of a legal document	86	Detect minor defects in a diamond
Problem Sensitivity	The ability to tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.	57	Recognize from the mood of prisoners that a prison riot is likely to occur	86	Recognize an illness at an early stage of a disease when there are only a few symptoms
Written Comprehension	The ability to read and understand information and ideas presented in writing.	57	Understand an apartment lease	86	Understand an instruction book on repairing missile guidance systems
Information Ordering	The ability to arrange things or actions in a certain order or pattern according to a specific rule or set of rules (e.g., patterns of numbers, letters, words, pictures, mathematical operations).	29	Follow the correct steps to make change	86	Assemble a nuclear warhead
Written Expression	The ability to communicate information and ideas in writing so others will understand.	57	Write a job recommendation for a subordinate	86	Write an advanced economics textbook

Deductive Reasoning	The ability to apply general rules to specific problems to produce answers that make sense.	71	Decide what factors to consider in selecting stocks	86	Design an aircraft wing using principles of aerodynamics
Inductive Reasoning	The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).	57	Determine the prime suspect based on crime scene evidence	86	Diagnose a disease using results of many different lab tests