



A Skilled and Educated

Workforce:

**An assessment of the number
and type of higher education
and training credentials
required to meet
employer demand**

A joint report:

**Higher Education Coordinating
Board**

**State Board for Community and
Technical Colleges**

**Workforce Training and
Education Coordinating Board**

March 2009

A Skilled and Educated Workforce:

**An assessment of the number and
type of higher education and training
credentials required to meet
employer demand.**

March 2009

Agency Contacts:

**Higher Education Coordinating Board
John Lederer, Ed.D., Associate Director
Academic Affairs
johnle@hecb.wa.gov
360.753.7822**

**State Board for Community and Technical Colleges
Deborah Stephens, Research Manager
Education Services
dstephens@sbctc.edu
360.704.1014**

**Workforce Training and Education Coordinating Board
Bryan Wilson, Ph.D., Deputy Director
Workforce Development Policy & Research Team
bwilson@wtb.wa.gov
360.753.0891**

A Skilled and Educated Workforce

Table of Contents

Executive Summary.....	1
Introduction	3
Recent Reports on High Demand.....	4
Systemic Commitment to Improved Alignment of Higher Education and Workforce Needs.....	7
Supply-Demand Gap by Education Level.....	8
Measuring Gaps in High Demand Programs of Study	11
Degree Production Trends in High Employer Demand Programs of Study	15
Summary of Findings	26
Future Updates of this Report.....	27
Appendix A: High Demand Logic Model.....	29
Appendix B: Common Definitions Relating to High Demand	31
Appendix C: Selected Recent Publications on Skill Demand and Supply Gaps in Washington	32

March 2009

A Skilled and Educated Workforce: an assessment of higher education and training credentials required to meet employer demand

Executive Summary

When the Legislature and Governor enacted House Bill 3103 in 2004, they intended to improve the quality of information available to help policymakers determine how well our state's higher education system was meeting employer demand for skilled workers. A key section of HB 3103 directed the Higher Education Coordinating Board, the State Board for Community and Technical Colleges, and the Workforce Training and Education Coordinating Board to produce every other year:

“...an assessment of the number and type of higher education and training credentials required to match employer demand for a skilled and educated workforce. The assessment shall include the number of forecasted net job openings at each level of higher education and training and the number of credentials needed to match the forecast of net job openings.”

This is the second joint report published by the three agencies in response to the 2004 statute; the first report was released in 2006. The report includes an updated analysis of the workforce supplied by higher education institutions in Washington, employer demand for higher education as measured by the number of projected job openings, and the match between supply and demand. This update also includes new detailed analysis of specific occupations within the following areas: engineering, health professions, and education.

This report also serves as part of the state needs assessment process, which will include a forthcoming statewide and regional analysis of student, employer, and community demand for education and training at the baccalaureate level and above. It compares forecast employment openings through 2016 with the current output of students who have completed one year of college through post-baccalaureate education.

The results of the report indicate:

- The state's current supply of workers who have completed mid-level preparation - more than one year but less than four years of postsecondary training or education - are estimated to prepare only 87 percent of the number needed to be competitive in the labor market during 2011-2016. Corresponding statistics for the baccalaureate and graduate levels are 88 percent and 67 percent, respectively.

- At the mid-level, there is a mismatch between the supply and demand of workers prepared for positions in science technology, manufacturing and production, some health occupations, early childhood education, construction, aircraft mechanics and technicians, and accounting and bookkeeping. The size of the mismatch is quite significant in several instances. The largest gap is in health occupations.
- At the baccalaureate level and above, there is a mismatch in supply and demand for positions in research and science occupations, human and protective service professionals, editors and writers, medical professionals, computer science occupations, and engineering. The largest gaps are in the engineering and computer science occupations and the medical professions.
- Degree production has steadily increased at all levels in the health occupations and medical professions. There has been slight growth in the engineering, computer science, and information technology programs of study. However, there may be reason to expect additional growth, as the number of students selecting these major fields has recently increased.
- The higher education system will need to expand at all levels in the technical and professional fields listed above to meet employer demand. Also needed are increased numbers of students who are prepared and interested in pursuing careers in fields including science technology, engineering, and computer science.

It is important to note that this report is based on forecasts of economic trends existing prior to the current economic crisis. These long-term projections could be inaccurate if the recession and recovery periods unexpectedly last for an extended number of years or if the recession causes long-term structural changes in the state economy. Otherwise, we can expect these trends to hold, and for the supply gaps in high demand programs of study to continue to remain a problem for the Washington economy.

March 2009

A Skilled and Educated Workforce: an assessment of higher education and training credentials required to meet employer demand

Introduction and Background

Purpose of the Report

The purpose of this report is to identify the degrees required to ensure a supply of well-qualified workers to meet the forecast skill needs of Washington employers. The report identifies forecast demand for degrees by education level, as well as the specific fields of study where supply falls short of employer demand - the high demand programs of study. In addition, the report will be used as a means to update and track progress toward the state's overall goals for degree and certificate production.

This report also serves as part of the state needs assessment process, which will include a forthcoming statewide and regional analysis of student, employer, and community demand for education and training at the baccalaureate level and above. The report compares forecast employment openings through 2016 with the current output of students who have completed one year of college through post-baccalaureate education. The analysis does not take into account issues related to student or community demand, nor does it fully account for emerging industries that have not yet resulted in actual job growth.¹

This report is an essential tool in the identification of high employer demand programs of study. Degree production in high employer demand programs of study are tracked through a series of measures in the Governor's Management for Accountability and Performance (GMAP) initiative to assess progress in closing the gaps in these fields. In the GMAP process, a logic model is employed to describe the connection between agency activities and the desired policy outcomes (see Appendix A). The term "high demand program of study" or "high employer demand program of study" is used throughout this report to refer to programs in which the number of students prepared for employment per year (from in-state institutions) is substantially less than the number of projected job openings per year in that field. The focus on expanding high demand programs of

¹ Student demand is the need for degrees and certificates expressed by students, typically based on historic participation rates, population projections, and student preferences regarding major field of study. Community demand is the demand for institutions, degrees, or programs expressed by communities. This may include regional or statewide economic development plans (especially those related to new or emerging industries), the recruitment/expansion, or exit of a major employer, the development of a key technology, or other demand factors not covered by either employment forecasts or student demand.

study is part of a state strategy to ensure that Washington maintains a vital and innovative economy.

The first release of this report in January of 2006 followed the HECB's development of the *State and Regional Needs Assessment*², a comprehensive assessment of student, community, and employer needs. The 2006 report found a substantial gap in production of degrees at the mid-level - and substantial gaps in key occupations including computer science, engineering, and health professions at the baccalaureate level and above.

Since the report was first published, several important publications have been released that help shape and inform this update (described below). Many Washington organizations and policymakers have studied and expressed concern about gaps between the state's production of, and the economic demand for, workers with specific academic degrees (and associated skills, knowledge, and abilities).

Recent Reports on High Demand

Washington has conducted a number of recent studies that demonstrate a common theme. The state's supply of workers in specific fields and at the postsecondary level is insufficient to meet the demand of the available jobs employers need filled. The number of students completing degrees and certificates needs to increase at a rate faster than population growth. If not, the gap is projected to grow wider in the next decade.

Task Force on the Supply and Demand of Math and Science Teachers

In reviewing workforce supply and demand numbers, the *2006 Joint Report* suggested that, in the aggregate, the supply of educators of all types is sufficient to meet demand. However, a more sharply focused analysis revealed some important exceptions. The Professional Educator Standards Board (PESB) estimated that hundreds of additional math teachers were needed to implement the new graduation requirement of three years of math in the state's public high schools. In addition, enrollment growth also required the addition of about 30 full-time equivalent math and science teachers each year, on top of replacement needs for teachers leaving the workforce.³

All indications are that the need in these areas will continue, and possibly even grow, as the shortages that already exist are compounded by the federal teacher qualification rules and the implementation of more rigorous state high school math and science graduation requirements.

² See <http://www.hecb.wa.gov/research/Issues/NeedsAssessment.asp> for access to these reports.

³PESB (2008) Ensuring an Adequate Supply of Well-Qualified Math and Science Teachers, Olympia, Washington.

Health Care Personnel Shortage Task Force

The report of the Health Care Personnel Shortage Task Force, *Progress 2007*, presents a detailed account of another area in which demand exceeds supply for Washington workers: health care. Data from a 2006 job vacancy survey show that Washington was short more than 12,000 health care professionals.⁴ The Task Force report also recounts the results of a 2007 hospital workforce survey that showed high vacancy rates for registered nurses and physicians in various important specialties. Thirty percent of the needed cardiology positions, for example, went unfilled, as did 16 percent of the needed pediatrics positions.⁵

In addition to the vacancy rate, the Task Force also analyzed the projected gap between occupational forecasts and the expected supply of health care graduates. By 2014, the Task Force predicts that Washington will need to produce an additional 3,500 registered nurses, more than 2,000 physicians, and almost 600 physical therapists to fill all the positions that will be needed.⁶ In fact, if there is no increase in the numbers of graduates of nursing programs, by 2025, Washington is expected to need an additional 25,000 registered nurses.⁷

Common Definitions Work Group

In response to concerns by the Washington Legislature and the Governor's Office, a Common Definitions Work Group was established in 2007 engaging several state agencies in the task of developing common definitions relating to high demand programs. The group developed several definitions for commonly used terms that had often been interpreted or defined inconsistently by state agencies in a program-specific context (see Appendix B). Among the terms defined by the group were "high employer demand program of study," "high demand occupation," and "high student demand program of study." The WTECB has taken the lead in proposing legislation that would modify the authorizing statutes of several state programs to better align with the common definitions developed by the work group.

The Council on Competitiveness

In 2008, the national Council on Competitiveness released *Thrive, the Skills Imperative* outlining an agenda to ensure that the United States remains competitive in the global economy. The report outlines four critical strategies. First, the nation must meet the mid-level skill needs of the U.S. economy. The report points out that the largest number of total openings will be at this mid-level (defined in our state as an apprenticeship or other sub-baccalaureate post-secondary credential requiring at least one year of education or training). These jobs may not require a degree, but in most cases will require some postsecondary training.

⁴ Employment Security Department, *Job Vacancy Survey*, April 2006; cited in Health Care Personnel Shortage Task Force report, *Progress 2007*, p. 5

⁵ Health Workforce Institute and the Washington State Hospital Association, "Results of the 2007 Hospital Work Force Survey," June 2007; cited in *Progress 2007*, pp. 5-6.

⁶ Workforce Training and Education Coordinating Board, *Progress 2007: Report of the Health Care Personnel Shortage Task Force*, pp. 6-7; June 2008.

⁷ The Center for Health Workforce Studies, "Washington State Registered Nurse Supply and Demand Projections: 2006-2025," Final Report #12, June 2007; cited in *Progress 2007*, p. 7.

Second, the report emphasizes the need to prepare workers for success in the service sector. Increasingly, this sector requires workers with “more complex and creative skill set - including problem solving, communications, entrepreneurship, computational analysis, collaboration, and teamwork”.⁸

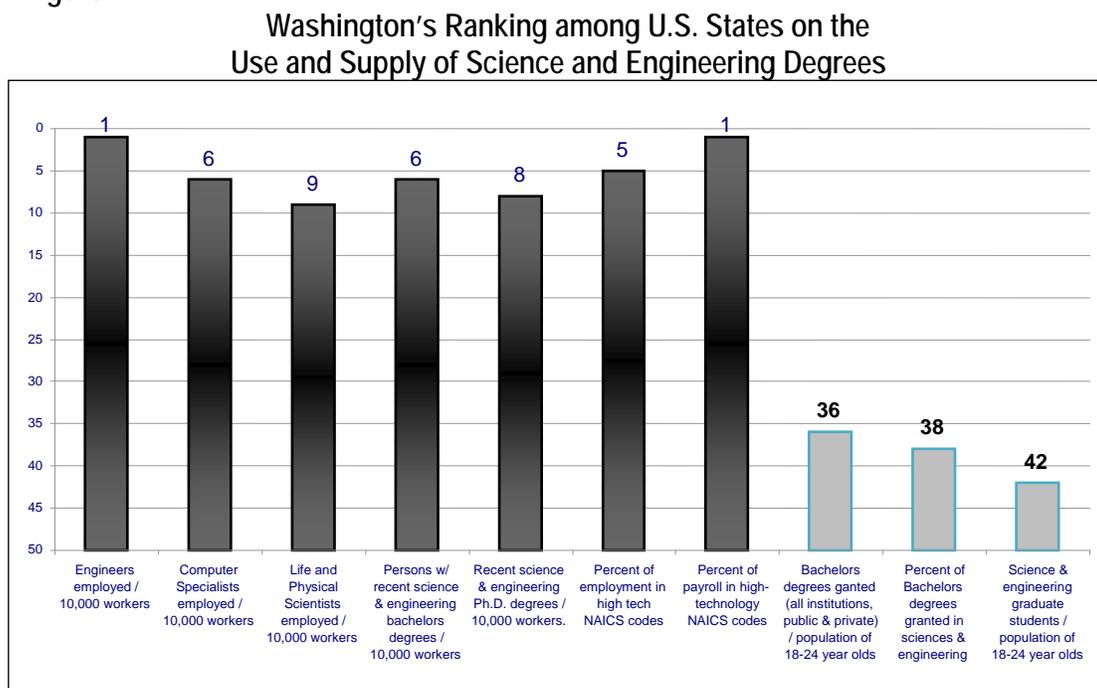
Next, the report calls for building on our traditional strengths. The U.S. must not simply produce more engineers and scientists, but foster and develop the “entrepreneurial, creative, and interdisciplinary talent” of students in these programs.

Finally, the report also mentions the importance of recognizing local talent, noting that firms will locate where the talent is found; and each region needs to ensure that a strong pool of local talent is available.⁹

Prosperity Partnership Analysis

Another significant recent contribution was the analysis conducted by the Puget Sound Regional Council’s Prosperity Partnership initiative,¹⁰ which produced the following chart that highlights those areas where degree demand is out of sync with degree production capacity:

Figure 1



Source: US Department of Commerce 2004 State Science & Technology Indicators¹¹

⁸ The Council on Competitiveness, *Thrive, the Skills Imperative*, 2008, p. 5.

⁹ *Ibid.*, pp. 12-13.

¹⁰ See <http://www.collegeworkready.org/> for more information on the initiative.

¹¹ Prosperity Partnership. *Increasing bachelor production will improve the economic health of our state’s people*. Seattle, Washington. http://collegeworkready.org/downloads/prosperity_ba_production_data.ppt. Retrieved on 3/5/2009

The chart suggests underproduction of degrees in Washington at the bachelors and graduate levels, in science and engineering fields, when compared to other states and the overall demand for these degrees.

Systemic Commitment to Improved Alignment of Higher Education and Workforce Needs

A key outcome of the joint work of the three agencies has been greater understanding of the role that each education and training sector plays in preparing workers for careers that support a vital economy. This shared understanding is reflected in the strategic plans of the respective agencies:

- “Promote economic growth and innovation...Fill unmet needs in high-demand fields...Promote student enrollment in STEM fields...” HECB *Strategic Master Plan*.¹²
- “Meet the needs of changing local economies by increasing the number of skilled employees in the areas of greatest unmet need.” SBCTC *System Direction*.¹³
- “Meet the workforce needs of industry by preparing students, current workers, and dislocated workers with the skills employers need”. WTECB *Strategic Plan*.¹⁴

It is important to note that the analysis that follows is based on forecasts of economic trends existing prior to the current economic crisis. These long-term projections could be inaccurate if the recession and recovery periods unexpectedly last for an extended number of years or if the recession causes long-term structural changes in the state economy. Otherwise, we can expect these trends to hold, and for the supply gaps in high demand programs of study to continue to remain a problem for the Washington economy.

¹² Washington Higher Education Coordinating Board. (2008). *2008 Strategic Master Plan for Higher Education in Washington*. Olympia, Washington.

¹³ State Board for Community and Technical Colleges (2006). *System Direction: Creating Opportunities for Washington's Future*. Olympia, Washington.

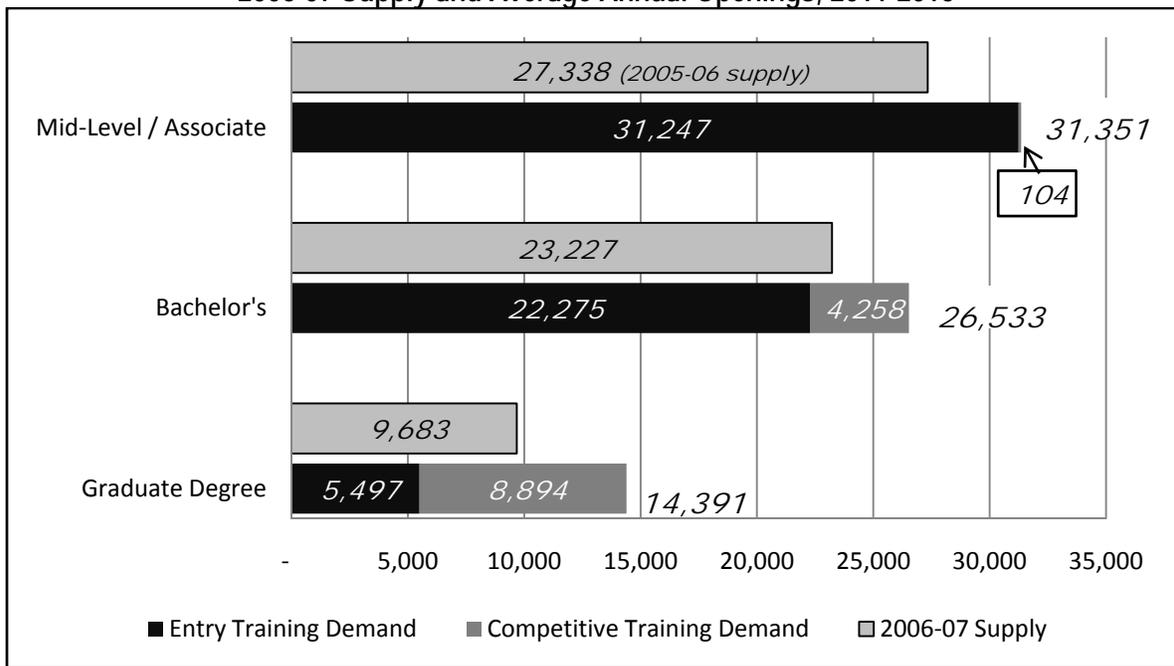
¹⁴ Workforce Training and Education Coordinating Board (2008). *High Skills, High Wages 2008-2018: Washington's Strategic Plan for Workforce Development*. Olympia, Washington.

Supply-Demand Gap by Education Level

To understand the responsiveness of our higher education system to the needs of employers, we compare total supply at three levels of education to the demand for workers trained at those levels. Figure 2 below shows the current annual supply and forecast annual demand by education level. The supply is based on in-state production of degrees, certificates, and apprenticeship completions at each of the three levels.

Figure 2

Annual Supply and Demand of Workers by Education Level
2006-07 Supply and Average Annual Openings, 2011-2016



Note: Mid-Level includes postsecondary education leading to an apprenticeship, one-year certificate, or Associate Degree.

Source: HECB, WTECB, SBCTC joint analysis of June 2008 Washington ESD long -term employment forecast; Bureau of Labor Statistics Training levels; 2000 Census PUMS data.

The two components of demand - entry training demand and competitive training demand - correspond to two different methods for allocating forecast employment opportunities to the three training levels. The black portions of the bars in Figure 2 represent entry-training levels, as defined by the Bureau of Labor Statistics.

The dark grey portions of the bars show the additional demand for workers who have more advanced skill levels than those required for entry-level workers, such as nurses who hold a bachelor's degree, K-12 teachers with a master's degree, or sales managers with an MBA. This method allocates forecast job growth for each occupation based on the actual level of education held by employed workers in Washington (in 2000). It includes workers who obtained their degree in Washington as well as those who migrated here with a degree or certificates and entered

the labor force. Adjustments are made to reallocate outlier data, such as workers with advanced degrees working as short-order cooks, or chief executives lacking post-secondary education. A further adjustment is made to compensate for the likely increase in training requirements for state economy (upskilling of the workforce) between 2000 and 2016, based on historic trends.

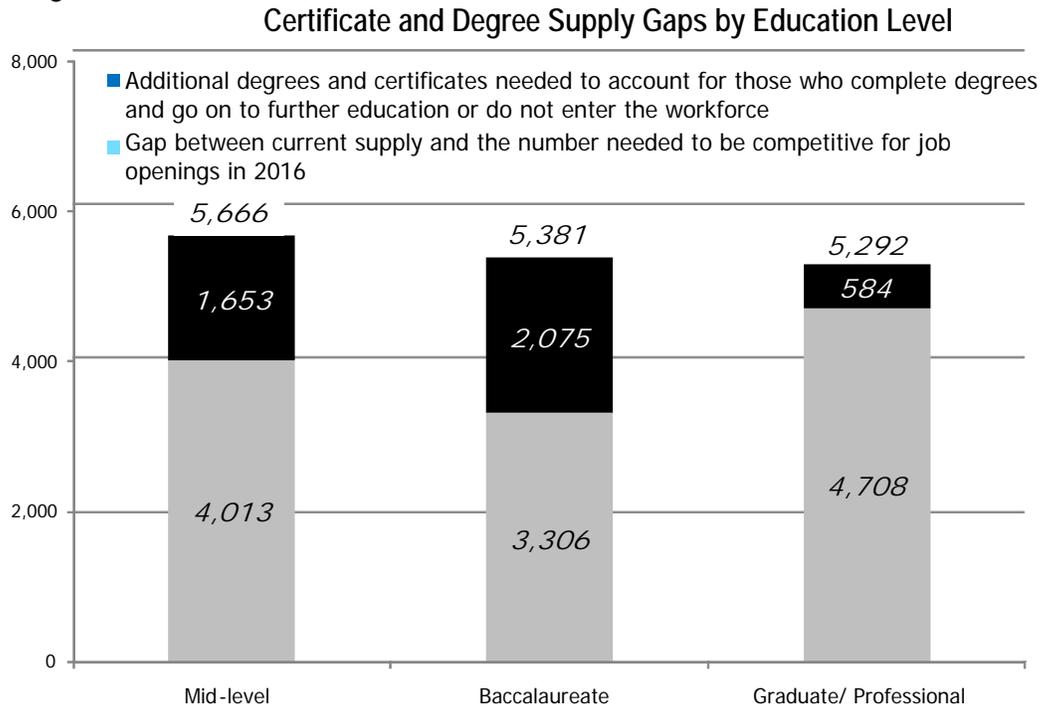
In short, the black portion of the bar in Figure 2 showing the demand component, is based on the level of training needed by the majority of workers to enter an occupation; and the dark grey portion is the level of training needed to be competitive in Washington labor markets, taking into account professional development and net immigration of skilled workers. Together the black and dark grey portion of the bars show a demand range corresponding to the observation that workers with the same occupational title often exhibit varying levels of responsibility and skills.

It is important to note that there is a component of the workforce that is not graphically represented on Figure 2 - the supply and demand for workers with little or no training requirements. Changing from an entry-training level to a competitive-training level represents a “net” shift. For example, at the mid-level, the competitive demand for workers with little or no training decreases, as many of those jobs now require a two-year degree or certificate to be competitive (increasing the demand at the mid-level). Similarly, many jobs with a two-year degree or certificate entry-training requirement move to the baccalaureate level. The increase in mid-level demand from little to no training offsets the shift from a two-year degree or certificate to the baccalaureate degree, resulting in a small “net” increase in mid-level competitive demand. The same increases and decreases occur at the baccalaureate level, resulting in somewhat larger net gain for competitive training demand.

When the current supply is expressed as a percentage of forecast demand, we can calculate that the supply is 87 percent of forecast competitive training demand at the mid-level, 88 percent at the baccalaureate level, and 67 percent at the graduate level.

Figure 2 compares current Washington degree and certificate production for the labor market with future demand based on forecast new and replacement jobs. We found gaps at all three levels when using U.S. Census Bureau data to allocate jobs to specific training levels. Figure 3 translates these “degree-job” gaps into “degree-degree” gaps by determining how many additional degrees will be needed to fill the gaps identified in Figure 2.

Figure 3



Source: HECB, SBCTC, WTECB analysis.

In Figure 3, the light grey component shows the gap between current supply and the competitive training demand. The black component includes the additional degrees that will be needed to replace students who leave the labor force after getting their degrees, or who must continue for further education to meet the additional demand at the next level (based on historic rates of transfer between each level). Figure 3 shows that to prepare Washingtonians to meet employer demand and be competitive in the labor market by 2016, we need to increase degree production by over 5,000 degrees at each level¹⁵.

¹⁵The analysis considers number of degrees and certificates we need to produce to respond to anticipated openings in Washington. In a forthcoming policy brief, the HECB takes an additional step to reconcile these numbers with the *Strategic Master Plan* degree production goals. The additional analysis also considers the effect of improving the educational attainment level of the entire workforce, in addition to the narrower objective of responding to forecast job openings.

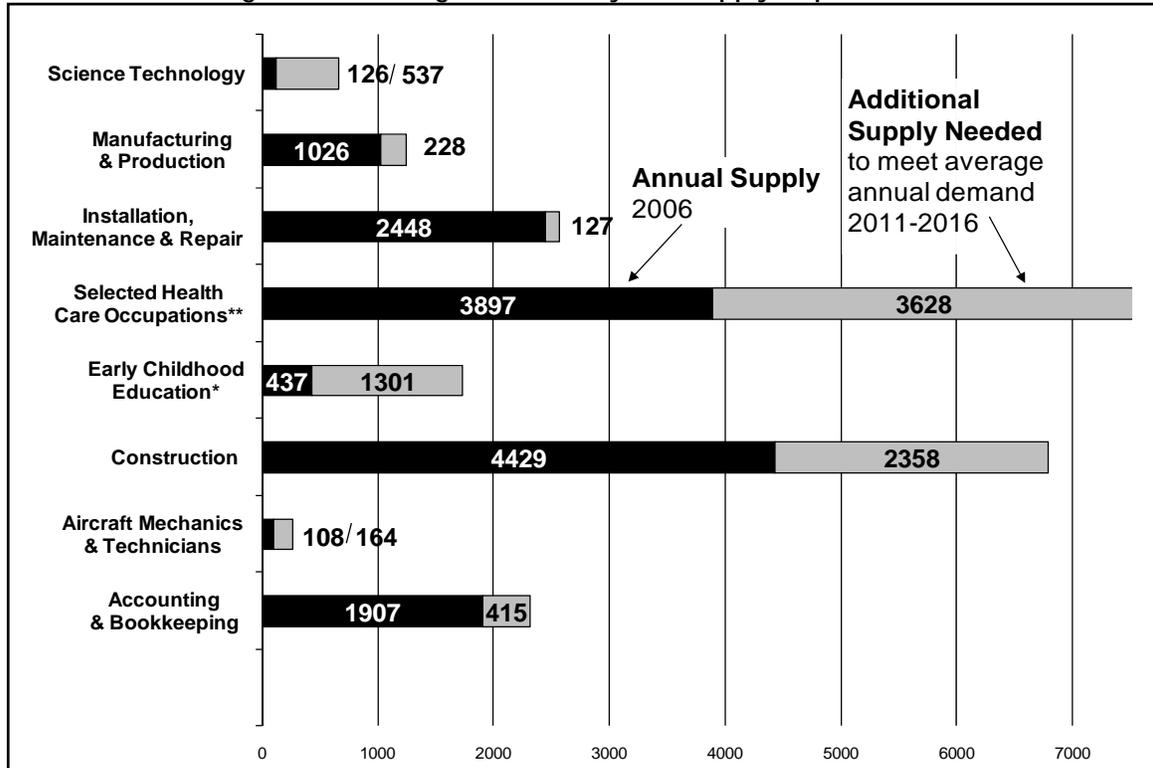
Measuring Gaps in High Demand Programs of Study

To identify high demand programs of study, it is essential to look beyond the need for additional degrees and certificates by education level and consider the number of workers prepared to enter specific occupations. Consistent with the 2006 version of this same report, this update provides more solid evidence of an insufficient supply of degrees and certificates to support Washington’s high employer demand occupations. The updated analysis uses 2006-07 as the base supply year, and average annual forecast demand is for the period 2011-2016. The analysis finds gaps in the same occupational clusters as the 2006 study, which used 2003-04 as the base supply year and 2007-12 for the forecast demand period. The results are shown below for the mid-level and the “baccalaureate-plus” level.

The results in Figure 4 are for mid-level skills. The analysis shows that several high-demand occupations exhibit large gaps between current supply and forecast demand. In some cases, more than twice as many workers are needed annually as are currently graduating with the requisite mid-level credentials. Among the areas with the largest relative gaps expressed as supply as a percentage of forecast demand, are science technology, aircraft mechanics and technicians, selected health care occupations, and construction - all showing current supply well below forecast demand.

Figure 4

High Demand Programs of Study and Supply Gaps at the Mid-Level



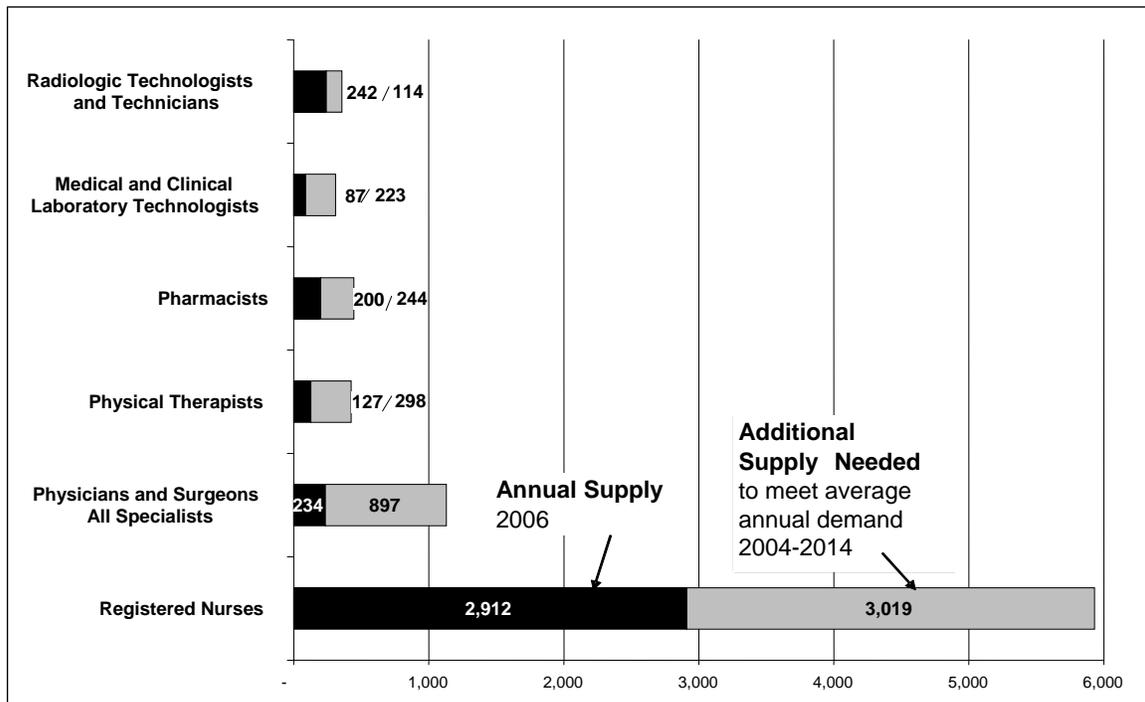
*Data from 2007 analysis of Health Care Occupations

**Calculation of additional supply needed derived from 2009-2014 workforce gap analysis forecast

Source: WTECB 2009 Major Occupation Group Supply and Demand Analysis

Figure 5 breaks out the selected health care bar in Figure 4 and also includes occupations that require higher level degrees, providing more detail about the specific gaps included in that occupational cluster. In this chart, a nearer-term forecast shows projections to 2014. The detailed look shows that in five of the six specialties, that is, all except radiologic technologists, current production is less than half of forecast future demand. By far, the largest gap is found for registered nurses where future annual demand exceeds current production by over 3,000 nurses.

Figure 5
High Demand Occupations and Supply Gaps in Health Care Occupations

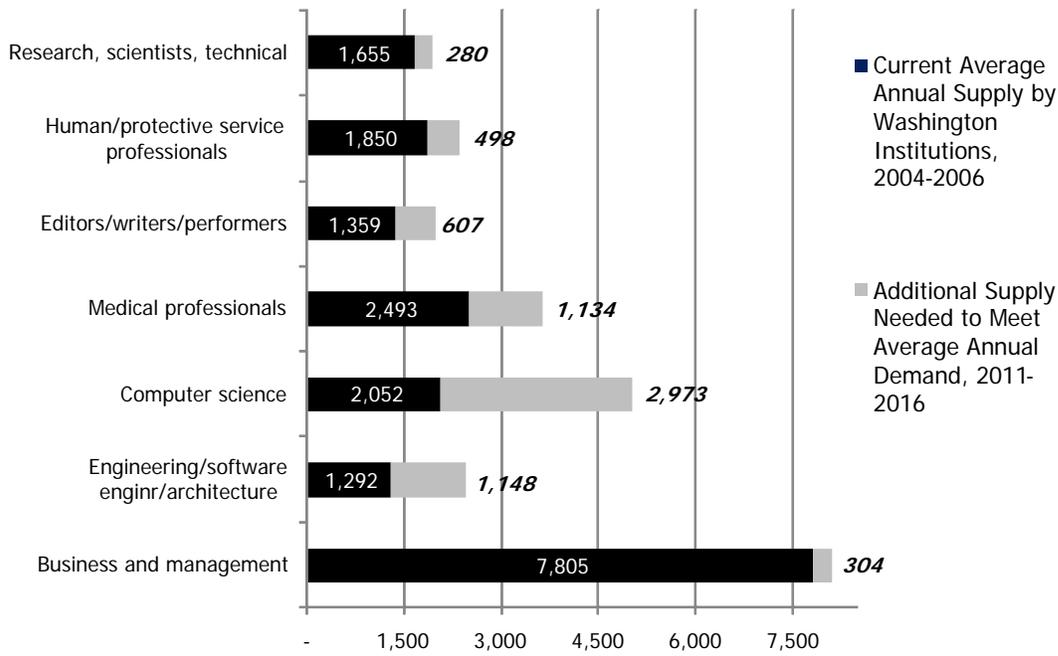


Source: Workforce Training and Education Coordinating Board

The results for baccalaureate and graduate degrees in Figure 6 also show persistent gaps in many of the same occupational clusters that were identified in 2006. The largest gaps are in the science, technology, engineering, and mathematics (STEM) disciplines and in health sciences including engineers, computer science, and medical professions. In addition, gaps persist for editors/writers/performers, and human/protective services occupations. Business and management is new to the list this year, with a slight gap.

Figure 6

Comparison of Current Supply with Future Demand for Baccalaureate and Graduate Degrees



Source: Openings: Washington ESD June 2008 Long Term Employment Forecast
Supply: HECB Analysis of IPEDS data. Current supply is a three year annual average of degree awards, 2006 -2008, adjusted for entry into the labor market.

A comparison of the updated data in Figure 6 with the 2006 analysis indicates that in areas such as engineering and computer science, the gaps between current supply and forecast demand have grown. Below, Table 1 shows that the occupations with the largest gaps requiring at least a baccalaureate degree remain engineers, computer science, medical professions, editors/writers/performers, and human/protective services.

The supply of workers has increased in most occupations, but projected future demand has also shifted, sometimes dramatically. Some of those dramatic changes in the demand forecasts can be explained by industry events occurring during or near the base year used for the employment forecasts. In almost all occupational clusters, supply remained steady or grew over the last two years, but projected future demand grew at a faster rate. Over the last three years, forecast business and management demand rose significantly taking it from a “surplus” status to rough equilibrium. Because of the sizable shift in demand, the field warrants ongoing monitoring.

Table 1

**Estimates of Available Current Supply and Future Demand
by Occupational Cluster
Comparison between 2006 and 2009 Analyses**

Baccalaureate and Above Occupational Clusters	Gap (Current supply as a percentage of future demand)		Percentage Change in Estimate of Current Supply Between Analyses	Percentage Change in Estimate of Future Demand Between Analyses
	2006	2009		
Business and management	116%	96%	7%	28%
Engineering/software engineer/architecture	67%	53%	1%	28%
Computer Science	56%	41%	3%	41%
Medical Professionals	65%	69%	16%	9%
Editors/writers/performers	75%	69%	6%	15%
Human/protective service professionals	75%	79%	8%	2%
Research, scientists, technical	89%	86%	9%	13%

Note: The supply estimates are based on average annual supply for 2001-2004 for the 2006 analysis and 2004-2006 for the 2009 analysis. The future demand estimates were based on annual average forecast demand for 2007-2012 in the 2006 analysis and 2011-2016 in the 2009 analysis.

Source: HECB Analysis, 2006 Gaps as reflected in "A Skilled and Educated Workforce (2006)".

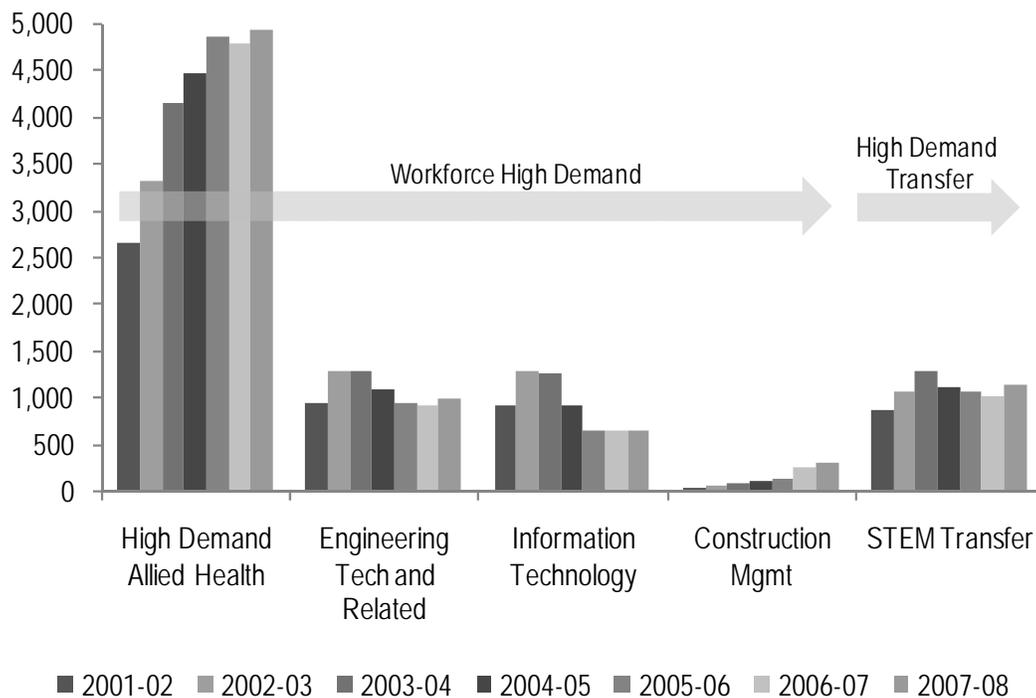
Degree Production Trends in High Employer Demand Programs of Study

As mentioned earlier in this document, degree production in high employer demand programs of study are tracked through a series of measures in the Governor’s Management for Accountability and Performance (GMAP) initiative to assess progress in closing the gaps in these fields. Some of the data recently reported to the Governor through the GMAP process is shown below. The data indicate that mixed progress is being made to increase degree and certificate production in high employer demand fields of study. As indicated in the previous section, the growth in supply over the last two years has not been sufficient to close, or even prevent, the widening of gaps for some occupations.

Figure 7 provides annual degree and certificate production in mid-level high demand fields where the State Board for Community and Technical Colleges (SBCTC) provided high demand funding. Degrees and certificates in allied health fields have grown sharply over the decade. Construction management also has grown significantly, though on a much smaller scale. Engineering technology and STEM transfer are up in the most recent year, and expected to continue to grow as more focus is placed on growing STEM transfer enrollments and enrollment growth overall. Information technology degree production decreased, following the dot com bust in the early part of the decade.

Figure 7

CTC High Demand Degrees and Certificates



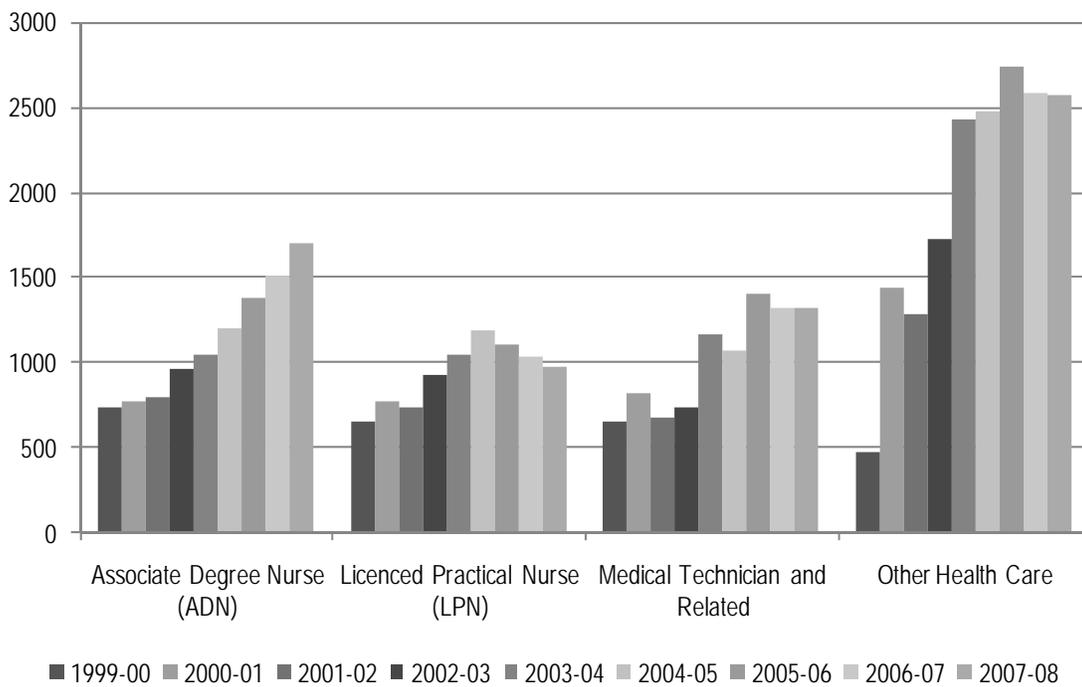
Source: SBCTC

Changes in supply over time result when colleges respond to employer demand by modifying their program mix. For example, in 2001, information technology was a high employer demand program of study at the mid-level. Since that time, supply and demand have come into balance, removing IT from the list of high employer demand programs at the mid-level. Consequently, after 2003, the community and technical colleges no longer focused resources on increasing the supply of IT completers.

Figure 8 provides additional detail about the high demand allied health cluster. Growth in associate degree nurses has been steady and sharp. As many health care providers, particularly hospitals, continue to replace practical nurses with registered nurses, the number of LPN certificates is declining. Other health care fields also have seen tremendous growth over the decade.

Figure 8

CTC Degrees and Certificates in High Demand Allied Health



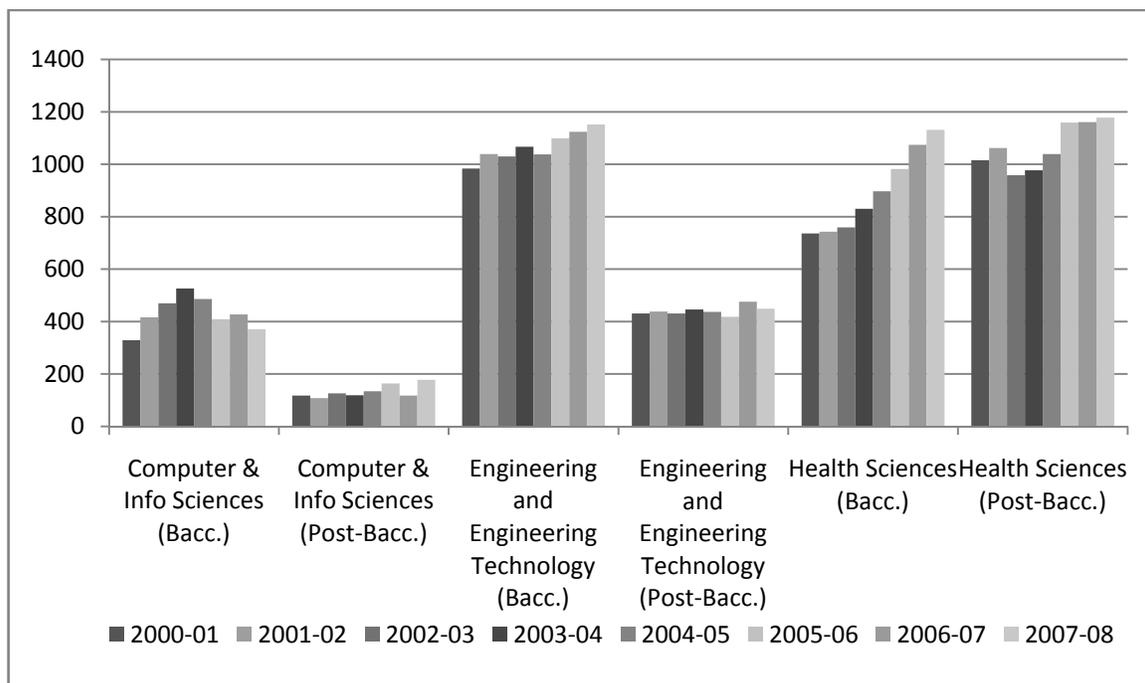
Source: SBCTC

Figure 9 shows the same information as above for the baccalaureate and graduate levels, focusing on engineering, computer science, and health occupations. Here again, we see steady and consistent growth in health sciences at the baccalaureate level. We also see declines in degree production over the last three years in computer sciences at the baccalaureate level. Results in

engineering are mixed, with some recent growth at the baccalaureate level and flat production at the post-baccalaureate level. The State Board for Community and Technical provides funding to two-year colleges to increase the number of students preparing to transfer in a STEM field, including teacher preparation in STEM areas. As shown in an earlier section, STEM transfers are on an upward trend since 2006.

Figure 9

Baccalaureate and Post-Baccalaureate High Demand Degree Production, 2000-2008



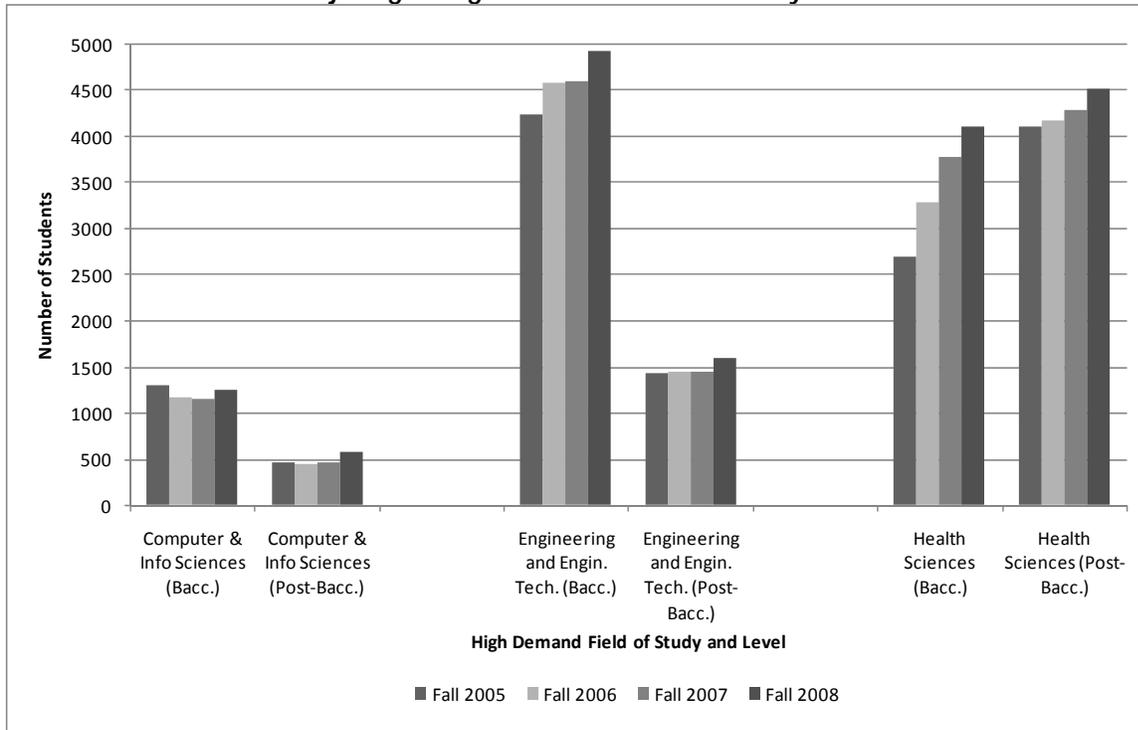
Source: Integrated Postsecondary Education Data System (IPEDS).

Putting this data together, we conclude that while we have had some considerable success in the last few years increasing degree production in some health care professions, especially nursing, we continue to see low or no progress in fields such as engineering, computer science, and other STEM fields. However, there may be some reason for optimism that progress may be coming.

Figure 10, below, tracks students at public four-year institutions who have declared majors in the high demand fields shown in Figure 9. This information is encouraging, since it shows some progress in the current academic year and the prospect of degree production growth to come. The majority of these students are juniors and seniors and should be graduating in the next year or two.

Figure 10

**Number of Students at Washington Public Four-Year Institutions
Majoring in High Demand Fields of Study Fall 2005-Fall 2008**



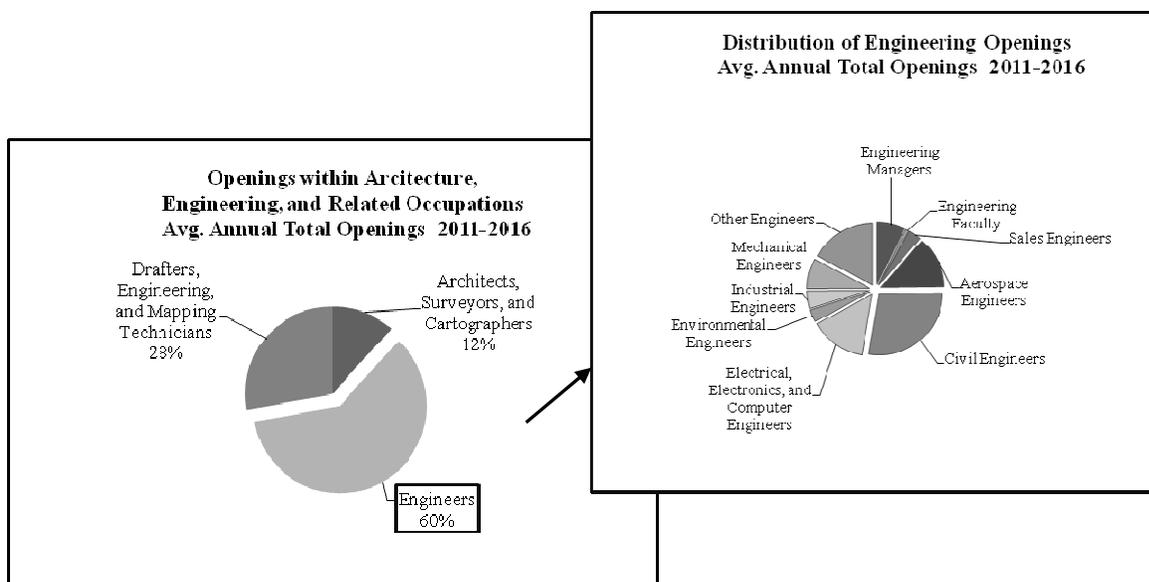
Source: Washington Public Centralized Higher Education Enrollment System (PCHEES).

Additional Analysis of Selected High Demand Occupations Engineering, Software Engineering and Architecture

The engineering, software engineering, and architecture cluster includes a broad range of occupations such as engineers, software engineers, engineering technologists, architects, and drafters. By far, the largest group in terms of openings is engineers, who account for 60 percent of the anticipated openings for the cluster. However, although smaller in terms of total openings, architects, surveyors, and cartographers represent the fastest growing set of occupations within this cluster.

Figure 11

Distribution of Openings in Architecture and Engineering 2011-2016



Source: Degree Data as reported in IPEDS; Openings as reported in ESD June 2008 Long-term Employment forecast for Washington.

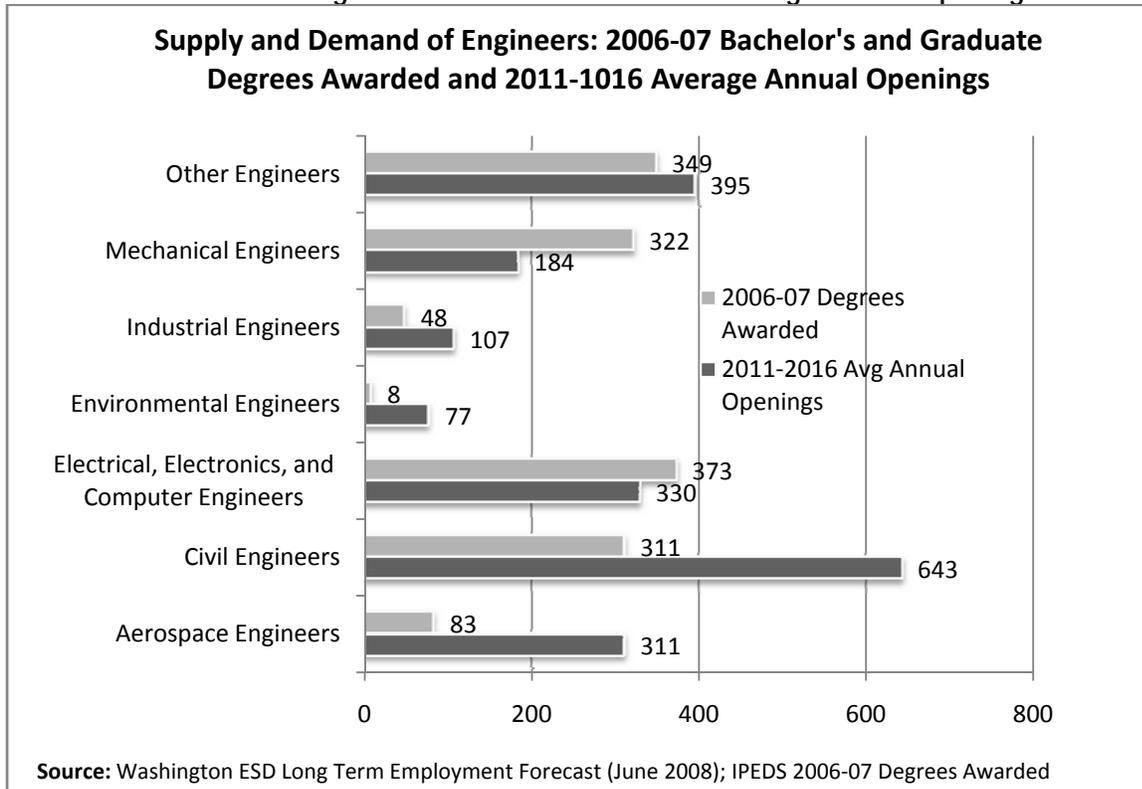
In Figure 11, engineering occupations are further broken down into eight disciplinary categories. In Washington, the greatest number of anticipated openings will be in civil engineers, aerospace engineers, and mechanical engineers. Overall, 1,905 openings in engineering are anticipated each year between 2011 and 2016. In the 2006-07 academic year, 1,494 bachelor's and graduate degrees were awarded in engineering in Washington for an overall gap of more than 400 annual openings.

Figure 12, on the following page, provides more detailed information on the specific gaps between current supply and forecast demand for each engineering discipline. In relative terms, the largest gaps are found for industrial, environmental, civil, and aerospace engineers, where current production is less than half of forecast demand. The latest data show that current supply may be sufficient in mechanical, electrical, electronics, and computer engineering. It is important to note that engineers share a common set of core competencies and may find work in a different specialty area other than the one in which they were trained. For example, some electrical engineers may

find work designing computers or computer components. In addition, the analysis does not take into account that as many as half of engineering graduates enter other occupations, most often business, computer science, and research¹⁶.

Figure 12

Supply and Demand of Engineers: 2006-07 Bachelor's and Graduate Degrees Awarded and 2011-2016 Average Annual Openings



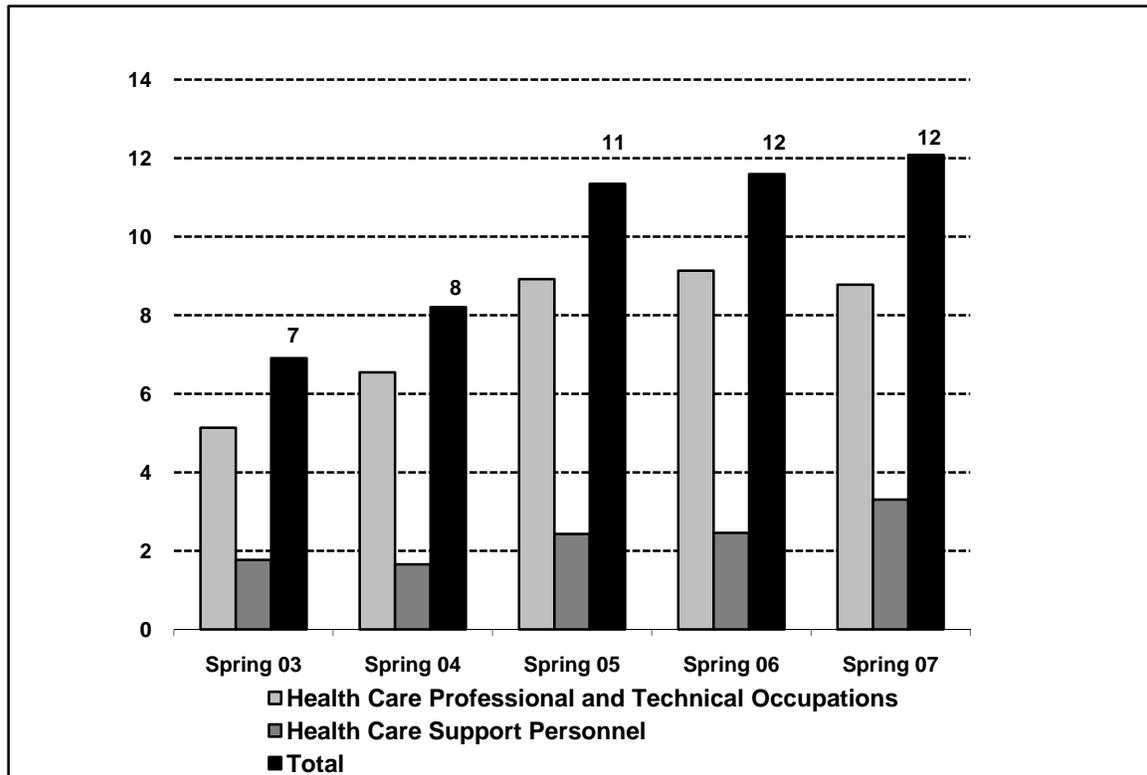
Health Professionals

A 2007 progress report from the Washington State Health Care Personnel Shortage Task Force shows the pressing need to train, attract, and retain health care workers. Cited in the report is a Washington Employment Security Department job vacancy survey that shines a spotlight on this personnel problem. In the spring of 2007, employers reported nearly 8,800 vacancies for health care professional and technical personnel and more than 3,300 vacancies for health care support personnel (see Figure 13). All told, the nearly double vacancy rate was reported just four years ago.

¹⁶ 2005 State and Regional Needs Assessment Table G.11

Figure 13

Job Vacancies for Health Care Personnel (in thousands), 2003-2007



Source: Employment Security Department job vacancy surveys for spring 2003, 2004, 2005, 2006, and 2007. These surveys represent vacancies during a point in time and do not represent vacancies for the whole year.

From community care to primary care and from pediatrics to geriatrics, personnel shortages are having an impact on every aspect of health care. Much of the focus has been on nurses, whose vital frontline work cuts across all segments of society in hospitals, community centers, and increasingly, inside homes. Indeed, the largest number of vacancies in 2007 of any occupation was for registered nurses. A 2007 Hospital Workforce Survey reveals that vacancies rates “rose or remained unacceptably high in 16 of 21 nursing and allied health professions.”

Meanwhile, physician vacancy rates were extremely high across 11 specialties, including cardiology (30 percent), pediatrics (16 percent) oncology (12 percent), and emergency medicine (12 percent).

The Future Need for Health Care Personnel: Workforce Board Gap Analysis

Since 2004, the Workforce Board has produced a gap analysis of supply and demand for health care personnel. Unlike the vacancy rates, which provide a snapshot of hiring needs at one particular point in time, a gap analysis compares occupational forecasts with the supply of graduates from educational programs over a span of several years.

The gap analysis makes clear that even with the recent expansion of our state programs, the state must invest in many more educational slots at our community colleges and universities to prepare an additional 500 registered nurses, 300 physicians, and more than 275 medical and clinical laboratory technologists and technicians each and every year, to meet forecast demand (Table 2). In order to boost the number of health care professionals in these areas, the State also must find ways to give newly trained health care professionals the clinical placements and supervised training they need to become credentialed.

Table 2
The Gap Between Supply and Demand for Health Care Professionals

Health Care Occupation	Annual Increase of Additional Newly Prepared Workers to Close the Gap by 2014
Registered Nurses	512
Physicians and Surgeons, All Specialists	311
Medical and Clinical Laboratory Technologists	186
Medical and Clinical Laboratory Technicians	93
Medical Equipment Preparers	83
Physical Therapists	78
Speech-Language Pathologists	78
Chiropractors	63
Dentists, Including All Specialists	61
Respiratory Therapists	56
Physical Therapist Aides	53
Surgical Technologists	52
Radiologic Technologists and Technicians	51
Pharmacists	48
Occupational Therapists	42
Dietitians and Nutritionists	40
Optometrists	40
Cardiovascular Technologists and Technicians	30
Psychiatric Technicians	16
Diagnostic Medical Sonographers	14

Source: Progress 2007: Report of the Health Care Personnel Shortage Task Force, Olympia, Washington.

While the Workforce Board gap analysis shows the state needs to expand education programs to accommodate and prepare more than 3,000 additional registered nurses to meet forecast demand, a 2007 University of Washington report extrapolates further. The report from the Center for Health Workforce Studies suggests that if the number of registered nurse graduates remains constant from 2006 to 2025, the demand for nurses will far outnumber supply by at least 25,000. The major reason for this increase in demand is due to the growth in our elderly population which not only requires more health care services but also is living longer, further compounding demand.

Education

The Professional Educator Standards Board (PESB) has estimated that in order to implement the new graduation requirement of three years of math in the state's public high schools, about 450 additional math teachers (full-time equivalent) than are currently employed will be required. In addition, current enrollment growth also will require the addition of about 30 full-time equivalent math and science teachers each year, on top of our replacement needs for teachers leaving the workforce.¹⁷ All Educational Service Districts in Washington already report shortages of math and science teachers.¹⁸ Additional evidence of this undersupply can be seen in the endorsement records the Standards Board collects. Where teachers are assigned to teach outside of their endorsement areas, the area to which unendorsed teachers are most frequently assigned is math.¹⁹

Much of Washington's teacher training capacity is focused on training teachers who will likely teach in other states. Of the 906 endorsements issued for math, biology, chemistry, earth science, science, physics, and mid-level math/science, 343 (or almost 38 percent) were issued to out-of-state teachers, rather than Washington residents.²⁰

All indications are that the need in these areas will continue, and possibly even grow, as the shortages that already exist are compounded by the federal teacher qualification rules and the pending implementation of changes in the state's high school math and science graduation requirements. In addition to math and science teaching shortages, the Office of the Superintendent of Public Instruction (OSPI) finds some shortages of middle and high school principals and superintendents - and considerable shortages of school psychologists, occupational therapists, school nurses, and speech and language pathologists.

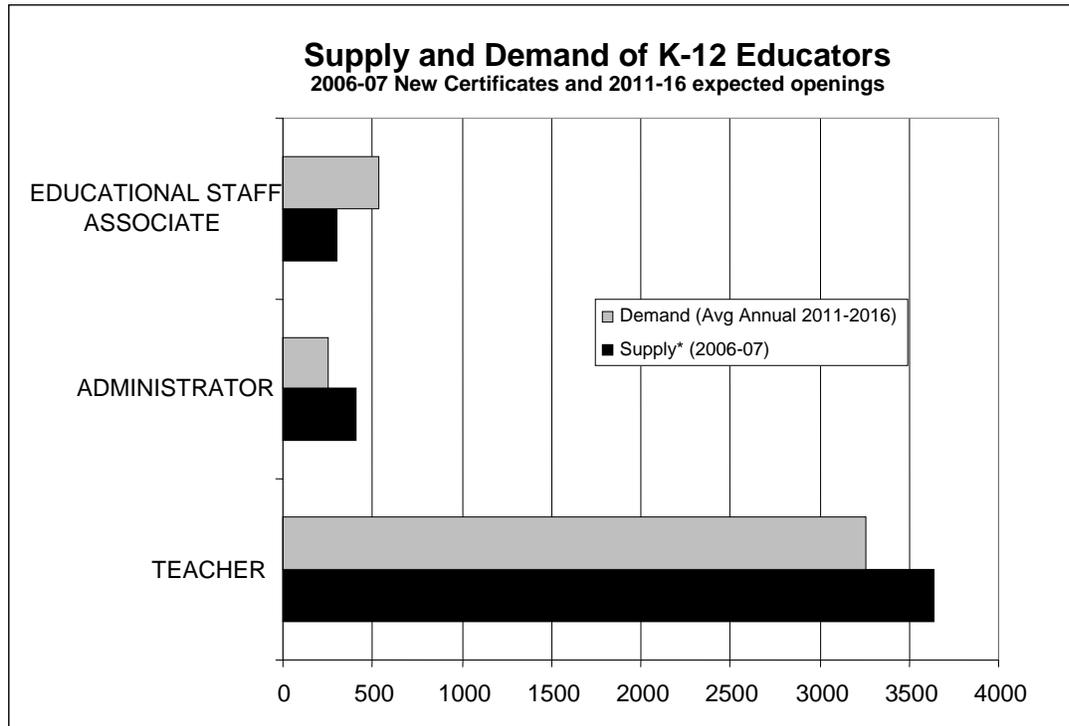
¹⁷PESB (2008) Ensuring an Adequate Supply of Well-Qualified Math and Science Teachers, Olympia, Washington.

¹⁸ Jennifer Wallace, presentation by the PESB Executive Director to the *Ensuring an Adequate Supply of Well-Qualified Math and Science Teachers Task Force*, August 15, 2008. Slide 3.

¹⁹ Wallace presentation, PESB, slide 10.

²⁰ Wallace presentation, PESB, slide 7.

Figure 14



Source: Supply databased on OSPI Records of Certificates Issued²¹ Demand databased on ESD June 2008 Long Term Employment Forecast.

The education cluster includes openings for educators at all levels. In previous reports,²² the cluster did not include educational administrators and educational staff associates²³. These occupations are added to the detailed analysis in Figure 14. Overall, 41 percent of the anticipated openings for educators will be for primary and secondary teachers; however, data related to the relative supply and demand for teachers in specific disciplines is quite limited. Despite the known gaps for sub-disciplines within the administrator and teacher categories, we do not find an aggregate gap in these areas. The available data does provide evidence of a demand for educational staff associates. Figure 14 shows the gap for school psychologists, school counselors, and school social workers. The category also includes speech language pathologists, occupational therapists, physical therapists, and school nurses; however, neither the occupational forecast nor the licensing data separates out those working in schools from the general supply and demand for these occupations in other places of employment²⁴.

²¹ Based on OSPI records of certificates issued before June 30, 2007.

²² HECB (2006) State and Regional Needs Assessment and HECB, SBCTC, WTECB (2006) A Skilled and Educated Workforce (2006).

²³ Educational Staff Associates include School Psychologists, Educational, Vocational, and School Counselors, Child, Family and School Social Workers.

²⁴ Four categories of Educational Staff Associates (ESAs) receive certification by completing degree programs approved by appropriate national accrediting agencies, holding valid Washington State licenses (if required), and completing a 30 clock hour course approved by the State Board of Education (SBE). They do not complete SBE approved preparation programs, so they are not included on this chart in either supply or demand indicators. Those four ESA categories are School Speech Language Pathologist or Audiologist, School Nurse, School Occupational

Math and Science

Despite the limited utility of the Educational Service District (ESD) projections in identifying gaps for educators, we do find ample evidence that shortages exist in key fields. For example, the Professional Educator Standard's Board estimates that the newly adopted high school math requirements will require an additional 450 trained math teachers²⁵. This is on top of a current and persistent shortage in these fields. The Office of the Superintendent of Public Instruction regularly conducts a survey of school districts to identify areas where districts are having the greatest difficulty filling positions. To get a better sense of the needs in specific shortage fields, the most recent report also included information on endorsements earned.

The 2006 analysis found that the degree of shortages in most areas had *increased* since 2004. The study found further that although the fields in the serious shortage list had varied somewhat from survey to survey, three clusters of fields had shown deep and persistent shortages since 2000:

1. Special education teachers
2. Math and science teachers
3. Educational staff associates

All evidence suggests that the need in these areas will continue. The need possibly will become even greater, as the shortages that already exist are being compounded by the federal highly qualified rules, a change in the high school math requirement, and potential change in the high school science requirement.

It is important to note that shortages result from a number of causes. OSPI cites three major types of shortages: recruitment/retention, training, and distribution.

A *training shortage* is the most relevant to the subject of this report. Training shortages occur when there are not enough accessible preparation programs to produce the number of educators needed for a particular role. This may be the case for some of the educational staff associate positions. For example, certification as a speech language pathologist requires a master's degree in that field, but there are only two such programs in Washington, both of which have a highly competitive admission process. Thus, there are capable individuals who want to become certified in this area but are unable to find a pathway; where this is the case, policy options may need to focus on adding programs or improving delivery systems for existing programs.

Therapist, and School Physical Therapist. These specialties are addressed more generally in the Healthcare section of this report.

²⁵ Professional Educator Standards Board found that 446.91 – 466.48 Additional Math Teachers (FTE) would be required based upon district reports (289 districts reported (97%) as of 4/3/08).

Teachers of visually impaired (TOVI) and orientation and mobility (O&M) teachers also appear to face a training shortage. While the PESB has recently adopted endorsement standards for these specialties there are currently no training programs available or planned in Washington. In fact, despite demand for these specialties in Washington (and nationally), only 50 programs are available nationally for TOVI and 17 programs for O&M. Of those, only a handful is available on the West Coast.

Summary of Findings

This analysis relies on our best estimate of the preparation needs of workers required to meet the labor needs of Washington employers. The assessment finds that the higher education system in Washington is not graduating enough students at all levels with the skills required to be competitive for forecasted job openings.

The state's current supply of workers who have completed mid-level preparation - more than one year but less than four years of postsecondary training or education - prepares only 87 percent of the number needed to be competitive in the labor market in 2011-2016. Corresponding statistics for the baccalaureate and graduate levels are 88 percent and 67 percent, respectively. Population growth alone will not increase the supply of these workers at these education levels to close the gap and meet employer demand. It will take policy changes to sufficiently increase post-secondary degree production.

There is a significant mismatch between supply and demand of workers prepared for specific high demand occupations. Washington does not produce enough graduates to meet demand for workers in a number of fields, most notably science technology, manufacturing and production, some health occupations, early childhood education, construction, aircraft mechanics and technicians, and accounting and bookkeeping at the mid-level; and research and science occupations, human and protective service professionals, editors and writers, medical professionals, computer science occupations, and engineering at the baccalaureate level and above.

Continued growth and development of the higher education system in Washington is critical to the continuing economic prosperity of the state and its residents. The preparation of workers with the skills and abilities employers demand relies on a strong public education system that can provide increasing numbers of students with learning opportunities of the appropriate depth and breadth to effectively compete in the labor force.

Future Updates of this Report

Based on the recommendations of the Economic Needs Assessment Working Group convened in the summer of 2008, the Higher Education Coordinating Board endorsed a plan to improve the process for developing and using this report. These recommendations will be implemented in the 2010 update of this report and thereafter, including:

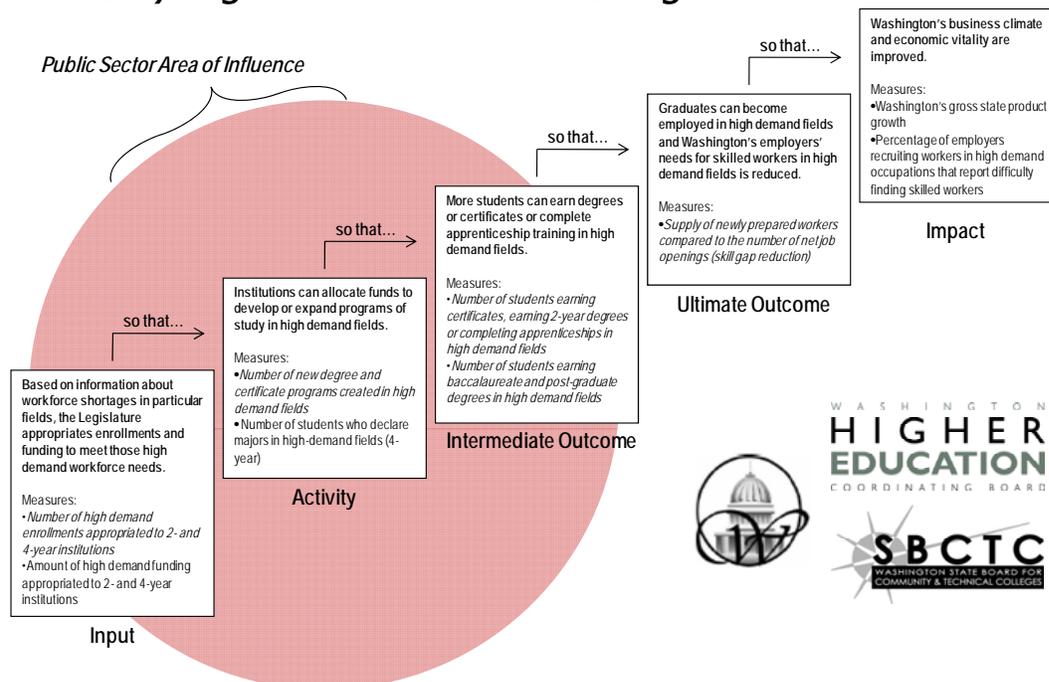
- Establishing a technical advisory committee to advise the three agencies responsible for this report on methodology and data sources;
- Surveying employers and reviewing industry publications to validate the report results; and
- Developing clearer plans on how the three agencies will incorporate the analysis results into program plans and accountability systems, and making greater use of the results to guide resource allocation decisions.

High Demand Logic Model

The Higher Education Coordinating Board, State Board for Community and Technical Colleges, and the Workforce Education and Training Coordinating Board have jointly developed a logic model to clarify to policymakers how high demand enrollment programs support the state's goals around economic vitality.

Figure 15

Logic Model for Meeting High Demand Workforce Needs by Higher Education in Washington



First, this report and other analyses help determine what academic programs are in greatest need to support the continued economic health of the state. Based on these analyses, the agencies and institutions make budget recommendations to the Governor and the Legislature.

Second, the three agency boards have a role in the approval of new programs and new institutions that will be required to provide the education and training to fill identified gaps. Enrollments at institutions and in new programs are also monitored.

Third, the agencies measure outcomes, which include the measures in the various accountability systems and most of the higher education indicators in the GMAP economic vitality dashboard.

Next, broader outcomes are tracked. Have we closed the gaps? Are we preparing enough graduates in the right fields? That information is then looped back into the next round of assessment and budget recommendations.

Finally, the economic health of the state is assessed, and that informs the broad policy direction for the next update to the policy agendas described in master plans and other documents.

Appendix B

Common Definitions Relating to High Demand

In 2007, a workgroup of state agencies and other institutional representatives participated in a Governor's Office led effort to develop a set of common definitions relating to targeted industries and occupations. These definitions were designed to be used by legislators and state agencies in program design and implementation. Subsequently, legislation and program guidelines have been modified to incorporate these definitions.

High Employer Demand Program of Study: Undergraduate or graduate certificate, apprenticeship or degree program in which the number of students prepared for employment per year (from in-state institutions) is substantially less than the number of projected job openings per year in that field statewide, or in a sub-state region.

High Demand Occupation: An occupation with a substantial number of current or projected employment opportunities.

High Student Demand Program of Study: Undergraduate or graduate certificate or degree program in which student demand substantially exceeds program capacity.

Sector: a group of industries with similar business processes, products, or services such as construction or health services; formerly categorized by the Standard Industrial Classification (SIC) system, now categorized by the North American Industry Classification System (NAICS).

Industry Cluster: A geographic concentration of interdependent competitive firms that do business with each other, including firms that sell inside and outside of the geographic region as well as support firms that supply new materials, components, and business services (RCW 43.330.090), and other institutions including government and education.

Targeted Industries or Clusters: Industries and industry clusters that are identified based on a strategic economic development consideration or other public concern.

Appendix C

Selected Recent Publications on Skill Demand and Supply Gaps in Washington

General

Council on Competitiveness (2008), *Thrive: The Skills Imperative*. Council on Competitiveness, Washington, D.C. Retrieved from www.compete.org/publications/detail/472/thrive/

Educational Needs Index (2006), "Washington State Report." Retrieved from www.educationalneedsindex.com/

Governor's Management Accountability Program (2008), "High Demand Enrollment Presentation, March 26, 2008." Retrieved from www.accountability.wa.gov/reports/economy/20080326/Tab6HighDemandEnrollment.pptm.pdf.

Higher Education Coordinating Board, State Board for Community and Technical Colleges, Workforce Training and Education Coordinating Board (2006), "A Skilled and Educated Workforce: An assessment of the number and type of higher education and training credentials required to meet employer demand," Olympia, Washington. Retrieved from www.hecb.wa.gov/research/Issues/documents/ASkilledandEducatedWorkforceJanuary2006final.pdf.

Higher Education Coordinating Board, (2006), *State and Regional Needs Assessment*, Olympia, Washington. Retrieved from www.hecb.wa.gov/research/Issues/NeedsAssessmentbychapters.asp.

Higher Education Coordinating Board (2008), *Strategic Master Plan for Higher Education in Washington: Moving the Blue Arrow, Pathways to Educational Opportunity*. Retrieved from www.hecb.wa.gov/research/masterplans/documents/2008MasterPlan-fromPRT.pdf

Higher Education Coordinating Board (2008). *Opportunity for Change: Implementing the 2008 Strategic Master Plan for Higher Education*. Retrieved from www.hecb.wa.gov/news/documents/Opportunities-Implementation-printversion.pdf

Prosperity Partnership, Puget Sound Regional Council (2006), "Educating Washington Citizens for High-Demand Jobs," Seattle, Washington. Retrieved from www.prosperitypartnership.org/foundation/education/whitepaper_final.pdf

Sommers, P., Gardner, M., and Scarpa, J. (2008), "Accessible Middle Wage Jobs in Seattle and the Puget Sound Region." Seattle Jobs Initiative. Retrieved from www.seattlejobsinitiative.com/policy/publications/index.html

Spaulding, Randy (2008), "Interstate Migration: Washington's Reliance on Imported Workers to meet Employer's Human Resource Needs," in *WICHE Fellows White Paper Compilation: a collection of higher education-related policy research and analysis papers written by 2006-08 Policy Fellows*, Retrieved from www.wiche.edu/policy/Ford/FellowsCompilation2008.pdf

State Board for Community and Technical Colleges (2006). *System Direction: Creating Opportunities for Washington's Future*. Olympia, Washington. Retrieved from www.sbctc.ctc.edu/docs/sbctc_system_direction_final.pdf

Workforce Training and Education Coordinating Board (2008). *High Skills, High Wages 2008-2018: Washington's Strategic Plan for Workforce Development*. Olympia, Washington. Retrieved from www.wtb.wa.gov/Documents/HSHW2008.pdf

Workforce Training and Education Coordinating Board (2008), "Employer Needs and Practices Survey Results, 2007." Retrieved from www.wtb.wa.gov/Documents/Tab4PDFEmployerSurvey.pdf

Washington State Legislature, "Report of the Joint Committee on the Education of Students in High Demand Fields," Olympia, Washington. Retrieved from www.leg.wa.gov/documents/Senate/SCS/HIE/FinalRptESHDF.pdf.

Education

Professional Educator Standards Board (2008), *Ensuring an Adequate Supply of Well-Qualified Math and Science Teachers*, Olympia, Washington. Retrieved from www.pesb.wa.gov/Publications/reports/documents/Final-recruit12-31-08.pdf.

Engineering

AeA Washington Council, "2008 Washington State Education Policy Priorities." Retrieved from www.aeanet.org/AeACouncils/wadz_IP_2008_Education.asp

Health Sciences

Health Work Force Institute and the Washington Association of Community and Migrant Health Centers (2007), *Results of the 2006-2007 Community Health Work Force Survey*, Seattle, Washington. Retrieved from healthcarepersonnel.org/publications/2006-07_Community_Health_Center_Workforce_Survey_07-11-08.pdf.

Health Work Force Institute and the Washington State Hospital Association (2007), *Results of the 2007 Hospital Work Force Survey*, Seattle, Washington. Retrieved from http://healthcarepersonnel.org/publications/07HospitalSurveyReport_FINAL.pdf

Skillman, Susan, et.al. (2008), "Demographic, Education, and Practice Characteristics of Registered Nurses in Washington State: Results of a 2007 Survey." WWAMI Center for Health Workforce Studies. Retrieved from depts.washington.edu/uwrhrc/uploads/CHWS%20FR120%20Skillman.pdf

Workforce Training and Education Coordinating Board, *Progress 2007: Report of the Health Care Personnel Shortage Task Force*, Olympia, Washington. Retrieved from www.wtb.wa.gov/Documents/Progress2007-Section1.pdf.

WWAMI Center for Health Workforce Studies (2007), "Washington State Registered Nurse Supply and Demand Projections: 2006-2025," Seattle, Washington. Retrieved from www.wcnursing.org/faqs/WA-RN-Suuply-Demand.pdf.

Washington Center for Nursing (2008), *A Master Plan for Nursing Education in Washington State*. Retrieved from www.wcnursing.org/faqs/WCN%20MP%204.2.08.pdf/at_download/file



STATE OF WASHINGTON
HIGHER EDUCATION COORDINATING BOARD

917 Lakeridge Way SW • PO Box 43430 • Olympia, WA 98504-3430 • (360) 753-7800 • FAX (360) 753-7808 • www.hecb.wa.gov

RESOLUTION NO. 09-05

WHEREAS, RCW 28B.76.230 directs the Higher Education Coordinating Board to develop a comprehensive and ongoing process to analyze the need for additional degrees and programs, additional off-campus centers and locations for degree programs, and consolidation or elimination of programs by the (public) four-year institutions; and

WHEREAS, As part of this needs assessment process, RCW 28B.76.230 directs the Higher Education Coordinating Board to regularly produce, jointly with the State Board for Community and Technical Colleges and the Workforce Training and Education Coordinating Board, an assessment of the number and type of higher education and training credentials required to match employer demand for a skilled and educated workforce; and

WHEREAS, This joint report, consistent with these statutory requirements, contains the number of forecasted net job openings at each level of higher education and training and the number of credentials needed to match the forecast of net job openings; and

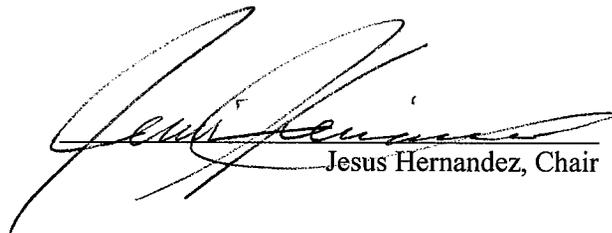
WHEREAS, The report identifies high employer demand programs of study in which the number of students prepared for employment per year (from in-state institutions) is substantially less than the number of projected job openings per year in that field;

THEREFORE, BE IT RESOLVED, That the Higher Education Coordinating Board adopts the methodology, findings, and recommendations of the 2009 update of the joint agency report entitled, *A Skilled and Educated Workforce: An assessment of higher education and training credentials required to meet employer demand*.

Adopted:

March 26, 2009

Attest:


Jesus Hernandez, Chair


Roberta Greene, Secretary



