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STUDY TWO: STRATEGIES TO DEVELOP A 21ST CENTURY WORKFORCE

REGIONAL ANALYSIS

Prepared for:
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May 2008

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SUMMARY

Introduction

The Center for Governmental Research (CGR) was engaged by the Washington-Saratoga-Warren-Hamilton-Essex (WSWHE) BOCES on behalf of the Tech Valley Standing Committee of the 31 component districts in order to determine how to help students prepare for high tech jobs of the future likely to be coming into the region as a result of Tech Valley initiatives. A previous study, referred to herein as Study One, focused on the desired academic courses that are likely to provide the skills needed to work in high technology occupations, comparing the courses currently provided by the districts and BOCES to the list of desired academic courses for high tech occupations.¹ This project went beyond the academic focus to drill down to labor market requirements, paying particular attention to the “soft skills” for success in the 21st century workplace. CGR was asked to identify actions that will ensure the districts and BOCES have the system/capacity (e.g., curricula, collaborations and facilities) to develop graduates with the knowledge, skills and abilities needed to succeed in the 21st century economy in Tech Valley.

¹ Charlie Zettek (2006) *Technology Needs Assessment: Preparing for Tech Valley Occupations in the School Districts of the Washington-Saratoga-Warren-Hamilton-Essex (WSWHE) BOCES*, Center for Governmental Research, Rochester, NY.

Project Elements

The first phase of Study Two involved a review of effective practices, looking at both the requirements for individual success, and the structures and processes to prepare individuals to succeed in the 21st century workplace. This portion is referred to as the Literature Review.

The Regional Analysis, or second phase, used the elements that emerged in that review to frame a discussion with key regional stakeholders about the challenges of preparing graduates for the global economy. This second phase also included a review of supply and demand in the regional labor market, as well as an analysis of the district technology plans. The results of the regional analysis are presented in here and include specific recommendations for building a regional talent pipeline.

The third phase, the Appendix, contains resources associated with the research and regional analysis phases of Study Two.

Both Study One and Study Two reference workforce and labor statistics. Some of the definitions and terms can be confusing. While the definition of high-tech is not precise, this report aims for some clarity by using a classification developed by the U.S. Bureau of Labor Statistics in 2004, based on the 2002 North American Industry Classification System (NAICS). Every industry across the country is classified by one or more NAICS codes. Therefore, as industries move into and out of the region, they can be uniformly identified. Employment and earnings data is reported annually by the U.S. Dept of Labor (USDOL). Further, the New York State Dept. of Labor (NYDOL) uses NAICS codes to report employment and earnings data, and to make regional employment projections by job category.

For each *industry* (NAICS code), the USDOL has identified common *occupations* that are generally found in those industries. Each occupation has a Standard Occupation Code (SOC). Thus, for each NAICS code, there are related SOC codes. Many of the same occupations are found in many different types of industries. The USDOL has classified certain occupations as being

“technology-oriented.” For each occupation, the USDOL has developed a written description that includes the nature of the work, working conditions, training and other qualifications, employment, job outlook, earnings and related occupations. While the amount of information in these descriptions varies by occupation, these descriptions do provide the most consistent way to compare specific job skill requirements across occupations.

Industry clusters is a non-official term that refers to companies and organizations that have similar or corresponding products or services. Study One analyzed national labor statistics to compile a list of *targeted industries* for the Tech Valley. These targeted industries and the corresponding *targeted occupations* are referred to throughout this report

Limitations of the Study

The information presented here reflects data gathering and analysis conducted from May 2007 to December 2007. Statistics and trends may have changed in the intervening period. Interviews and surveys conducted with teachers and administrators in the Washington-Saratoga-Warren-Hamilton-Essex (WSWHE) BOCES provided a good deal of background on the schools, the system, and the issues. However, the findings are limited to including content from those that made themselves available to the research team for surveys and interviews. Changes to curriculum, programs, and policy that occurred after this report was written cannot be accounted for here.

Findings

The analysis used a workforce planning framework. This looks at the anticipated demand for talent and the sources of supply (in this case, with particular attention to the talent pipeline), identifies gaps between supply and demand, and develops actions to address the gaps. The framework was used to look at both the national and regional labor markets.

Supply and Demand

Demand

Globalization, advances in technology, and consumer choice have increased competition and produced significant changes in the structure of industry and occupational profiles, and the nature of work, while increasing the importance of innovation to business success. This has changed the skills required for successful performance, with technological literacy, business acumen, problem-solving, creativity, communication, cultural sensitivity, and learning to learn among the skills increasing in importance. There is also increased emphasis on multi-disciplinary technological skills.

Demand in the regional economy

The three largest employment industries in the Capital Region are government, health care and social assistance, and retail trade, which cover 43% of the jobs in the region.² The three industries that contain the targeted industries identified in Study 1 – manufacturing, information, and professional and technical services – account for slightly more than 14% of the region’s employment.

Fewer than 25% of the total anticipated vacancies in the regional labor market between 2007 and 2014 require four years or more of post-secondary education. While sixty-five percent of the demand in the regional labor market is due to replacement as opposed to job growth, 60% of the vacancies due to job growth require some post-secondary education. In the high-tech sectors used as a baseline in Study 1, 93% of the new jobs require post-secondary education.

Knowledge, skills and abilities in the regional market

Business knowledge is the most required form of knowledge in the regional labor market, followed closely by liberal arts knowledge (26.9% and 26.3% of knowledge, respectively). Health knowledge is the most rapidly growing form of knowledge, followed by liberal arts knowledge.

² New York State Department of Labor, <http://www.labor.state.ny.us/workforceindustrydata/index.asp?reg=cap>

Basic skills are the most required form of skills in the regional labor market, representing over one-third of the skills. Technical skills are the second largest form of skills, representing less than a quarter of the skills in the regional labor market. The need for social skills, resource management skills and complex problem solving skills is growing at the same rate, followed closely by the need for basic skills and system skills. The requirement for technical skills is growing at the slowest rate.

In the 21st century, cognitive abilities are the foremost concern, representing over half of the abilities required in the regional labor market. They are also the fastest growing form of ability.

The knowledge, skills and abilities required in the government, health care and social assistance, and retail trade, are not very different from the overall regional economy: 9 of the top 10 knowledge requirements, all 10 of the top skill requirements, and 9 of the top 10 abilities are the same in these industries as they are in the overall regional economy.

The most common tools and technologies used in the occupations in the targeted industries are: Information Technology Broadcasting and Telecommunications tools and technologies, (used by 61% of the occupations) and 1) Laboratory and Measuring; and 2) Observing and Testing Equipment tools and technologies (used by 22%).

Supply

The key to success of almost every business cluster is the presence of a labor force with the appropriate skills for and the knowledge of the industries located within the commuting boundaries of the cluster. These are the technical, support, and customer service positions that do the bulk of the operations work. They are a key part of any industry cluster and are best sourced through a regional talent pipeline. Building a solid core of technically trained employees is critical to any region's efforts to sustain and grow an industry cluster.

The aging of the baby boomers and the smaller cohorts entering the labor market raise some concerns about the quantity of the labor supply. The state and region are also concerned with a brain drain caused by young adults leaving New York State to work in other states. While in many regions this is offset by immigration and/or in-migration, Upstate New York has a low level of in-migration.

The greater concern for both the region and the nation is the quality of the available labor force. Achievement gaps, high school drop-out rates, the need for remediation when entering college, college drop-out rates and poor performance on international comparisons of educational performance all raise questions about the quality of the regional and national talent pipeline.

An analysis of New York State's high school proficiency, graduation rates, college attendance rates, and college graduation rates suggest that: 1) there will be jobs for people with only a high school degree, but high school graduates may not be sufficiently proficient to qualify for or to succeed in those jobs; 2) there will be jobs for people with two-year degrees, but not enough graduates of two-year programs; and 3) many who go to college will not finish or may have difficulty finding a job that requires a college degree.³

Low literacy levels among incumbent workers and immigrants are causes of concern in adult workers.

Gaps and Action

Targets

Secondary school reform

From this regional analysis, in terms of the workforce labor supply, there are two major gaps between anticipated demand and supply: Gap 1) The foundation or core skills in the talent pipeline do not match those required for successful performance in the 21st century workplace; and, Gap 2) There is concern that the quantity of individuals with the technical skills needed to fill specific occupations will not meet the anticipated demand. Initiatives to

³ School Data Direct: New York State: <http://www.schooldatadirect.org>

address each of these gaps are reflected in efforts to reform both high school and career and technical education. The themes in the reform efforts in high school and career and technical education converge in the fact that in today's economy, college readiness also means workplace readiness.

The main challenge faced by America's high schools is preparing students for postsecondary educational opportunities and the workforce of the 21st century. Common elements in secondary education reform to address these challenges include rigor (which involves academic and skill standards, assessment, and interventions to enhance performance), relevance (which involves career awareness, a shift toward contextual teaching and learning, and business/community engagement), relationships (which involve personalization and collaboration), professional development, technology, and facilities/learning environment. Research suggests that while rigor, relevance, relationships and professional development are each important, it is the combination of those elements that creates success.⁴ Reform depends on improving both school climate and the quality and rigor of classroom instruction.

The current "state of the art" in secondary education reform organizes the delivery of educational services around career pathways. A career pathway is defined as a series of tools and activities based on students' interests and talents. A standardized career pathway program consists of three essential components: 1) a college-preparatory academic core; 2) a professional/technical core typically focused on a broad range of occupations and well grounded in academic and real-world standards; and 3) more demanding opportunities for field-based learning that deepen students' understanding of academic and technical knowledge

⁴ Craig D. Jerald. 2006. *Measured Progress: A Report on the High School Reform Movement*. Washington, DC: Education Sector Reports; Norton Grubb. 2004. *Pedagogical Issues and Institutional Linkages for the Information-Based Workplace*. University of California, Berkeley.

through application in authentic situations. Additionally, each career pathway provides students with necessary support services that can include supplemental instruction, counseling, transportation, and so on. The career pathways attempt to integrate academic and occupational learning, and to keep options for college open.⁵

Effective Practice

Two national initiatives attempt to address the mismatch between the skills in the talent pipeline and those required for successful performance in the 21st century workplace by influencing state policy: the American Diploma Project (ADP) and the Partnership for 21st Century Skills (P21). ADP seeks to align K-12 curriculum with college and work requirements, while P21 focuses on a new set of knowledge, skills, and abilities based on the 21st century workplace. These represent two very different approaches to the same goal. New York State does not participate in either partnership.

A number of initiatives were examined that illustrate the types of changes taking place across the country to address the gaps identified above. The models were divided into three categories, based on the level of change they required: charter/full-school reform, programmatic change, and supplemental change. The schools/programs in each category include:

Charter/full school reform: Big Picture Schools, Envision Charter School Network, Henry Ford Learning Institute, New Technology High Schools, High Tech High, Central Educational Center;

Programmatic change: Project Lead the Way, Talent Development, High Schools That Work, Health Careers Academy (Palmdale, CA), Career and Technical Education Act (Dover, DE), Caddo Career and Tech Center (Shreveport, LA), College and Career

⁵ Committee on Increasing High School Students' Engagement and Motivation to Learn (2003) Engaging Schools: Fostering High School Students' Motivation to Learn. National Research Council.

Transitions Initiatives (CCTI), Robotics pathway (California, PA); and;

Supplemental change models: Arlington Career Center, Virtual Schools, VA Governor's Schools.

A review of these effective practice models suggests that they reflect the common elements of school reform. They:

- ❖ Set high expectations for academic and 21st century skills, use both traditional and authentic assessment, and design interventions to enhance performance (rigor);
- ❖ Implement structured programs for career awareness often beginning in the middle school, use contextual learning strategies, and establish business and community partnerships to link school and work (relevance);
- ❖ Utilize small schools, flexible scheduling, a variety of support structures to create a culture or personalization that enables each student to know and be known as an individual within the school community, and collaborative forms of management to improve teacher-teacher and teacher-administrator relationships;
- ❖ Invest in long-term professional development to support role changes that accompany reform and to build a learning community focused on continuous school improvement;
- ❖ Use technology to develop proficiency in 21st century skills, to support innovative teaching and learning and to create robust education support systems; and
- ❖ Use the built environment to support and reinforce learning.

Pictures from the edge

Some of the research and exploratory programs uncovered during the literature review depict even more radical changes that may provide an idea of what is coming next. Three trends in learning are discussed: individualized learning, collaborative learning and new modes of delivery.

Regional Practice

While district activity around rigor is driven primarily by academic standards and state assessments, there is a belief that graduates should demonstrate 21st century skills. A variety of similar initiatives are underway regionally to improve student performance on state proficiency exams. These include curriculum mapping, articulated curricula, and use of data to inform instructional decisions. Many superintendents would prefer to see the state free schools to deliver the core in a creative manner, and to move beyond the approach that assumes one size fits all that is reflected in the current assessments.

Regional efforts to increase the relevance of the high school curriculum to engage students and to allow them to develop career and technical skills revolve around career awareness and changes in pedagogy. There is a mix of pedagogy in the region, with many districts employing time-tested traditional teaching strategies, some integrating curriculum, and some implementing innovative problem-based curriculum. Career awareness is an eclectic but potentially effective mix of activities highly dependent on the local connections of individual teachers or the assistance of strategic partners. The most common activities involve a mix of career counseling with a focus on regional business, career exploration in the middle school, and career-oriented speakers at the high school. A few districts have more structured programs.

The majority of investments in professional development reflect the need to provide staff the knowledge and skills needed to implement the district's or school's strategic objectives. Thus the significant investments made by districts revolve around differentiated instruction, articulated curriculum, use of data, use of technology, and learning communities.

An analysis of district technology plans revealed that the thoroughness and quality of the plans ranged significantly. The better plans outlined how technology was acquired, how it was paid for, and how it was integrated into the school day. A majority of the plans focused primarily on the acquisition of technology

and spent little time on how the technology would be used in the classroom.

Recommendations for Regional Action

Recommendation 1: Craft a Regional Vision

The region needs to move beyond random acts of improvement to a regional vision and collaborative action. CGR believes the vision should touch on how key elements of education reform -- standards, assessment, curriculum, pedagogy, postsecondary articulation, technology, professional development, business engagement, etc. – will be used to promote development and universal access to multiple pathways integrating preparation for both postsecondary education and career.

Recommendation 2: Develop Pathways

The Tech Valley Committee should build on the state's academic and CTE standards to develop model comprehensive career pathways for the industry sectors or occupational clusters that are most relevant to the regional economy. One challenge is to select a set of career pathways that will appeal to all of the schools in the region.

Recommendation 3: Develop Design Specs

Career pathways are defined by program content, not by the location or delivery system of courses. The Tech Valley Committee must also articulate expectations about delivery, i.e. how and where the content will be provided. CGR offered suggestions for possible design specs.

Recommendation 4: Promote Professional Development

CGR believes there are two actions related to professional development that should be considered in implementing the career pathways model. First, the pathways model is a new approach, and like any new initiative, staff must receive appropriate training to ensure it is implemented successfully. Second, CGR believes the Tech Valley Committee should promote professional development

that reinforces ownership of learning, utilizes a non-centralized approach, and identifies specific learning objectives for each session. This can best be done by implementing a regional learning community that enables teachers from different districts to share and discuss tools and techniques to help their students develop 21st century skills.

*Recommendation 5:
Promote Business
Partnerships*

The mission of the Tech Valley Committee is helping to forge new relationships between school and work. Business partnerships are critical to this effort. First, CGR recommends the Committee create an Advisory Panel for each pathway that is comprised of industry representatives, secondary and postsecondary educators, and other interested individuals. Second, the Committee pursues a regional business/education compact to solidify this partnership and to facilitate coordination of career awareness activities across the region.

*Recommendation 6:
Conduct an Awareness
Campaign*

Regional coordination requires building a regional mindset – orchestrating the acts of random improvement toward a common vision. To this end, CGR recommends a two-phased awareness campaign to support the development and implementation of the career pathways model. Phase 1 seeks to increase general awareness to create a sense of urgency and desire for action, while Phase 2 targets communication through schools’ career guidance on new opportunities once the career pathways model is in place.

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ACKNOWLEDGMENTS

CGR expresses its deepest appreciation to the education and business leaders who took time out of their demanding schedules to participate in this study. The conversations with business leaders about changing talent requirements and with educators about education reform reflected both the urgency and the difficulty of preparing graduates to succeed in the 21st century economy. We came away impressed with the many initiatives already in place to help achieve this goal, as well as the commitment to do even more.

CGR also wishes to extend our thanks to the WSWHE BOCES and the members of the Tech Valley Committee for the opportunity to work on both Study 1 and Study 2. We applaud their willingness to take a leadership role.

Staff Team

Stephen M. Mitchell, Ph.D. served as project director. He had primary responsibility for framing the study, conducting the literature review and field interviews, and preparing the report.

Charles Zettek helped ensure the links between and a smooth transition from Study 1 to Study 2.

Kirstin Pryor had responsibility for summarizing the effective practices case studies.

Kathi Willis helped research and summarize the work on professional development and facilities.

David Cohen analyzed the district technology plans and prepared the summary report.

David Landry and Sergey Zinger assisted in the analysis of labor market and school performance data and prepared a preliminary review of the impact of technology and globalization on talent requirements in the workplace.

Katherine McCloskey assisted in scheduling the interviews and administering surveys to stakeholders with whom we were unable to schedule interviews.

Bethany Welch edited and managed dissemination.

Katherine Corley assisted with editing.

INTRODUCTION

Background

In 2006, the Center for Governmental Research (CGR) was engaged by the Washington-Saratoga-Warren-Hamilton-Essex (WSWHE) BOCES on behalf of the Tech Valley Standing Committee of the 31 component districts to determine how to help students prepare for high tech jobs of the future likely to be coming into the region as a result of Tech Valley initiatives. That project focused on the desired academic courses that are likely to provide the skills needed to work in high technology occupations, comparing the courses currently provided by the districts and BOCES to the list of desired academic courses for high tech occupations. From the client's perspective, the first study accomplished two things: (1) it identified the districts' offerings in advanced study and sophisticated and technical programming beyond the Regent's course levels, and (2) it provided an analysis of the job landscape that is likely with increased development like that of Advanced Micro Devices, Inc. (AMD) and associated support and service businesses.

The districts and BOCES subsequently engaged CGR to conduct a second study that would build on the first study. This study is comprised of three components: Literature Review, Regional Analysis, and Appendix of Resources and References.

Purpose

- 1) Analyze the gaps existing between current offerings and the future employment needs, paying particular attention to both technical competencies and the "soft skills" for success in the 21st century workplace.
- 2) Identify new curricula, classroom design options, collaborations and facilities that will ensure the districts and BOCES have the capacity to develop graduates with the knowledge, skills and

competencies needed to meet the 21st century workforce requirements of employers projected for Tech Valley and for the global economy in general.

Methodology

Step 1: Literature Review

CGR conducted a review of the literature and research on the nature of the changing workplace, the impact of these changes on required competencies for successful performance in the workplace, and the response of the education community to better prepare their graduates for success in this new environment. The review focused primarily on research from 2000 to the present.

Step 2: Field Interviews

CGR staff conducted field interviews to solicit information and input from key stakeholders on: 1) requirements for success in a 21st century workplace; 2) capacity of the existing system to meet those requirements, including effective models in the region; 3) recommended system changes; and 4) barriers to change. Staff interviewed superintendents, Workforce Investment Board (WIB) directors, community college presidents, business leaders, and regional non-profit leaders working at the intersection of workforce and economic development. Surveys were sent to those individuals who were not available for interviews. Technology plans were collected from the component WSWHE BOCES districts.

Step 3: Market Analysis and Data Analysis

CGR also analyzed the projected labor markets demands in the extended WSWHE region.⁶ The data was gathered from the United States Department of Labor's Occupational Information Network (O*Net). The analysis of this dataset looked at projections for 2007 to 2014 from the industry and occupational perspectives. It focused on the skills and competencies needed to fill positions in the top jobs in the targeted industries identified in

⁶ The extended region included Albany, Columbia, Essex, Greene, Hamilton, Rensselaer, Saratoga, Schenectady, Schoharie, Warren, and Washington Counties.

Study 1, but also looked at how these skills and competencies compare to those required in the region's overall labor market.

CGR also included analysis of New York State Department of Education data, comparing the WSWHE region to the state as a whole. This included comparisons on ELA and Math scores and graduation rates.

Step 4: Report Preparation

CGR prepared a draft report for review and comment by the members of the Tech Valley Committee. CGR revised the report based on the committee's comments. The report provides specific recommendations for building a regional talent pipeline.

Analysis Framework

The analysis used a workforce planning framework. This looks at the anticipated demand for talent and the sources of supply, identifies gaps between supply and demand, and develops actions to address the gaps. For this study, particular attention was paid to the talent pipeline, i.e., the preparation provided by the K-12 system to enable graduates to enter the world of work. This approach is consistent with two decades of reports by national commissions, from *A Nation at Risk* (1983), through *America's Choice: High Skills or Low Wages* (1991), to *Tough Choices or Tough Times* (2006) that have highlighted the critical role that education plays in ensuring the nation's economic competitiveness.⁷

The first component of this study, which summarizes the review of literature and effective practice, starts by looking at the drivers of changing demand, as well as the impact of these drivers on the skills required for successful performance on the job. The second section examines issues of supply, looking briefly at global and/or national concerns. The third section of the report investigates the

⁷ The link between education and the economy actually goes back much further, as documented in David Tyack and Larry Cuban, *Tinkering Towards Utopia: A Century of Public School Reform*. (1995) Cambridge, MA: Harvard University Press.

primary gaps between demand and supply, and the initiatives that have been implemented to address these gaps nationally.

This portion of Study Two presents the regional analysis. It starts by taking a close look at the regional labor market, and moves on to consider how global and/or national issues of supply are manifest in the region. The latter portion of the report examines the primary gaps between demand and supply, and the initiatives that have been implemented to address these gaps in the region. This Regional Analysis concludes with recommendations for regional action.⁸

SUPPLY AND DEMAND

Regional Economy No one knows for sure which businesses will grow by how much, particularly in a volatile global economy. One of the challenges of economic development is to identify those sectors that can capitalize on the region's unique strengths and whose occupations provide well-paying jobs.

Demand in the Capital Region The focus of this research is the skills required in the jobs associated with the technology-related industries targeted for growth in the Capital Region. However, as demonstrated by the brief review of the impact of the changing nature of work on skill requirements presented in the literature review, most jobs are subject to increasing skill requirements in the fast-changing global economy. It is worth taking a brief look at the demands of the entire labor market before drilling down to the specific requirements of the technology-related targeted industries. This will provide a better sense of the degree to which a common

⁸ The appendix contains resources associated with the research and regional analysis sections of Study Two.

foundation can be used to prepare students for all of the jobs in the Capital Region, as well as the degree to which preparation must be targeted to specific occupations and/or industries. There are two ways to consider labor market demand: by *industry* or by *occupation*.

Industry

Table 1 provides an overview of the current (2007) and anticipated growth (2014) in demand by industry in the Capital Region.⁹ It is worth noting that:

- ❖ The three largest employment industries in the Capital Region are: government, health care and social assistance, and retail trade, comprising 43% of the jobs in the region. The three target industries identified in Study 1 – manufacturing, information, and professional and technical services – account for slightly more than 14% of the region’s employment.
- ❖ The three industries in the Capital Region with the largest predicted increase in jobs are healthcare and social assistance, government, and administrative and waste services. The predicted fastest growing sectors are administrative and waste services, educational services, and real estate and rental and leasing, each expected to increase by 19%. In contrast, the target industries sectors are expected to grow by less than 2% combined.
- ❖ The top three industries in the Capital Region in terms of earning per worker (EPW) are utilities, manufacturing and management of companies and enterprises. Each of the targeted industries are among the top six in terms of earnings per worker.

⁹ Unless otherwise noted, the data presented in these tables refers to these counties that comprise the WSWHE Extended Region: Albany, NY; Columbia, NY; Essex, NY; Greene, NY; Hamilton, NY; Rensselaer, NY; Saratoga, NY; Schenectady, NY; Schoharie, NY; Warren, NY; Washington, NY.

Table 1: Regional Industry Overview

Description	2007 Regional Jobs	% Regional Jobs	Projected 2014 Jobs	Projected Growth	Projected % Growth	2006 EPW ¹⁰
Agriculture, forestry, fishing and hunting	6814	0.99%	6399	(415)	(6%)	\$17,533
Mining	985	0.14%	1131	146	15%	\$58,015
Utilities	527	0.08%	486	(41)	(8%)	\$147,211
Construction	39020	5.68%	42468	3448	9%	\$50,249
Manufacturing	37783	5.50%	35587	(2196)	(6%)	\$74,612
Wholesale trade	20328	2.96%	21186	859	4%	\$69,513
Retail trade	78492	11.42%	84085	5594	7%	\$28,039
Transportation and warehousing	21292	3.10%	22751	1459	7%	\$49,227
Information	14149	2.06%	13791	(358)	(3%)	\$67,022
Finance and insurance	29211	4.25%	32511	3300	11%	\$57,454
Real estate and rental and leasing	20077	2.92%	23986	3909	19%	\$35,097
Professional and technical services	47173	6.86%	49955	2782	6%	\$68,669
Management of companies and enterprises	6620	0.96%	7040	420	6%	\$71,816
Administrative and waste services	31445	4.57%	37424	5979	19%	\$29,498
Educational services	22849	3.32%	27178	4329	19%	\$34,428
Health care and social assistance	83766	12.18%	96759	12994	16%	\$43,270
Arts, entertainment, and recreation	14392	2.09%	16413	2021	14%	\$22,215
Accommodation and food services	41,994	6.11%	45748	3754	9%	\$19,032
Other services, except public administration	35,744	5.20%	39980	4236	12%	\$29,849
Government	134,821	19.61%	142372	7551	6%	\$54,577

Source: Industry report, targeted industries Economic Modeling Specialists, Inc. - 8/07

¹⁰ EPW refers to Earning Per Worker.

Table 2 provides similar data for the ten industries used in Study 1 to define and explore the academic skill requirements for jobs in technology-related sectors.

Description	2007 Jobs	2014 Jobs	Projected Growth	Projected % Growth	EPW
Scientific research and development services	10156	10306	150	1.47%	\$102,777
Computer systems design and related services	5516	6484	968	17.56%	\$76,333
Electronic instrument manufacturing	2127	2400	272	12.81%	\$78,255
Pharmaceutical and medicine manufacturing	1204	1741	538	44.70%	\$112,047
Software publishers	481	332	(149)	-30.90%	\$85,469
Industrial machinery manufacturing	433	345	(88)	-20.43%	\$101,620
Metalworking machinery manufacturing	157	125	(32)	-20.42%	\$82,078
Semiconductor and electronic component manufacturing	59	45	(14)	-24.46%	\$91,601
Communications equipment manufacturing	39	33	(5)	-13.83%	\$58,022
Magnetic media manufacturing and reproducing	13	20	7	50.46%	\$73,774

Source: Industry report by region, Economic Modeling Specialists, Inc. - 8/07

Occupation

Table 3 provides an overview of the current (2007) and anticipated growth (2014) in demand by occupational groups in the Capital Region, while Table 4 provides a listing of the top 25 occupations in the targeted industries.¹¹ It is worth noting that:

- ❖ The three largest occupational groups in the Capital Region are office and administrative support, sales and related, and education, training and library, which account for slightly greater than 35% of the jobs in the region. The three occupational groups that contain the top jobs in the targeted industries identified in Study 1 – computer and mathematical, office and administrative support, and life, physical and social science -- account for slightly more than

¹¹ The top occupations in regional industry are different than those occupations in the state staffing profile for these sectors (see the appendix).

a fifth of the region's employment, with the vast majority of that percentage in office and administrative support.

- ❖ The three occupational groups in the Capital Region with the largest expected absolute increase in jobs are sales and related, education, training and library, and management. The fastest growing percent of occupational groups are healthcare support, and personal care and service, expected to grow by 18% and 15% respectively. The groups containing the top jobs in the targeted industries are expected to grow 4.7% combined.
- ❖ The three occupational groups in the Capital Region with the largest number of total vacancies (growth plus replacement jobs) are office and administrative support, sales and related, and food preparation and serving. The occupational groups with the highest percentage of vacancies are food preparation and service, sales and related, and personal care and service. Each is expected to have a minimum of 30% vacancies. The occupational groups containing the top jobs in the targeted industries combined are expected to have 21% vacancies.
- ❖ The top occupational groups in the Capital Region in terms of Earning Per Worker (EPW) are management, legal, and healthcare practitioners and technical. Two of the three occupational groups containing the top jobs in the targeted industries -- computer and mathematical occupations, and life, physical and social science occupations -- are among the top 6 in terms of earnings per worker. EPW for the third group, office and administrative support occupations, is below the average for all occupational groups.

Table 3: Regional Occupation Overview

Occupational Groups	2007 Regional Jobs	% Regional Jobs	2014 Jobs	Projected Growth	Projected % Growth	Projected % Change	Projected Replacement Jobs	Projected % New & Rep.	2006 EPW
Management	42260	6.15%	46968	4708	11%	11%	5408	24%	\$33.21
Business and financial operations	32548	4.73%	36647	4099	13%	13%	3884	25%	\$23.18
Computer and mathematical science	15396	2.24%	17541	2144	14%	14%	1567	24%	\$27.60
Architecture and engineering	9898	1.44%	10337	439	4%	4%	1491	20%	\$28.93
Life, physical, and social science	9162	1.33%	9938	776	8%	8%	1537	25%	\$24.06
Community and social services	13774	2.00%	15680	1907	14%	14%	1752	27%	\$17.12
Legal	7711	1.12%	8204	493	6%	6%	632	15%	\$32.13
Education, training, and library	48478	7.05%	54789	6312	13%	13%	6823	27%	\$19.35
Arts, design, entertainment, sports, and media	17725	2.58%	20026	2301	13%	13%	2264	26%	\$15.90
Healthcare practitioners and technical	33264	4.84%	37934	4670	14%	14%	4184	27%	\$30.11
Healthcare support	17398	2.53%	20498	3100	18%	18%	1778	28%	\$11.64
Protective service	17311	2.52%	18533	1222	7%	7%	3320	26%	\$20.23
Food preparation and serving related	41182	5.99%	44605	3423	8%	8%	11269	36%	\$8.62
Building and grounds cleaning and maintenance	26802	3.90%	30480	3679	14%	14%	3659	27%	\$9.60
Personal care and service	22797	3.32%	26127	3329	15%	15%	3613	30%	\$9.02
Sales and related	77125	11.22%	83766	6641	9%	9%	17000	31%	\$13.26
Office and administrative support	117127	17.04%	120945	3818	3%	3%	20171	20%	\$13.76
Farming, fishing, and forestry	2050	0.30%	2035	(14)	(1%)	(1%)	390	18%	\$8.98
Construction and extraction	35160	5.11%	38656	3496	10%	10%	4552	23%	\$17.59
Installation, maintenance, and repair	26808	3.90%	28177	1369	5%	5%	4242	21%	\$17.51
Production	33721	4.91%	33298	(424)	(1%)	(1%)	6471	18%	\$13.60
Transportation and material moving	36305	5.28%	38849	2544	7%	7%	5604	22%	\$13.74
Military	3479	0.51%	3217	(262)	(8%)	(8%)	608	10%	\$23.03

Source: Occupations 2007-2014, Regional Analysis Economic Modeling Specialists, Inc. - 9/07

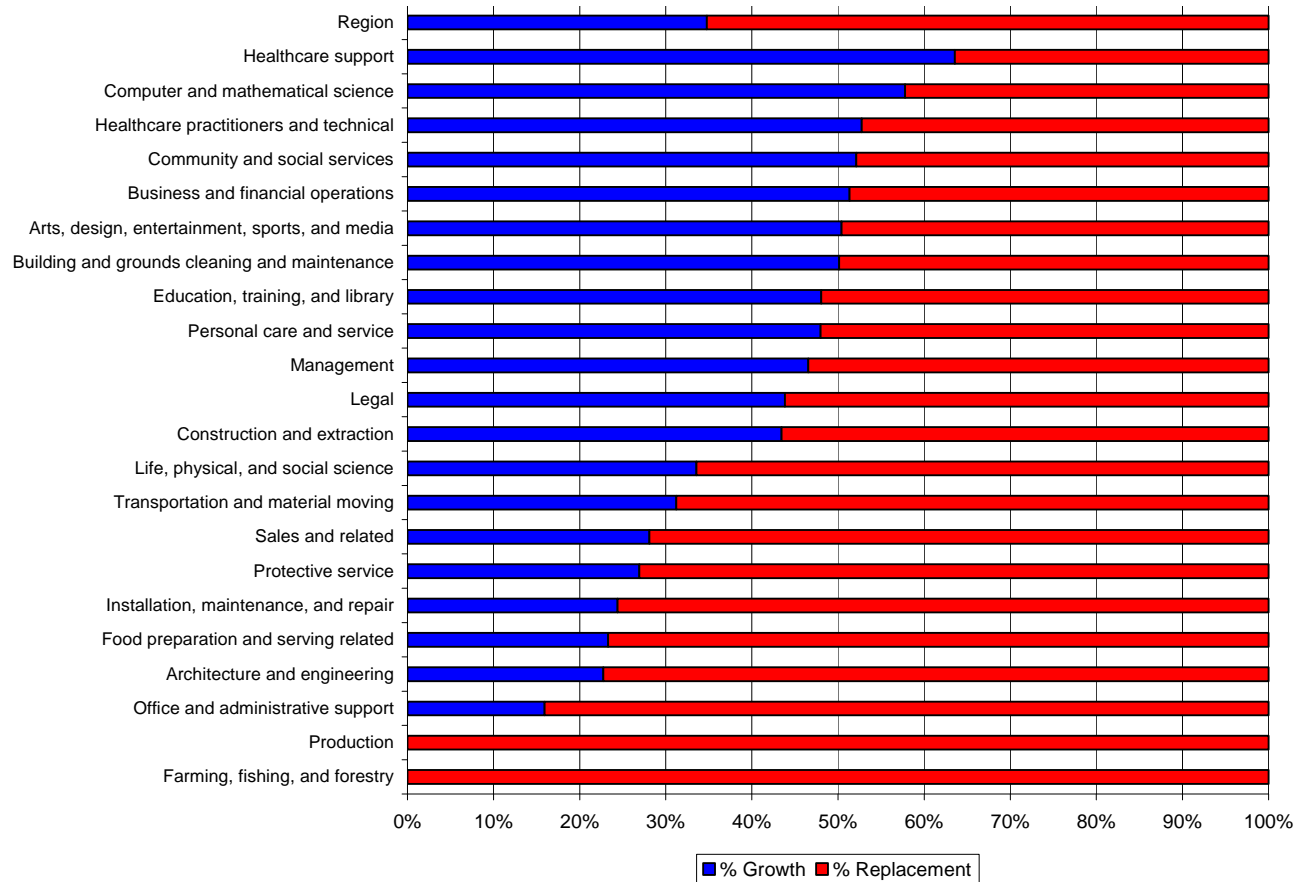
Table 4: Top 25 Occupations in the Capital Region's Target Industries	
Occupations	
Computer programmers	
Computer software engineers, applications	
Computer software engineers, systems software	
Computer systems analysts	
Executive secretaries and administrative assistants	
Chemists	
Computer support specialists	
Secretaries, except legal, medical, and executive	
Network systems and data communications analysts	
Office clerks, general	
Managers, all other	
Electrical engineers	
Computer and information systems managers	
General and operations managers	
Mechanical engineers	
Chief executives	
Management analysts	
Medical scientists, except epidemiologists	
Industrial engineers	
Bookkeeping, accounting, and auditing clerks	
Customer service representatives	
Accountants and auditors	
Interviewers, except eligibility and loan	
Chemical technicians	
First-line supervisors/managers of office and administrative support workers	
Team assemblers	
Source: Occupational Makeup, Top 25 in Region, Economic Modeling Specialists, Inc. - 8/07	

The Majority of Job Openings
for Many Years Will Be
Replacement Jobs

Many analyses of the jobs of the future focus on how many “new” jobs will be created, i.e., jobs that did not exist before. From a job seeker’s point of view, this emphasis on the percentage growth of occupations is misleading since it fails to take into account *replacement* jobs, i.e., openings that occur due to turnover and retirements. Projections on the regional economy demonstrate the importance of looking at all future job openings, not just jobs resulting from growth. On average, estimates indicate that 65% of future openings in the region will be due to replacement. Production (100%), farming, fishing and forestry (100%), office

and administrative support (84%), architecture and engineering (77%) and food preparation and serving related (77%) occupations have the highest proportion of openings due to replacement. Even in healthcare support, which has the highest percentage of vacancies due to growth, over one-third (36%) of the vacancies are due to replacement. If there were no net job growth in the region over the next seven years, there are projected to be 112,740 job openings in existing jobs.

Table 5: Percentage of Job Growth and Replacement by Occupation and in Region Total



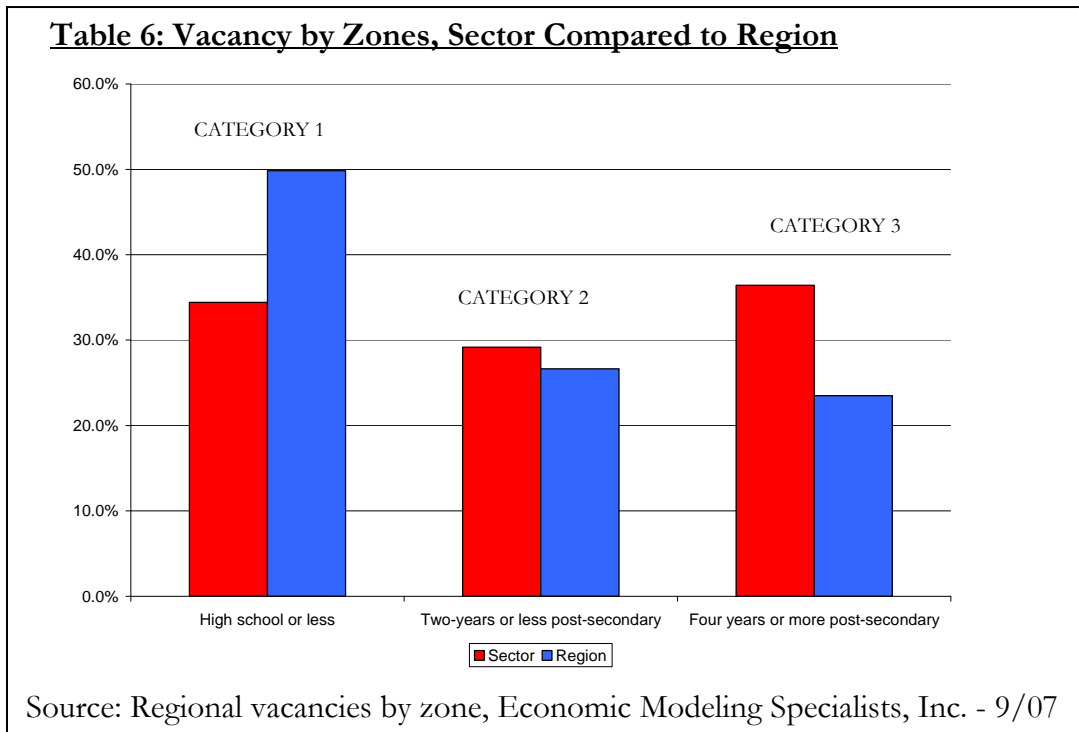
Source: Regional occupation growth and replacement, Economic Modeling Specialists, Inc. - 9/07

Over Three-Quarters of the Job Openings Will Require Only a High School Diploma or a Two-Year Degree

What level of preparation is required for the anticipated regional job openings? Each occupation was assigned to one of five “Job Zones” as defined by the Department of Labor’s Occupational Information Network (O-Net). A Job Zone is a group of occupations that are similar in these ways: 1) how most people get into the work; 2) how much overall experience people need to do the work; 3) how much education people need to do the work; and 4) how much on-the-job training people need to do the work. For this analysis, the five O*Net defined zones were collapsed into three categories:

- ❖ Category 1 – High school degree or less (job zones 1 and 2)
- ❖ Category 2 – Two-years or less post-secondary education (job zone 3)
- ❖ Category 3 – Four years or more post-secondary education (job zones 4 and 5)

Based on the O-Net categorization, between 2007 and 2014 almost half (49.8%) of projected regional vacancies require a high school degree or less.



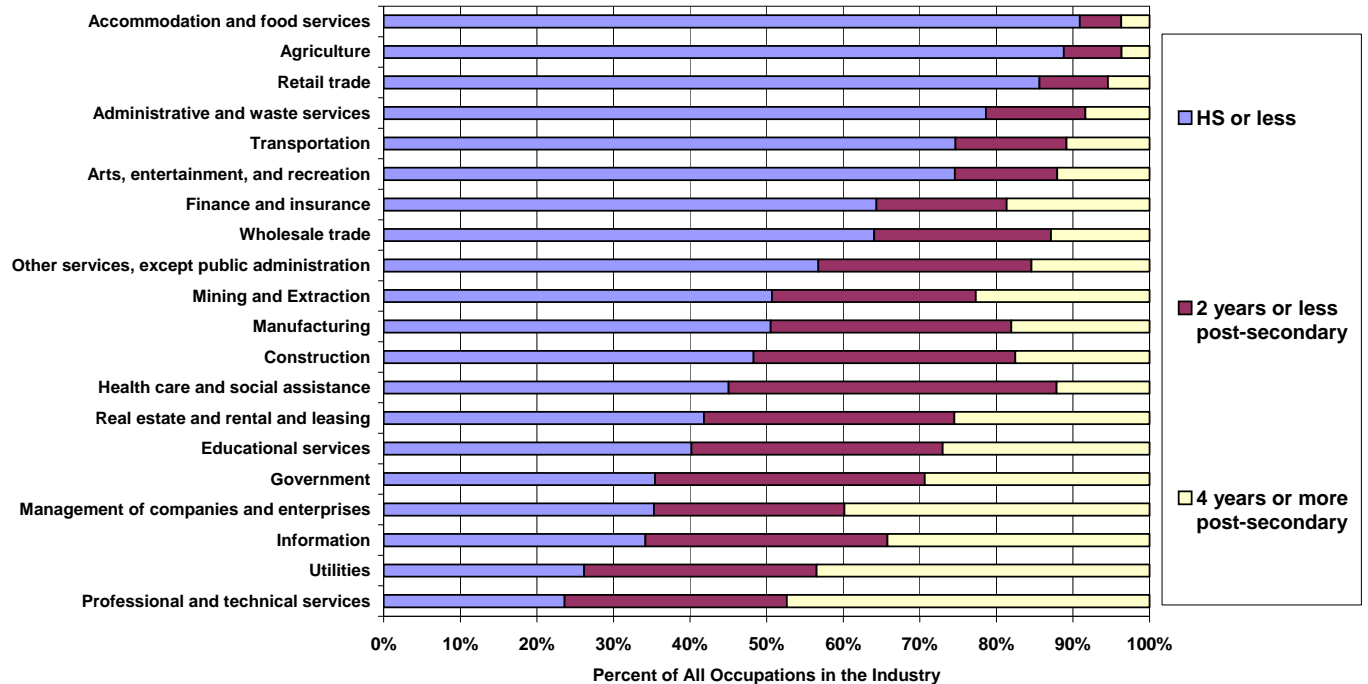
Targeted Industry Jobs Require More Preparation than the Average Job Opening

A review of the projected vacancies in the region’s targeted industries show that on a percentage basis, their openings require higher levels of preparation than the region as a whole.

The Preparation Required for Jobs Varies Across Industries

The distribution of occupations (staffing profile) varies across industry sectors. A review of the national staffing profiles of different industry sectors reveals that some sectors (e.g., agriculture, accommodation and food services) are dominated by jobs requiring high school or less, other sectors (e.g., healthcare, construction) have a higher percentage of jobs requiring two years of post-secondary education, and a few (e.g., professional and technical services) have a larger percentage of positions requiring four years or more of post-secondary education (See Table 7). Importantly, there is no sector in which the majority of jobs require four years or more of post-secondary preparation.

Table 7: Type of Preparation Required Across Industries (National Profile)



Source: <http://www.pittsburghregionalcompact.org/PDFs/JobsOfTheFutureReport2005.pdf>, p11

Many Jobs Requiring Less Education Still Require High Skill

It would be a mistake to presume that jobs that require on-the-job training as opposed to formal education are necessarily low-skill jobs. In a global economy, a company's success is defined by quality and productivity, which are dependent on the skills of the workforce. National and international research has shown that the steps that employers have taken to compete in a global economy (e.g., adoption of technology, process improvement) require skilled workers to achieve the desired productivity improvements.¹² The good-paying jobs that require two years of post-secondary preparation or less do require workers to have skills. The National Association of Manufacturers reports that 60% of manufacturers are having difficulty maintaining the production levels necessary to meet demand, and 40% say they cannot implement new productivity improvements because they cannot find skilled workers.¹³ While lack of technical skills are a concern, more important are lack of basic employability skills (attendance, timeliness, work ethic, etc.) and poor reading, writing, math, and communications skills. This is one reason that employers are increasingly relying on a variety of tools to assess an applicant's skills as part of the recruiting and screening process.

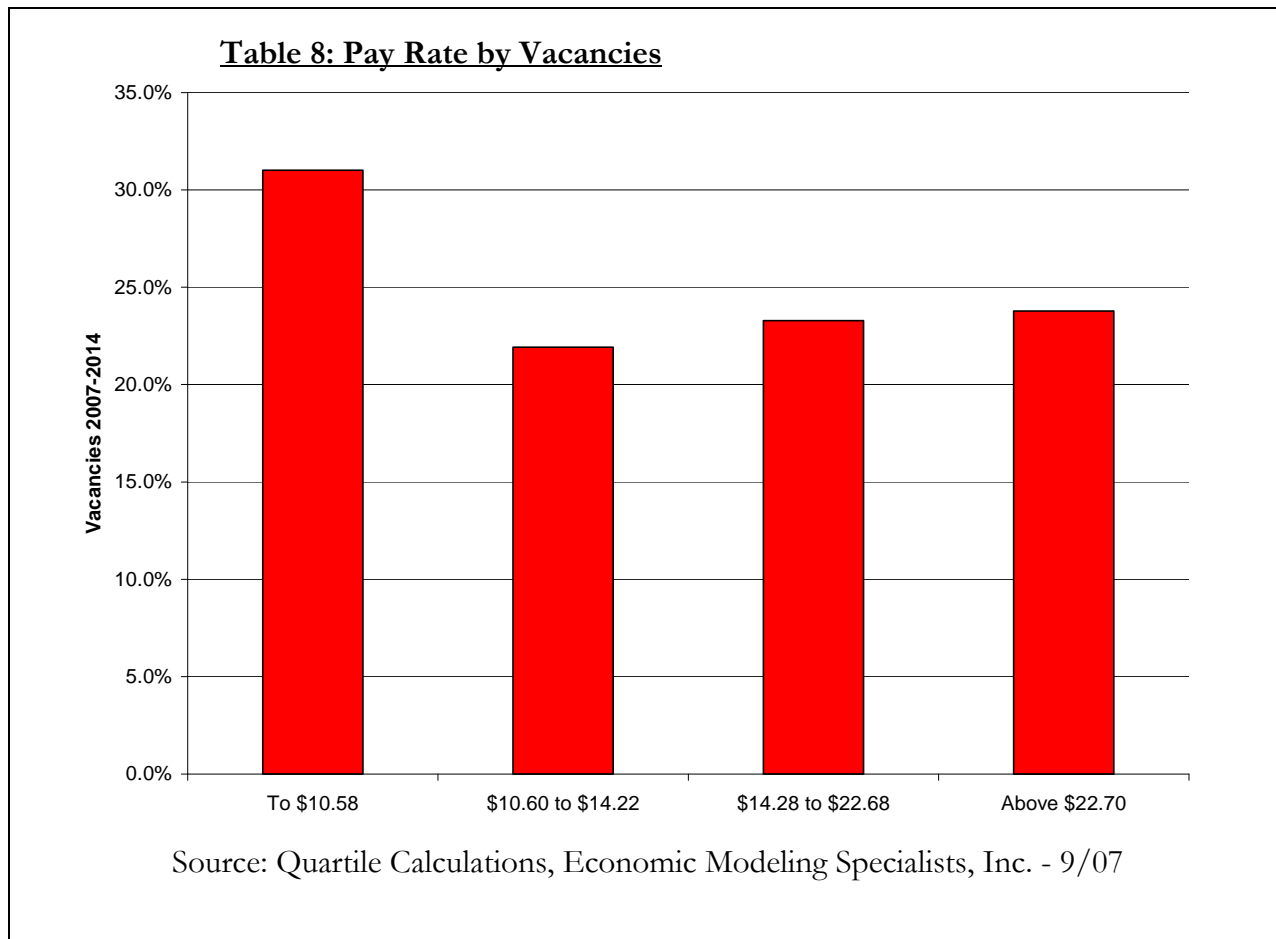
Pay Rates of Job Openings Will Vary Widely

It is not enough to have jobs – jobs are needed that enable a worker to sustain a family. The health and vitality of the region is increased to the degree that as many of its residents as possible can obtain good quality jobs. To obtain a picture of how well the jobs of the future will pay the average salaries for each of the region's occupations were weighted by the number of people in each occupation to identify the overall distribution of wages. The number of vacancies that are projected to occur between 2007 and 2014 in each quartile were then calculated. The results show that over one-third of the vacancies involve jobs paying \$10.58 an hour

¹² Mark Troppe and Pete Carlson. 2006. *An Analysis of Market and Skill Changes: The Impact of Globalization on American Jobs in Selected Industries*. The New Commission on the Skills of the American Workforce. The National Center on Education and the Economy.

¹³ National Association of Manufacturers, www.nam.org

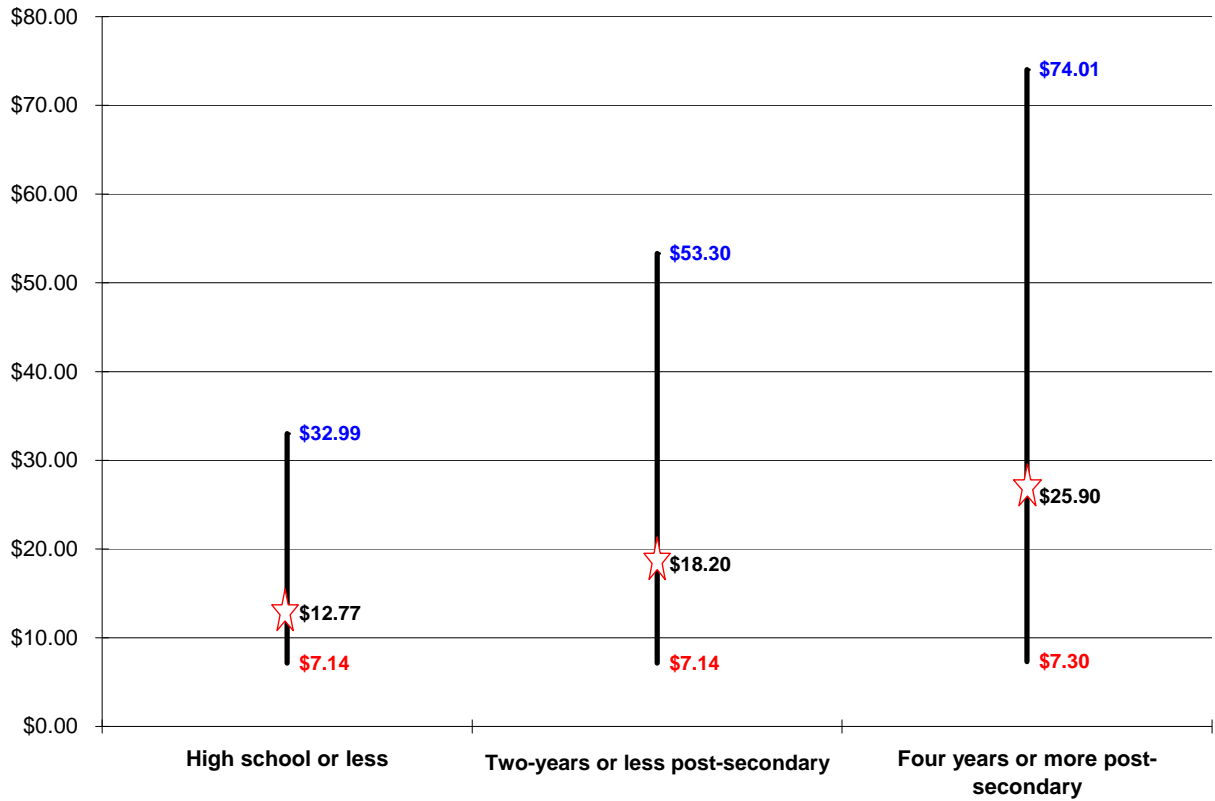
or less (See Table 8). However, the majority of jobs will pay over \$10.60 an hour, with the remaining vacancies fairly evenly distributed between jobs paying \$10.60 to \$14.22, jobs paying \$14.28 to \$22.68, and jobs paying above \$22.70 an hour.



There Is a Return to Education, But Having a College Degree Does Not Guarantee You a High-Paying Job

An analysis of the average salaries for occupations requiring different levels of education shows that a person can work in an occupation requiring a college degree and earn less than someone who works in an occupation requiring a high school degree (See Table 9). It is the occupation that makes the difference, not the degree per se.

Table 9: Pay Rate Ranges by Level of Education

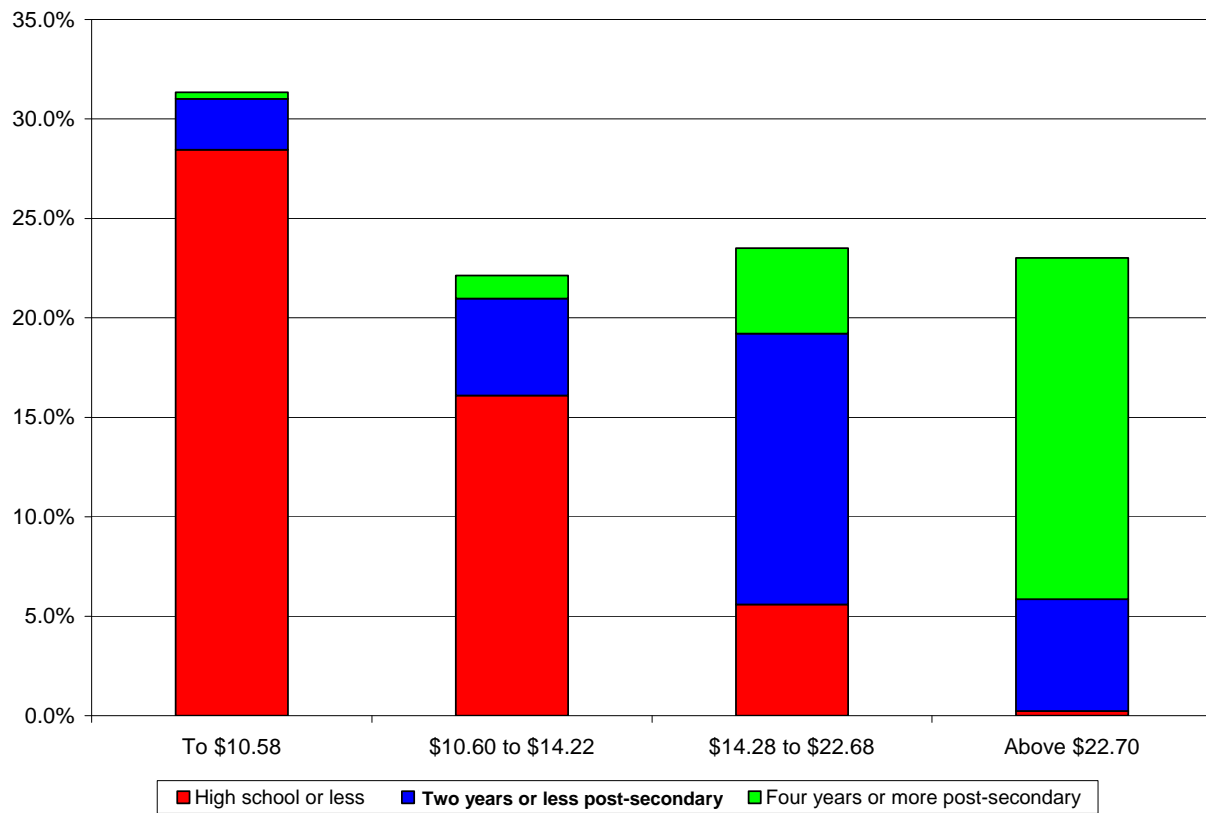


Source: Salary and Zone calculations, Economic Modeling Specialists, Inc. - 9/07

Good-Paying Jobs are Available Without a 4-Year Degree, Although Most of the Best-Paying Jobs Do Require a 4-Year Degree

Eighteen percent of the projected vacancies that require a high school degree or less (11.63% of the total vacancies) pay an average salary over \$26,170. Half of the vacancies requiring two years or less of post-secondary preparation (10.13% of the total vacancies) are in this pay range. 21.76% of the total vacancies pay an average salary of \$26,000 (See Table 10).

Table 10: Distribution of Pay Rates by Level of Education



Source: Quartile and Zone Calculations, Economic Modeling Specialists, Inc. - 9/07

Knowledge, Skills and Abilities in the Regional Labor Market

While the numerous general, sector and occupational studies and reports provide insight into the knowledge, skills and abilities necessary for successful performance in a rapidly changing economy, most do not provide a common set of definitions and measurements that will allow comparisons between jobs and/or sectors. The U.S. Department of Labor's Occupational Information Network (O*Net) does provide a way to compare the knowledge, skills and abilities required by different occupations. CGR used the O*Net database to assess the knowledge, skills and abilities required in both the regional labor market and the target sectors. This sub-section provides the results of that analysis.

O*Net rates the knowledge, skills and abilities required for successful performance in each occupation in the database. The accompanying table provides a listing of the primary knowledge, skill and ability categories on which each occupation is rated (ratings are based on finer distinctions called concentrations within each of the primary categories). CGR aggregated the ratings for the entire labor market and for the occupations in the targeted industries. Ratings were identified for 2007, as well as the growth trends for knowledge, skills and abilities between 2007 and 2014 in the regional labor market. Knowledge, skills and abilities required in the regional labor market were compared to those required in the targeted industries. The results are presented in the following series of tables (pages 19-29).

O*Net Knowledge, Skills and Abilities United States Department of Labor, Occupational Information Network (O*Net) http://online.onetcenter.org/	
Knowledge	<ul style="list-style-type: none"> • Business and Management — Knowledge of principles and facts related to business administration and accounting, human and material resource management in organizations, sales and marketing, economics, and office information and organizing systems • Manufacturing and Production — Knowledge of principles and facts related to the production, processing, storage, and distribution of manufactured and agricultural goods • Engineering and Technology — Knowledge of the design, development, and application of technology for specific purposes. • Mathematics and Science — Knowledge of the history, theories, methods, and applications of the physical, biological, social, mathematical, and geography • Health Services — Knowledge of principles and facts regarding diagnosing, curing, and preventing disease, and improving and preserving physical and mental health and wellbeing • Arts and Humanities — Knowledge of facts and principles related to the branches of learning concerned with human thought, language, and the arts.
Skills	<ul style="list-style-type: none"> • Basic Skills — Developed capacities that facilitate learning or the more rapid acquisition of knowledge • Cross-Functional Skills — Developed capacities that facilitate performance of activities that occur across jobs • Social Skills — Developed capacities used to work with people to achieve goals • Complex Problem Solving Skills — Developed capacities used to solve novel, ill-defined problems in complex, real-world settings • Technical Skills — Developed capacities used to design, set-up, operate, and correct malfunctions involving application of machines or technological systems • Systems Skills — Developed capacities used to understand, monitor, and improve socio-technical systems • Resource Management Skills — Developed capacities used to allocate resources efficiently
Abilities	<ul style="list-style-type: none"> • Cognitive Abilities — Abilities that influence the acquisition and application of knowledge in problem solving • Psychomotor Abilities — Abilities that influence the capacity to manipulate and control objects • Endurance — The ability to exert oneself physically over long periods without getting out of breath • Flexibility, Balance, and Coordination — Abilities related to the control of gross body movements • Sensory Abilities — Abilities that influence visual, auditory and speech perception

Knowledge in the regional labor market

Business knowledge is the most required form of knowledge in the regional labor market, followed closely by liberal arts knowledge (26.9% and 26.3% of knowledge, respectively). Health knowledge is the most rapidly growing form of knowledge, followed by liberal arts knowledge.

The top five concentrations in 2007 are: customer and personal service, English language, mathematics, education and training, and clerical. Biology and medicine and dentistry are the most rapidly growing knowledge concentrations.

Knowledge Summary¹⁴

Knowledge Sector	2007 % of All Knowledge	2007-2014 % Growth
Business Knowledge	26.9%	9.1%
Liberal Arts Knowledge	26.3%	9.5%
Technical Knowledge	14.5%	8.9%
Manufacturing Knowledge	13.8%	8.4%
Science Knowledge	10.5%	9.2%
Health Knowledge	8.0%	10.5%

Business Knowledge Concentrations

Knowledge	2007 % of All Knowledge	2007-2014 % Growth
Customer and Personal Service	6.8%	9.4%
Clerical	5.1%	8.6%
Administration and Management	4.9%	9.1%
Personnel and Human Resources	3.6%	9.3%
Sales and Marketing	3.5%	9.1%
Economics and Accounting	3.1%	8.8%

¹⁴ All figures are rounded to the closest tenth of a percent.

Manufacturing Knowledge Concentrations

Knowledge	2007 % of All Knowledge	2007-2014 % Growth
Production and Processing	3.1%	7.9%
Mechanical	2.9%	7.9%
Transportation	2.7%	8.6%
Design	2.2%	8.8%
Building and Construction	1.7%	9.2%
Food Production	1.1%	9.0%

Technical Knowledge Concentrations

Knowledge	2007 % of All Knowledge	2007-2014 % Growth
Computers and Electronics	4.7%	8.7%
Communications and Media	3.3%	9.2%
Engineering and Technology	2.3%	8.3%
Telecommunications	2.2%	9.1%
Geography	2.1%	9.3%

Science Knowledge Concentrations

Knowledge	2007 % of All Knowledge	2007-2014 % Growth
Mathematics	5.3%	8.8%
Chemistry	2.2%	9.5%
Physics	1.6%	8.7%
Biology	1.3%	11.1%

Health Knowledge Concentrations

Knowledge	2007 % of All Knowledge	2007-2014 % Growth
Psychology	4.0%	10.1%
Therapy and Counseling	2.3%	10.8%
Medicine and Dentistry	1.7%	11.1%

Liberal Arts Knowledge Concentrations

Knowledge	2007 % of All Knowledge	2007-2014 % Growth
English Language	5.8%	9.0%
Education and Training	5.2%	9.4%
Public Safety and Security	3.9%	9.1%
Law and Government	3.6%	9.4%
Sociology and Anthropology	2.3%	10.5%
Philosophy and Theology	2.0%	10.4%
Foreign Language	1.5%	9.4%
History and Archeology	1.2%	10.1%
Fine Arts	0.8%	10.5%

Skills in the regional labor market

Basic skills are the most required form of skills in the regional labor market, representing over one-third of the skills. Technical skills are the second largest form of skills, representing less than a quarter of the skills in the regional labor market. Social skills, resource management skills and complex problem solving skills are growing at the same rate, followed closely by basic skills and system skills. Technical skills are growing at the slowest rate.

Reading comprehension, active listening, critical thinking, speaking, learning strategies, active learning, coordination and social perceptiveness are the most required skill concentrations in the current labor market. Science and negotiations are the two most rapidly growing skill concentrations.

Skills Summary

Skills Sector	2007 % of All Skills	2007-2014 % Growth
Basic Skills	35.8%	9.2%
Technical Skills	22.4%	8.6%
Social Skills	20.8%	9.3%
Resource Management Skills	10.4%	9.3%
System Skills	7.5%	9.1%
Complex Problem Solving Skills	3.0%	9.3%

Basic Skills Concentrations

Skills	2007 % of All Skills	2007-2014 % Growth
Reading Comprehension	4.1%	9.2%
Active Listening	4.1%	9.2%
Critical Thinking	4.0%	9.1%
Speaking	3.9%	9.2%
Learning Strategies	3.8%	9.0%
Active Learning	3.8%	9.1%
Writing	3.7%	9.2%
Monitoring	3.7%	9.3%
Mathematics	3.2%	8.8%
Science	1.6%	9.7%

Social Skills Concentrations

Skills	2007 % of All Skills	2007-2014 % Growth
Coordination	3.8%	9.2%
Social Perceptiveness	3.8%	9.4%
Instructing	3.7%	9.1%
Service Orientation	3.4%	9.4%
Persuasion	3.2%	9.4%
Negotiation	2.9%	9.5%

Complex Problem Solving Skills Concentrations

Skills	2007 % of All Skills	2007-2014 % Growth
Complex Problem Solving	3.0%	9.3%

Technical Skills Concentrations

Skills	2007 % of All Skills	2007-2014 % Growth
Equipment Selection	3.0%	8.9%
Troubleshooting	2.5%	8.7%
Operations Analysis	2.4%	9.0%
Operation and Control	2.2%	8.3%
Quality Control Analysis	2.2%	8.6%
Equipment Maintenance	2.1%	8.4%
Technology Design	1.9%	9.0%
Operation Monitoring	1.9%	8.3%
Installation	1.7%	8.2%
Repairing	1.7%	8.2%
Programming	0.9%	8.9%

System Skills Concentrations

Skills	2007 % of All Skills	2007-2014 % Growth
Judgment and Decision Making	3.3%	9.3%
Systems Evaluation	2.2%	9.0%
Systems Analysis	2.0%	8.8%

Resource Management Skills Concentrations

Skills	2007 % of All Skills	2007-2014 % Growth
Time Management	3.7%	9.4%
Management of Personnel Resources	2.6%	9.1%
Management of Financial Resources	2.1%	9.3%
Management of Material Resources	2.1%	9.3%

Abilities in the regional labor market Cognitive abilities are far and away the top form of ability, representing over half of the abilities required in the regional labor market. They are also the fastest growing form of ability.

Oral expression, oral comprehension, near vision, written comprehension, problem sensitivity and deductive reasoning are the top ability concentrations in the regional labor market. Originality and fluency of ideas are the fastest growing ability concentrations.

Abilities Summary

Abilities Sector	2007 % of All Abilities	2007-2014 % Growth
Cognitive Abilities	54.8%	9.0%
Sensory Abilities	20.4%	8.9%
Psychomotor Abilities	14.3%	8.1%
Physical Abilities	10.5%	8.7%

Cognitive Abilities Concentrations

Abilities	2007 % of All Abilities	2007-2014 % Growth
Oral Expression	3.7%	9.1%
Oral Comprehension	3.6%	9.1%
Written Comprehension	3.3%	9.0%
Problem Sensitivity	3.2%	9.2%
Deductive Reasoning	3.2%	9.1%
Information Ordering	3.1%	8.8%
Inductive Reasoning	3.0%	9.2%
Written Expression	2.9%	9.1%
Category Flexibility	2.8%	8.9%
Selective Attention	2.6%	8.8%
Time Sharing	2.4%	8.9%
Fluency of Ideas	2.4%	9.4%
Originality	2.4%	9.5%
Flexibility of Closure	2.4%	9.0%
Visualization	2.3%	8.9%
Perceptual Speed	2.2%	8.7%
Speed of Closure	2.2%	9.1%
Memorization	2.2%	9.1%
Number Facility	2.1%	8.7%
Mathematical Reasoning	1.9%	8.7%

Psychomotor Abilities Concentrations

Abilities	2007 % of All Abilities	2007-2014 % Growth
Finger Dexterity	2.2%	8.7%
Arm-Hand Steadiness	1.9%	8.6%
Manual Dexterity	1.9%	8.1%
Control Precision	1.7%	8.3%
Multi-limb Coordination	1.6%	8.6%
Wrist-Finger Speed	1.2%	6.3%
Reaction Time	1.2%	7.8%
Speed of Limb Movement	1.0%	8.5%
Response Orientation	1.0%	8.2%
Rate Control	0.7%	7.1%

Physical Abilities Concentrations

Abilities	2007 % of All Abilities	2007-2014 % Growth
Trunk Strength	2.0%	8.9%
Extent Flexibility	1.8%	8.6%
Static Strength	1.6%	8.7%
Gross Body Coordination	1.3%	9.1%
Stamina	1.2%	8.9%
Dynamic Strength	1.0%	8.5%
Gross Body Equilibrium	0.9%	8.8%
Explosive Strength	0.4%	8.0%
Dynamic Flexibility	0.3%	6.6%

Sensory Abilities Concentrations

Abilities	2007 % of All Abilities	2007-2014 % Growth
Near Vision	3.4%	8.8%
Speech Recognition	3.1%	9.2%
Speech Clarity	3.0%	9.2%
Far Vision	2.3%	9.2%
Auditory Attention	1.9%	8.7%
Visual Color Discrimination	1.8%	9.0%
Hearing Sensitivity	1.5%	8.9%
Depth Perception	1.4%	8.9%
Glare Sensitivity	0.6%	8.3%
Sound Localization	0.5%	8.2%
Peripheral Vision	0.5%	8.1%
Night Vision	0.5%	8.5%

Region versus Targeted industries

The following three tables compare the top twenty lists of knowledge, skills and abilities in the regional labor market to the top twenty lists for the occupations in the targeted industries.¹⁵

Seventeen of the top twenty knowledge concentrations represented in the regional labor market correspond to the top

¹⁵ These three tables (Knowledge in Demand, Skills in Demand, and Abilities in Demand) are comprised of data on Competency Growth Analysis for the WSWHE Extended region, Economic Modeling Specialists, Inc. - 8/07

knowledge concentrations in the targeted industries. The knowledge concentrations of engineering and technology, telecommunications, and design represented in the target sector are not in the top-twenty list for the regional labor market. Rather, the regional labor market includes therapy and counseling, sociology and anthropology, and chemistry in its top-twenty list.

Knowledge In Demand

Region	Targeted Industries
Customer and Personal Service	English Language
English Language	Computers and Electronics
Education and Training	Customer and Personal Service
Mathematics	Mathematics
Administration and Management	Administration and Management
Clerical	Clerical
Psychology	Education and Training
Computers and Electronics	Engineering and Technology
Public Safety and Security	Economics and Accounting
Personnel and Human Resources	Production and Processing
Law and Government	Communications and Media
Sales and Marketing	Public Safety and Security
Communications and Media	Telecommunications
Economics and Accounting	Personnel and Human Resources
Production and Processing	Law and Government
Therapy and Counseling	Design
Sociology and Anthropology	Psychology
Transportation	Sales and Marketing
Mechanical	Mechanical
Chemistry	Transportation
<i>The bolded items represent categories that do not appear in the top twenty list in both the region and the target cluster.</i>	

Eighteen of the top twenty skill concentrations represented in the regional labor market correspond to the top skill concentrations in the targeted industries. The skill concentrations of troubleshooting and operations analysis represented in the target sector are not in the top-twenty list for the regional labor market. Rather, the regional labor market includes negotiation and management of personal resources in its top-twenty list.

Skills In Demand

Region	Targeted Industries
Active Listening	Reading Comprehension
Reading Comprehension	Active Listening
Critical Thinking	Critical Thinking
Speaking	Active Learning
Social Perceptiveness	Time Management
Coordination	Speaking
Active Learning	Writing
Time Management	Complex Problem Solving
Learning Strategies	Coordination
Instructing	Learning Strategies
Writing	Judgment and Decision Making
Monitoring	Mathematics
Service Orientation	Monitoring
Judgment and Decision Making	Instructing
Persuasion	Social Perceptiveness
Complex Problem Solving	Troubleshooting
Mathematics	Service Orientation
Negotiation	Operations Analysis
Equipment Selection	Persuasion
Management of Personnel Resources	Equipment Selection
<i>The bolded items represent categories that do not appear in the top twenty list in both the region and the target cluster.</i>	

Sixteen of the top twenty abilities concentrations represented in the regional labor market correspond to the top abilities concentrations in the targeted industries. The abilities concentrations of mathematical reasoning, perceptual speed, memorization, and number facility represented in the target sector are not in the top-twenty list for the regional labor market. Rather, the regional labor market includes near vision, far vision, visualization and speed of closure in its top-twenty list.

Abilities In Demand

Region	Targeted Industries
Oral Expression	Oral Comprehension
Oral Comprehension	Oral Expression
Near Vision	Written Comprehension
Written Comprehension	Deductive Reasoning
Problem Sensitivity	Problem Sensitivity
Deductive Reasoning	Speech Clarity
Speech Recognition	Information Ordering
Inductive Reasoning	Inductive Reasoning
Information Ordering	Written Expression
Speech Clarity	Speech Recognition
Written Expression	Category Flexibility
Category Flexibility	Selective Attention
Selective Attention	Mathematical Reasoning
Originality	Fluency of Ideas
Fluency of Ideas	Originality
Time Sharing	Flexibility of Closure
Flexibility of Closure	Perceptual Speed
Far Vision	Time Sharing
Visualization	Memorization
Speed of Closure	Number Facility
<i>The bolded items represent categories that do not appear in the top twenty list in both the region and the target cluster.</i>	

Tools and technology

The O*Net database identifies the common tools and technologies used in each occupation. According to the database, the most common tools and technologies used by those in the occupations in the targeted industries are: 1) Information Technology, Broadcasting, and Telecommunications, (used by 61% of the occupations) and 2) Laboratory, Measuring, Observing, and Testing Equipment (used by 22%). Software is the most commonly used form of information tool (92%). Development software (40%) and data management and query software (12%) are the most common types of software used within the software category. Measuring, observing, and testing instruments (60%) and laboratory and scientific equipment (32%)

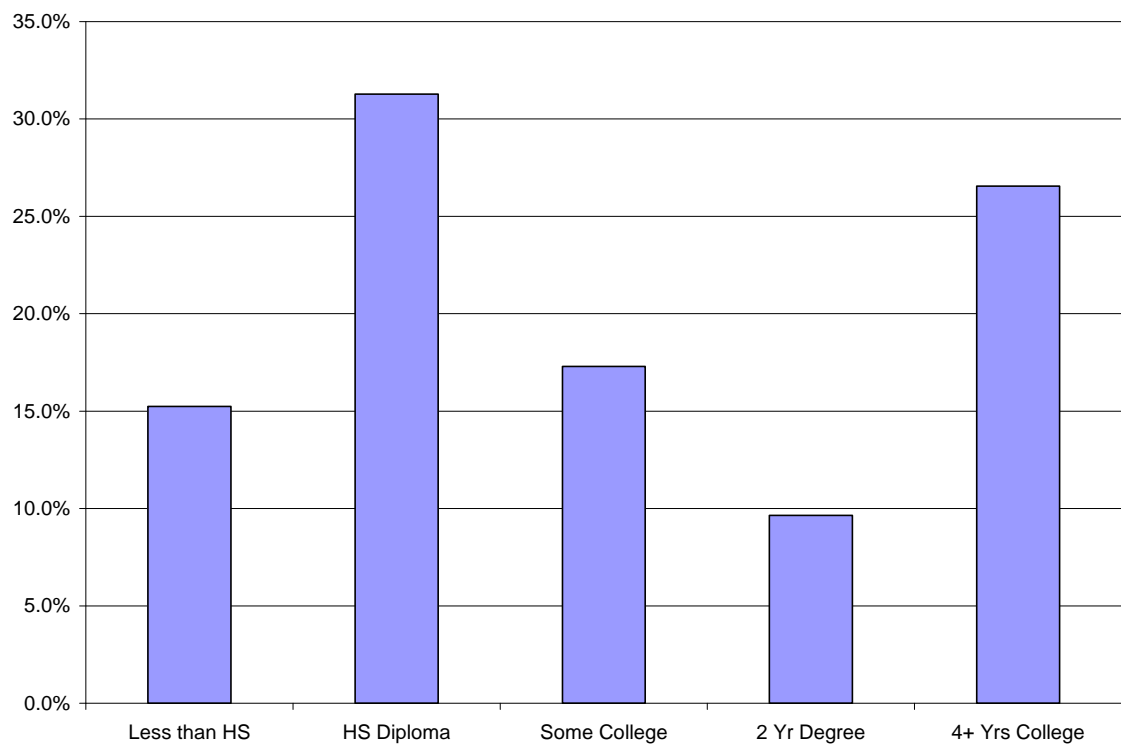
are the most common forms of laboratory and measuring equipment used, with a diversity of types of equipment employed.

Supply

The supply side of this discussion illustrates the link between economic development and workforce development. Rosenfeld et al (2003) argue that the key to success of almost every cluster is the presence of a labor force with the appropriate skills for and the knowledge of the industries located within the commuting boundaries of the cluster.¹⁶ This talent market is local and focuses on positions that require less than four years of postsecondary preparation. These are the technical, support and customer service positions that do the bulk of the operations work. They are a key part of any industry cluster and are best sourced through a regional talent pipeline. Individuals in these positions are less likely to move for a job and more likely to have ties to the region. If an employer cannot find an adequate number of job applicants with high school or technical degrees locally, it is likely to impede the employer's operations. Building a solid core of this technical labor is critical to any region's efforts to sustain and grow an industry cluster.

The data show that of the population in the extended WSWHE BOCES region who 24 years of age or older, 46.4% have a high school degree or less, 29% have two years or fewer of postsecondary education, and 24.6% have four years or more of postsecondary education. It appears the population as a whole is fairly well aligned to the preparation requirements of the employers in the region. Although companies in the targeted industries may offer disproportionately more jobs to higher skilled workers, these jobs will be accessible to the local workforce with the education/training they have or with some remediation in basic skills and/or technical skill upgrading.

¹⁶ Stuart Rosenfeld, Jim Jacobs and Cynthia Liston. 2003. Cluster-Based Workforce Development: A Community College Approach. Carrboro, NC: Regional Technology Strategies, Inc.

Table 11: Educational Attainment for Population 25 Years and Older

Source: Educational attainment, WSWHE Extended Region, Economic Modeling Specialists, Inc. - 8/07

Dire predictions of labor shortages are common, although it is probably more accurate to frame the challenge as a potential skill shortage caused by a supply of talent that lacks the necessary skills to succeed in the changing workplace. Supply issues may arise from insufficient numbers (a quantity problem) and/or a lack of talent with the necessary skills (a quality problem).

Quantity

The aging of the baby boomers and smaller cohorts entering the labor market raise some concerns about the quantity of the labor supply. Roughly 22 million workers are expected to retire from the nation's workforce between 2000 and 2010; this figure could rise to more than 35 million between 2010 and 2020, as the baby-boom generation begins to retire. While the baby boomers may not all retire at the speed previously anticipated, they will retire and will

take their knowledge and skills with them. The subsequent generations are simply not of sufficient size to replace them.

As the baby-boom generation begins to retire, employers in Upstate New York (north of the core of the New York City metropolitan area) will be confronted with the dual pressures of replacing these workers and filling new jobs created in growing segments of the economy. Dietz (2006) argues that the need for new workers is likely to be particularly acute in Upstate New York.¹⁷ The region has a population that is older and has aged more rapidly than the national average. Complicating the employment picture is the ongoing restructuring of the regional economy, which will create jobs in some occupations but reduce them in others. Dietz estimates that given current trends, between 2000 and 2010 roughly half a million Upstate workers are likely to retire, a figure that will rise to nearly 800,000 between 2010 and 2020. His analysis of projected hiring rates in the region suggests that although there will be demand for workers in all occupations, employers may face a particular challenge filling positions in growing services occupations with relatively high retirement rates, such as health care, community and social services, and education.¹⁸

Young adults are normally a vital source of replacements for retired workers. However, Upstate New York's weak population and labor force growth in recent years has raised concerns about a loss of educated workers. Indeed, the region has seen a net outflow of college-educated people. Dietz (2007) has found that Upstate New York, along with twelve states, experienced a net

¹⁷ Richard Dietz. 2006. Baby-Boom Retirements and Emerging Labor Market Pressures. *Upstate New York Review*. 1(1).

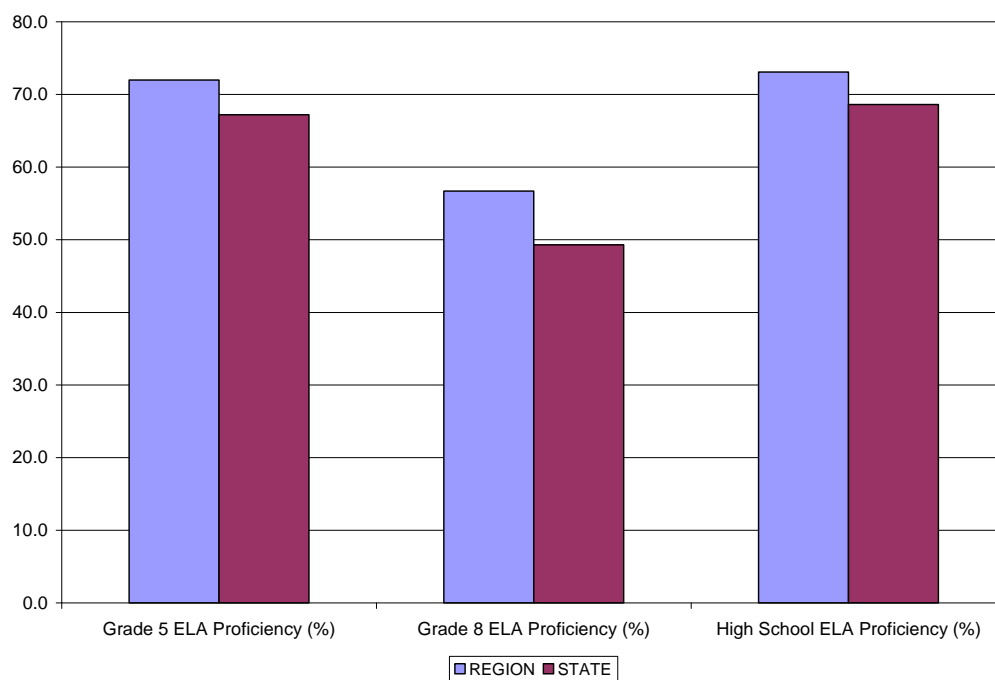
¹⁸ Dietz's list of the 10 occupations in Capital Region with the highest hiring rates are: community and social services; health care support; health care practitioner and technical; construction and extraction; education, training, and library; computer and mathematical; personal care and service (including tourism); legal; building and grounds cleaning and maintenance; and management.

outflow of college-educated workers between 1995 and 2000.¹⁹ Upstate’s net loss was 4.1 percent, the second worst in the nation if the region were a state. However, compared with U.S. states, Upstate New York’s net outflow of college-educated workers reflects a lack of a “brain gain” rather than an unusually large “brain drain.” College-educated adults are not moving to the region fast enough to stem natural out-migration flows.

Regional Pipeline

It is a mistake to think we can make up for the lack of quantity through the quality of the future workforce. Aspects of our regional data reflect national trends and raise concerns about the academic preparation of the future workforce. The state educational data suggests that the region’s schools are doing a relatively good job of preparing their graduates with the necessary basic academic skills.

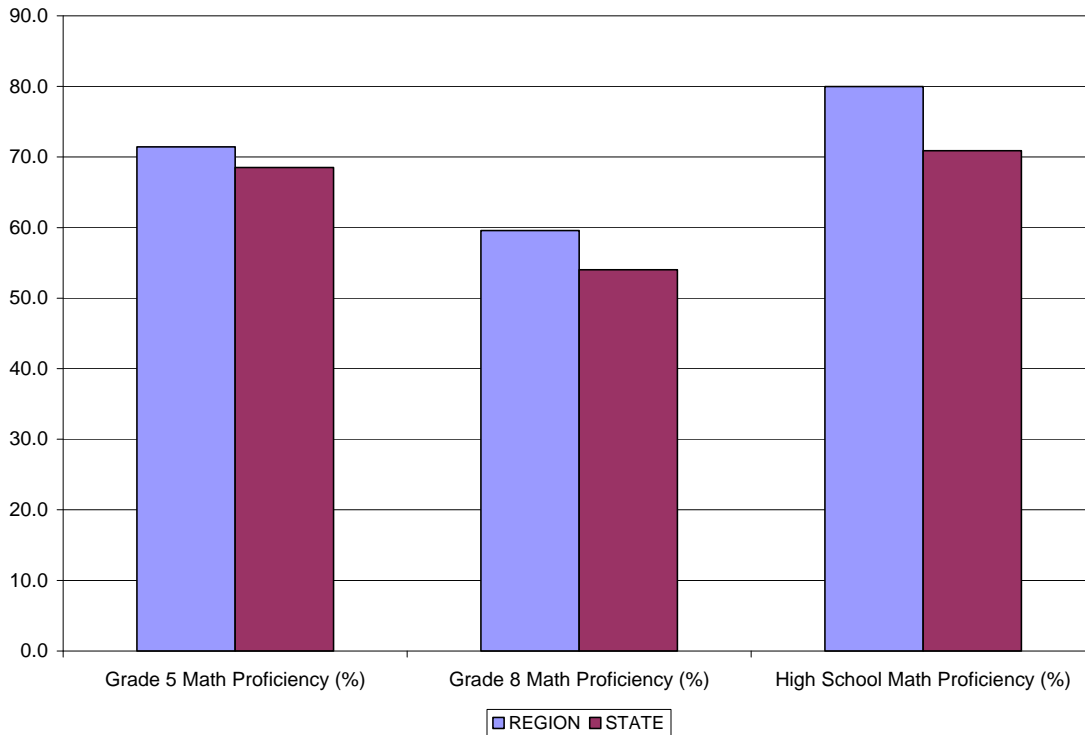
Table 12: Comparison of Regional and State ELA Proficiency



Source: New York State Department of Education, <http://www.nysed.gov>

¹⁹ Richard Dietz. 2007. A Brain Drain or an Insufficient Brain Gain? *Upstate New York at a Glance*. 2 (August).

Table 13: Comparison of Regional and State Math Proficiency



Source: New York State Department of Education, <http://www.nysed.gov>

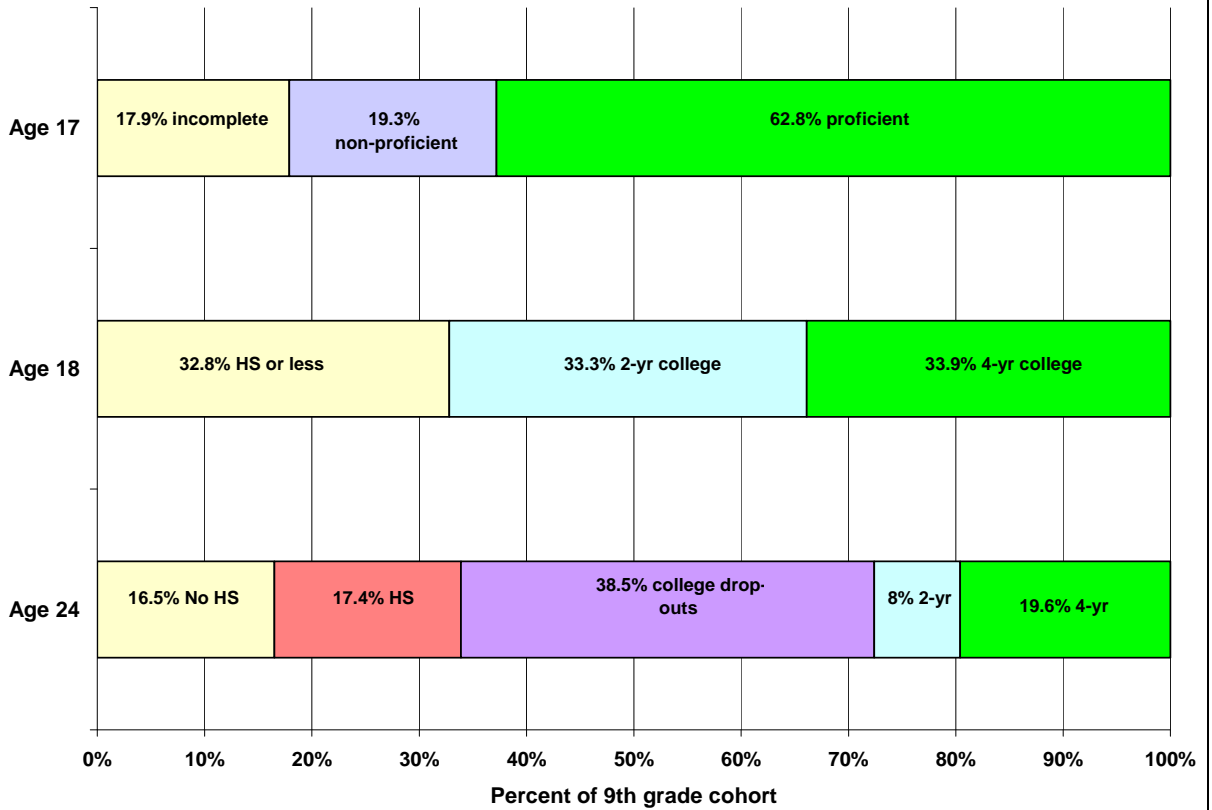
In 2006, over 80% of the high-school graduates in the region intended to go to college – 40% to four-year schools and 40% to two-year schools. But looking at the colleges and universities in New York, only 59.6% of the students have graduated from four-year schools six years after enrolling (the national rate is between 54% and 58%, with the variation based on the use of institutional or individual reports), and less than a quarter of those enrolled in two-year schools have graduated three years after enrolling. In other words, almost half (47.9%) of the students entering a two- or four-year college after graduating from high school will not graduate from college.

Using these high school graduation and college entrance and graduation rates, one can project that each cohort of children will have the following education characteristics in the labor market at the age of 24: 19.6 % will have four-year college degrees, 8% will have two-year postsecondary degrees, 38.5% will have some college, 17.4% will have a high school degree but probably not be proficient in basic skills, and 16.5% will have no high school degree.

These numbers raise serious questions about the region's potential to compete in the future. They suggest that: (1) there will be jobs for people with only a high school degree, but high school graduates may not be sufficiently proficient to qualify for or succeed in those jobs; (2) there will be jobs for people with 2-year degrees, but not enough graduates of 2-year programs; and (3) many who go to college will not finish or may have difficulty finding a job that requires a college degree.

A discussion with community college presidents compliments these examples. From their perspective: (1) High school graduates entering community college programs require remedial math to succeed at the two year level; and (2) Community college courses in math are not often accepted at four year colleges (e.g. business math at Adirondack Community College does not transfer in toward an accounting degree at Siena College).

Table 14: Percentage of Proficiency in 9th Grade Cohort



Source: New York State Department of Education, <http://www.nysed.gov/>

Adult Literacy

While the emphasis in this report is on the talent pipeline, given WSWHE BOCES adult education programs, it is worth noting that low literacy levels among of incumbent workers and immigrants are causes of concern in adult workers. The 2003 New York State Assessment of Adult Literacy (Baer and Hsu, 2004) defined literacy as “using printed and written information to function

in society, to achieve one's goals, and to develop one's knowledge and potential."²⁰ Results are reported on three literacy scales:

- ❖ **Prose Literacy:** The knowledge and skills needed to perform prose tasks (i.e., to search, comprehend, and use information from continuous texts).
- ❖ **Document Literacy:** The knowledge and skills needed to perform document tasks (i.e., to search, comprehend, and use information from non-continuous texts in various formats).
- ❖ **Quantitative Literacy:** The knowledge and skills required to perform quantitative literacy tasks (i.e., to identify and perform computations, either alone or sequentially, using numbers embedded in printed materials).

The results for New York showed that:

- ❖ **Average Prose and Document Literacy of Adults in New York Lower Than Prose and Document Literacy of Adults in the Nation.** The average prose and document literacy of adults in New York was significantly lower than the average literacy of the nation's adults, though differences in quantitative literacy were not significant. A higher percentage of adults in New York also had *Below Basic* prose literacy compared with the percentage of adults in the nation with *Below Basic* literacy. In addition, the percentage of adults in New York with *Proficient* prose, document, and quantitative literacy was significantly lower than the percentage of adults in the nation with *Proficient* literacy.
- ❖ **Prose Literacy of High School Graduates and GED Recipients Lower in New York Than in the Nation.** In both New York and the nation, increasing educational attainment was associated with higher average prose, document, and quantitative literacy. Although the document and quantitative literacy of adults in New York was similar to

²⁰ Justin D. Baer and Yung-chen Hsu. 2004. Highlights from the 2003 New York State Assessment of Adult Literacy. American Institutes for Research.

literacy in the nation for most levels of educational attainment, the average prose literacy of adults who received a GED or stopped their schooling after graduating high school was lower in New York than the prose literacy of adults with the same educational background in the nation. Average literacy in New York and the nation was lowest for adults who did not complete high school. More than half of the adults in New York who did not graduate from high school had *Below Basic* prose literacy, while two-thirds had *Below Basic* quantitative literacy.

- ❖ **Prose Literacy of Adults Employed Full Time Lower in New York Compared With the Nation.** The average prose literacy of adults in New York employed full time or not in the labor force was significantly lower than the average prose literacy of adults in the same employment categories in the nation. Similar to adults in the nation, the average literacy of adults in New York employed full time was significantly higher than the average literacy of adults who were not in the labor force.

GAPS AND ACTION TARGETS

This section of the report examines the primary gaps between demand and supply, and the initiatives that have been implemented to address these gaps. It discusses the findings from interviews with regional stakeholders and uses secondary data to highlight the region's status with regard to the common elements of school reform.

Rigor

Rigor relates to statements of what graduates will know and be able to do (academic, skills and employability standards), assessments to measure performance against those standards, and interventions to enhance performance. Based on the interviews, it appears that academic standards are typically related to scores on the state proficiency tests for grades 3-8, and scores on the state Regents tests at the secondary level. These are the measures for which schools are held accountable under No Child Left Behind

and state policy, and are given the most attention, and therefore drive the majority of district and school activity.

A variety of similar initiatives are underway in many districts to improve student performance on state proficiency exams. Several districts have or are engaged in curriculum mapping. This process identifies how each grade level is implementing curriculum. The mapping is a tool to assess how each grade and classroom is aligned to the state standards. Responding to the mapping outcomes can improve the transitions from elementary to middle school and middle school to high school, allowing the districts to operate along a continuum.

While they may use different assessments, most of the districts engage in the use of data to inform instructional decisions. Several respondents commented on the value of BOCES data services to improve the staff's use of data, particularly in the area of consistency. For some districts, the use of data has opened up discussions with other schools on how they achieved the results that they obtained. The knowledge gained on individual student performance through the use of assessments (particularly formative assessments) supports one of the other common interventions: the implementation of differentiated instruction. However, it is clear that districts do not use data uniformly to drive improvement.

There is a mix of expectations in the vast geography and variety of districts in the consortium supporting this study. While all promote a four-year college education as a desired goal for high school graduates, the expectation varies from a goal of having all high school graduates obtain a four-year degree within five years after graduation to having to sell the community on the need for all students to take a college prep program. This variety is reflected in the variety of program offerings and interventions.

For some districts concerned with their drop-out rate, the Regents curriculum is a challenge. Several of these districts commented on the value of BOCES career programs to keeping at-risk students in

school. The WSWHE BOCES has also designed a new service, “Converging for Success,” to assist these districts. A 10-member audit team examines the district’s K-12 program and operations to identify opportunities to reduce the drop-out rate by improving student engagement, connections, and literacy.

In addition to the Regents Standards, districts accept, develop, and offer electives that meet the state standards. For example, Burnt Hills offers 23 different literature courses, all of which meet the state Language Arts requirements. An alternative strategy is seen in North Warren, which is cutting back on offerings in order to allow students to go into more depth. For example, they have replaced two criminology courses with a single course that is linked to the science offerings in chemistry and physics.

As noted in Study 1, every district offers at least four high tech courses, over and above courses required to meet basic New York State standards, with two districts offering as many as 25 courses. Furthermore, the number of high tech courses offered is not solely dependent on size. Many smaller districts offer more tech courses than larger districts. Offerings above and beyond the Regents standards are also apparent in the growth of Advanced Placement programs and dual enrollment, both of which are offered by all the districts interviewed. It is worth noting, however, that while there are numerous dual enrollment opportunities, they focus on supplemental courses, i.e., programs that could not be offered by the district. For the most part these courses are offered through BOCES. None of the dual enrollment programs are tied to any career path or economic development strategy.

Despite the state reports to Achieve, several of the respondents noted the difficulty many graduates have in their first year of college and the number that were required to take remedial math and language arts, and questioned whether the Regents adequately reflected the knowledge and skills needed to succeed in college. The community colleges offer a variety of programs to assist in the transition from high school to college. For example, North Country Community College provides pre-college and remedial

programs, and has learning labs at each site to assist with college preparation. The WSWHE BOCES is also convening the superintendents and community college presidents to look more closely at the alignment of secondary curriculum to post-secondary requirements.

Based on the interviews conducted, there appeared to be some consensus around the idea that K-12's role is to provide a foundation of skills, including 21st century skills that will prepare graduates for success in the economy, rather than preparing graduates for a position in a specific company or even a target sector. The sense was that the economy is just too uncertain to target specific jobs. Rather, K-12 should focus on preparing graduates for whatever jobs could be, not for jobs that might exist in 5 to 10 years.

Despite the state's report to Achieve that standards are aligned to real-world expectations and graduation requirements are aligned to workplace expectations, many superintendents interviewed for this study see the Regents itself as an impediment to providing students with 21st century skills. They note that the silo and content focus of the regents runs counter to the demand in the 21st century workplace for a multidisciplinary approach to problem-solving. Some interviewees characterized the increasing focus on standardized assessments as problematic. These superintendents would prefer to see New York State Department of Education provide more opportunity for schools to deliver the core in a creative manner, and move beyond a "one size fits all" approach that might be assumed by the current assessments. A more creative approach to instruction and assessment would also help facilitate the development of multiple career pathways to lifetime success.

Preparing students for success in the economy emphasizes the development of foundation skills that can be applied and awareness of career opportunities. The belief is that this broader presentation will engage students and bring them into more targeted courses. In this regard, there was a general recognition by

interviewees that BOCES and the community colleges should play a role in regional workforce development, i.e., they are a likely provider of the more targeted courses. The challenge for both BOCES and the community colleges is to balance and/or blend rigor and relevance.

For BOCES, this requires Career and Technical Education (CTE) programs with rigorous academics, while for community colleges it requires balancing their mission as transfer institutions with their mission around occupational preparation. At present, the perceptions of BOCES programs are mixed. Some see BOCES programs as vocational and not adequate for college prep, while others recognize the occupational focus but believe they have improved in quality (which does not necessarily equate to college prep). BOCES staff counters that what people believe about BOCES does not match the reality (a belief supported by reports on an activity in a summer program offered through the Adirondack Business-School Partnership where participating teachers had the opportunity to learn about BOCES programs). They believe there is little understanding of the academic theory and application/problem-solving learning in BOCES programs. All BOCES CTE programs cover math, English, occupational, career and financial management, and soft skills. Moreover, to ensure the rigor and relevance of its programs, the WSWHE BOCES does academic audits by component district staff and technical audits by business staff.

It is worth noting that New York education policy for career and technical education is characterized by some to be a national exemplar.²¹ New York's recently instituted program re-approval process is built around visits by school district officials and outside experts who assess evidence of curricular quality, including integrated academics, faculty certification in their fields, the use of

Richard Kazis. 2005. *Remaking Career and Technical Education for the 21st Century: What Role for High School Programs?* Boston, MA: Jobs for the Future.

and results from industry-recognized technical assessments, and the extent of access to work-based learning. The state's efforts have stimulated demand from local programs to earn the state's "seal of approval," and they have also spurred the development of new programs in occupational areas such as engineering/technology and human/public service. State-wide, CTE program enrollments have started to climb, attendance is improving, and there is evidence of better results on academic Regents exams and of an increase in the percentage of students who receive a CTE endorsement on their diplomas. Many CTE programs have a postsecondary partner and a clear articulation agreement that encourages continuation of technical studies after high school.

As noted in the discussion of workforce readiness credentials in the appendix, the four Workforce Investment Boards (WIB) in the Capital Region recently received two grants from the NYS Department of Labor to develop and implement a regional strategy for workforce development aligned to the region's emerging technology sectors. One action item in the implementation proposal was the development of a regional workforce readiness certificate. There are at least three workforce readiness programs in the region: Schenectady Chamber, Columbia/Greene WIB, and Saratoga/Warren/Washington WIB. Despite New York's partnership in the National Work Readiness Credential, the current plan is to try to obtain regional agreement on the use of a program developed by the Schenectady Chamber of Commerce (see appendix). Their vision is to have every junior or senior in the region take this as a course and earn the regional workforce readiness credential.

In summary, while district activity around rigor is driven primarily by academic standards and state assessments, there is a belief that graduates should demonstrate 21st century skills. This belief is reflected in mission statements, but it does not always translate into a clear statement of graduate characteristics or competencies or relevant assessments and interventions. Shenendehowa's profiles of high school graduates, middle school and elementary

school students may serve as a model in developing statements of excellence.²²

Relevance

Regional efforts to increase the relevance of the high school curriculum to engage students and to allow them to develop career and technical skills revolve around career awareness and changes in pedagogy.²³

Pedagogy

The interviews suggest there is a mix of pedagogy in the region. Many districts employ time-tested traditional strategies. Some are integrating curriculum, often starting with the social science and language arts courses at a single grade level. Programs that integrate science are rare. Project Lead the Way (see the effective practices in the Literature Review section) was developed by a Shenendehowa teacher and is present in several regional districts. The growing popularity of forensics, driven by the media, has led several districts to offer forensics courses. Examples of other efforts to create new courses that engage students include:

- ❖ Ballston Spa, Burnt Hills, Lake George, and Saratoga all have a high school science research program in which students work with a mentor over the course of three years and that provides connections to universities. Students work on individual projects and the emphasis is on hands-on experience.
- ❖ A physics and a technology teacher in Burnt Hills worked together to create nanotechnology curriculum for grades 9-12. The school is acquiring an electron microscope from RPI to use in the program. The Workforce Consortium for Emerging Technologies is currently seeking funding to replicate this program in other regional high schools.

²² (http://www.shenet.org/shen_Excellence_06.pdf).

²³ The interviews suggest that business engagement is an integral part of career awareness activities and select changes in pedagogy.

- ❖ Shenendehowa offers a problem-based physics course targeted at students who do not normally take physics but would like a fourth year of science. Ballston Spa has a similar applied physics program while Shenendehowa has an integrated math/science academy.
- ❖ North Warren offers a variety of programs tied to the local economy or exciting career opportunities. These include sports management, journalism/broadcasting, and hotel management. Each makes extensive use of experiential learning.
- ❖ The BOCES New Visions programs offer pre-professional elective opportunities that enhance student career exploration and work-based learning. The programs are held at business/industry sites where students work and learn side by side with professionals.

Two other regional initiatives warrant attention. First is the Albany New Technology High School. Developed in partnership between the Capital Region BOCES and Questar III BOCES, the high school is a part of the New Technology High School Network (see effective practices in the Literature Review portion of this study). Respondents who served on committees involved in creating that school said the experience offered several lessons for this study (see the Recommendations).

The second is the partnership between the College of Nanoscale Science and Engineering of the University at Albany and Albany High School. This University of Albany college sees itself as a state-wide resource. Its K-12 focus is on science, technology, engineering and mathematics (STEM) and increasing awareness of nanotechnology as an enabling science with broad applications in many areas (Advanced Micro Devices, Inc. is an example of the application of nanotechnology to electronics). Under the partnership with Albany High School, students take nanotechnology courses developed by the college and Albany science teachers as electives (the electives have science and math prerequisites). Enrollment, currently 20, is based on interest. The coursework is supplemented with hands-on activity at the college.

The college considers the Albany High School program a pilot; the challenge will be how the program can be taken to scale in the region and across the state.

Career awareness

It is worth noting that New York does have a set of Learning Standards for Career Development and Occupational Studies at Three Levels (<http://www.emsc.nysed.gov/ciai/pub/cdoslea.pdf>) that establish expectations for career awareness at the elementary, intermediate and commencement levels. The state also implemented a career planning initiative that provides teachers resources to embed career planning in their classroom activity. However, a 2002 evaluation of that initiative by the Westchester Institute indicated that relative to other educational initiatives such as Title I and the NYS Learning Standards, the Career Plan Initiative is viewed as having less priority in many districts and schools (this conflict between NCLB and career awareness for time and attention was also a finding in a survey conducted for the Adirondack Business & School Partnership). This may explain why neither the standards nor CareerZone, the state-developed resource for career awareness (<http://www.nycareerzone.org/>), were not mentioned in our discussions with stakeholders on career awareness initiatives.²⁴

What did get mentioned was an eclectic but possibly effective mix of activities highly dependent on the local connections of individual teachers (mostly business or guidance faculty) or the assistance of strategic partners. The most common activities involve a mix of career counseling with a focus on regional business, career exploration in the middle school, and career oriented speakers at the high school. Career and Technology Education competitions, such as the ENYCAR (Eastern New York Coalition of Automotive Retailers, Inc.) Regional High

²⁴ Tech Valley Careers (<http://www.techvalleycareers.org/>) is also an excellent resource. It is an online clearinghouse for information about high tech careers in the Greater Capital Region. Through this website, educators, students and parents are linked to education and career opportunities made possible by the high tech growth and expansion in Tech Valley.

School Automotive Competition builds relationships between the school districts and local partners. In this case, automotive technology students compete at an event sponsored by ENYCAR that is hosted at Hudson Valley Community College. SkillsUSA, ProStart, and Future Farmers of America offer other CTE competitions.

A few districts have more structured programs. For example, Warrensburg provides a 7-8 hour occupations and careers course and has a formal school-to-work program. It also conducts an annual career day with 150 employers that it opens up to 20 other districts. Burnt Hills provides teleconferences featuring a variety of organizations and occupations for its elementary school students to promote career awareness. It also works with the Schenectady Chamber of Commerce to conduct a career expo that is attended by all 10th graders. Mechanicville also conducts a career day, but at the middle school level. As an example of an activity that is not strictly career-related but is future-oriented, Argyle takes all its seniors on college visits, going to a different part of the state every year (this is part of an effort to address the culture of farm family that does not place a high value on postsecondary education).

Interviews and surveys recount that several districts rely on the services offered through the Adirondack Business & School Partnership (ABSP). The Partnership has supported, advised, and assisted districts in providing: career days, career panels, special speakers, staff development programs, a summer program for teachers on occupational trends, and a series of science kits on industry practices that can be loaned to regional schools.

While individual districts have internship programs, most are relatively small. Many districts rely on BOCES for assistance in establishing internships. Internships are a form of work-based learning that helps students put classroom theory to use in real-life situations. These customized work experiences offer students the opportunity to network with future employers. Students are also matched with mentors. BOCES staff plays a significant role in these student-centered programs. For example, in the Career

Exploration Program, a Placement Coordinator designates a job-site, develops a personalized curriculum for the student, and develops a training plan for the company with which the student works. The BOCES New Visions got consistently high marks from all the respondents that had students participating in this initiative. According to the state, the New Vision programs were created to offer pre-professional elective programs that enhance student career exploration and work-based learning. The programs are held at business/industry sites where students work and learn side by side with professionals. Career areas represented in New Vision programs in three regional BOCES include:

- WSWHE BOCES: Engineering, Health, Careers Exploration, Theatre Arts
- Questar III BOCES: Math, Technology, Engineering and Science, Medicine and Allied Health, Scientific Research and World Health, Visual and Performing Arts
- Capital Region BOCES: Health Careers, Human Services and Special Education, Law and Government, Journalism and Media Studies

New Vision students attend classes in a work setting for a portion of each school day. They also learn via job shadowing experiences where they can apply classroom theory to a real-world context. Since most New Vision curricula include an integration of senior English and social studies, students can meet their requirements for graduation through participation in the program. Typically, a New Vision program grants four units of credit: one credit for senior English, one credit for senior social studies and two career and technical education credits.

Professional development

The majority of responses to CGR's questions about investments in professional development reflect the need to provide staff the knowledge and skills needed to implement the district or school's strategic objectives. Thus the significant investments made by districts revolve around the topics discussed under rigor, relevance

and relationships: differentiated instruction, articulated curriculum, use of data, use of technology (see below), and learning communities. Other topics mentioned include cognitive and brain development, 21st century skills, and career awareness.

The above topics tended to be provided to entire staff. A few superintendents talked of a strategic approach to change management in which small teams or individual staff were selected and sent to different development sessions outside of the district. The staff was expected to return and begin to seed and champion the change throughout the district.

Lake George has a unique program that is used to support risk-taking and innovation. It provides mini-grants for unique professional development opportunities outside of the district, with the expectation that the enrichment will be brought back to the district. For example, the district supported a music teacher who wrote an opera that is being presented in Maryland. The grant enabled her to make the trip, and that experience will inform and enrich her teaching when she returns to the district.

There are numerous staff development programs provided by BOCES districts, including the Adirondack Business to School Partnership components mentioned previously and the Technology Toolkit Days. In addition, Albany-Colonie Chamber offers teacher externships. This summer program provides middle and high-school teachers with first-hand work experience in a technology company. The program, which runs from six to eight weeks, depending upon the needs of the company, provides teachers with the opportunity to work side-by-side with leaders in cutting-edge technology companies from throughout the region. The experience is designed to expose teachers to careers in the math, science and technology fields, and to educate them about the skills that are needed for the future workforce in Tech Valley. Teachers are paid at a rate of \$20.00 per hour, for a full-time working schedule, and are granted professional credit.

Technology

CGR conducted an analysis of the district technology plans submitted to the WSWHE BOCES. A summary of that analysis is included in the appendix. The thoroughness and quality of the plans ranged significantly. Some plans were less than twenty pages long, while others were over a hundred. The better plans outlined how technology was acquired, how it was paid for, and how it was integrated into the school day.

A majority of the plans focused primarily on the acquisition of technology and spent little time on how the technology would be used in the classroom. The interviews also reflect the investments in classroom technology. When asked about technology, the most common response was interactive whiteboards (such as SMART Boards). Interviewees were also interested in having staff trained in BlackBoard e-Education platform and hosting staff web sites. One district, North Warren, made investments in classroom technology the foundation for offering an entirely new program in broadcast journalism.

Roughly half (53%) of the strategic plans submitted included a set of grade-specific competency goals for students. These sets of goals generally consist of an outline of general computing skills that a student should have at a specific grade level. Two districts referred to recently initiated efforts to develop information literacy skills that deal not with the use of the technology, but with the ability to accurately assess and employ the information that technology makes available.

Almost all of the district level strategic plans recognized the need for educators to be trained in technology for its effective implementation into the classroom environment. Of the 34 strategic plans, 17 (50%) outlined competency goals for teachers in technology, and 18 (53%) detailed the training options and opportunities available to teachers. Consistent with the interviews, many school districts state that they take advantage of the WSWHE BOCES Model Schools Program for professional development. One superintendent commented that the best step the district had taken to advance teachers' computer skills was to

implement a computer-based student management system that all staff was required to use.

An area of potential concern is the degree to which the districts are ready for new innovations on the horizon. Although it is difficult to plan for unknown advances, the strategic plans had little mention of how unforeseen technology developments would be integrated at the district. For example, most of the plans failed to mention any attempt to engage students using their own forms of technology or to discuss the presentation of online courses for students. However, both of these factors came up in the interviews, so this may indeed reflect the difficulty of relying on a multi-year plan as a vehicle for keeping abreast of changes in technology. For example, Shenendehowa's instructional technology committee convened this year to look at pedagogy and the way in which students' use of technology (e.g., teachers' blogs, parent portal) is changing dynamics of relationships. Several other districts are implementing or have plans to implement parent portals and discussion boards. Queensbury may be at the forefront of this trend, with its superintendent operating his own blog with material on 21st century skills.

The majority of districts that CGR talked with take advantage of the BOCES distance learning network, both offering and receiving courses. Typically, districts take advantage of distance learning for programs they cannot provide themselves, while offering programs that they have developed using unique resources that may not be available in other districts. For example, Corinth offers a Bioethics course developed by one of its teachers. Several respondents talked about the need to go even further and to begin to take advantage of the opportunities available through virtual and global learning. In addition, it is worth noting that there are still substantial impediments to using distance learning more, such as changing all schools to block scheduling so course times coincide. This would ensure that some students are not shut out of the opportunity to access this resource merely because their school's course scheduling is different.

Another example of the use of technology to overcome the geographic distances separating districts in the region is North Country Community College's investments in videoconferencing across its campuses. This enables them to offer a course at all the facilities when a given campus may not have adequate numbers to justify the program. Under this arrangement, faculty presentations rotate through sites so that the professor gets the chance to meet all students in person (and vice versa). A final example of using technology to achieve regional scale is the College of Nanoscale Science and Engineering's use of TV and webcasts to reach all of the districts in the region and across the state.

One of the more intriguing findings from the interviews was the degree to which technological advances and associated curricular innovations in the districts depend upon the skills, interests and external connections of the individual technology staff. These individuals, alone or in partnership with teachers (usually business or science faculty), are their district's champions of innovation.

Facilities

CGR did not ask any questions about facilities. Comments related to facilities that emerged during the interviews tended to involve either changes in enrollment (necessitating opening or closing a building) or changes in facility required to install new technology. One superintendent noted that the technology infrastructure of schools will be an issue, since it is hard for schools to keep pace with the changes in technology. He suggested that a joint use flexible center with the ability to adapt would be a welcome regional resource. Another example is the South Glens Falls School District that uses a technology on wheels approach. These units rely on wi-fi technology and mobility to extend the high tech capability of any classroom or corner.

Barriers

CGR closed its interviews by asking respondents to identify the primary barriers to reform in their districts (and by extension, the region). Three primary barriers were identified. These are:

- ❖ **Industrial model of education.** It is difficult to predict labor market demand in the region. Even when the focus is on a

single entity such as Advanced Micro Devices, Inc., the timeframe is elusive. The fact that the region and/or sub-regions do not have clearly articulated visions of economic development that would help to focus predictions only adds to the uncertainty. The current education and workforce system is not designed to maximize responsiveness and adaptability to changing demand. Addressing uncertain demand requires more modular programming (a strategy that has served North Country Community College well) and effective coordination of program offerings across secondary and post-secondary institutions (e.g., BOCES allied health certificates, community college associate degrees, and university bachelors and post-graduate degrees). The industrial model of education is not designed to deliver multiple career pathways and individualized learning cost-effectively.

- ❖ **Systemic challenge.** Education is controlled by a two-headed hydra, both of which are barriers to change. One head is the state education bureaucracy in the form of the Department of Education and the SUNY system. As one respondent put it, the “complexity of bureaucracy anesthetizes enthusiasm for learning.” The other head is the fragmentation of local education, making it necessary to deal with a multitude of entities in order to implement a regional change. Trying to establish a new way of doing business requires “selling” each of the participating entities.
- ❖ **Geo-political boundaries.** The labor market and business do not recognize the geographic and political boundaries that have been established and that govern the operation of many educational and workforce development entities (e.g., BOCES, community colleges, WIBs). Everyone is frustrated by the barriers that arise from these geo-political boundaries.

RECOMMENDATIONS

Oakes and Saunders (2007) provide an excellent summary of the current state of high school reform when they note that it is time to move “beyond the tired debate between the “academic” and

“vocational” sides of high school, [and to recognize] that graduates who go directly to work need solid academic skills, and those who go to college will also have careers ...[acknowledge] that the 21st century economy will forge new relationships between schooling and work, with many [individuals] learning new skills and changing jobs over the course of their careers, often requiring movement between work, on-the-job training and school to assist in these transitions.”²⁵

The work being done by the Tech Valley Committee is a first step toward forging the new relationships that are a critical part of this new era. Based on the review of effective practice and the state of education in the region relative to effective practice, this section of the report will recommend steps the committee could take to move boldly into this new era.

Recommendation 1: Craft a Regional Vision

CGR found examples of three levels of change—charter/full-school, programmatic and supplemental change—in the region. There is also evidence of effective practice in the region, although not necessarily in a single program. But these “random acts of improvement” do not represent a common regional vision or collaborative action. Nor does the presence of a program in district or school mean that the region has that program. The region needs to move beyond an environment marked by random acts of improvement toward a regional vision and collaborative action.

Anticipating other recommendations, CGR believes the vision should touch on how key elements of education reform—standards, assessment, curriculum, pedagogy, postsecondary articulation, technology, professional development, business engagement, etc. – will be used to promote development and

²⁵ Jeannie Oakes and Marisa Saunders. 2007. *Multiple Perspective on Multiple Pathways: Preparing California’s youth for College, Career, and Civic Responsibility*. Los Angeles: University of California.

universal access to multiple career pathways integrating preparation for both postsecondary education and career. The vision should present a comprehensive pathway that includes the following components:

- ❖ An academic core enabling students to meet the minimum academic course requirements for admission into college without remediation in the community college system;
- ❖ A technical core focused on the knowledge and skill needed for career preparation in a major industry of occupational clusters relevant to the regional economy;
- ❖ A series of increasingly challenging work-based learning opportunities, beginning at least by the 9th grade and culminating in 12th grade;
- ❖ Postsecondary articulation linking secondary programs of study to postsecondary majors and other programs in two- and four-year colleges, apprenticeships, the military, and other recognized formal employment training opportunities;
- ❖ Supplemental services to ensure proficiency and graduation.

The vision should provide a sense of what will be accomplished by these actions, possibly in the form of goal statements such as these adapted from the RFP for the Virginia Governor's Career and Technical Academies:

- 1) To maximize opportunities to prepare students for targeted careers by breaking down barriers between traditional core academics and career and technical education, between high school and postsecondary education and training, and between education and the workplace.
- 2) To raise student aspirations and to attract more students to postsecondary education in preparation for technical careers, especially targeting students who might otherwise have settled for a curriculum that did not prepare them well for postsecondary education or work.

- 3) To provide well-trained workers to support the recruitment of new businesses and industries to New York and to meet the workforce needs of existing business and industry.

The vision should also include a statement on how the regional stakeholders will work together to make the vision a reality. However, the level of collaboration and coordination may vary from resource sharing to joint action on a common initiative.

Recommendation 2: Develop Career pathways

The Tech Valley Committee should build on the state's academic and CTE standards to develop model comprehensive career pathways for the industry sectors or occupational clusters that are most relevant to the regional economy.

While identifying the sectors, career clusters or themes relevant to the regional economy on which to base career pathways will not be easy (see below), a career pathways model is a viable strategy for addressing two tensions regarding the appropriate focus of secondary education. The first tension revolves around the type of skills that should be developed at the secondary level. There is general support for 21st century skills but distaste for preparing students for specific occupations. The second tension revolves around the economic targets used to enhance relevance. CGR found significant differences among the regional stakeholders regarding the perceived impact that Advanced Micro Devices, Inc. and its multipliers may have on a district's community. Districts closest to Luther Forest tended to be most receptive to Advanced Micro Devices, Inc.'s possible arrival. Districts slightly farther away tended to adopt a wait and see attitude, and districts most removed from Malta were more likely to see no impact for their community from Advanced Micro Devices, Inc.'s arrival in the Tech Valley. The potential of Advanced Micro Devices, Inc.'s to locate at Luther Forest can be used to drive awareness of the competency requirements of the 21st century workplace and the

changes in education required to prepare graduates to those standards, but it will not engage the entire region as the focus of an initiative. Districts that do not believe they will be affected by Advanced Micro Devices, Inc.'s would be receptive to career pathways that they see as more relevant to their local economy. Career pathways related to the local economy provide relevance while enabling students to develop the desired foundation of 21st century skills.

Identifying career pathways

Two options for organizing career pathways are by industry or by occupation. Study 1 and part of the analysis in the demand section of this report were driven by an industry focus and examined eleven “high-tech” sectors. The Workforce Consortium for Emerging Technologies is focused on: Advanced Manufacturing, Construction, Biotechnology, Energy and Nanotechnology. An industry approach would look at the industry sectors that are most relevant to the regional economy. Consideration should be given to both anticipated employment and to the potential for future growth. The high-tech sectors’ analysis and the work of the Workforce Consortium emphasize growth opportunities, but do not address some major areas of the regional economy such as retail, hospitality and government. Two benefits of a sector approach are the ability to identify employers to serve as potential partners and the alignment to economic development strategies.

An occupation focus looks at career pathways within the 16 career clusters. This is the approach used by state CTE programs and the national CCTI discussed as an effective practice in the Literature Review. The occupational focus faces the same decisions regarding whether to emphasize anticipated vacancies or future growth as the sector focus (the appendix includes a graph showing the anticipated vacancies in the region for each career cluster, as well as the percentage of vacancies due to replacement and growth). A significant advantage of an occupational focus is the multitude of resources already available to support this approach (e.g., the CCTI pathways).

While the industry and occupational approaches are related, they are not the same. Most industries will include multiple occupations, and most career clusters will cross multiple industries. A blended strategy might focus on the career clusters that capture the majority of the occupations in the target industry sectors, and emphasize those sectors in developing contextual curriculum.

The detail

The hard work of career pathways comes in creating the competency models that provide a foundation for career awareness activities, that establish the baseline for developing articulations from secondary schools to both two-year and four-year colleges and universities, and that delineate the knowledge, skills, and abilities to be developed in the program courses. This is part of what has to be accomplished in the next stage of the Tech Valley Committee's work. There are a number of resources to assist with this work, including the CCTI career pathway materials, O*Net generated career pathway models that identify specific jobs and preparation required within a regional career path (see the appendix for one example – Scientific Research/Engineering), and the DOL competency model knowledge base.

It is important that this work be taken on by sector or cluster advisory teams that include representatives from secondary education, postsecondary education, and business. Business is needed to validate the competencies, while secondary and postsecondary educators outline and align curriculum that forms the foundation for articulation agreements. All can begin to discuss appropriate assessments.

The common core across the competency models in the different career pathways identifies the knowledge, skills, and abilities that should be the focus on learning and development for all students. Consideration should be given to developing or adopting a valid, reliable, and fair assessment of “work-readiness” that reflects this foundation. To this end, the Tech Valley Committee should participate in the discussion on regional workforce readiness credentials that will be undertaken by the Workforce Consortium for Emerging Technologies as an activity in its NYS DOL regional

partnership grant. Ideally, the workforce readiness credential would reflect the common core from the pathway competency models. While the timing of the activities may not allow this to happen, it would be beneficial to have a say in its development and to understand its content.

Recommendation 3: Develop Design Specs

The development of career pathways (Recommendation 2) begins to supply content. It does not specify how or where the program will be delivered. Thus the career pathways are defined by program content, not by the location or delivery system of courses. This recommendation focuses on expectations about delivery: the “how” and “where” content is provided.

Individuals that were on the Tech High committee reported that the discussions between business and education (K-16) were invaluable. They would like to see that partnership replicated.

There are also aspects of Tech High that they would like to avoid. For example, they would prefer a delivery model that allows broader delivery and participation, possibly through the use of on-line delivery and partial day components. They would also like to consider the possibility of rotating teachers for staff development. Based on the interviews and effective practice, CGR has developed some suggestions for possible design specs. These include:

- ❖ Each career pathway should include a distance learning, videoconferencing and/or web-based component to ensure full regional access.
- ❖ The distance learning, videoconferencing and/or web delivery should be designed as part of a blended learning model that mixes on-line delivery, self-study and hands-on group work. The group work may take place at a common facility, perhaps a BOCES.

- ❖ Projects should be developed that require teamwork across districts.
- ❖ Courses may be delivered on a high school, technical center or community college campus, online or in other innovative ways.
- ❖ To encourage innovative approaches, consideration should be given to issuing RFPs for curriculum development based on the content developed under Recommendation 2. Districts, teams of teachers from multiple districts, vertical teams from secondary and postsecondary institutions and teams of educators and businesspeople could submit proposals to develop modules targeted at specific competencies or portions of the curriculum.
- ❖ The resources and means should be made available so that supporting local school systems can turn a proposed program of study into high-quality instruction in the classroom and technical laboratory. For example, any proposals for the development of modules should include methods for sharing the developed module across the region.
- ❖ One goal is to assemble a portfolio of career pathways, each of them rigorous, which allows students and their parents to choose from an array of possibilities.

Recommendation 4: Promote Professional Development

The literature review and the interviews make it clear that professional development is a critical part of successful reform. CGR believes there are two actions related to professional development that should be considered in implementing the career pathways model.

First, the career pathways model is a new approach, and like any new initiative, staff must receive appropriate training to ensure it is implemented successfully. In particular, the Tech Valley Committee should promote professional development that builds capacity: 1) among existing CTE teachers to recognize, reinforce, and supplement key academic concepts and skills that are particularly well-suited to the industry and career cluster that is the pathway's organizing theme, and 2) among district and BOCES'

academic teachers to apply their particular academic discipline to authentic problems and projects in the industry and career cluster. Teacher externships in companies in the pathway would be of benefit to both CTE and academic staff.

Second, insofar as the design specs (Recommendation 3) support a distributed learning model,²⁶ the Tech Valley Committee needs to promote an approach to professional development that reinforces and enables this design spec. This model reinforces ownership of learning, utilizes a non-centralized approach, and identifies specific learning objectives for each session. Implementing a regional learning community that empowers teachers from different districts to share and to discuss tools and techniques to help their students develop 21st century skills would help achieve this recommendation.

Possible ways to jump-start the learning community include:

- ❖ Convene the technology and business staff that is championing new programs in many districts. Issue them a design challenge, such as determining how to use Web 2.0 resources to enhance student learning;
- ❖ Convene the staff that have developed nanotechnology programs for their schools to make their curriculum available to other districts, possibly through a conference and also on a web site; and
- ❖ Conduct a regional inventory of secondary curriculum relevant to the career pathways and post it on the web with appropriate links to staff. Ask the staff to start a blog, of course while adhering to appropriate blog policies.

²⁶ Distributed Learning Model, Tech Sheet, 1999 <http://techcollab.csumb.edu/techsheet2.1/distributed.html>

Recommendation 5: Promote Business Partnerships

As noted in the introduction to this section, the work of the Tech Valley Committee is helping to forge new relationships between school and work. Clearly, business partnerships are critical to this work. CGR believes there are two aspects to promoting business partnerships.

First, as noted in Recommendation 2, an Advisory Panel comprised of industry representatives, secondary and postsecondary educators, and other interested individuals needs to be created for each pathway. The panel will advise on pathway design, further refinement of academic and technical content standards, curriculum development, assessment, and teacher preparation. The industry representatives should be the business champions for this initiative. The accompanying text box captures the results of the work of one national business champion.

Pathways to Pharmacy

A fully functioning, award-winning program developed by CVS. It includes:

- Class career presentations (Elementary school)
- Job shadowing (Middle school)
- Rigorous academics, mentors, internships, and dual enrollment (High school)
- Graduation with certification as a pharmacy technician and entry into a two-year apprenticeship that combines community college course and work as pharmacy assistant in a CVS store. Community college graduates are prepared for admission into a four-year college program. CVS provides scholarships and loan forgiveness for work.

Second, there is value in pursuing a regional business and education compact to solidify this partnership and facilitate coordination of career awareness activities across the region. The Boston Compact is possibly the oldest business-education partnership in the U.S. Its partners have pioneered a variety of activities to connect high school students and the world of work and continue to serve as role models for other regions. Milestones in the Boston Compact's history include:

- ❖ 1982—City leaders sign the initial Boston Compact, the first collaborative school-improvement agreement between business, higher education and a school system. Business partners committed priority jobs and scholarships for Boston Public Schools graduates in exchange for improved test scores, attendance and drop-out rates.
- ❖ 1991—The Boston Private Industry Council (PIC) and area hospitals created ProTech, a groundbreaking School-to-Career initiative.
- ❖ 1996—The Boston PIC and the Boston Public Schools established Groundhog Job Shadow Day to introduce Boston students to the world of work.
- ❖ 2000—The fourth Boston Compact commits all partners to meet the "High Standards Challenge," bringing together stakeholders around shared goals and accountability measures to improve opportunities for students. Through the Boston PIC, more than 60 businesses are partnering with more than 70 schools to bring knowledge from the "boardroom to the classroom," and vice versa. The business community has become a vital force in school reform by providing volunteer time for employees, technical assistance, access to the worksite and charitable contributions.

The Boston Compact inspired the recently implemented Pittsburgh Regional Compact, an employer-educator partnership. The Pittsburgh Regional Compact engages regional employers, educators and program providers in a coordinated partnership to prepare southwestern Pennsylvania students for successful careers in the region. Employers partner with local educators to customize career education for students through a variety of activities, including:

- Career Education Collaboration with Schools – working with educators to develop career education programs aligned with school and employer needs;

- Educators in the Workplace – providing teachers the opportunity to spend a period of time working for a company during the summer;
- Work Readiness Training – teaching youth basic work skills and methods with which to approach the job application process;
- Career Awareness Activities – exposing students to careers through activities such as job shadowing, worksite visits and classroom speakers;
- Career Mentoring – providing students one-on-one career guidance;
- Experiential Learning -- enlisting students for hands-on, real-world projects or competitions related to business activities.
- Student Internships – providing students part-time work opportunities or business- focused group projects.

The Pittsburgh Regional Compact asks participants—both employers and educators—to sign a letter of commitment. A copy of that form is included in the appendix and could serve as a model for the Capital Region.

Recommendation 6: Conduct an Awareness Campaign

While national polls suggest that Americans recognize the importance of 21st Century skills to individual and economic competitiveness and while they point towards recommendations that schools ensure its students obtain these skills (Partnership for 21st Century Skills, 2007), the changes required in education to achieve this goal are hard to come by. Regional coordination requires building up a regional mindset – orchestrating the acts of random improvement toward a common vision. To this end, CGR recommends a two-phased awareness campaign to support the development and implementation of the career pathways model. Phase 1 is general awareness to create a sense of urgency and desire for action, while Phase 2 is targeted communication in

schools' career guidance on new opportunities once the career pathways model is in place.

Phase 1

In a summary of effective awareness campaigns undertaken by its partner states, Achieve (2007) identifies a common set of objectives for early awareness campaigns. These objectives are applicable to the Phase 1 campaign, and can be adapted as follows:

- ❖ Raise awareness of the research supporting the value and use of pathway models;
- ❖ Identify those opponents, supporters and messengers who are most likely to enter the public debate about the career pathways model;
- ❖ Provide these key individuals and organizations with appropriate outreach and information while listening to their goals and concerns;
- ❖ Generate constructive feedback from the most well-known education and business organizations, as well as from influential opinion leaders and students, parents and educators; and
- ❖ Use the input and feedback to inform the component district's adoption of the proposed plan of action.

Based on the results of this study, elements of a Phase 1 campaign might include:

- Synchronizing the body of knowledge that students need to know to be ready for both college and workplace success;
- Emphasizing the importance of all students being ready for college and work when they graduate from high school.;
- Raising expectations that *all* students can meet college and workplace readiness standards;

- Imparting awareness of the importance of 21st century skills to individual and economic success;
- Advertising the breadth of career opportunities available in the region starting in the middle sector (career pathways opportunity)²⁷; and
- Promoting the innovations in education taking place related to these factors.

Consideration should be given to creating position papers to clearly communicate the goals of and reasons for the proposed career pathways initiative. The goal is to help stakeholders to understand both the *why* — the urgency of high academic standards and 21st century skills raising requirements — and the *how* — the details of the career pathways model. These position papers should be brief and should include details about the proposed plan of action as well as the research base supporting the proposal. These concept papers should get wide circulation. In addition to creating a sense of urgency, these documents become tools to guide conversations among various constituencies. Other essential communications materials include fact sheets, frequently asked questions, talking points, and supportive editorials and op-eds.

Phase 2:

While the pathway models are being developed, work should begin on Phase 2 of the awareness campaign. The goal is to ensure that information on the pathway opportunities becomes a part of the career and educational planning services provided to all students.

The ideal career pathway program would contain components at the middle school level, high school level and postsecondary level. For Phase 2, it is particularly important that attention be given to ensuring that the career pathways model informs the middle

²⁷ The Edge is a UK campaign for vocational degrees that may provide ideas for a regional campaign. See: <http://www.edgecampaign.co.uk/>

school and high school components involving career assessments and interpretation of the results for all students, as well as creates a plan of study after review of a student's interests, skills and work values. One objective is to communicate the foundational principle of career clusters and career pathways, namely, that a set of knowledge and skills can be identified within an occupation that is shared with other occupations in a pathway and other pathways in a cluster.