Students can shorten the path to a good job after graduating from high school by taking career and technical education (CTE) courses that align with courses offered at community and technical colleges or through apprenticeships. However, this performance audit found that many high school students are not given the information or courses necessary to take advantage of these options.

The three lead agencies that deliver, oversee and operate Washington's CTE programs do so with little coordination and are guided by statutes that lack clarity. The lack of coordination extends to school districts and colleges, making a student's secondary-to-postsecondary transition more difficult. Implementing the leading practices identified in this report will be challenging for these three agencies, as each has its own leadership, mission and funding, but lacks the statutory authority to require cooperation.

This report makes recommendations to the Legislature, the Office of Superintendent of Public Instruction, the Workforce Training and Education Coordinating Board, and the State Board for Community and Technical Colleges. Recommended actions include clarifying statutes and improving coordination, oversight and cooperation across Washington's career and technical education system. These recommendations should help improve career guidance for students, increase dual credit opportunities for college courses taken in high school, smooth secondary to postsecondary transitions and strengthen engagement with the state's business community.
The mission of the Washington State Auditor’s Office

The State Auditor’s Office holds state and local governments accountable for the use of public resources.

The results of our work are widely distributed through a variety of reports, which are available on our website and through our free, electronic subscription service.

We take our role as partners in accountability seriously. We provide training and technical assistance to governments and have an extensive quality assurance program.

For more information about the State Auditor’s Office, visit www.sao.wa.gov.

Americans with Disabilities

In accordance with the Americans with Disabilities Act, this document will be made available in alternative formats. Please email Communications@sao.wa.gov for more information.

To request public records

Public Records Officer
360-725-5617, PublicRecords@sao.wa.gov

State Auditor’s Office contacts

State Auditor Pat McCarthy
360-902-0360, Pat.McCarthy@sao.wa.gov

Chuck Pfeil, CPA – Director of Performance Audit
360-902-0366, Chuck.Pfeil@sao.wa.gov

Christopher Cortines, CPA – Principal Performance Auditor
206-355-1546, Christopher.Cortines@sao.wa.gov

Carolyn Cato – Senior Performance Auditor
360-725-5551, Carolyn.Cato@sao.wa.gov

Isaiah Berg – Performance Auditor
360-725-5619, Isaiah.Berg@sao.wa.gov

Emily Cimber – Performance Auditor
360-725-5430, Emily.Cimber@sao.wa.gov

William Clark – Performance Auditor
360-725-5632, William.Clark@sao.wa.gov

Kathleen Cooper – Deputy Director for Communications
360-902-0470, Kathleen.Cooper@sao.wa.gov
Executive Summary

While some high school students pursue a bachelor’s degree after graduation, others are looking for good jobs that do not require four years of college or university education. Many mid-level-skill jobs pay well and require no more than two years of education from a community or technical college. Students can shorten that time by taking college-level career and technical education (CTE) courses while in high school. Opportunities also exist for some CTE students to enter into apprenticeships or other mid-level jobs right out of high school. However, Washington employers report being unable to fill many of their mid-level-skill openings.

The audit found that CTE courses offered in Washington’s public schools with the highest enrollment could more strongly align with high-wage, high-demand occupational areas. It identifies four areas for improvement. If Washington adopts leading practices in these four areas, the state could create more opportunities for students while closing the gap between students’ skills and employers’ needs.

1. Improve career guidance given to students, and provide it in a classroom setting in the 7th or 8th grade

Introducing students to the many careers and jobs available after high school could help them choose occupations that pay well but may not require a four-year degree. Paths to such careers include taking courses in high school that align to CTE courses in colleges or apprenticeships. The Office of Superintendent of Public Instruction (OSPI) and district CTE officials said many students and their parents are unaware of the options available to them, which can become a problem when students try to develop their High School and Beyond Plan.

While recent legislation requires an inventory of each student’s career interests and skills in the 7th or 8th grade, more could be done to address this lack of awareness. According to educational research, a major reason that students drop out of high school is they cannot see the connection between their high school courses and a job. Helping students explore the many career options that are available to them in a comprehensive way in the 7th or 8th grade is a recommended practice incorporated in career-focused educational models to address this problem.

2. Strengthen employer engagement to better align CTE programs and courses with high-wage industry-needed skills

Businesses report difficulty finding job candidates with the technical skills they need. More coordinated outreach through CTE advisory committees would strengthen school districts’ ability to incorporate the skills employers need into coursework. The CTE courses schools currently offer do not always reflect the skills and trades most in demand.

To prepare students for the postsecondary world of education and work, the Workforce Board, OSPI and the State Board for Community and Technical Colleges (SBCTC) can do more to ensure that schools and colleges strengthen their engagement with employers. Establishing a systematic approach to engagement could achieve three benefits: better aligning industry expectations across college and district CTE curricula; reducing some of the duplicative effort employers expend by serving on multiple committees; and allowing regional employers to reach a wider group of schools and colleges.
3. Update the list of high-demand programs, strengthen the review of local labor demand data and clarify laws to help reduce the skills gap

OSPI currently lacks an updated list of statewide high-demand programs. State law requires OSPI to work with the Workforce Board, SBCTC and the Washington State Apprenticeship and Training Council to develop this list to help inform school districts about what types of programs are needed. When districts want to propose additional CTE programs, state law requires them to submit evidence of local high demand to OSPI when seeking approval for those programs. To ensure that each district’s CTE programs help address the state’s skills gap, OSPI reviews this evidence before approving the district’s CTE plans.

OSPI could strengthen the approval process for new and existing programs if it consistently reviewed actual labor market data or analysis that is sufficient to demonstrate high demand. Collecting and reviewing this type of evidence for all CTE programs and having the Legislature define key terms in the state's CTE statutes would help OSPI to better assess whether district CTE programs are helping to address the skills gap.

4. Expand the number of CTE dual-credit opportunities to increase the number of pathways from high school to college

Students can take CTE courses in high school that align with similar courses in college programs, allowing them to gain “dual credit” at the college. This dual credit is typically achieved through articulation agreements between one high school and one college. While all colleges are required to give equivalent credit, some may only award the credit as an elective. Articulated CTE courses offered and transcripted by one college might not be accepted towards the same CTE program at another college. This could lead to students having to retake courses when they enter or transfer to other colleges. Additionally, the content and the number of these agreements between school districts and colleges can vary significantly across the state because they are managed and negotiated between the faculty of individual colleges and high schools – a time-consuming and costly process.

SBCTC maintains a database containing most existing agreements, but there is little funding available to expand them. In addition, the state as a whole lacks a mechanism to develop statewide agreements for CTE that could serve many districts and colleges more efficiently. A statewide approach to articulation could increase the number of dual-credit opportunities for students and reduce administrative costs to school districts and colleges.

A stronger, more coordinated CTE system could improve student outcomes

The agencies that deliver, oversee and operate Washington’s CTE programs do so with little coordination. This lack of coordination extends to school districts and colleges, making a student’s secondary-to-postsecondary transition more difficult. Implementing the leading practices identified in this report is challenging when multiple agencies work together. This coordination is more difficult because no agency has the statutory authority to require other agencies to cooperate or hold them accountable.
Industry sources recognize it is a leading practice to coordinate a state’s secondary and postsecondary CTE programs. Greater coordination should be supported by legislation that helps the two systems undertake the task of engaging with large or regional businesses to improve the connection between employer needs and student learning, as well as leading the process of establishing statewide articulation agreements for CTE courses that are common across the college system and are easily tied to industry standards.

Consequently, we make recommendations to the Legislature, OSPI, Workforce Board and SBCTC that will clarify statutes and improve coordination, oversight and cooperation across Washington's career and technical education system. These recommendations should help improve career guidance for students, increase dual credit opportunities for college courses taken in high school, smooth secondary to postsecondary transitions and strengthen engagement with the state’s business community.

**Recommendations**

**We recommend the Legislature:**

1. Require the Office of Superintendent of Public Instruction (OSPI) to work with the State Board of Education to establish a model course framework required for all students in the 7th or 8th grade that:
   a) Teaches students about multiple career paths that include postsecondary career and technical education (CTE), apprenticeships, military and four-year professional opportunities along with the educational costs and anticipated incomes that accompany each
   b) Informs students about dual-credit opportunities that exist within CTE programs
   c) Includes the development of students’ High School and Beyond plans
   d) Incorporates the improved Career Bridge website or other comprehensive career guidance tools

2. Require the Workforce Board to establish a workgroup that is funded by the Legislature and consists of staff from the Workforce Board, OSPI and the State Board for Community and Technical Colleges (SBCTC). This workgroup should be responsible for establishing:
   a) A complete inventory of all active articulation agreements maintained in a centralized database, which must be used by all districts and colleges
   b) A list of all CTE programs across districts and colleges to help identify articulation opportunities
   c) Statewide articulation agreements for those courses offering a good return on investment that incorporate common course numbering and lead to dual credit for use by all school districts and colleges
   d) Standards identifying key elements required for all unique and statewide articulation agreements
   e) A structured process to increase regional coordination of secondary and postsecondary advisory committees to more effectively and efficiently engage employers
   f) A method to coordinate data sharing and analysis using:
      - Employment Security Department data on occupational wages and growth forecasts
      - Biennial business surveys conducted by the Workforce Board
• Labor-market demand data collected by colleges and SBCTC that drives postsecondary CTE programs and courses

3. Once established, require the workgroup to:
   a) Define how to prioritize the establishment of new statewide articulation agreements. These agreements should:
      • Be implemented through a deliberative process between faculty in school districts and colleges
      • Begin with the most common CTE courses, including those with curricula that can be easily tied to nationally recognized industry standards
      • Incorporate curricula that are established in partnership with the Centers of Excellence and businesses where applicable
      • Require reviews at least once every three years to update the curricula
   b) Develop and report performance measures to the Legislature that show:
      • The increase in the number of CTE college paths (articulated dual credit courses multiplied by the number of colleges that accept them)
      • Cost savings achieved across the secondary and postsecondary systems

4. Revise RCW Chapter 28A.700 to:
   a) Define the term “skills gap”, as used in RCW 28A.700.010 (2)(a), which requires districts to demonstrate how their CTE plans helps address the skills gap. Clarifying this term would potentially affect how and the extent by which high-demand occupations drives CTE programming. This new definition should apply consistently across agencies.
   b) Define the term “high wage” as used in the definition of CTE (RCW 28A.700.010 (5)), which in part defines CTE as “a planned program of courses that enable options for students to obtain high-wage employment preparation.” This new definition should apply consistently across agencies.
   c) Require districts to submit evidence of high local labor demand for existing CTE programs when OSPI reapproves them every five years

We recommend the Office of Superintendent of Public Instruction:

5. Communicate to school counselors annually the importance of discussing CTE and apprenticeship paths along with academic paths as part of each student’s High School and Beyond Plan

6. Consistent with state law, work with the Workforce Board, Washington State Apprenticeship and Training Council, and SBCTC to establish a regularly updated list of high-demand CTE programs using the occupational demand data provided by Workforce Board

7. Consistent with state law, strengthen procedures and documentation requirements to assess whether CTE programs that districts propose or renew correspond with local high demand

We recommend the Workforce Board:

8. Gather input from OSPI and the State Board of Education to enhance the Career Bridge website. This website should include information about CTE and dual-credit opportunities in high school.

We recommend the State Board for Community and Technical Colleges:

9. Share with OSPI and the Workforce Board the labor market data and analysis that colleges and SBCTC consider when developing postsecondary CTE programs and courses
Introduction

Every year, about 60,000 Washington high school students graduate. While many graduates plan to attend a four-year college, others seek good jobs that do not require a bachelor’s degree. Many of these jobs require at least some level of postsecondary education at a community or technical college. Nonetheless, employers report being unable to fill many of these jobs, which contributes to a skills gap.

Career and technical education (CTE) courses in high school can lead to certificates, apprenticeships or two-year college degrees that help prepare students for these opportunities at a much lower cost than a four-year degree. Obtaining a certificate or a degree at a community or technical college is almost always less expensive than completing a university degree. For the 2016-2017 school year, annual tuition and fees for an in-state community and technical college cost about $4,000; four-year public universities ranged from $6,000 to $10,000. Most private universities topped $40,000 a year.

Washington spends about $450 million annually on CTE programs in middle and high schools. The Office of Superintendent of Public Instruction (OSPI) and individual school districts administer these CTE programs and are responsible for making sure students and parents know enough about the benefits of CTE programs to take advantage of them.

According to leading practices, one measure of CTE program effectiveness is how well CTE students are prepared for high-paying, high-demand or stable-demand occupations. Another is how easily employers can find employees with the skills they need. Communication between educators and the business community is critical for CTE programs to effectively meet the business community’s needs.

The State Auditor’s 2015 performance audit of Washington’s workforce development system identified three risks to the system, which are examined in greater depth in this audit. Risks include inconsistencies in the:

- Quality of counseling intended to help students transfer into training and employment
- Way schools offer career and technical education courses to students
- Degree of engagement between employers and educators

Each inconsistency can pose challenges that the state must overcome if both students and businesses are to achieve their desired outcomes: good jobs and skilled employees. If the state fails, the result is a gap between what students learn and what employers need.

This audit is the second in a series focusing on CTE. The first, published in December 2016, examined CTE outcomes by studying the state’s 2012 and 2013 graduating classes. The audit found that CTE and non-CTE students had similar overall rates of employment and educational outcomes after graduating from high school. However, of those who did not enroll in any type of college or four-year university, CTE students had significantly higher employment, including apprenticeships, than non-CTE students. The recommendations in this report can help CTE programs reach and benefit more students in a manner that is more efficient for the state’s school districts and colleges.
This audit seeks to answer these questions:
- Are secondary CTE programs and courses aligned with the needs of students and employers?
- Are there leading practices that could improve the success of the state’s secondary CTE programs?
Background

The Carl D. Perkins Career and Technical Education Act and how it shaped CTE in Washington

Nationally, and in Washington, CTE has been influenced and shaped by the federal Carl D. Perkins Career and Technical Education Act (Perkins Act), which was originally authorized by Congress in 1984. The Act was intended to strengthen and expand the economic base of the nation, develop human resources, reduce structural unemployment, increase productivity, and to expand, improve, and update high-quality programs of vocational-technical education.

In 2006, Congress reauthorized the Perkins Act and made major revisions intended to more fully develop students’ academic, career and technical skills. The Legislature has incorporated many parts of the Act into Washington law. State law defines career and technical education as “a planned program of courses and learning experiences that begins with exploration of career options; supports basic academic and life skills; and enables achievement of high academic standards, leadership, options for high skill, high wage employment preparation, and advanced and continuing education.”

How CTE is delivered in Washington

Career and technical education (CTE) introduces middle and high school students to occupational and technical skills in a classroom setting. CTE programs and courses offer hands-on learning in a wide variety of career paths, including agriculture, business, health and technology. Some also offer college credit for classes taken in high school.

CTE courses are approved by the Office of Superintendent of Public Instruction (OSPI), and designated as either exploratory or preparatory. CTE students learn foundational skills in exploratory courses; preparatory courses focus on building rigorous technical skills. Both incorporate leadership and employability skills – preparing students to meet the demands of the 21st century workplace.

Preparatory courses are often taught at specialized CTE skill centers, which are an integral part of CTE programming in Washington. Skill centers are regional schools that serve students from multiple school districts, providing instruction that is either too expensive or too specialized for school districts to offer individually.

Districts often assemble CTE courses into programs of study that are a coordinated, progressive sequence of classes from exploratory to preparatory coursework. As defined under federal law, a program of study is a set of courses leading either to industry certifications or linked to related postsecondary programs through articulation agreements. To meet federal funding requirements, a program of study must achieve or lead to at least one of these:

- Alignment with a postsecondary program of study
- An industry-recognized credential
- An academic certificate or degree
- Employment

Exploratory CTE courses provide students foundational and occupation-specific skills required to meet industry or national standards. Students explore and gain knowledge of career options, and demonstrate leadership and employability skills. Examples of these types of courses are: Introduction to Technology Foundations, Family Health and Introduction to Materials Engineering.

Preparatory CTE courses are taught at skill centers or traditional high schools. These courses are technically intensive and rigorous. Students demonstrate a mastery of skills that meet industry-defined standards. Completing a sequence of prescribed courses can lead to a certificate or credential necessary for employment, or result in college credit (known as dual credit). Examples of these types of courses are: Welding Technology, Commercial Construction Trades and Digital Electronics.
Students must take at least one credit of “occupational education” to meet graduation requirements

Washington high school students are required to take at least one credit of “occupational education” to graduate. The Washington Administrative Code defines occupational education as:

“…A series of learning experiences designed to assist the student to acquire and demonstrate competency of skills…which...are required for success in current and emerging occupations.”

Occupational education courses are not necessarily CTE courses; only those courses that meet standards set by OSPI and are taught by certified CTE instructors are designated as CTE.

Four state agencies and boards are responsible for CTE in Washington

The state’s system for administering and supporting CTE programs is highly decentralized. School districts and community and technical colleges make many decisions at the local level. However, the Legislature has given four state agencies discrete responsibilities for providing oversight and establishing policy and standards for the educational system.

- **The Office of Superintendent of Public Instruction (OSPI)** oversees the state’s 295 school districts and provides guidance, professional development and program monitoring. OSPI also distributes federal funds to school districts and monitors compliance with Perkins funding requirements.

  OSPI is required by state law to evaluate and approve all district CTE programs and courses to ensure they help address the skills gap. Districts decide what types of CTE programs and courses to offer and develop the content. To inform these decisions, districts are required to work closely with local CTE advisory committees whose members include representatives of business and labor and offer perspectives about local employment needs. On an annual basis, these advisory committees and school boards are required to review, evaluate and approve their districts’ 5-year CTE plans. Modifications to the plans are based on these annual evaluations.

- **State Board for Community and Technical Colleges (SBCTC)** must approve new CTE programs offered by the state’s 34 community and technical colleges (see sidebar). The colleges decide what CTE programs and courses to offer based on feedback from affiliated advisory committees. Colleges use labor market information when making program decisions. Labor market analysis – including wage data and employment opportunities – is required as part of SBCTC’s program approval process. Need studies, or indication of need from an employer, are required to support new and emerging occupations that are not covered by standard forecasts or data. The state also has 10 Centers of Excellence, funded by SBCTC, that serve as statewide liaisons between the educational system and business and labor groups.

A note about the term “colleges” in this report

This audit examines how the state’s two-year community and technical colleges support CTE in secondary schools. “Colleges” in this report refers to these two-year colleges; four-year colleges and universities will be identified as such.
• **State Board of Education** (SBE) establishes the state’s career- and college-ready graduation requirements and provides advocacy and strategic oversight of public education. SBE also develops policy and approves course frameworks for statewide CTE-related equivalent credit to help CTE students meet graduation requirements. Currently, SBE has three strategic goals related to career readiness:
  1. Promote research-based practices in student personalized-planning experiences
  2. Explore definitions of career readiness
  3. Develop a model course to inform the High School and Beyond Plan

• **Workforce Training and Education Coordinating Board** (**Workforce Board**) is the primary coordination, planning, evaluation, monitoring and policy guidance agency for the state training system. The Workforce Board administers employment surveys, analyzes occupational skills gap data, and publishes the state’s strategic workforce plan. The Workforce Board is also responsible for oversight of programs funded by the Carl D. Perkins Act. The Perkins Act was reauthorized in 2006 to increase the quality of career and technical education. In this oversight role, the Workforce Board tracks and publishes performance measures related to the Perkins Act, and allocates Perkins funding to both secondary and postsecondary institutions.

In addition to these four principal agencies, several others, such as the Washington Student Achievement Council and the Professional Educator Standards Board, shape policy and standards that affect career and technical education.

**The state’s basic education funding provides about 85 percent of secondary school CTE funding**

OSPI distributes CTE funding to school districts and skill centers using a per-student full-time equivalent (FTE) formula and federal grants. In the 2016 school year, a total of about $450 million in state and federal money was spent on CTE programs (see Exhibit 1). About 85 percent of CTE funding is drawn from the basic education apportionment, which helps pay for teacher salaries, school building maintenance and administrative costs.

**“CTE enhanced funding” helps schools pay for the special requirements of CTE courses**

Because CTE courses must meet industry standards, they often incur costs beyond typical classroom expenses, driven largely by the need for extra materials or expensive equipment. Teachers also need additional professional development to keep their knowledge, skills and abilities up to date with industry standards. The primary state funding mechanism for these added expenses is a per-student FTE enhancement, which was $283 in the 2016 school year.
Funding challenges have made CTE program delivery more difficult

Exhibit 2 compares funding and student enrollment. OSPI reports that between 2014 and 2017, per-student CTE enhancement declined 63 percent even as CTE enrollment remained steady. Although CTE enhanced funding makes up just 4 percent of total K-12 CTE classroom funding, stakeholders say that this funding is particularly important for high-quality CTE programs.

Exhibit 2 – CTE Enhanced per-student FTE funding declined by 63% while enrollment remained steady between 2014-2017

Exhibit 3 breaks out CTE funding by category per student to show more clearly the relationship between decreasing CTE enhanced funding and the increase in basic education funding.

Exhibit 3 – While basic education funding has increased, CTE enhanced funding has declined

2014-2016, 2017 OSPI projection based on current enrollment

<table>
<thead>
<tr>
<th>CTE funding by category</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Education Apportionment per FTE student</td>
<td>$5,284</td>
<td>$5,493</td>
<td>$6,047</td>
<td>$6,131</td>
</tr>
<tr>
<td>CTE enhancement per FTE student</td>
<td>$745</td>
<td>$590</td>
<td>$283</td>
<td>$277</td>
</tr>
<tr>
<td>Total state funding per CTE FTE student</td>
<td>$6,029</td>
<td>$6,082</td>
<td>$6,330</td>
<td>$6,408</td>
</tr>
<tr>
<td><strong>Total state K-12 CTE funding</strong></td>
<td><strong>$368 million</strong></td>
<td><strong>$379 million</strong></td>
<td><strong>$403 million</strong></td>
<td><strong>$414 million</strong></td>
</tr>
<tr>
<td>K-12 CTE FTE student enrollment*</td>
<td>61,076</td>
<td>62,344</td>
<td>63,635</td>
<td>64,559</td>
</tr>
</tbody>
</table>

* Does not include funding for Skills Center, Dropout Reengagement CTE and Running Start CTE.

Source: OSPI Apportionment Report.

The Legislature attempted to address this funding challenge in the 2017 legislative session by increasing the amount of CTE enhanced funding. OSPI said the rules for calculating the number of hours that equate to a 1.0 annual average student FTE will be changing in the 2018-19 school year. With this change, OSPI reports this will result in an estimated 4 percent increase to the CTE enhancement on a per-pupil basis.
**Fewer federal dollars support state CTE programs**

In 2011, Congress defunded the Tech-Prep program, part of the reauthorized Perkins Act. At one point, Tech-Prep provided more than $2 million in funding to Washington for faculty from high schools and colleges to work together to develop dual-credit opportunities for CTE students. Although diminished, Perkins Act funding continues to support local CTE programs; it is tied to specific requirements for programs of study that help link high school to college CTE programs.

Federal law awards CTE funding to states based primarily on demographics. States have discretion in allocating the money. Up to 10 percent of the funds can be used for “leadership activities.” Agency officials said these leadership funds are some of the most flexible and useful funds available to the state’s CTE program providers. Washington received $20.6 million in Perkins funds in 2016, of which $8.5 million was dedicated to high school CTE programs. The remainder went to SBCTC and Workforce Board for adult CTE and administration.

**State laws require that OSPI establish CTE standards and approve all CTE programs**

OSPI is statutorily required to establish the standards for CTE programs in addition to reviewing and approving the CTE plans of local school districts. To receive approval, school district plans must:

- Demonstrate how CTE programs will ensure academic rigor
- Align with the state’s education reform requirements
- Maintain strong relationships with local CTE advisory committees for the design and delivery of CTE
- Help address the skills gap of Washington’s economy

OSPI is also required to develop a list of statewide high-demand programs for secondary CTE by consulting with the Workforce Board, SBCTC and the Washington State Apprenticeship and Training Council. A high-demand occupation is defined in statute as “an occupation with a substantial number of current or projected employment opportunities.”

Districts may recommend additional high-demand programs by submitting evidence of this demand and of consultation with their advisory committees, whose members include business and labor representatives from the community. The law considers these committees an integral part of the program development process. School districts must also demonstrate that approved CTE programs maximize opportunities for students to earn dual credit for high school and college. (Portions of the relevant law, RCW 28A.700, can be found in Appendix C.)
Washington identified key shortcomings in the state’s CTE system in a recent self assessment

In 2015, the Council of Chief State School Officers (CCSSO), a nonprofit organization dedicated to improving education, partnered with JP Morgan Chase to develop an initiative called New Skills for Youth. The initiative’s goal was to identify and promote high-quality state CTE programs through a competitive grant process that would help states identify the principal elements needed for an effective education system that produces career-ready students.

Washington was awarded CCSSO funding to help the Workforce Board, OSPI and SBCTC assess the state’s education system against nationally recognized criteria. In late 2016, the three agencies jointly reviewed the criteria and responded to the CCSSO’s Career Readiness Initiative Needs Assessment (CCSSO Assessment) to inform the grantor about the current state of CTE in Washington. These responses revealed shortcomings in the state’s secondary CTE system. This audit used those responses to describe Washington’s CTE landscape.
Scope & Methodology

The scope of this audit examines ways that OSPI and school districts can make students more aware of CTE and apprenticeship career opportunities. The audit also looks at how well CTE courses in high school align with high-growth or stable-growth occupations that are high-paying and the potential causes for any misalignment. Finally, the audit examined how to improve the process of engagement between school districts, colleges and employers to create more dual-credit opportunities for students, reduce redundant efforts and foster greater collaboration.

To identify the leading practices and to determine how Washington could improve secondary CTE programs, we took these steps.

Reviewed:
- Washington state CTE legislation
- CTE legislation and approaches from other states
- Research publications on CTE practices in other states
- Publications by educational experts on leading CTE practices and the resulting benefits
- Studies on the skills gap in Washington
- Council of Chief State School Officers (CCSSO) criteria and a 2016 self-assessment of Washington’s educational system that used this criteria
- Secondary to postsecondary CTE articulation and statewide articulation implementation practices in Ohio and Colorado

Interviewed:
- Officials from state agencies, including Office of Superintendent of Public Instruction (OSPI), State Board for Community and Technical Colleges (SBCTC), Workforce Board, Department of Labor and Industries, Washington Student Achievement Council, and State Board of Education
- Officials from 16 school districts, four colleges and two Centers of Excellence
- Officials from Advance CTE, Washington Association for Career and Technical Education (WA-ACTE) and Washington Association of Career and Technical Administrators (WACTA)
- Representatives from the Aerospace Joint Apprenticeship Committee (AJAC) and the Washington Business Alliance
- State CTE directors and administrators in Ohio, Colorado and California

Compared:
- Washington’s high school CTE course areas with the highest enrollment in 2015 to those occupations with the highest forecasted growth provided by Washington’s Employment Security Department. CTE course area enrollment numbers come from OSPI. Because OSPI collects these numbers from the state’s 295 school districts, it would have been cost-prohibitive to audit the accuracy and completeness of these numbers.
The audit did not examine:

- How well CTE courses in the community and technical college system align with high-growth occupations
- How OSPI and school districts could incorporate youth apprenticeships into high school curricula. However, the audit did examine ways that OSPI and school districts could make students more aware of the high-paying jobs that result from apprenticeships.
- The role of Workforce Development Councils and how they interact with school districts
- The State Board of Education, beyond its role in developing statewide course equivalencies for CTE students

**Audit performed to standards**
The performance audit was conducted under the authority of state law (RCW 43.09.470), approved as Initiative 900 by Washington voters in 2005, and in accordance with generally accepted government auditing standards as published in Government Auditing Standards (December 2011 revision) issued by the U.S. Government Accountability Office. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for the findings and conclusions based on the audit objectives. We believe that the evidence obtained provides a reasonable basis for the findings and conclusions based on the audit objectives.

See Appendix A, which addresses the I-900 areas covered in the audit. For more information about methodology and key publications and resources used in this audit, see Appendix B.

**Next steps**
Performance audits of state programs and services are reviewed by the Joint Legislative Audit and Review Committee (JLARC) and/or by other legislative committees whose members wish to consider findings and recommendations on specific topics. Representatives of the State Auditor’s Office will review this audit with JLARC’s Initiative 900 Subcommittee in Olympia. The public will have the opportunity to comment at this hearing. Please check the JLARC website for the exact date, time, and location (www.leg.wa.gov/JLARC). The State Auditor’s Office conducts periodic follow-up evaluations to assess the status of recommendations and may conduct follow-up audits at its discretion.
Audit Results

Are secondary career and technical education (CTE) programs and courses aligned with the needs of students and employers?

Are there leading practices that could improve the success of the state’s secondary CTE programs?

Answer in brief

Do CTE programs and courses align well with the needs of students and employers?

Based on our analysis and the difficulty that employers report trying to fill numerous mid-level skill jobs, CTE programs and courses could better align with the needs of employers. Such alignment is important to prepare students for the skills needed to enter into postsecondary CTE programs and to obtain these mid-level skill jobs.

What leading practices could improve the success of the state’s secondary CTE programs?

The audit identified four areas that could improve the alignment between the courses students are offered and job opportunities. If state agencies adopt leading practices in these areas, Washington could create more opportunities for students while closing the gap between students’ skills and employers’ needs. The four areas are:

1. Improve career guidance given to students, and provide it in a classroom setting in the 7th or 8th grade
2. Strengthen employer engagement to better align CTE programs and courses with high-wage industry-needed skills
3. Update the list of high-demand programs, strengthen the review of local labor demand data and clarify laws to help reduce the skills gap
4. Expand the number of CTE dual-credit opportunities to increase the number of pathways from high school to college
1. Improve the career guidance given to students, and provide it in a classroom setting in the 7th or 8th grade

Introducing students to the many careers and jobs available after high school could help them choose occupations that pay well but may not require a four-year degree. Paths to such careers include taking courses in high school that align to CTE courses in colleges or apprenticeships. OSPI and district CTE officials said many children and their parents are unaware of the options available to them, which can become a problem when students try to develop their High School and Beyond Plan. While recent legislation requires an inventory of each student’s career interests and skills in the 7th or 8th grade, more could be done to address this lack of awareness. According to educational research, a major reason that students drop out of high school is they cannot see the connection between their high school courses and a job. Helping students explore the many career options that are available to them in a comprehensive way in the 7th or 8th grade is a recommended practice incorporated in career focused educational models to address this problem.

The Association of Career and Technical Education and the Council of Chief State School Officers said that when students are given better upfront information about career opportunities, and an understanding of local, regional and state labor market conditions, they can make more informed educational choices that help them prepare for entering the job market.

More information about CTE options may help students discover other high-wage job opportunities

District CTE directors, officials at OSPI and SBCTC and one business group reported that high schools focus on steering students to four-year university degrees rather than to CTE-related careers. When teachers, counselors and administrators recommend only a bachelor’s degree, few students and parents are aware of the high wages and lower educational costs that can result from CTE and apprenticeship career paths.

Business groups, OSPI officials and educators report that schools need to do a better job of promoting CTE and apprenticeships, and the careers that are available in various industries. State legislators have also concluded there is a lack of awareness about CTE opportunities, noting:

“The legislature further finds that teachers, counselors, students, and parents are not well-informed about the opportunities presented by high quality career and technical education.” (RCW 28A.700.005 (3))
Three barriers likely contribute to a lack of CTE awareness:

- **Too few counselors** – The American School Counselor Association recommends a student-to-counselor ratio of no more than 250 to 1. Washington’s ratio is about 500 to 1, which limits the amount of time counselors have to discuss career options with students and parents. OSPI and SBCTC officials said that this problem is magnified when counselors emphasize only four-year degrees.

- **An occupational education requirement that does not give students enough exposure to the many CTE opportunities that are available** – Every high school student is required to take a one-credit occupational education course to graduate. Students may take the course in any semester before graduation, and select from dozens of topics. They may choose a single course in an area that, while useful or personally enriching (such as typing, photography or personal fitness), is nonetheless a low-growth, low-paying occupational area. For many students, this may be the only CTE course they take. As part of the required High School and Beyond Plan, students must identify courses of interest for their own personalized educational pathway. Legislation passed in 2017 now requires that all students initiate their High School and Beyond Plan in the 7th or 8th grade. This legislation requires schools to work with students to develop an inventory of each student’s career interests and skills. **Appendix D** shows the essential elements of a high quality High School and Beyond Plan as identified by the State Board of Education.

- **Limited online career guidance tools** – Washington’s Workforce Board maintains the Career Bridge website for job-seekers. While the site has strong content, it could be tailored more toward students. Both OSPI and SBE said some school districts have opted to pay for other career development software to help students explore their personalized career pathways.

**Washington schools are not required to provide a class to students that explores multiple career options**

Washington does not require schools to offer any sort of comprehensive overview class that addresses the costs and rewards of multiple occupational paths. Local school districts make their own decisions about what types of career guidance courses to offer. Consequently, students may not learn about CTE or apprenticeship opportunities early enough in high school to take action and begin earning credits for courses that correspond with high-paying fields.

Students who are at risk of falling into one of these groups could benefit from receiving career advice early in their high school years:

- Students who start 9th grade but do not graduate from high school
- High school graduates who did not take CTE courses and do not enroll in higher education or participate in an apprenticeship
- Students who enroll at one of Washington’s four-year public colleges and universities, but do not receive a bachelor’s degree within seven years

High school graduates who do not complete CTE programs, apprenticeships, college degrees or college certificates contribute to the state’s skills gap. High school dropouts further contribute to this gap. Failure to complete at least some of these educational milestones makes it more difficult for students to find good jobs at high wages and for employers to find skilled workers.
In the *Washington Kids 4 Washington Jobs* report, the Washington Roundtable and Boston Consulting Group examined the outcomes of students enrolled in Washington high schools and expected to graduate with the class of 2006. Exhibit 4 illustrates how many students dropped out before graduation, never enrolled in a college or failed to complete a degree within seven years of graduation. Of the 80,800 students, less than one-third obtained a postsecondary credential.

**Exhibit 4** – Washington students fall behind early and fall out of education over time

![Chart showing the number of students who drop out at various milestones](chart.png)

1. Includes students who transfer in after 9th grade and excludes students who transfer out.
2. Estimate includes students who do not graduate in five years as dropouts.
3. Six years after graduation.
4. Seven years after graduation.

Notes: Numbers are rounded. Data analysis unaudited.


**Greater awareness could draw more people to higher paying occupations and help close the state’s skills gap**

In *A Skilled and Educated Workforce* (published in 2015), the Washington Student Achievement Council, SBCTC and Workforce Board identified the types of occupations that might be open to CTE students, typically requiring more education than high school, but not a bachelor’s degree. The list of mid-level-skill occupational groups includes production and trades, which form nearly one-third of the state’s skills gap. For this occupational group, the projected gap between
supply and demand totaled 3,259 job openings. Some of the high-paying jobs in this category include carpenter, electrician, plumber, sheet metal worker, pipe fitter and many others. Workers in these fields typically enter into paid apprenticeships (discussed further in Appendix E); once they complete them, many earn more than the state average annual wage of $54,000. Exhibit 5 shows the skills gap for all mid-level occupational groups based on projected workforce needs from 2018 to 2023.

Exhibit 5 – Introducing more students to production and trades occupations through CTE could help meet demand for mid-level-skilled labor

<table>
<thead>
<tr>
<th>Mid-level occupational groups</th>
<th>Supply</th>
<th>Demand</th>
<th>Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service occupations</td>
<td>4,435</td>
<td>7,791</td>
<td>3,356</td>
</tr>
<tr>
<td>Production and trades</td>
<td>6,182</td>
<td>9,441</td>
<td>3,259</td>
</tr>
<tr>
<td>Business, management, sales</td>
<td>7,615</td>
<td>10,288</td>
<td>2,673</td>
</tr>
<tr>
<td>Computer science</td>
<td>668</td>
<td>1,385</td>
<td>717</td>
</tr>
<tr>
<td>Human and protective services</td>
<td>998</td>
<td>1,592</td>
<td>594</td>
</tr>
<tr>
<td>Educators</td>
<td>1,351</td>
<td>1,875</td>
<td>524</td>
</tr>
<tr>
<td>Media, design, communications</td>
<td>922</td>
<td>1,305</td>
<td>383</td>
</tr>
<tr>
<td>Research, science, technical</td>
<td>317</td>
<td>510</td>
<td>193</td>
</tr>
<tr>
<td>Administrative, clerical</td>
<td>6,281</td>
<td>6,308</td>
<td>27</td>
</tr>
<tr>
<td>Engineering</td>
<td>641</td>
<td>388</td>
<td>(253)</td>
</tr>
<tr>
<td>Legal</td>
<td>511</td>
<td>185</td>
<td>(326)</td>
</tr>
<tr>
<td>Health professions</td>
<td>5,794</td>
<td>4,664</td>
<td>(1,130)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>35,715</strong></td>
<td><strong>45,732</strong></td>
<td><strong>10,017</strong></td>
</tr>
</tbody>
</table>

*Note: Unaudited data.*

Source: A Skilled and Educated Workforce, published by SBCTC, Workforce Board and Washington Student Achievement Council, 2015.

Increasing student awareness of multiple career paths is recognized as a leading practice

To increase student awareness of multiple career paths, research suggests schools offer career exploration courses or counseling to students by the 9th grade. The University of Chicago found that 9th grade is:

“...a pivotal year that provides a unique intervention point to prevent school dropout...when schools concentrate their efforts on helping students make a successful transition to 9th grade, it results in dramatic increases in graduation.”

Another study from January 2013, funded by the Institute of Education Sciences, the U.S. Department of Education and the Bill and Melinda Gates Foundation, made a similar observation:

“...raising college and career awareness early in high school rather than waiting until the senior year can be beneficial, because students can take steps earlier to prepare for their futures.”
According to educational research, a major reason that students drop out of high school is they cannot see how their high school courses connect to work. Helping students explore the many career options that are available to them by the 9th grade is a recommended practice incorporated in career focused educational models to address this problem. High school dropouts are more likely to lack the skills needed to help fill the state’s skill gap.

An informative careers website can help teach students and parents about CTE and apprenticeship opportunities. One example of a student-friendly careers website is run by Ohio (illustrated in Exhibit 6). It is interactive and has a K-12 specific interface that students can use to explore what career fields might interest them most. Students can learn about skills needed for high-demand jobs and apprenticeships, create profiles, save favorite jobs and colleges, create a resume, and record practice interviews specific to a particular industry.

## More can be done to inform students about CTE career pathways

To help school districts increase student awareness of CTE and apprenticeship opportunities:

- OSPI can develop a model course framework that teaches students about multiple career opportunities
- The Workforce Board can improve the state’s Career Bridge website

### OSPI can develop a model course framework that teaches students about multiple career opportunities

One targeted outcome of the CCSSO Career Readiness Needs Assessment (CCSSO Assessment) is that

“all career pathways [should] begin broadly, focusing on career awareness and exposure; progress to more occupationally-specific courses; and offer multiple entry and exit points to enable students to change paths as their interests and goals evolve.”

After reviewing other states’ practices and recent research, this audit recommends a new statewide, model course framework, developed by OSPI, required for all students in the 7th or 8th grade. This course should inform students about the costs and benefits of a broad sample of the career paths open to them, at an age when they can take advantage of the options education can offer.

Officials at OSPI and other state agencies said the state should provide students with at least one course that informs them of the numerous postsecondary CTE, apprenticeship, military and four-year professional paths that are available, including the educational costs and incomes associated with each. Such a course could help point more students toward high-paying careers that do not require costly university degrees and are in demand in Washington’s economy.
According to the U.S. Department of Education’s 2014 National Assessment of Career and Technical Education, one benefit of engaging youth in CTE programs is that they are more likely to graduate. For example:

- Tacoma School District’s CTE Director told us that some students who had attendance problems in academic classes consistently attended a summer certification program related to the merchant marines without missing a day.
- New York City’s school system reported that high schools with CTE programs have higher attendance and graduation rates than those without.

The course could also provide a cost-effective way of connecting more students with age-appropriate career guidance, bearing in mind that the typical school counselor serves a large number of students. In terms of content, the class should:

- Teach students about the multiple career paths and educational costs and anticipated incomes that accompany them
- Incorporate the development of the High School and Beyond Plan
- Inform students about dual-credit opportunities that exist with CTE programs. (This topic is discussed in detail in Section 4, below.)

Both OSPI and the Workforce Board expressed support for such a required course, although middle school funding requirements might need to be modified to pay for it. Currently, only STEM-related middle school courses may be paid for with CTE funds. OSPI officials further said they were open to developing this course framework, and said a handful of districts have already developed similar types of courses. OSPI said these existing courses can be reviewed to ensure they meet the requirements of a new statewide course framework. This course should meet one of the desired outcomes noted in the CCSSO Assessment, which is the presence of “evidence-based, scalable career advisement models” in regions across the state “to help all students – beginning in middle school – make sound, well-informed decisions about course and pathway participation.”

**Workforce Board can improve the state’s Career Bridge website**

Washington’s Career Bridge website (illustrated in Exhibit 7) is funded and maintained by the Workforce Board. It offers similar information to Ohio’s site. The Career Bridge website allows users to learn about the various career opportunities that correspond with their interests. It provides users with information about the:

- Educational requirements and wages associated with these opportunities
- Regional cost of living and the incomes necessary to cover planned costs

The website links to information about apprenticeships for K-12 students, which is provided by Department of Labor and Industries. However, much of the Career Bridge website’s navigation is tailored more toward adults than high school students. An improved, one-stop website with a specific K-12 interface would let students and parents more easily explore the skills necessary for high-demand jobs. Once improved, Career Bridge could become a more useful tool and component of the new model course discussed above.
2. **Strengthen employer engagement to better align CTE programs and courses with high-wage industry-needed skills**

Businesses report difficulty finding job candidates with the technical skills they need. More coordinated outreach through CTE advisory committees would strengthen school districts’ ability to incorporate the industry skills employers need into coursework. The CTE courses schools currently offer do not always reflect the skills and trades most in demand. To prepare students for the postsecondary world of education and work, Workforce Board, OSPI and SBCTC can do more to ensure that schools and colleges strengthen their engagement with employers. Establishing a systematic approach to engagement could achieve three benefits: better aligning industry expectations across college and district CTE curricula; reducing some of the duplicative effort employers expend by serving on multiple committees; and allowing regional employers to reach a wider group of schools and colleges.

**Employers have reported Washington job applicants lack needed skills or credentials**

In 2016, the Washington Roundtable, whose board consists of private sector executives who seek policy changes to improve economic vitality, reported that employers can find only 25,000 Washington residents to fill the 38,000 jobs each year that require some sort of credential. Consequently, employers must hire candidates from other states to meet their needs. The Roundtable concluded that the state’s educational system is not equipping graduates with the skills that make them employable.

Skill-Up Washington, a non-profit organization that connects low-income individuals with living-wage jobs in high-demand fields, identified a similar skills gap. In the March 2016 Manufacturing Employer Survey of 66 Washington manufacturers, Skill-Up found that 74 percent had difficulty hiring for certain positions that included entry-level manufacturing jobs. For those that had difficulty, the top two reasons were applicants’ lack of relevant work experience (76 percent of respondents) and lack of occupational or technical skills (65 percent of respondents).

Research by the Washington Student Achievement Council, SBCTC and Workforce Board also identified a gap between the needs of Washington’s businesses and the skills of graduates. In 2013 and 2015, these agencies compared employers’ demand for mid-level-skill occupations to the availability of qualified in-state workers. Workforce Board reports that mid-level-skill occupations include those that require a certificate or a two-year degree from a college or a private career school. Their research found large workforce shortages, extending through or beyond 2021, for the occupational areas listed in Exhibit 8.

**Exhibit 8: Employment areas that have a skills gap**

- Manufacturing, production and trades (includes auto and diesel mechanics and machine tool technicians)
- Human protective services (includes firefighters, criminal justice and law enforcement)
- Computer science
- Selected health occupations
- Business, management and sales occupations (includes accountants)
- Service occupations (includes management jobs in culinary and hospitality fields)
- Installation, maintenance and repair

Source: *A Skilled and Educated Workforce – 2013 and 2015 Update*
OSPI, SBCTC and Workforce Board have recognized that the education system must better identify high-skill, high-demand occupations and incorporate them into CTE programs. In their CCSSO Career Readiness Needs Assessment, the three agencies reported:

“There is no cross-system state-wide process that regularly convenes K-12, postsecondary education and workforce development communities with a primary focus on reviewing labor market information and establishing career pathway priorities.”

**Employers have difficulty engaging the many players in Washington’s educational system to discuss employment needs**

Washington’s school districts and colleges are required to have advisory committees to help them identify local employment needs and select CTE course offerings. Districts and colleges sometimes rely on the same local employers to serve on their individual advisory committees. One business association representative said that such demands can overload individual employers and create inefficiencies for both businesses and educators.

Officials at Workforce Board acknowledged that businesses with regional or statewide job openings struggle to engage districts and colleges because they must discuss their skill needs with each one individually. Washington Business Alliance also characterized the state’s education system as difficult for employers to engage.

OSPI officials said some districts have found that having a CTE advocate in district leadership is necessary to maintain relationships with the local business community. For example, Evergreen School District in Clark County hired an employer liaison to partner with employers. This person works with targeted industries to identify CTE programming opportunities where there are significant employer needs but a small supply of job candidates. However, other districts have not established such a position and may not have the resources to do so. Even with such a position, districts may still lack a regional or statewide employment perspective.

Some CTE directors said an additional barrier to effective employer engagement is a lack of interest by some districts and colleges in partnering with one another. This is unfortunate because colleges use labor market information when making program decisions. Labor market analysis – including wage data and employment opportunities – is required as part of SBCTC’s program approval process. Need studies, or indication of need from an employer, are required to support new and emerging occupations that are not covered by standard forecasts or data. This lack of partnering is particularly problematic for the smaller districts that have the fewest resources. Without a coordinated, statewide approach to gaining meaningful industry input, individual districts may be unaware of some high-demand employer needs and the corresponding student opportunities that accompany them as they develop their CTE programs and courses.
The state’s approach to employer engagement may limit the alignment between CTE courses and job opportunities

The audit compared CTE course area enrollments (see sidebar) to corresponding high-paying occupations that are projected by the Employment Security Department (ESD) to have high 10-year growth rates. ESD has forecasted about 409,000 average annual job openings over a 10-year period.

Exhibit 9 compares the 10 CTE course areas with the highest enrollments to ESD forecasted job openings and shows whether the average annual wage for each job category is above or below the state average of $54,000.

The analysis suggests the CTE course areas with the most enrollments do not strongly align with high-paying and high-growth occupations. Moreover, 14 percent of all CTE course areas had no clear alignment to any occupations ESD tracked; examples include independent living, personal choices and interpersonal relationships. For this reason, the courses making up the 14 percent have been excluded from the analysis shown in Exhibit 9.

Exhibit 9 - Ten CTE course areas with the highest enrollment could more strongly align with high-wage, high-demand occupational areas

<table>
<thead>
<tr>
<th>CTE course areas (highest to lowest enrollment)</th>
<th>Percent of CTE enrollments</th>
<th>Average annual jobs</th>
<th>Average wage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Percent of jobs</td>
<td>Rank</td>
</tr>
<tr>
<td>Data Entry</td>
<td>8.3%</td>
<td>&lt; 0.1%</td>
<td>146</td>
</tr>
<tr>
<td>Design</td>
<td>5.3%</td>
<td>0.16%</td>
<td>93</td>
</tr>
<tr>
<td>Photography</td>
<td>4.5%</td>
<td>&lt; 0.1%</td>
<td>147</td>
</tr>
<tr>
<td>Interpreter/Translator</td>
<td>4.2%</td>
<td>&lt; 0.1%</td>
<td>155</td>
</tr>
<tr>
<td>Family and Consumer Sciences</td>
<td>3.9%</td>
<td>&lt; 0.1%</td>
<td>258</td>
</tr>
<tr>
<td>Dietetics/Nutrition</td>
<td>3.9%</td>
<td>&lt; 0.1%</td>
<td>201</td>
</tr>
<tr>
<td>Marketing Management &amp; Research</td>
<td>3.7%</td>
<td>0.59%</td>
<td>43</td>
</tr>
<tr>
<td>Agricultural/Food Sciences</td>
<td>3.7%</td>
<td>&lt; 0.1%</td>
<td>213</td>
</tr>
<tr>
<td>Drafting</td>
<td>3.6%</td>
<td>0.11%</td>
<td>122</td>
</tr>
<tr>
<td>Communication Technologies</td>
<td>3.3%</td>
<td>&lt; 0.1%</td>
<td>140</td>
</tr>
</tbody>
</table>

Note: CTE course areas are defined by Economic Development and Employer Planning System (EDEPS) occupational groupings, not by OSPI program areas or career cluster groupings.


The percentage of overall CTE enrollment for all of these course areas was greater than the percentage of forecasted job openings, and half paid wages that were lower than the state’s average. (Appendix F shows similar results for all the course areas that make up 75 percent of total CTE enrollment.)
CCSSO describes high performing CTE systems as those where states:

...make their high school programs more responsive to the labor market by enlisting the employer community as a lead partner...States need a new “demand-driven” system for determining which programs and pathways warrant continued development and investment, and which should be scaled down and phased out; a system that places a greater value on preparing students for high-paying, in demand jobs.

Consistent with the CCSSO criteria, the Legislature intended for secondary CTE to increasingly focus on high-demand fields to better prepare students for jobs with options for high wages. With this focus in mind, state law requires district CTE plans to help address the state’s skills gap. State law also requires OSPI to establish a list of statewide high-demand programs for secondary career and technical education. But districts may also propose additional high-demand programs by submitting evidence of local high demand. State law does not extend these requirements to the course level. However, because most CTE course enrollments are in course areas that do not strongly align with high-wage, high-demand areas, this suggests that CTE plans and programs could be strengthened to better meet the increased focus on high-demand fields and OSPI’s CTE vision (noted in the sidebar).

This audit did identify CTE course areas, such as computer systems and business management and administration, in high-wage, high-demand occupations that made up the top 75 percent of CTE course area enrollments, listed in Appendix F. The audit also identified high-wage or high-demand CTE course areas, such as firefighting, health occupations, manufacturing and the trades, that were not in the top 75 percent of enrollments.

**Approaches for identifying additional opportunities for CTE programming**

One way to assess CTE programs is to compare CTE course enrollment with those occupations that are forecasted to have the highest number of job openings. Appendix G shows a comprehensive table listing the top 75 percent of forecasted job openings that have corresponding CTE courses, which may show where there are more opportunities for new CTE programs. Another way to assess the opportunities that exist with high-demand occupations is shown in Appendix H. This appendix shows high-demand areas that do not have corresponding CTE courses.

The state can provide more opportunities to CTE students not only by improving alignment of CTE courses with high-wage, high-demand occupations, but also high-wage, stable-demand occupations. For purposes of this audit, high-wage stable-demand occupations are defined as those that pay higher than average wages, but do not have a substantial number of openings or have below average growth.

The primary sources of data used in these analyses consisted of forecasted employment data from ESD and secondary CTE enrollment data from OSPI. But school districts and their local advisory committees may not have the skills or resources to analyze this type of data, which inhibits their ability to make informed decisions about the direction their CTE courses should take.
Leading practices suggest engaging employers to identify high-demand occupations can guide CTE program offerings

Industry researchers say that because of CTE and workforce development’s close ties, educational agencies, workforce boards and local school districts must work together.

For example, the Ohio Governor’s Office of Workforce Development coordinates strategically with the leaders of the state’s business community. Officials work with business partners to develop a list of in-demand occupations and industry-recognized credentials that drive programming across the state’s CTE schools. They also work together to identify community-specific industry-recognized credentials that may differ from the statewide in-demand occupations.

Workforce Board, OSPI and SBCTC could do more to help district and college advisory committees engage employers on a regional basis

One strategy to engage employers more effectively is to coordinate school district and college advisory committees within a region. Doing so could achieve three benefits: better aligning industry expectations across college and district CTE curricula; reducing some of the duplicative effort employers expend by serving on multiple committees; and allowing regional employers to reach a wider group of schools and colleges.

This coordinated approach is supported by Workforce Board, OSPI and business association representatives. In fact, state agencies identified these problems in their CCSSO Career Readiness Needs Assessment:

“...Schools, the workforce system, and CTCs often work separately; even within a region, employer led processes in these systems may be duplicative, redundant, or not shared.”

The assessment also said that the state needs better ways to store and share results of employer-led discussions. This information is not usually shared with OSPI to inform the programs.

While some districts may use a coordinated approach, OSPI reported in the CCSSO Assessment that this approach is not common across the state. SBCTC recognizes the importance of regional coordination in its policy manual and guidelines for college-level advisory committees, emphasizing the benefits of reducing the burden upon businesses. The increased coordination permitted within regional committees can also produce greater continuity in course offerings between secondary and postsecondary institutions.

Kennewick School District meets with businesses as part of an area-wide cooperative committee with six other school districts.

“It needs to be a win-win for businesses – they don’t need to be on seven different advisory committees for the same thing.”

~ Source: Kennewick School District CTE Director
Workforce Board is well-positioned to take the lead in engaging Washington employers

Just as the Governor’s Office of Workforce Development takes a leading role in Ohio, Washington’s Workforce Board is well-positioned to help OSPI and SBCTC identify high-wage, high- or stable-demand job sectors in a coordinated fashion. The CCSSO Assessment noted that the state needs to improve employer engagement and the sharing of labor market data. It concluded that the state should:

“Establish protocols and venues for cross system review of labor market data to plan high-demand, high-skill pathways and systematically identify over time how to identify gaps…continually integrate OSPI, [Workforce Board and colleges’] employer engagement efforts to ensure that this work is shared and streamlined…”

State law already gives Workforce Board authority to solicit employers’ feedback about how CTE programs align with their needs. Workforce Board is also required to help OSPI prepare a list of high-demand programs.

Officials at Workforce Board said they are best positioned to collect feedback from businesses that have regional or statewide job openings and to share that information with districts and colleges. Such data could supplement the conversations with employers that already take place at the district and college levels. Workforce Board could help improve secondary CTE business engagement as it implements the state’s workforce strategic plan, “Talent and Prosperity for All,” which was approved in 2016. One of the plan’s four strategic goals aims to increase employer engagement across the state.
3. Update the list of high-demand programs, strengthen the review of local labor demand data and clarify laws to help reduce the state’s skills gap

OSPI currently lacks an updated list of statewide high-demand programs, which state law requires to help inform school districts about what types of programs are needed. When districts want to propose additional CTE programs, state law requires them to submit evidence of local high demand to OSPI when seeking approval for those programs. To ensure that each district’s CTE programs help address the state’s skills gap, OSPI reviews this evidence before approving the district’s CTE plans. OSPI could strengthen the approval process for new and existing programs if it consistently reviewed actual labor market data or analysis that is sufficient to demonstrate high demand. Collecting and reviewing this type of evidence for all CTE programs and having the Legislature define key terms in the state’s CTE statutes would help OSPI to better assess whether district CTE programs are helping to address the skills gap.

Below are four areas that either OSPI or the Legislature needs to address to improve efforts to ensure that secondary CTE programs are helping address the state’s skills gap:

- OSPI lacks an updated list of high-demand CTE programs as state law requires
- Districts are not required to submit labor market data or analysis that is sufficient to demonstrate high demand. This evidence might help OSPI better assess whether district CTE programs help address the skills gap
- Some course equivalencies might limit how well CTE programs align with high-wage, high demand occupations
- State laws governing CTE contain undefined terms

Update the list of high-demand CTE programs as state law requires

OSPI is required by state law to work with SBCTC, Workforce Board and the Washington State Apprenticeship and Training Council to develop a list of high-demand programs for the benefit of secondary CTE, but this list has not been updated since 2009. The law’s intent is to help OSPI focus secondary CTE programs on current high-demand areas that help address the state’s skills gap. Without an updated list of high demand programs, districts are missing valuable information that could help improve their CTE programming.

The U.S. Department of Education found problems associated with states’ limited role in determining CTE programming in the Department’s 2012 publication, *Investing in America’s Future: A Blueprint for Transforming Career and Technical Education*:

“...the current [Perkins] Act does not require states to systematically identify the economic needs and priorities of the state, regional, or local economies when making decisions on which CTE programs should be funded...As a result, local program administrators...cannot make informed decisions on which programs to support...”
The Department’s proposed solutions are consistent with Washington’s requirement for a statewide list of high demand programs.

“In collaboration with its workforce and economic development agencies, each state would identify in-demand occupations in high-growth sectors on which CTE programs...would focus. States then would disseminate this information to local CTE administrators to ensure that programs are responsive to labor-market needs and aligned with regional priorities for economic growth.”

**Require districts to submit actual labor market evidence demonstrating high demand for both new and existing CTE programs**

Districts must obtain OSPI approval for new CTE programs based on evidence of local high demand. State law directs districts to submit evidence that demonstrates how new CTE programs align with local high-demand fields when those programs are not part of OSPI’s list of high-demand programs. OSPI is required by law to consider this evidence before approving new CTE programs. State law requires districts to submit this evidence after having first consulted with an advisory committee.

OSPI guidance currently allows school districts two options for demonstrating how CTE programs help address the skills gap:

- Districts may submit advisory committee approvals in the meeting minutes with an attestation that these approvals were based on review of evidence of labor market demand. However, officials from Workforce Board, OSPI and the Washington Business Alliance said that the rigor that these committees demonstrate when reviewing and approving district CTE programs and courses can vary across districts.
- Districts may submit the actual evidence of labor market demand instead of the committee meeting minutes.

Evidence of local high demand is not required for existing programs. State law does not require districts to periodically resubmit evidence that demonstrates how existing CTE programs align with local high-demand fields. Currently, districts attest to whether there have been any changes to their existing programs through OSPI’s five-year re-approval process. However, there is no ongoing requirement that current evidence of local labor market demand be periodically resubmitted to OSPI to demonstrate that existing programs remain in high-demand. Consequently, over time, there is a risk that some programs that once corresponded with local high demand may no longer do so.

With help from the Legislature, OSPI could strengthen the approval process for ensuring that new and existing CTE programs are helping address the state’s skills gap. OSPI could improve the approval process for new CTE programs if it consistently based its review on the actual labor market data or analysis that sufficiently demonstrates high local demand. OSPI currently accepts advisory committee approvals in the meeting minutes with an attestation that these approvals were based on review of evidence of labor market demand. OSPI could further improve the approval process with additional funding and new legislation requiring districts to also submit actual labor market data or analysis for existing CTE programs when OSPI re-approves them every five years.
As discussed in more detail earlier, SBCTC has established robust expectations for the evidence that colleges must submit when seeking approval of their CTE programs. OSPI should encourage districts to engage with local colleges to obtain their labor market data and analysis wherever applicable and submit it when seeking CTE program approval.

With additional funding and new legislation, these steps would not only strengthen OSPI's ability to ensure that district CTE plans are helping to address the state's skills gap, they would also help improve the alignment with high-wage, high-demand occupations listed in Exhibit 9 on page 26.

**Evaluate how some course equivalencies might limit how well the state's CTE programs align with high-wage, high-demand occupations**

School districts are required to adopt CTE course equivalencies and offer them to students at high schools and skill centers. Through course equivalencies, students can take CTE courses that satisfy two graduation requirements while earning one credit. This allows students greater flexibility in meeting graduation requirements while preparing for their career of interest. SBE and OSPI have developed and approved more than 30 statewide CTE course equivalency frameworks. These frameworks allow CTE courses to result in credits in subjects like algebra, geometry and lab science. School districts also have the authority to develop local course equivalencies. At a minimum, districts must grant academic course equivalency in mathematics or science for high school CTE courses either through statewide or local CTE course equivalency frameworks. To help them, OSPI has issued guidance that tells districts how CTE courses can meet student graduation requirements in areas such as math, science, English, health and fitness, and art.

In the past, some CTE directors expressed concern that course equivalencies might dilute the “career and technical” focus of CTE programs. OSPI, Workforce Board, SBCTC and other CTE stakeholders said that some districts:

- Adapt their basic education courses to meet CTE course standards to increase funding from the state
- Select CTE programs and courses that are more affordable or can easily meet multiple graduation requirements through course equivalencies

As shown in Exhibit 9 and Appendix F, those CTE course areas with the highest enrollment did not strongly align with high-wage, high-demand occupations. This may be partly because some CTE course equivalencies do not strongly align with high-wage, high-demand occupations. For example, students can meet the graduation requirement for art by taking CTE courses in photography, jewelry making, theater design and floral design.

**Define key terms used in state law governing CTE**

This audit found undefined statutory terms, which contribute to a lack of clarity around the Legislature’s intent for CTE programming. Under state law, OSPI must approve all district CTE plans and programs to ensure that they help address the skills gaps of Washington’s economy. However, the term “skills gap” is undefined in statute.
The Legislature might have intended the term to mean a condition in which “the number of students per year prepared for employment from in-state programs is substantially fewer than the number of projected job openings per year in that field” (RCW 28A.700.020 (2)(b)). The Legislature might also have intended it to mean “occupations with a substantial number of current or projected employment opportunities” (RCW 28A.700.020 (2)(c)). Another possible definition is “the number and type of higher education and training credentials required to match employer demand for a skilled and educated workforce” (RCW 28B.77.080 (3)).

In addition, the statutory language defining CTE refers to preparing students for “high wage” employment options but does not define what constitutes a high wage. Oregon recognized the need for a common definition of high wage. In 2007, the Oregon Employment Department collaborated with the Oregon Workforce Investment Board, Oregon Department of Education and others to define high wage as “paying more than the all-industry, all-ownership median wage for statewide or a particular region.”

Clarifying these laws would help ensure that CTE programs meet legislative intent.
4. Expand the number of CTE dual-credit opportunities to increase the number of pathways from high school to college

Students can take CTE courses in high school that align with similar courses in college programs, allowing them to gain “dual credit” at the college. This dual credit is typically achieved through articulation agreements negotiated between one high school and one college. While all colleges are required to give equivalent credit, some may only award the credit as an elective. Articulated CTE courses offered and transcripted by one college might not be accepted towards the same CTE program at another college. This could lead to students having to retake courses when they enter or transfer to other colleges.

The content and number of agreements can vary significantly across the state. Because they are negotiated and managed between individual college faculty and district CTE directors and teachers – a time-consuming and costly process – these agreements result in duplicative costs for the system.

SBCTC maintains a database of most existing agreements, but there is little funding available to expand them. In addition, the state as a whole lacks a mechanism to develop statewide articulation agreements for CTE that could serve many districts and colleges more efficiently. A statewide approach to articulation could increase the number of dual credit opportunities for students and reduce the administrative costs to school districts and colleges.

**Students experience difficulties obtaining dual credit**

Although state law requires schools and colleges to work together to develop a seamless transition into higher education for students across the state, school districts and OSPI officials said this does not happen consistently. Even when articulation agreements are established, high school students do not always receive equivalent college credit for the specific CTE course taken. Instead, the student might only receive an elective credit if he or she moves or chooses to attend another college. This can result in students taking additional college-level courses to make up credits, adding to the cost and time needed to complete their postsecondary CTE program.

**Fewer articulation agreements may have led to fewer dual-credit opportunities for students**

SBCTC’s Statewide Enrollment and Reporting System (SERS; see sidebar) database, which captures most of the state’s active articulation agreements, shows the number of agreements has dropped from just over 4,200 in the 2010 school year to about 2,800 in the 2016 school year. Exhibit 10 (on the following page) illustrates a 33 percent decline over this seven-year period.
Two factors make maintaining and expanding articulation agreements challenging.

1. **Loss of Tech-Prep funding.** The Tech-Prep program is part of the Carl D. Perkins CTE Act of 2006. Until the funding was discontinued in 2011, districts and colleges nationwide used Tech-Prep funding to pay for the staff time needed to negotiate articulation agreements. OSPI officials said the loss of Tech-Prep funding, which amounted to $2 million a year in Washington, contributed to the drop in articulation agreements. The Legislature has not compensated for this loss by adding or redirecting other funding.

   Interviews with school district CTE directors, agency staff and colleges revealed that having strong CTE leadership positions to build close relationships between college faculty and school districts was important to establishing and maintaining articulation agreements. However, the loss of Tech-Prep funding has made it less likely a district can pay for these types of positions.

2. **Long distances between districts and colleges.** SBCTC said colleges are required by law to focus on schools in their local communities. Even without this requirement, long distances between colleges and districts might impede the establishment and maintenance of articulation agreements. For example, the University of Alaska recently found that rural districts are less likely to have active articulation agreements than urban districts.

Exhibit 10 – The number of articulation agreements in Washington has declined from the 2010 school year

*Limited to agreements with students enrolled, 2010-2016 school years*

Note: Data is limited to the 30 colleges that record articulation agreements in SERS.

We did not audit the accuracy or completeness of the SERS database.

Data source: SBCTC’s SERS system.
OSPI and SBCTC acknowledged in the CCSSO Assessment that they need to better integrate secondary programs with postsecondary programs so the CTE courses students take build on one another. State agencies have long recognized the benefits of this integration. In response to the elimination of Tech-Prep funding in 2011, the Workforce Board worked with SBCTC and OSPI to develop statewide model programs of study and articulation agreements for four industry clusters: agriculture, allied health, information technology and aerospace and manufacturing. Anticipated benefits included more dual-credit opportunities for students across the state, and less time and labor needed to craft individual articulation agreements. Ultimately, none of the statewide articulation agreements were completed for the four industry clusters. Detailed reasons for this lack of success are not clear, but Workforce Board minutes from the time say faculty time and financial support were the challenges.

**Statewide articulation and common course numbering can help students transfer credits from secondary to postsecondary schooling**

Educational experts point to articulation as a way to maximize students’ dual-credit opportunities. Industry literature recognizes two key leading practices that can help students transfer credits from secondary to postsecondary education:

- Statewide articulation agreements
- Common course numbering

The benefit to students of these practices is a virtually seamless transition from a high school CTE course to the related program at any college in the state system without losing any of the dual credits already earned. Exhibit 11 illustrates the portability of credits.

**Exhibit 11 – Portable credits help students carry high school credits into college**

Vertical alignment is achieved by establishing articulation agreements that allow all state students who take a specific high school CTE course to receive college credit at any college that offers that CTE program statewide.

Horizontal alignment is achieved by aligning courses between different colleges, using common course numbering to easily transfer credits between colleges.
Ohio’s statewide articulation agreements help high school students earn college credit

Ohio is an example of a state that has implemented statewide articulation. Ohio uses statewide articulation agreements to maximize dual-credit opportunities through a more consistent, transparent and efficient process in which every student can transfer CTE credit to any college in the state. The state began by focusing on the most common CTE courses with curricula that could be tied to nationally recognized industry credentials in fields such as nursing, welding and automotive repair. To identify specific employers' needs, Ohio solicits industry input and builds these technical skills into CTE curricula requirements.

Ohio has articulated more than 100 CTE courses across more than 30 CTE programs, benefitting the state's colleges, school districts and students. Most of these courses are used by at least seven colleges, some by more than 20. The state has used Perkins Act funding to partly pay for the statewide articulation project.

For CTE courses that are not common across the state's college system and thus not subject to statewide articulation agreements, Ohio allows districts and colleges to independently enter into one on one articulation agreements. However, they must use state-issued guidance to develop articulation agreements at the local level to ensure consistency.

Common course numbering allows students to transfer credits more easily

Other states use common course numbering to achieve horizontal alignment at the college level. Common course numbering, along with statewide articulation, allows colleges to evaluate one another’s courses and helps students transfer credits between institutions seamlessly. The following practices helped Ohio and Colorado achieve horizontal alignment:

- **Legislation in Ohio requires a common course numbering system** that helps vertical and horizontal transfer of credits for Ohio's common CTE courses. The procedures and policies in Ohio have given high school students access to a large number of postsecondary CTE credits statewide.

- **Colorado uses consistent course numbering for the most common college programs** to help transfer credits. Colorado’s Community College System has applied common CTE course numbering across most of the state’s 13 colleges. This horizontal alignment is intended to allow students to transfer high school or college credits more easily to any college in the system.

Common CTE course numbering in Washington

SBCTC recently put a new online process in place that makes it easier for two or more colleges to voluntarily establish common CTE course numbering. SBCTC said that as of September 2017, there are 65 professional-technical common courses with more in development. These efforts should complement the common course numbering that will be needed if Washington moves to statewide articulation agreements.
Statewide articulation could bring benefits and savings to the state but will require cooperation between agencies

The benefits of targeted, statewide articulation agreements are clear to many stakeholders. While SBCTC officials supported statewide articulation, they noted agreements should be limited to courses that have a good return on investment, such as those that are common across the college system. They also said that statewide articulation should be initiated on a pilot basis with additional funding. Workforce Board indicated that legislative changes are needed to require the cooperation that is necessary for statewide articulation.

An opportunity for statewide articulation in aerospace

Washington’s 10 Centers of Excellence focus on developing curricula and training related to industry sectors that are recognized as strategic to the state’s economic competitiveness. Their courses are intended to help the college system operate more efficiently and effectively to provide students with the relevant skills needed for jobs in those industries.

The Director at the Center of Excellence for Aerospace and Advanced Manufacturing in Everett told us the Center works with Boeing to create curriculum that meets the needs of Boeing and company suppliers, explaining the importance of standardized assessments that demonstrate the skills students learn meet industry requirements. The Director also noted the potential for establishing a statewide articulation agreement for aerospace, once benchmarks for industry skills are fully established.

The decentralized approach districts and colleges take in establishing articulation agreements results in duplicative costs. This is one reason why Ohio has pursued statewide articulation. These individual negotiations require college and district staff time, costs that could be reduced across the state’s education system if the efforts were pooled.

An example of regional articulation: Pierce County Careers Connection

To avoid duplicative costs, Pierce County school districts and colleges developed a consortium – the Pierce County Careers Connection (PC3) – to articulate CTE courses in a pooled manner. The consortium includes 16 school districts, three colleges and four skill centers, a few of which are outside the Pierce county line.

As of January 2017, PC3 has 113 articulation agreements that are available for use by every member of the consortium. Based on the time and costs the PC3 administrator said were needed to develop a typical articulation agreement, the total cost of negotiating all 113 agreements are an estimated $196,000 (see Exhibit 12, and Appendix B for information about the methodology behind all these calculations).

Exhibit 12 – Estimated cost to negotiate one PC3 articulation agreement

<table>
<thead>
<tr>
<th>Time</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 hours</td>
<td>$1,734</td>
</tr>
</tbody>
</table>

To negotiate all 113 PC3 agreements currently in use cost about $196,000 (See Appendix B for our assumptions and methodology.)
If each member of the consortium had to negotiate each of the articulation agreements that they used individually, consortium members would have spent approximately $1.2 million more, including an additional 27,600 hours of staff time, to achieve the same level of articulation they have under the umbrella of PC3, shown in Exhibit 13.

**Exhibit 13 – Regional articulation agreements in Pierce County likely saved more than $1 million in labor costs**

*Estimates based on PC3 articulation agreements for 2016*

<table>
<thead>
<tr>
<th>Potential costs savings for PC3 participants</th>
<th>Additional uses of agreements</th>
<th>Estimated savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based on number of times PC3 pooled agreements are currently used</td>
<td>690</td>
<td>$1.2 million</td>
</tr>
</tbody>
</table>

Return on investment estimated for each pooled articulation agreement $10,404

Note: Data provided by PC3 administrator and SERS for these calculations was unaudited.

Data source: PC3 administrator, Student Enrollment Reporting System (SERS), U.S Department of Labor.

Statewide articulation agreements for courses with the highest return on investment could offer even greater savings because they could be distributed across the state’s entire education system. **Exhibit 14** illustrates the number of additional school districts, colleges and skill centers that could benefit from statewide articulation.

Because the state relies mostly on articulation agreements negotiated between one college and one district, rather than using statewide articulation where it is cost-effective, school district and college resources are strained and fewer student pathways achieved. Statewide articulation could lower costs, provide greater opportunities for students across the state, and provide more consistent and equitable access to these pathways.

**Exhibit 14 – Opportunity for savings through statewide articulation**

*Based on 295 school districts, 34 colleges, 15 skill centers*

Data source: PC3 administrator, OSPI and SBCTC.
The state must determine how to pay for statewide articulation efforts in the face of reduced funding

Shifting from individual articulation agreements to statewide agreements should eventually reduce costs across the entire CTE system. However, Workforce Board, OSPI and SBCTC will have additional demands placed on their resources to achieve statewide articulation, as will district and college faculty who work on these agreements. Once the costs of these agency, district and college efforts are calculated, the Legislature will need to decide how to fund them. After statewide articulation is established and is achieving system savings, the Legislature will need to decide where to invest these funds.

A legislatively mandated workgroup could help establish statewide articulation agreements that incorporate common course numbering

Agencies, colleges and districts that administer Washington’s CTE programs lack the statutory authority to require cooperation from one another, which has resulted in a fragmented CTE system. This is partly because no one group is responsible for system oversight. Many of the difficulties districts and colleges face in developing articulation agreements are exacerbated by this lack of coordination. A legislatively mandated workgroup, led by Workforce Board, including representatives from OSPI and SBCTC and aided by district and college faculty, could achieve the coordination needed to establish statewide articulation agreements. These agreements should incorporate common course numbering and lead to dual credit for use by all school districts and colleges. This workgroup would be accountable to the Legislature.

Workforce Board already has these significant statutory roles (see Appendix C):

- Provides for coordination among the different agencies that administer CTE
- Performs a biennial assessment of the vocational education needs and assesses the extent to which vocational education along with employment, training, and basic education services represent a consistent, integrated approach to meet such needs
- Facilitates the transfer of credit policies and encourages articulation agreements between secondary and postsecondary CTE programs

It is due to these statutory roles that Workforce Board is well positioned to serve as the lead agency over the workgroup.
Conclusion

Stakeholders have identified a number of long-standing issues that continue to affect CTE delivery. As we talked to agencies, school districts, colleges and other stakeholders, a recurring observation emerged: a fragmented CTE system prevents the state from successfully addressing these issues, creating barriers for CTE students after high school. In the 2016 CCSSO Career Readiness Needs Assessment, OSPI, SBCTC and Workforce Board reached a similar conclusion.

The agencies that deliver, oversee and operate Washington's CTE programs do so with little coordination and are guided by statutes that lack clarity. The lack of coordination extends to school districts and colleges, making a student's secondary-to-postsecondary transition more difficult. Implementing the leading practices identified in this report can be more difficult when multiple agencies must work together – each with its own leadership, mission and funding – but lack the statutory authority to require cooperation.

Industry sources recognize it is a leading practice to coordinate a state’s secondary and postsecondary CTE programs. Greater coordination should be supported by legislation that helps the two systems undertake the task of engaging with large or regional businesses to improve the relationship between employer needs and student learning, as well as leading the process of establishing statewide articulation agreements for CTE courses that are common across the college system and are easily tied to industry standards.

Consequently, we make recommendations to the Legislature, OSPI, Workforce Board and SBCTC that will clarify statutes and improve coordination, oversight and cooperation across Washington's career and technical education system. These recommendations should help improve career guidance for students, increase dual credit opportunities for college courses taken in high school, smooth secondary to postsecondary transitions and strengthen engagement with the state's business community.
Recommendations

We recommend the Legislature:

1. Require the Office of Superintendent of Public Instruction (OSPI) to work with the State Board of Education to establish a model course framework required for all students in the 7th or 8th grade that:
   a) Teaches students about multiple career paths that include postsecondary career and technical education (CTE), apprenticeships, military and four-year professional opportunities along with the educational costs and anticipated incomes that accompany each
   b) Informs students about dual-credit opportunities that exist within CTE programs
   c) Includes the development of students’ High School and Beyond plans
   d) Incorporates the improved Career Bridge website or other comprehensive career guidance tools

2. Require the Workforce Board to establish a workgroup that is funded by the Legislature and consists of staff from the Workforce Board, OSPI and the State Board for Community and Technical Colleges (SBCTC). This workgroup should be responsible for establishing:
   a) A complete inventory of all active articulation agreements maintained in a centralized database, which must be used by all districts and colleges
   b) A list of all CTE programs across districts and colleges to help identify articulation opportunities
   c) Statewide articulation agreements for those courses offering a good return on investment that incorporate common course numbering and lead to dual credit for use by all school districts and colleges
   d) Standards identifying key elements required for all unique and statewide articulation agreements
   e) A structured process to increase regional coordination of secondary and postsecondary advisory committees to more effectively and efficiently engage employers
   f) A method to coordinate data sharing and analysis using:
      • Employment Security Department data on occupational wages and growth forecasts
      • Biennial business surveys conducted by the Workforce Board
      • Labor-market demand data collected by colleges and SBCTC that drives postsecondary CTE programs and courses

3. Once established, require the workgroup to:
   a) Define how to prioritize the establishment of new statewide articulation agreements. These agreements should:
      • Be implemented through a deliberative process between faculty in school districts and colleges
      • Begin with the most common CTE courses, including those with curricula that can be easily tied to nationally recognized industry standards
• Incorporate curricula that are established in partnership with the Centers of Excellence and businesses where applicable
• Require reviews at least once every three years to update the curricula

b) Develop and report performance measures to the Legislature that show:
• The increase in the number of CTE college paths (articulated dual credit courses multiplied by the number of colleges that accept them)
• Cost savings achieved across the secondary and postsecondary systems

4. Revise RCW Chapter 28A.700 to:
   a) Define the term “skills gap”, as used in RCW 28A.700.010 (2)(a), which requires districts to demonstrate how their CTE plans help address the skills gap. Clarifying this term would potentially affect how and the extent by which high-demand occupations drives CTE programming. This new definition should apply consistently across agencies.
   b) Define the term “high wage” as used in the definition of CTE (RCW 28A.700.010 (5)), which in part defines CTE as “a planned program of courses that enable options for students to obtain high-wage employment preparation.” This new definition should apply consistently across agencies.
   c) Require districts to submit evidence of high local labor demand for existing CTE programs when OSPI reapproves them every five years

We recommend the Office of Superintendent of Public Instruction:
5. Communicate to school counselors annually the importance of discussing CTE and apprenticeship paths along with academic paths as part of each student’s High School and Beyond Plan
6. Consistent with state law, work with the Workforce Board, Washington State Apprenticeship and Training Council, and SBCTC to establish a regularly updated list of high-demand CTE programs using the occupational demand data provided by Workforce Board
7. Consistent with state law, strengthen procedures and documentation requirements to assess whether CTE programs that districts propose or renew correspond with local high demand

We recommend the Workforce Board:
8. Gather input from OSPI and the State Board of Education to enhance the Career Bridge website. This website should include information about CTE and dual-credit opportunities in high school.

We recommend the State Board for Community and Technical Colleges:
9. Share with OSPI and the Workforce Board the labor market data and analysis that colleges and SBCTC consider when developing postsecondary CTE programs and courses
Dear Auditor McCarthy:

Thank you for the opportunity to review and respond to the State Auditor’s Office (SAO) performance audit report on Leading Practices for the State’s Secondary Career and Technical Education Programs. The State Board for Community and Technical Colleges (SBCTC) and the Workforce Training and Education Coordinating Board (Workforce Board) worked with the Office of Financial Management to provide this response.

We commend your staff for their efforts to evaluate our state’s complex career and technical education (CTE) system and the report’s emphasis on better aligning CTE courses more directly with high-wage, in-demand occupations.

We wholeheartedly agree that Washington students must be exposed early to a full range of career options — including well-paying careers that require more than a high school diploma but less than a bachelor’s degree. As the report shows, Washington employers are struggling to find enough people to fill jobs that require such mid-level of education.

We also agree with the need to make better use of labor market data to guide high school CTE efforts, and to create seamless connections between high school and community and technical college programs. We support expanding dual-credit opportunities for CTE programs as well as strengthening and expanding local articulation agreements. Articulation agreements are formal agreements that provide a smooth transfer of credits to college programs. We also recognize the need to use sound data in determining the labor market value of particular CTE courses, and whether they should be expanded or reduced.

The SAO used readily available data crosswalks from the Economic Development and Employer Planning System (EDEPS). However, this system, which directly links any single CTE course to the outcomes from a small number of jobs, has significant limitations and can confound results. A better method is needed to provide accurate career guidance information.

For example, EDEPS shows only two occupations for the family and consumer sciences career cluster; both are at or above the bachelor’s degree level. This suggests family and consumer sciences is a CTE course that leads to above-average wages. At the same time, data entry — the course group with the highest CTE enrollment in Washington schools — shows below average wages because it is linked solely to basic data entry jobs, despite computer skills being foundational for most modern occupations, including those at the highest wage levels.

We recommend further research and analysis that focuses on career pathways so students planning their future can more fully understand the potential labor market. Complementary analysis at the course level...
should distinguish different “types” of CTE courses: separating career and education planning courses; distinguishing between exploratory and preparatory courses in programs of study; and identifying broadly applicable foundational skill courses while distinguishing those primarily applicable within technical education from those with general applicability to education.

The recommendations in your report align well with the mission and goals of the state strategic plan for workforce development — Talent and Prosperity for All (TAP). We invite the SAO to present its findings and recommendations to the Workforce Board, which oversees TAP implementation, and discuss potential strategies to advance recommendations.

With regard to legislative recommendation No. 2, we appreciate that you called upon the Legislature to fund the proposed work group. If funded, we ask that the Legislature consider the work, structure and relationships already established as it outlines the structure and responsibilities for the group.

The Workforce Board is the legislatively designated coordinating body for policy and strategy linking Washington’s secondary and postsecondary education systems. For many years, the Workforce Board has advocated creating multiple pathways to economic self-sufficiency and engaged stakeholders in secondary and postsecondary education regarding articulation policy. The business- and labor-led Workforce Board is well situated to provide staff support and coordination for the work group.

The Office of Superintendent of Public Instruction (OSPI) and SBCTC, as governing bodies for high schools and colleges, are in a strong position to leverage partnerships and bring faculty together to forge successful articulation agreements. (The “Bridge to College” courses are a good example). Superintendent Reykdal and Executive Director Yoshiwara have already directed staff to develop a dual-credit pilot program that could be adopted by multiple districts and colleges. It is important to note that credit acceptance policy and curriculum rests with the colleges and their faculty according to accreditation standards spelled out by the Northwest Commission on Colleges and Universities. Articulation agreements cannot be mandated by the SBCTC, the Workforce Board or OSPI. That said, SBCTC has a proven track record in facilitating system-wide initiatives and has the trust, experience and understanding to navigate faculty and institutional roles.

We recommend starting with a smaller pilot project to identify barriers and opportunities. Creating a statewide articulation agreement and common course numbering among 30 community and technical college districts and 295 school districts — all governed by their own local boards of trustees — will be complex and time-consuming.

SBCTC and the colleges have a deep level of experience in engaging employers through program advisory committees, centers of excellence, job skills and customized training programs. More than 2,000 employers serve on program advisory committees.

We would be pleased to explore a more coordinated approach to advisory committees. Advisory committee structure is defined in statute (RCW 28B.50.252) and under SBCTC policies. Additionally, colleges have longstanding, effective advisory committees. Regional and combined advisory committees are permissible under SBCTC guidelines, but requiring a regional or statewide approach is unlikely to achieve the desired outcome as employers are often loyal to specific programs and institutions. Consideration can be given to increasing the presence of high school faculty on college advisory committees and vice versa, better coordination of employer engagement and regional entities, where warranted.
We also respectfully suggest that success would be better measured by including the number of students who articulate from high school CTE programs to college professional-technical programs, not solely by the number of articulation agreements that are in effect. Also, it would likely be impossible to measure success in terms of cost savings because of the complexity and time involved in designing robust articulation agreements.

Your report on the state’s CTE system demonstrates opportunities to help ensure more students gain earlier access to career planning, a more unified and expanded range of high school-to-college dual credit opportunities, a renewed focus on engaging business to ensure coursework is current and connected to the real world, and more CTE courses that better align with the high-wage, high-demand jobs available in Washington.

SBCTC and the Workforce Board remain committed to working closely together — with OSPI — to expose students to the exciting array of career options before them and to supply the relevant, research-based programs to move them into those careers. With that in mind, we are providing the attached response to recommendations in the audit report.

Please extend our thanks to your staff for exploring innovative approaches here in Washington and in other states and for gathering numerous perspectives for this report.

Sincerely,

Jan Yoshiwara
Executive Director
State Board for Community and Technical Colleges

Eleni Papadakis
Executive Director
Workforce Training and Education Coordinating Board

David Schumacher
Director
Office of Financial Management

cc: David Postman, Chief of Staff, Office of the Governor
Kelly Wicker, Deputy Chief of Staff, Office of the Governor
Drew Shirk, Executive Director of Legislative Affairs
Pat Lashway, Deputy Director, Office of Financial Management
Scott Merriman, Legislative Liaison, Office of Financial Management
Inger Brinek, Director, Results Washington, Office of the Governor
Tammy Firkins, Performance Audit Liaison, Results Washington, Office of the Governor
Nancy Dick, Director of Workforce Education, State Board for Community and Technical Colleges
Dave Pavelchek, Denutv Director, Workforce Training and Education Coordinating Board
This coordinated management response to the State Auditor’s Office (SAO) performance audit report received November 21, 2017, is provided by the Office of Financial Management, the State Board for Community and Technical Colleges and the Workforce Training and Education Coordinating Board (Workforce Board).

SAO PERFORMANCE AUDIT OBJECTIVES:

The SAO designed the audit to identify school districts that are providing effective Career and Technical Education (CTE) programs that meet the needs of students and employers and develop a set of leading practices that may be useful to other districts across the state. It asked:

1. Are secondary CTE programs and courses aligned with the needs of students and employers?
2. Are there leading practices that could improve the success of the state’s secondary CTE programs?

SAO found the following conditions that could improve the alignment between the courses students that are offered in secondary CTE programs and job opportunities:

1. Improving career guidance given to students and providing it in a classroom setting in the seventh or eighth grade.
2. Strengthening employer engagement could better align CTE programs and courses with high-wage industry-needed skills.
3. Updating the list of high-demand programs, strengthening the review of local labor demand data and clarifying laws may help reduce the skills gap.
4. Expanding the number of CTE dual-credit opportunities to increase the number of pathways from high school to college.

SAO directs recommendations 1-4 to the Legislature and 5-7 to the Office of Superintendent of Public Instruction (OSPI).

SAO Recommendation 8 to the Workforce Board: Gather input from OSPI and the State Board of Education to enhance the Career Bridge website. This website should include information about CTE and dual-credit opportunities in high school.

STATE RESPONSE: The Workforce Board agrees with the recommendation and will gather input from OSPI and the State Board of Education on improving the Career Bridge site. We agree with the report’s emphasis on Career Bridge as a useful tool for career and education planning for students. The Workforce Board has been working on creating new components to Career Bridge that demonstrate the value of secondary career and technical education as well as developing concepts such as a digital portfolio, where students can save their resumes and letters of recommendation, along with other career-connected learning efforts. These features would make the site much more valuable for middle and high school students.
The Workforce Board also will reach out to OSPI and the State Board of Education to retrieve data on dual-credit opportunities and CTE. This will take place on a regular basis once information is available and contingent on additional funding to support the creation and maintenance of additional webpages on Career Bridge.

The Workforce Board is also interested in working with its stakeholders on other resource and revenue models for Career Bridge. Currently, Career Bridge does not have a sustained or predictable funding source.

**Action Steps and Time Frame**

- The Workforce Board will consult with OSPI and the State Board of Education for feedback about ongoing efforts to make Career Bridge a more useful tool for students. *By March 31, 2018.*

---

**SAO Recommendation 9 to the State Board for Community and Technical Colleges (SBCTC):** Share with OSPI and the Workforce Board the labor market data and analysis that colleges and SBCTC consider when developing postsecondary CTE programs and courses.

**STATE RESPONSE:** The State Board for Community and Technical Colleges agrees with the recommendation. Due to the large number of programs, it is not practical to share program-specific data. We will share tools and processes used by the community and technical colleges when developing postsecondary CTE programs and courses.

**Action Steps and Time Frame**

- SBCTC will share with OSPI and the Workforce Board the labor market data tools and professional-technical program approval process used by community and technical colleges when developing postsecondary CTE programs and courses. *By March 1, 2018.*
December 14, 2017

The Honorable Pat McCarthy  
Washington State Auditor  
P.O. Box 40021  
Olympia, WA 98504-0021

Dear Auditor McCarthy:

I have received and reviewed the State Auditor’s Office performance audit report on Leading Practices for the State’s Secondary Career and Technical Education Programs, and appreciate the opportunity to provide a response. On behalf of our Career and Technical Education department, please share our appreciation for your staff’s willingness to engage in dialogue and attempt to understand the systems, structure, and policy that guide CTE programs. We also appreciate your recognition of the challenges of creating recommendations that reflect secondary CTE delivery through the K-12 system in a local control state.

We agree that the role a counselor plays in the school system is critical, and appreciate that you called attention to our state’s students-to-counselor ratio being double the ratio recommended by the American School Counselor Association. As reflected in our 2018 supplemental budget request related to High School and Beyond Plans, our agency is requesting an increase in funding for middle school counselors, support for the development of counseling resources, and professional development funds. If a middle school career exploration course were pursued, our office would collaborate to create a model course framework as an option for school districts. Eventually, a law would need to be amended to allow for a non-STEM CTE funded course to be offered at the middle school level.

Our agency has consistently supported Career Bridge as a useful tool for school district use, and look forward to providing feedback for improvements. The lack of an updated statewide high demand list was an oversight, which can be corrected and maintained with cooperation from our partners at the Workforce Training and Education Coordinating Board, Washington State Apprenticeship and Training Council, and the State Board for Community and Technical Colleges. Once updated, this resource will be provided to districts and be used to inform decision making at our agency.

We also agree that the role a district advisory committee plays is critical. Both federal Perkins and state law require annual evaluations of CTE programs, but the potential engagement of our business partners surpasses the legal requirements. Many districts have combined efforts to create consortium or regional based advisory groups, and we are looking forward to gauging school district interest and investigating the benefits of shared advisory committees with community and technical college partners. It is common for secondary CTE programs to have both general and program specific advisory committees. In areas of shared programs, we can seek structures that will enable us better to respect the time of our industry partners.
I believe in the importance of making data-driven decisions. We believe that the course area data, when crosswalked with Economic Development and Employer Planning System (EDEPS) occupational groupings, does not provide the most reliable narrative of our state's offerings. For example, Family & Consumer Sciences is a program area in our state, not a single course area. There are more than 30 unique Classifications of Instructional Programs (CIP) codes that exist within Family and Consumer Science program offerings, with multiple course types within single CIP code areas. After the statewide high-demand list is re-established, we will be able to gather and analyze data that will provide a much more consistent reflection of CTE in Washington. This information will assist districts and state staff in making decisions related to course offerings.

The report suggests that course equivalencies may limit the alignment of CTE programs to high-wage, high-demand occupations. We would respectfully note the intent of course equivalencies is to increase academic rigor, and support student choice in achieving high school graduation. We believe course equivalencies play a critical role in our educational system, in service to our students, as achieving high school graduation is critical to all employment sectors. The opportunity for students to earn academic credit towards graduation through CTE courses that reflect their career pathways better prepares students to enter all post-secondary pathways. We need to expand statewide equivalencies beyond mathematics and science, produce supporting resources for implementation of course frameworks, and provide intentional professional development opportunities for CTE instructors.

I am committed to an educational system with multiple, high-quality pathways to graduation. CTE programs play a critical role in supporting graduation rates, increasing student engagement, and supporting career planning. Our system must support diverse pathways that reflect the many careers that require more than a high school diploma, but less than a baccalaureate degree. Students want to touch, create, develop, and learn by doing, opportunities that are prevalent in our CTE courses. To achieve multiple, valued pathways to graduation and eventual employment we need:

1. Robust programs of study that clearly articulate a sequence of courses for students to explore and prepare for employment, while developing an understanding of the training and education required to achieve their career goals.

2. An educational system that responds to student interest, allowing students to enter a pathways phase of education in the 11th and 12th grade. This requires increased utilization of statewide equivalency courses, enabling students to choose the courses that best support their interests and goals while earning academic credit through CTE coursework and supporting on-time high school graduation.

3. Increased dual credit opportunities for all students, and increased CTE dual credit opportunities in cooperation with SBCTC. Working towards creating statewide articulations and increasing models for articulation agreements will be accomplished with leadership within our systems, and most importantly through partnership of local LEA instructors and college faculty working together. SBCTC Executive Director Yoshihara and I have requested support for a pilot program to help move the needle on this important work, and our staff are excited to continue this work.
4. Alignment of our education system to our workforce needs. This will require increasing opportunities through CTE, work-based learning, youth and adult apprenticeships and internships, and multiple pathways to successful employment. Early exposure to options, and informed students, parents, and school personnel to support preparing students for post-secondary success through academic pathways, technical pathways, youth apprenticeship, work-based learning, internships, and other innovations linking HSBP to direct instruction and/or employment.

We are proud of the current opportunities afforded our students throughout CTE programs in our state, and appreciate your staff took the time to engage with local school district personnel. OSPI welcomes the opportunity to reflect, and assess our current protocols and procedures related to CTE programs. Our staff is committed to continual advancement, and has already began systemically approaching coordinated efforts for improvement. We have begun the process to review longitudinal CIP code data to begin streamlining CIP codes, removing outdated and low or no-demand course areas, in addition to assessing current resources for improvement.

The original intention of this audit was to gather best practices from CTE programs to result in the creation of a resource toolkit to share across the state; this potential resource was of great interest to school districts and OSPI, and we would recommend consideration of completing this initial task. We are providing the attached response to the recommendations in the audit report, and welcome any further questions you may have.

Career and Technical Education is foundational to success in our school system and to our economy, and OSPI is committed to our role in this important work. We will continue to work in close partnership with the SBCTC and Workforce Boards, and appreciate your staff's attention to this important work.

Sincerely,

[Signature]

Chris Reykdal
Superintendent of
Public Instruction
Communicate to school counselors annually the importance of discussing CTE and apprenticeship paths along with academic paths as part of each student’s High School and Beyond Plan.

OSPI RESPONSE:
The Office of Career and Technical Education (CTE) collaborates regularly with the Office of System and School Improvement (OSSI) to provide information and common messaging to our state’s counselors. OSPI CTE staff presented at the 2017 Washington School Counselors Association (WSCA) conference, which provides the opportunity to elicit feedback and determine what school counselors need to support students’ knowledge and pursuit of CTE opportunities.

Conversely, OSSI staff present at CTE conferences, including the summer and fall Washington Association of Career and Technical Educators (WA-CTE) conferences and summits. Washington Career Counseling and Employment Readiness (WA-CCER) is a recognized membership section within WA-CTE, and the spring Washington Association of Career and Technical Administrators (WACTA) will be offering professional development specifically for school counselors. We will continue to seek opportunities to assess and respond to needs identified by our counselors. We understand the school and guidance counseling model targets academic achievement, social emotional support, and career and college readiness to provide personalized planning for all students.

Should funds be appropriated to support RCW 28A.700.080, “Awareness campaign for career and technical education,” OSPI could engage in a more formal campaign to “increase awareness among teachers, counselors, students, parents, principals, school administrators, and the general public about the opportunities offered by rigorous career and technical education programs.” The law, enacted in 2008, specifically directs the campaign to include technical CTE guidance including information about career and technical education course equivalencies and dual credit for high school and college; and education, apprenticeship, and career opportunities in emerging and high-demand programs. Both of these directives align with the intended outcome of recommendation 5.

ACTION STEPS AND INTENDED TIME FRAME:
The OSPI CTE Department will continue to work in collaboration with OSSI staff to identify professional development and technical assistance opportunities for shared initiatives, and will present at the WSCA conference in March of 2018. OSSI staff will present at the WACTA spring conference in March of 2018, and the summer WA-CTE conference in August of 2018. Staff will work together to assess resource needs and respond by creating high-quality and consistently-messaged communications for counselors and other interested school staff. If an awareness campaign is funded, staff will work with the communications department to create a campaign utilizing multiple communication strategy platforms.

SAO RECOMMENDATION 6 TO THE OFFICE OF SUPERINTENDENT OF PUBLIC INSTRUCTION:
Consistent with state law, work with the Workforce Board, Washington State Apprenticeship and Training Council, and SBCTC to establish a regularly updated list of high-demand CTE programs using the occupational demand data provided by Workforce Board.

OSPI RESPONSE:
We appreciate this recommendation calling our attention to the need to update the list of statewide high demand CTE programs. An updated list will enable our school districts, advisory committees, and state CTE office to make more informed decisions related to CTE programming and approval. To meet the law requirements, the high employer
demand programs of study list will be developed by the Workforce Board, to be considered in addition to the available high demand list maintained by the workforce development councils.

**ACTION STEPS AND INTENDED TIME FRAME:**
In alignment with RCW 28A.700.020, OSPI will work with the Workforce Board (WFB), Washington Apprenticeship and Training Council (WSATC), and State Board for Community and Technical Colleges (SBCTC) to develop the list, and create and communicate a process by March 1, 2018. OSPI will collaborate with the Workforce Board to develop the high employer demand programs of study list, which will enable OSPI to create the required high demand list by February 1, 2018.

Once the list has been drafted, reviewed, and finalized, OSPI will establish and communicate the appropriate process for local school districts to recommend additional programs consistent with the law. The process will include the submission of evidence of local demand, and reflect local program and general advisory committee review and recommendations. The process will include annual review and update timelines, to ensure proper maintenance and assistance to school districts. OSPI will provide technical assistance to school district personnel related to utilizing this resource, and requirements to amend the state list. Additional funding to increase the grant program outlined in RCW 28A.700.050, “Grants to develop or upgrade high-demand career and technical education programs,” would enable districts to develop more high-demand programs. This grant program was initially funded in 2008, and the allocation for these grant funds has not increased since then.

**SAO RECOMMENDATION 7 TO THE OFFICE OF SUPERINTENDENT OF PUBLIC INSTRUCTION:**
Consistent with state law, strengthen procedures and documentation requirements to assess whether CTE programs that districts propose or renew correspond with local high demand.

**OSPI RESPONSE:**
RCW 28A.700.010 states CTE school district plans must, “Demonstrate how career and technical education programs will ensure academic rigor; align with the state's education reform requirements; help address the skills gap of Washington's economy; and maintain strong relationships with local career and technical education advisory councils for the design and delivery of career and technical education.” We will continue seek ways to strengthen our procedures and documentation requirements, in part by elevating the important role that advisory committees play in the direction of CTE program offerings.

**ACTION STEPS AND INTENDED TIME FRAME:**
OSPI will establish a committee to create recommendations of improvement to strengthen the approval process for new and existing programs with committee recommendations made available to stakeholders for review and comment by July 2018. Based upon recommendations, CTE staff will work with Information Technology (IT) staff to create program work tickets to reflect technical changes to the re-approval and course approval system, and will communicate these expected changes to CTE directors by August 2018. IT staff will complete any required changes prior to the program re-approval window opening in January of 2019.

In the meantime, the new CTE program re-approval system is scheduled to launch February 1, 2018, and all CTE courses offered in all program areas will be submitted by districts during this launch year. This process will require districts to upload advisory minutes showing approval of the course including a narrative that demand was established. As we do not estimate that the high-demand list and required guidance will be established prior to this system launching, we will engage our stakeholders to recommend specific evidence that should be required to be uploaded in addition to advisory minutes in both the course approval and program re-approval system. Additionally, we believe that the streamlining of our CIP code chart, with better alignment to the national clusters will aid in the removal of no/low-demand CIP code offerings.
SAO RECOMMENDATIONS TO THE LEGISLATURE INVOLVING OSPI:

1. Require the Office of Superintendent of Public Instruction (OSPI) to work with the State Board of Education to establish a model course framework required for all students in the 7th or 8th grade that:
   a. Teaches students about multiple career paths that include postsecondary career and technical education (CTE), apprenticeships, military and four-year professional opportunities along with the educational costs and anticipated incomes that accompany each
   b. Informs students about dual-credit opportunities that exist within CTE programs
   c. Includes the development of students’ High School and Beyond plans
   d. Incorporates the improved Career Bridge website or other comprehensive career guidance tools

OSPI RESPONSE:
We agree that the appropriate setting for career exploration is within the middle level grades to best inform a student’s high school and beyond plan. With or without a legislative directive, OSPI will work to consolidate and provide information related to multiple career paths; post-secondary opportunities, in addition to dual credit opportunities; and the High School and Beyond Plan (HSBP) to school districts. OSPI can develop of a career exploration model framework without it being a middle school required class.

ACTION STEPS AND INTENDED TIME FRAME:
Consistent with SAO recommendation 8 to the Workforce Board, OSPI will provide feedback related to the Career Bridge website when requested, and in alignment with the WFB goal of March 31, 2018. If legislative action is taken, OSPI will consult with stakeholders and internal and external partners to respond to the legislature’s request.

2. Require the Workforce Board to establish a workgroup that is funded by the Legislature and consists of staff from the Workforce Board, OSPI and the State Board for Community and Technical Colleges (SBCTC). This workgroup should be responsible for establishing:
   a. A complete inventory of all active articulation agreements maintained in a centralized database, which must be used by all districts and colleges
   b. A list of all CTE programs across districts and colleges to help identify articulation opportunities
   c. Statewide articulation agreements for those courses offering a good return on investment that incorporate common course numbering and lead to dual credit for use by all school districts and colleges
   d. Standards identifying key elements required for all unique and statewide articulation agreements
   e. A structured process to increase regional coordination of secondary and postsecondary advisory committees to more effectively and efficiently engage employers
   f. A method to coordinate data sharing and analysis using:
      - Employment Security data on occupational wages and growth forecasts
      - Biennial business surveys conducted by the Workforce Board
      - Labor-market demand data collected by colleges and SBCTC that drives postsecondary CTE programs and courses

OSPI RESPONSE:
OSPI will continue working with the SBCTC to maximize articulation agreements, and establish and communicate best practices and processes to share statewide. Funding to support the OSPI/SBCTC initiatives would help both agencies to proceed with this important work. We believe we can accomplish this task without burdening the WFB with the task of facilitating the workgroup.
Appendix A: Initiative 900

Initiative 900, approved by Washington voters in 2005 and enacted into state law in 2006, authorized the State Auditor’s Office to conduct independent, comprehensive performance audits of state and local governments. Specifically, the law directs the Auditor’s Office to “review and analyze the economy, efficiency, and effectiveness of the policies, management, fiscal affairs, and operations of state and local governments, agencies, programs, and accounts.” Performance audits are to be conducted according to U.S. Government Accountability Office government auditing standards.

In addition, the law identifies nine elements that are to be considered within the scope of each performance audit. The State Auditor’s Office evaluates the relevance of all nine elements to each audit. The table below indicates which elements are addressed in the audit. Specific issues are discussed in the Audit Results section of this report.

<table>
<thead>
<tr>
<th>I-900 element</th>
<th>Addressed in the audit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify cost savings</td>
<td>Yes. Although the audit did not quantify the savings, it concludes that statewide articulation agreements can replace some of the many one-on-one agreements that are made between individual districts and colleges.</td>
</tr>
<tr>
<td>2. Identify services that can be reduced or eliminated</td>
<td>No. The audit focused on leading practices the state can use to improve the CTE programs. Consequently, it did not identify services that can be reduced or eliminated.</td>
</tr>
<tr>
<td>3. Identify programs or services that can be transferred to the private sector</td>
<td>No. The audit focused on leading practices the state can use to improve the CTE programs. Consequently, it did not identify services that can be transferred to the private sector.</td>
</tr>
<tr>
<td>4. Analyze gaps or overlaps in programs or services and provide recommendations to correct them</td>
<td>Yes. The audit found that OSPI and SBCTC can do more to coordinate between the secondary and postsecondary educational systems to improve CTE outcomes. Establishing statewide articulation agreements for the most common CTE programs and courses would replace some of the numerous individual agreements. The audit also found that OSPI can better assess whether district CTE programs align with high-wage, high- or stable-demand occupations.</td>
</tr>
<tr>
<td>5. Assess feasibility of pooling information technology systems within the department</td>
<td>No. However, the audit recommends that all districts and colleges report their articulation agreements in a centralized system so that the state can better manage articulation agreements.</td>
</tr>
<tr>
<td>6. Analyze departmental roles and functions, and provide recommendations to change or eliminate them</td>
<td>Yes. The audit analyzed the roles and responsibilities of OSPI, SBCTC, Workforce Board, and State Board of Education and identified ways they could work together to use leading practices to improve the state’s CTE programs.</td>
</tr>
<tr>
<td>7. Provide recommendations for statutory or regulatory changes that may be necessary for the department to properly carry out its functions</td>
<td>Yes. The audit recommends that the Legislature establish a workgroup comprised of members from Workforce Board, OSPI and SBCTC to improve CTE program outcomes. It also recommends the Legislature clarify certain statutes related to the state’s secondary CTE program requirements.</td>
</tr>
<tr>
<td>I-900 element</td>
<td>Addressed in the audit</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------</td>
</tr>
</tbody>
</table>
| 8. Analyze departmental performance data, performance measures and self-assessment systems | Yes. The audit determined that the use of specific performance measurements would improve the state's secondary CTE system. For example, to assess the benefits of statewide articulation efforts, the audit recommends that Workforce Board, OSPI and SBCTC establish performance measures to determine:  
  - The increase in the number of college pathways (dual credit courses times the number of colleges that accept them)  
  - Cost savings achieved across the entire K-14 system  
The audit also recommends that Workforce Board, OSPI, and SBCTC regularly engage employers to assess whether the state's CTE programs are providing employers with the skills and qualifications they need so they can adjust and improve the CTE programs and courses they offer. |
| 9. Identify relevant best practices | Yes. The audit identified leading practices used in other states to improve CTE outcomes in our state. |
Appendix B: Methodology

Comparing the alignment between high school CTE course enrollment and occupations with high-growth forecasts

To compare CTE course enrollment with occupation forecasts, we used a crosswalk from the Economic Development and Employer Planning System (EDEPS; see the sidebar for a link to the definitions used in the crosswalk).

Consistent with determinations by the National Research Center for Career and Technical Education, we excluded courses that did not appear to align with a particular occupation (14 percent), as well as courses with low student enrollments that lacked a designation in the EDEPS crosswalk (2 percent). The excluded courses made up about 16 percent of all CTE courses taken by Washington high school students in 2015.

The National Research Center determined many of these courses fit into a category of Classification of Instructional Programs (CIP) codes called “Basic Skills.” The National Research Center excluded such courses in the Center’s CIP code validation project, concluding that they are not academic or occupationally specific and do not provide transferable credit. Examples include independent living, personal choices and interpersonal relationships.

We reviewed the remaining 84 percent of CTE courses (including those at skill centers) offered to Washington students in grades 9 through 12 during the 2015 school year, comparing them to 10-year state occupation projections made by the Employment Security Department (ESD). The EDEPS crosswalk was used to assess how well these courses align with the high-demand requirement established in RCW 28A.700.020 (see Appendix C). This crosswalk is recognized as valid by the Perkins Collaborative Research Network.

We also compared these CTE courses to average annual job growth and in-state wage information from ESD and the U.S. Bureau of Labor Statistics using CIP codes and Standard Occupational Classification (SOC) codes. For the in-state wage information, this audit defined high-wage as higher than the average state wage of $54,000, since RCW 28A.700.010 (5) does not define high-wage.
For each occupation, the ESD projections show average annual job growth from 2014 to 2019 and from 2019 to 2024. Annual job growth for these occupations includes newly created positions as well as job openings resulting from vacancies or churn. Average wages are weighted by the total employment of each occupation within each unit of analysis. The wage estimates used in this audit lacked information for a small portion of the occupations that were included in the analysis. This affected 2,846 student enrollments (1.01 percent of total enrollments from the final analysis) and around 0.36 percent of the average annual growth projections used for comparison. ESD explains in the wage file that certain occupations are suppressed for various reasons. (See the sidebar for a link to ESD website.)

To assess course enrollment, we counted students once for each unique CTE course they took in 2015, regardless of duration. For example, if a student enrolled in two agriculture courses over two semesters, and a photography course for one semester, they would be counted three times (once for each unique course).

This method counts each unique CTE enrollment the same way across all students and school districts, regardless of the actual course duration. Ideally, we would have counted the number of hours that students were enrolled in a course, but this information was not accessible.

**Leading practices in statewide CTE articulation and case study selection criteria**

The literature about CTE described statewide secondary to postsecondary articulation agreements as a promising practice that could replace the numerous individual agreements created between different high schools and community colleges throughout a state. The literature highlights both benefits and challenges states face in their efforts to implement statewide articulation.

When we attempted to compare articulation practices across states, we found state education websites and the Association of Career and Technical Education’s database on state articulation practices were often incomplete, outdated and unreliable. Specifically, the term “statewide articulation” was used inconsistently, often referred to horizontal (college-to-college) articulation rather than secondary to postsecondary articulation. Reliably identifying all states with statewide articulation would have required us to interview CTE administrators in every state. Instead, we adapted the selection criteria to identify states with well developed and documented processes which could provide a high level of detail, serving as case studies related to implementing statewide articulation. While none of the states we reviewed has a CTE governance structure identical to Washington’s, two states, Ohio and Colorado, have well documented processes that could be useful to policy makers and CTE administrators in Washington.
Calculations used to evaluate the costs and benefits of the Pierce County Careers Consortium (PC3)

To assess the costs and benefits of the pooled articulation agreements negotiated within the consortium and used by its 23 members (16 school districts, four skill centers and three colleges), data was assembled from several sources. We did not independently audit any of the numbers provided.

<table>
<thead>
<tr>
<th>Source</th>
<th>Calculation methods</th>
<th>Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC3 administrator</td>
<td>An estimate of the time needed to develop and negotiate a typical articulation agreement between a school district and a college</td>
<td>About 40 hours, distributed equally between district and college faculty</td>
</tr>
<tr>
<td></td>
<td>The number of current articulation agreements in use by PC3 members</td>
<td>113 agreements</td>
</tr>
<tr>
<td></td>
<td>The number of school districts and skill centers that are members of PC3</td>
<td>20</td>
</tr>
<tr>
<td>U.S. Department of Labor</td>
<td>Average hourly wage and benefits information about such employees</td>
<td>Average wage plus 50% for benefits = $43.35</td>
</tr>
<tr>
<td>Student Enrollment Reporting System [SERS] maintained by SBCTC</td>
<td>The number of unique and active articulation records for PC3 agreements identified in our analysis of SERS data</td>
<td>803</td>
</tr>
</tbody>
</table>

To estimate PC3’s costs for current agreements, we performed these calculations:

<table>
<thead>
<tr>
<th>Typical cost to negotiate an articulation agreement</th>
<th>Time and wages</th>
<th>Number of agreements</th>
<th>Estimated costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours per negotiation (20 for secondary, 20 for postsecondary)</td>
<td>40 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average hourly wage (1 CTE secondary teacher, 1 CTE college professor)</td>
<td>$43.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average cost per articulation agreement</td>
<td>40 x $43.35 x 1</td>
<td>$1,734</td>
<td></td>
</tr>
<tr>
<td>Number and cost for all PC3 articulation agreements</td>
<td>$1,734 x 113</td>
<td>$195,942</td>
<td></td>
</tr>
</tbody>
</table>

We estimated what the costs to PC3 members would be without the 113 pooled articulation agreements, which are currently used 803 times by PC3 members, at about $1.2 million.

Finally, to calculate potential benefits in cost avoidance to PC3 participants, we multiplied the number of additional uses of agreements by the average cost for each articulation agreement.

<table>
<thead>
<tr>
<th>Potential cost savings for PC3 participants by using pooled articulation agreements</th>
<th>Additional uses of agreements</th>
<th>Estimated costs avoided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based on number of times PC3 pooled agreements are currently used</td>
<td>690</td>
<td>$1.2 million</td>
</tr>
<tr>
<td>Return on investment estimated for each pooled articulation agreement</td>
<td></td>
<td>$10,404</td>
</tr>
</tbody>
</table>

We also calculated the return on investment for each articulation agreement by dividing the number of uses by the number of agreements (803/113 = 7). This shows that PC3 participants use each of the 113 agreements an average of seven times. We then multiplied the average additional number of times each PC3 agreement is used (7-1 = 6) by the cost for each agreement ($1,734), which comes to $10,404.
List of CTE-related publications and resources

The following is a partial list of publications and resources which helped provide background for this audit. Many of these publications provide more detail about the current and leading practices discussed in the report and may be useful to a variety of CTE stakeholders.


Washington State Publications and Resources


Equivalency Credit Toolkit 3.3. OSPI. http://www.k12.wa.us/careerteched/Forms/EquivalencyCreditToolkit.PDF


Appendix C: RCWs for OSPI and Workforce Board’s CTE Responsibilities

State laws included in this appendix describe the roles of OSPI and Workforce Board and the requirements regarding CTE. [Emphasis added by auditor is shown by underlining.]

OSPI

RCW 28A.700.010 defines CTE and describes what is required of school districts to receive approval for their CTE programs:

(2) To receive approval, school district plans must:

(a) Demonstrate how career and technical education programs will ensure academic rigor; align with the state’s education reform requirements; help address the skills gap of Washington’s economy; and maintain strong relationships with local career and technical education advisory councils for the design and delivery of career and technical education;

(d) Demonstrate progress toward meeting or exceeding the targets established under RCW 28A.700.040 of an increased number of career and technical programs in high-demand fields;

(5) As used in this section, “career and technical education” means a planned program of courses and learning experiences that begins with exploration of career options; supports basic academic and life skills; and enables achievement of high academic standards, leadership, options for high skill, high wage employment preparation, and advanced and continuing education.

RCW 28A.700.020 defines a high-demand program and requires the development of a list of high-demand programs:

(1) The office of the superintendent of public instruction, in consultation with the workforce training and education coordinating board, the Washington state apprenticeship and training council, and the state board for community and technical colleges, shall develop a list of statewide high-demand programs for secondary career and technical education. The list shall be developed using the high-demand list maintained by workforce development councils in consultation with the employment security department, and the high employer demand programs of study identified by the workforce training and education coordinating board. Local school districts may recommend additional high-demand programs in consultation with local career and technical education advisory committees by submitting evidence of local high demand.

(2)(a) “High-demand program” means a career and technical education program that prepares students for either a high employer demand program of study or a high-demand occupation, or both.

(2)(b) “High employer demand program of study” means an apprenticeship or an undergraduate or graduate certificate or degree program in which the number of students per year prepared for employment from in-state programs is substantially fewer than the number of projected job openings per year in that field, either statewide or in a substate region.

(2)(c) “High-demand occupation” means an occupation with a substantial number of current or projected employment opportunities.
RCW 28A.700.040 suggests that not all CTE course offerings must align with high demand areas:

1) The office of the superintendent of public instruction shall establish performance measures and targets and monitor the performance of career and technical education programs in at least the following areas:

   a) Student participation in and completion of high-demand programs as identified under RCW 28A.700.020.

RCW 28A.700.060 requires that OSPI, SBCTC and Workforce Board continue to select additional model programs of study to develop:

3) During the 2008-09 school year, model career and technical education programs of study shall be developed for the following high-demand programs: Construction, health care, and information technology. Each school year thereafter, the office of the superintendent of public instruction, the state board for community and technical colleges, and the workforce training and education coordinating board shall select additional programs of study to develop, with a priority on high-demand programs as identified under RCW 28A.700.020.

**Workforce Board**

RCW 28C.18.060 describes Workforce Board’s duties to make the state’s CTE programs more integrated and coordinated. These duties, which are shown below, are not accompanied by specific authority to require other agencies to take specific measures towards this integration and coordination.

The board, in cooperation with the operating agencies of the state training system and private career schools and colleges, shall:

3) …perform a biennial assessment of the vocational education, training, and adult basic education and literacy needs of the state; identify ongoing and strategic education needs; and assess the extent to which employment, training, vocational and basic education services represent a consistent, integrated approach to meet such needs…

6) Provide for coordination among the different operating agencies and components of the state training system at the state level and at the regional level…

Workforce Board has specific statutory responsibilities related to articulation. RCW 28C.18.060 describes these duties:

The board, in cooperation with the operating agencies of the state training system and private career schools and colleges, shall…

12) Provide for the development of common course description formats...

14) In cooperation with the student achievement council, facilitate transfer of credit policies and agreements between institutions of the state training system, and encourage articulation agreements for programs encompassing two years of secondary workforce education and two years of postsecondary workforce education…

**Under RCW 28C.18.070**, Workforce Board has a significant role with regards to the development of the state’s CTE policy, but lacks specific authority to require other agencies to take specific measures to enact this policy.

2) The establishment of the [Workforce Board] was an integral step in developing a strategic approach to workforce development. For the coordinating board to carry out its intended role, the board must be able to give unambiguous guidance to operating agencies, the governor, and the legislature. It is the intent of chapter 130, Laws of 1995, to clarify the preeminent role intended for the [Workforce Board] in coordination and policy development of the state’s workforce development efforts.
Appendix D: A Model Course Framework and the High School and Beyond Plan

How the model course framework recommended in this audit would help students plan their future and meet one of their graduation requirements

Educating students about CTE and apprenticeship opportunities in the 7th or 8th grade can help them make more informed decisions about potential career paths.

Better marketing of CTE and apprenticeship opportunities in the 7th and 8th grades through an OSPI-developed career exploration course could make students and parents aware of these and other career pathways that require higher education. This course could help point more students toward high-paying careers and allow them to meet the High School and Beyond Plan graduation requirements as illustrated in Figure 1.

Figure 1 – The State Board of Education illustrates the actions and goals that are essential for a high quality High School and Beyond Plan

Note: The actions and goals listed above go beyond the minimum required by law and include promising practices for a high-quality plan, according to the State Board of Education.

Source: State Board of Education’s representation of the High School and Beyond Plan.
Appendix E: Washington Apprenticeship Programs Leading to High Wage Employment

Recent state efforts to incorporate youth apprenticeships into the state’s K-12 system

In 2006, the Legislature tasked OSPI and the Washington State Apprenticeship and Training Council with developing pre-apprenticeship program guidelines, as well as awarding incentive and pilot grants to school districts to aid in secondary pre-apprenticeship development and articulation. This initiative helped launch Running Start for the Trades, which the Legislature funded until the 2011-12 school year. Afterward, legislative budget priorities shifted, and the state stopped collecting data on student participation in apprenticeship programs. Officials at the Department of Labor & Industries (L&I) said that although this work resulted in apprenticeship programs at two skill centers that are still in existence, funding was discontinued because of the recession.

The importance of youth apprenticeships was recently recognized by Governor Inslee:

> We ought to be strengthening and expanding pre-apprenticeship programs in our schools… youth apprenticeship leverages one of our state’s most effective workforce development investments, which is registered apprenticeships. The apprenticeship model is the gold standard of work-based learning.

In 2016, Washington was awarded a $2.7 million federal grant to help grow and diversify apprenticeships. The grant, overseen by L&I, focuses partly on youth and will allow the agency to improve tracking of youth apprenticeship growth and success.

The Aerospace Joint Apprenticeship Committee (AJAC) is taking a leading role in expanding youth apprenticeships into the K-12 educational system. As of July 2017, AJAC reports the following progress in secondary schools:

- Tacoma Public Schools has 14 youth apprentices receiving full-time on-the-job-training (OJT) at local advanced manufacturing companies. As these students entered their second related supplemental instruction (RSI) class in fall 2017, the program began recruiting for a new class of youth apprentices.
- West Valley School District has three youth apprentices receiving full-time OJT at local advanced manufacturing companies. Recruitment will continue as a selection of youth apprentices enter from the Core Plus program. The goal is to enroll 10-15 youth apprentices by fall 2017.

In addition, AJAC is exploring ways to expand their apprenticeship efforts with school districts in Everett, Puyallup, Snohomish and Sumner as well as the Sno-Isle Skills Center.

Federal government departments also acknowledge youth apprenticeships

The U.S. Department of Education recognized the importance of youth apprenticeships in a July 2016 report titled Connecting Secondary Career and Technical Education to Registered Apprenticeships, stating that:

> Administrators in study states suggested that there is often a lack of awareness—among employers, school district staff, students, and parents – of the potential benefits that aligned CTE and RA [registered apprenticeship] programs offer. To counter commonly held misperceptions, states created marketing materials to disseminate information on program opportunities. These include resources to help employers understand how high school program
sponsorship could benefit their companies, and tools to support educators in recruiting CTE students. Several study states also developed strategies to market apprenticeship opportunities to CTE students and their parents, who often lacked information on program options. Engaging with parents was particularly important, because parental consent is typically required for minors to participate in RA or pre-apprenticeship programs offered in some industry areas.

To assess the opportunities that apprenticeships offer, this audit compared L&I’s list of apprenticeship offerings with the most current (May 2015) occupational and employment wage estimates from the Bureau of Labor Statistics. Figure 2 lists the current apprenticeship program offerings in Washington resulting in trade jobs that pay more than $54,000 a year on average.

### Figure 2 – Occupations with apprenticeship pathways

<table>
<thead>
<tr>
<th>Annual wages above the state average of $54,000</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace (Aircraft Mechanic)</td>
<td>$70,200</td>
</tr>
<tr>
<td>Boilermakers</td>
<td>$54,620</td>
</tr>
<tr>
<td>Electrical Lineworkers</td>
<td>$82,220</td>
</tr>
<tr>
<td>Electrical Workers (Electrician)</td>
<td>$64,860</td>
</tr>
<tr>
<td>Glaziers, Architectural Metal and Glass Workers</td>
<td>$58,400</td>
</tr>
<tr>
<td>Heat and Frost Insulators and Asbestos Workers</td>
<td>$58,330</td>
</tr>
<tr>
<td>Ironworkers</td>
<td>$75,310</td>
</tr>
<tr>
<td>Masonry (Bricklaying and Tilesetting)</td>
<td>$74,170</td>
</tr>
<tr>
<td>Millwrights</td>
<td>$63,870</td>
</tr>
<tr>
<td>Operating Engineers</td>
<td>$58,830</td>
</tr>
<tr>
<td>Painters and Decorators (Taper)</td>
<td>$54,030</td>
</tr>
<tr>
<td>Piledrivers</td>
<td>$72,930</td>
</tr>
<tr>
<td>Plumbers, Steamfitters, Pipefitters</td>
<td>$66,560</td>
</tr>
<tr>
<td>Refrigeration Workers</td>
<td>$56,450</td>
</tr>
<tr>
<td>Sheet Metal Workers</td>
<td>$61,670</td>
</tr>
<tr>
<td>Stationary Engineers</td>
<td>$64,310</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional occupations with annual wages at or above $50,000</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive Machinists (auto body)</td>
<td>$50,290</td>
</tr>
<tr>
<td>Carpenters</td>
<td>$53,810</td>
</tr>
<tr>
<td>Lathing, Acoustical, Drywall and Thermal Insulation</td>
<td>$53,740</td>
</tr>
<tr>
<td>Plasterers</td>
<td>$52,510</td>
</tr>
</tbody>
</table>

*Note: Not every L&I apprenticeship program has an equivalent on the Bureau of Labor Statistics list, so this table may not be exhaustive.

Sources: Washington State Department of Labor and Industries Catalog of Programs and Services (http://www.lni.wa.gov/tradeslicensing/apprenticeship/files/pubs/appcat.pdf)
Appendix F: How CTE Courses Align with High-Paying, High Demand Occupations

A comparison of CTE course enrollment to corresponding high-paying, high-demand occupations (listed in Figure 3) shows many courses did not correspond to the percentage of forecasted job openings. OSPI and school districts should focus their CTE programs in occupational areas that pay more than the state annual average and have high or stable demand. Conversely, OSPI and school districts should discontinue CTE programs in occupational areas that pay less than average and do not have high or stable demand. Appendix I lists CTE course areas and breaks out their corresponding Classification of Instructional Program (CIP) number and title.

Figure 3 – Top 75% CTE course areas by enrollment compared to annual average forecasted job openings and state average wage

Percent of CTE enrollments in 2015 school year; Percent of forecasted job openings through 2024; Job ranking out of 284 groups of related occupations; State average wage $54,000 in 2015; Average wage for each occupation

<table>
<thead>
<tr>
<th>Top 24 CTE course areas (highest to lowest enrollment)</th>
<th>Percent of CTE enrollments</th>
<th>Average annual jobs</th>
<th>Average wage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent of all growth</td>
<td>Rank</td>
<td>Below or above $54,000</td>
</tr>
<tr>
<td>Data Entry</td>
<td>8.3%</td>
<td>0.08% 146</td>
<td>↓</td>
</tr>
<tr>
<td>Design</td>
<td>5.3%</td>
<td>0.16% 93</td>
<td>↓</td>
</tr>
<tr>
<td>Photography</td>
<td>4.5%</td>
<td>0.08% 147</td>
<td>↓</td>
</tr>
<tr>
<td>Interpreter/Translator</td>
<td>4.2%</td>
<td>0.06% 155</td>
<td>↓</td>
</tr>
<tr>
<td>Family &amp; Consumer Sciences</td>
<td>3.9%</td>
<td>0.01% 258</td>
<td>↑</td>
</tr>
<tr>
<td>Dietetics/Nutrition</td>
<td>3.9%</td>
<td>0.03% 201</td>
<td>↑</td>
</tr>
<tr>
<td>Marketing Management &amp; Research</td>
<td>3.7%</td>
<td>0.59% 43</td>
<td>↑</td>
</tr>
<tr>
<td>Agricultural/Food Sciences</td>
<td>3.7%</td>
<td>0.02% 213</td>
<td>↑</td>
</tr>
<tr>
<td>Drafting</td>
<td>3.6%</td>
<td>0.11% 122</td>
<td>↑</td>
</tr>
<tr>
<td>Communication Technologies</td>
<td>3.3%</td>
<td>0.08% 140</td>
<td>↓</td>
</tr>
<tr>
<td>Mathematics</td>
<td>3.1%</td>
<td>0.04% 184</td>
<td>↑</td>
</tr>
<tr>
<td>Food Preparation</td>
<td>3.0%</td>
<td>1.53% 14</td>
<td>↓</td>
</tr>
<tr>
<td>Digital Graphics</td>
<td>3.0%</td>
<td>0.39% 57</td>
<td>↑</td>
</tr>
<tr>
<td>Business Management &amp; Administration</td>
<td>2.8%</td>
<td>2.64% 10</td>
<td>↑</td>
</tr>
<tr>
<td>Computer Systems</td>
<td>2.8%</td>
<td>1.62% 13</td>
<td>↑</td>
</tr>
<tr>
<td>Communications, Journalism &amp; Broadcasting</td>
<td>2.3%</td>
<td>0.33% 63</td>
<td>↑</td>
</tr>
<tr>
<td>Athletic Training</td>
<td>2.2%</td>
<td>0.01% 266</td>
<td>↓</td>
</tr>
<tr>
<td>Woodworking</td>
<td>2.2%</td>
<td>0.21% 86</td>
<td>↓</td>
</tr>
<tr>
<td>Agricultural Mechanics &amp; Machinery Operation</td>
<td>2.0%</td>
<td>0.24% 76</td>
<td>↓</td>
</tr>
<tr>
<td>Forestry &amp; Conservation</td>
<td>1.8%</td>
<td>0.09% 137</td>
<td>↓</td>
</tr>
<tr>
<td>Medical Science</td>
<td>1.7%</td>
<td>0.09% 131</td>
<td>↑</td>
</tr>
<tr>
<td>Arts and Crafts</td>
<td>1.6%</td>
<td>0.03% 199</td>
<td>↑</td>
</tr>
<tr>
<td>Miscellaneous Health Services</td>
<td>1.5%</td>
<td>0.23% 81</td>
<td>↓</td>
</tr>
<tr>
<td>Sales</td>
<td>1.4%</td>
<td>3.80% 5</td>
<td>↑</td>
</tr>
</tbody>
</table>

Appendix G: How Occupations with the Most Forecasted Job Openings Align with CTE Courses

A comparison of occupations with the most forecasted job openings and how they align with CTE course enrollments shows that some job openings had related CTE enrollment that corresponds to high-paying, high-demand occupations and others had none. OSPI and school districts should focus their CTE programs in occupational areas that pay more than the state annual average wage and have high or stable demand. Conversely, OSPI and school districts should discontinue CTE programs in occupational areas that pay less than average or do not have high or stable demand.

The comprehensive table in Figure 4 shows the job openings that had some related CTE enrollment for the top 75 percent of job openings. Courses with some enrollment represent opportunities for districts to refocus their efforts on more desirable opportunities. For example, the table shows how carpentry pays above average wages, while the percentage of CTE enrollments for these types of courses is less than the percentage of forecasted openings.

Figure 4 – Top 75% of forecasted job openings with some CTE enrollment in related courses

Percent of CTE enrollments in 2015 school year; Percent of forecasted job openings through 2024; Job ranking out of 284 groups of related occupations; State average wage $54,000 in 2015; Average wage for each occupation

<table>
<thead>
<tr>
<th>Jobs (highest to lowest openings)</th>
<th>Average annual jobs</th>
<th>CTE enrollments</th>
<th>Average wage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent of jobs</td>
<td>Rank</td>
<td>Percent of all</td>
</tr>
<tr>
<td>Sales</td>
<td>3.8%</td>
<td>5</td>
<td>1.4%</td>
</tr>
<tr>
<td>Business Management &amp; Administration</td>
<td>2.6%</td>
<td>10</td>
<td>2.8%</td>
</tr>
<tr>
<td>Computer Systems</td>
<td>1.6%</td>
<td>13</td>
<td>2.8%</td>
</tr>
<tr>
<td>Food Preparation</td>
<td>1.5%</td>
<td>14</td>
<td>3.0%</td>
</tr>
<tr>
<td>Secretarial</td>
<td>1.5%</td>
<td>15</td>
<td>0.9%</td>
</tr>
<tr>
<td>Bookkeeping</td>
<td>1.4%</td>
<td>16</td>
<td>&lt; 0.1%</td>
</tr>
<tr>
<td>Chef</td>
<td>1.0%</td>
<td>21</td>
<td>0.9%</td>
</tr>
<tr>
<td>Barbing/Cosmetology</td>
<td>1.0%</td>
<td>22</td>
<td>0.3%</td>
</tr>
<tr>
<td>Carpenter</td>
<td>1.0%</td>
<td>24</td>
<td>0.7%</td>
</tr>
<tr>
<td>Health, Physical Education &amp; Fitness</td>
<td>0.9%</td>
<td>26</td>
<td>0.3%</td>
</tr>
<tr>
<td>Nurse Assisting</td>
<td>0.8%</td>
<td>27</td>
<td>0.5%</td>
</tr>
<tr>
<td>Accounting</td>
<td>0.8%</td>
<td>31</td>
<td>0.8%</td>
</tr>
<tr>
<td>Security Services</td>
<td>0.7%</td>
<td>33</td>
<td>&lt; 0.1%</td>
</tr>
<tr>
<td>Clerical Supervision &amp; Management</td>
<td>0.7%</td>
<td>37</td>
<td>&lt; 0.1%</td>
</tr>
<tr>
<td>Law Enforcement</td>
<td>0.6%</td>
<td>39</td>
<td>0.8%</td>
</tr>
<tr>
<td>Finance &amp; Financial Management Services</td>
<td>0.6%</td>
<td>40</td>
<td>0.5%</td>
</tr>
<tr>
<td>Metal/Plastic Machine Work</td>
<td>0.6%</td>
<td>42</td>
<td>0.2%</td>
</tr>
<tr>
<td>Marketing Management &amp; Research</td>
<td>0.6%</td>
<td>43</td>
<td>3.7%</td>
</tr>
</tbody>
</table>

Appendix H: Occupations with 75 percent of Forecasted Job Openings and No CTE Enrollment

A comparison of occupations with the most forecasted job openings and how they align with CTE course enrollments shows that some job openings had related CTE enrollment that corresponds to high-paying, high-demand occupations and others had none at all. OSPI and school districts should focus their CTE programs in occupational areas that pay more than the state annual average wage and have high or stable demand. Conversely, OSPI and school districts should discontinue CTE programs in occupational areas that pay less than average or do not have high or stable demand.

The comprehensive table in Figure 5 shows the job openings that had no related CTE enrollment for the top 75 percent of job openings. However, many of these occupations pay poorly or are unsuitable for teaching to young people.

Figure 5 – Top 75% of forecasted job openings with no related CTE courses

Percent of forecasted job openings through 2024; Job ranking out of 284 groups of related occupations; State average wage $54,000 in 2015; Average wage for each occupation

<table>
<thead>
<tr>
<th>Jobs (highest to lowest openings)</th>
<th>Average annual jobs</th>
<th>Average wage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent of all growth</td>
<td>Rank</td>
</tr>
<tr>
<td>Misc. Retail</td>
<td>7.6%</td>
<td>1</td>
</tr>
<tr>
<td>Misc. Food Preparation &amp; Serving</td>
<td>5.4%</td>
<td>2</td>
</tr>
<tr>
<td>Office Clerical</td>
<td>4.8%</td>
<td>3</td>
</tr>
<tr>
<td>Food Serving</td>
<td>3.9%</td>
<td>4</td>
</tr>
<tr>
<td>Building &amp; Grounds Cleaning &amp; Maintenance</td>
<td>3.8%</td>
<td>6</td>
</tr>
<tr>
<td>Misc. Material Moving</td>
<td>3.5%</td>
<td>7</td>
</tr>
<tr>
<td>Misc. Clerical &amp; Admin Support</td>
<td>3.3%</td>
<td>8</td>
</tr>
<tr>
<td>Misc. Farm, Forestry &amp; Conservation</td>
<td>2.9%</td>
<td>9</td>
</tr>
<tr>
<td>Truck &amp; Bus Driving</td>
<td>2.2%</td>
<td>11</td>
</tr>
<tr>
<td>Misc. Personal Service</td>
<td>2.1%</td>
<td>12</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>1.3%</td>
<td>17</td>
</tr>
<tr>
<td>Line Supervision</td>
<td>1.2%</td>
<td>18</td>
</tr>
<tr>
<td>Misc. Construction &amp; Extraction</td>
<td>1.2%</td>
<td>19</td>
</tr>
<tr>
<td>Misc. Recreation &amp; Entertainment</td>
<td>1.1%</td>
<td>20</td>
</tr>
<tr>
<td>Misc. Production</td>
<td>1.0%</td>
<td>23</td>
</tr>
<tr>
<td>Teaching Assisting</td>
<td>1.0%</td>
<td>25</td>
</tr>
<tr>
<td>Misc. Transportation</td>
<td>0.8%</td>
<td>28</td>
</tr>
<tr>
<td>Nursing</td>
<td>0.8%</td>
<td>29</td>
</tr>
<tr>
<td>Building Maintenance</td>
<td>0.8%</td>
<td>30</td>
</tr>
<tr>
<td>Real Estate</td>
<td>0.7%</td>
<td>32</td>
</tr>
<tr>
<td>Misc. Management &amp; Management Support</td>
<td>0.7%</td>
<td>34</td>
</tr>
<tr>
<td>Adult &amp; Continuing Education</td>
<td>0.7%</td>
<td>35</td>
</tr>
<tr>
<td>Child Care</td>
<td>0.7%</td>
<td>36</td>
</tr>
<tr>
<td>Human Resources Management</td>
<td>0.7%</td>
<td>38</td>
</tr>
<tr>
<td>Elementary Education</td>
<td>0.6%</td>
<td>41</td>
</tr>
<tr>
<td>Bartending</td>
<td>0.6%</td>
<td>44</td>
</tr>
</tbody>
</table>

Appendix I: Classification of Instructional Programs

The information below shows the specific types of courses that fall within each CTE course area. Each course has a corresponding Classification of Instructional Programs (CIP) code. As mentioned in the report, the CIP code was used to match CTE course areas to corresponding occupations and to assess how well CTE course areas with the most enrollment aligned with high-wage, high-paying occupations.

<table>
<thead>
<tr>
<th>Name of course area</th>
<th>Classification of Instructional Programs (CIPs)</th>
<th>Number of CTE enrollments</th>
</tr>
</thead>
</table>
| Data Entry                               | 110601 - Digital Communication Tools  
110699 - Office User Specialist                                                        | 15,396  
8,044 |
| Design                                   | 500499 - Design and Commercial Art Foundations  
100290 - Visual Communications  
500402 - Graphic Design/Commercial and Advertising Art  
500502 - Technical Theater/Theater Design Technology/Technician | 2,091  
4,967  
6,066  
1,646 |
| Photography                              | 500406 - Commercial Photography                                                                          | 12,719 |
| Interpreter/Translator                   | 161603 - Sign Language Interpretation/Interpreter  
160103 - Translation and Interpretation                                                               | 11,499  
226 |
| Family and Consumer Sciences             | 190401 - Consumer and Family Resources  
190704 - Family Systems  
190707 - Family and Community Services  
190601 - Housing, Interiors and Furnishings  
190706 - Child Development/Parenting  
190403 - Consumer Services  
190701 - Human Development               | 3,093  
1,005  
14  
565  
3,158  
679  
2,586 |
| Dietetics/Nutrition                      | 190504 - Food Science, Dietetics, and Nutrition  
190501 - Nutrition and Wellness                                                                | 559  
10,471 |
| Marketing Management and Research        | 521401 - Marketing Management  
521403 - International Marketing  
521400 - Introduction Marketing                                                          | 1,904  
8  
8,479 |
| Agricultural/Food Sciences               | 11101 - Plant Sciences, General  
11102 - Agronomy and Crop Science  
11103 - Horticultural Science  
10901 - Animal Sciences, General  
11201 - Soil Science and Agronomy, General  
10000 - Agriculture, General  
11001 - Food Science  
11002 - Food Technology and Processing                                                | 822  
19  
3,765  
1,829  
55  
3,708  
67  
27 |
| Drafting                                 | 151302 - CAD/CADD Drafting and/or Design Technology  
151304 - Civil Drafting and Civil Engineering CAD/CADD  
151305 - Electrical/Electronics Drafting CAD/CADD  
151306 - Mechanical Drafting and CAD/CADD  
151303 - High-Performance Green Building Architectural Drafting and Design  
151301 - Drafting and Design Technology General  
1499991 - Engineering Design 1 | 2,690  
166  
335  
399  
720  
1,450  
4,413 |
| Communication Technologies               | 500602 - Cinematography and Cinema Production  
100202 - Video Production Technology/Technician  
100201 - Photography and Video Foundations  
100203 - Recording Arts and Sound Reinforcement Technology | 436  
5,399  
3,118  
459 |
<table>
<thead>
<tr>
<th>Name of course area</th>
<th>Classification of Instructional Programs (CIPs)</th>
<th>Number of CTE enrollments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>270301 - Applied Math</td>
<td>4,240</td>
</tr>
<tr>
<td></td>
<td>270305 - Financial Math</td>
<td>4,601</td>
</tr>
<tr>
<td>Food Preparation</td>
<td>120505 - Food Production and Services</td>
<td>4,454</td>
</tr>
<tr>
<td></td>
<td>120500 - Foods and Related Culinary Arts foundations</td>
<td>4,049</td>
</tr>
<tr>
<td>Digital Graphics</td>
<td>100304 - Animation Technology/Video Graphics and Special Effects</td>
<td>947</td>
</tr>
<tr>
<td></td>
<td>110801 - Webpage/Digital/Multimedia and Information Design</td>
<td>5,235</td>
</tr>
<tr>
<td></td>
<td>110803 - Video Game Design/Digital Computer Animation for Game Design</td>
<td>1,965</td>
</tr>
<tr>
<td></td>
<td>111004 - Web/Multimedia Management and Webmaster</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>500102 - Digital Arts</td>
<td>212</td>
</tr>
<tr>
<td>Business Management and Administration</td>
<td>520701 - Entrepreneurship</td>
<td>1,440</td>
</tr>
<tr>
<td></td>
<td>279998 - Business Math</td>
<td>3,108</td>
</tr>
<tr>
<td></td>
<td>520211 - Project Management</td>
<td>898</td>
</tr>
<tr>
<td></td>
<td>520703 - Small Business Administration/Management</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>520000 - Introduction to Business</td>
<td>1,430</td>
</tr>
<tr>
<td></td>
<td>521101 - International Business and Commerce</td>
<td>633</td>
</tr>
<tr>
<td></td>
<td>520201 - Business Administration Management</td>
<td>308</td>
</tr>
<tr>
<td>Computer Systems</td>
<td>110701 - Introduction to Computer Science</td>
<td>843</td>
</tr>
<tr>
<td></td>
<td>110103 - Fundamentals of Information Technology</td>
<td>288</td>
</tr>
<tr>
<td></td>
<td>111006 - Computer Support Specialist</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>430116 - Cyber/Computer Forensics</td>
<td>153</td>
</tr>
<tr>
<td></td>
<td>110901 - Computer Systems Networking and Telecommunications</td>
<td>526</td>
</tr>
<tr>
<td></td>
<td>110201 - Computer Programming</td>
<td>6,015</td>
</tr>
<tr>
<td>Communications, Journalism and Broadcasting</td>
<td>520501 - Business Communications</td>
<td>2,773</td>
</tr>
<tr>
<td></td>
<td>90701 - TV/Radio Broadcast Journalism Technology</td>
<td>639</td>
</tr>
<tr>
<td></td>
<td>10802 - Agricultural Communications/ Journalism</td>
<td>303</td>
</tr>
<tr>
<td></td>
<td>91001 - Publishing</td>
<td>2,693</td>
</tr>
<tr>
<td>Athletic Training</td>
<td>510913 - Sports Medicine</td>
<td>6,204</td>
</tr>
<tr>
<td>Woodworking</td>
<td>480701 - Woodworking Foundations</td>
<td>5,185</td>
</tr>
<tr>
<td></td>
<td>480703 - Cabinetmaking and Millwork/Mill Wright</td>
<td>894</td>
</tr>
<tr>
<td>Agricultural Mechanics and Machinery Operation</td>
<td>10204 - Agriculture Power Machinery Operation</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>10201 - Agricultural Mechanization, General</td>
<td>4,005</td>
</tr>
<tr>
<td></td>
<td>10205 - Agricultural Mechanics and Equipment/Machine Technology</td>
<td>1,587</td>
</tr>
<tr>
<td>Forestry and Conservation</td>
<td>30601 - Wildlife and Wild lands Science and Management</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>30501 - Forestry, General</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td>30201 - Natural Resources Management and Policy</td>
<td>810</td>
</tr>
<tr>
<td></td>
<td>30508 - Urban Forestry</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>30101 - Natural Resources/Conservation, General</td>
<td>3,974</td>
</tr>
<tr>
<td>Medical Science</td>
<td>260102 - Biomedical Sciences</td>
<td>4,727</td>
</tr>
<tr>
<td>Arts and Crafts</td>
<td>500797 - Professional Production Arts Technology/Technician</td>
<td>3,007</td>
</tr>
<tr>
<td></td>
<td>500713 - Wearable Metal and Jewelry Design Technology/Technician</td>
<td>1,539</td>
</tr>
<tr>
<td>Miscellaneous Health Services</td>
<td>510800 - Therapeutic Services, other</td>
<td>2,317</td>
</tr>
<tr>
<td></td>
<td>510000 - Introduction to Health Science Careers</td>
<td>1,901</td>
</tr>
<tr>
<td>Sales</td>
<td>521801 - Marketing Operations</td>
<td>3,195</td>
</tr>
<tr>
<td></td>
<td>521804 - Selling Skills and Sales Operations</td>
<td>442</td>
</tr>
<tr>
<td></td>
<td>521999 - Social Media Marketing</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>521902 - Fashion Merchandising</td>
<td>221</td>
</tr>
</tbody>
</table>
Standard occupational classifications (SOCs) code titles and their Unit of Analysis Title designations were gathered from the EDEPS website (http://www.edeps.org/). Several of the SOC codes from the EDEPS website were missing, so we used the ESD Alternative Occupation Projections document to fill in codes for the following: 11-3011, 11-3051, 11-3061, 11-2022, 11-3021, 11-3111, 11-3121, 11-3131.

<table>
<thead>
<tr>
<th>Unit of analysis</th>
<th>Standard Occupational Classifications (SOC)</th>
</tr>
</thead>
</table>
| Miscellaneous Retail Workers           | 41-2011 - Cashiers  
11-3011 - Counter and Rental Clerks  
11-9091 - Door-to-Door Sales Workers, News and Street Vendors, and Related Workers  
11-2012 - Gaming Change Persons and Booth Cashiers  
11-2031 - Retail Salespersons          |
| Miscellaneous Food Preparation and Serving Workers | 35-3021 - Combined Food Preparation and Serving Workers, Including Fast Food  
35-9011 - Dining Room and Cafeteria Attendants and Bartender Helpers  
35-9021 - Dishwashers  
35-9099 - Food Preparation and Serving Related Workers, All Other  
35-2021 - Food Preparation Workers     |
| Office Clerical                        | 43-5011 - Cargo and Freight Agents  
43-4021 - Correspondence Clerks  
43-4051 - Customer Service Representatives  
43-5032 - Dispatchers, Except Police, Fire, and Ambulance  
43-4161 - Human Resources Assistants, Except Payroll and Timekeeping  
43-4199 - Information and Record Clerks, All Other  
43-9041 - Insurance Claims and Policy Processing Clerks  
43-9199 - Office and Administrative Support Workers, All Other  
43-9061 - Office Clerks, General  
43-9071 - Office Machine Operators, Except Computer  
43-3061 - Procurement Clerks  
43-4171 - Receptionists and Information Clerks  
43-2021 - Telephone Operators  
43-9022 - Word Processors and Typists   |
| Food Serving                           | 35-3022 - Counter Attendants, Cafeteria, Food Concession, and Coffee Shop  
35-3041 - Food Servers, Nonrestaurant  
35-9031 - Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop  
35-3031 - Waiters and Waitresses       |
| Sales                                  | 41-3011 - Advertising Sales Agents  
41-9011 - Demonstrators and Product Promoters  
41-1012 - First-Line Supervisors of Non-Retail Sales Workers  
41-1011 - First-Line Supervisors of Retail Sales Workers  
41-2022 - Parts Salespersons  
13-1023 - Purchasing Agents, Except Wholesale, Retail, and Farm Products  
41-9099 - Sales and Related Workers, All Other  
41-9031 - Sales Engineers  
41-3099 - Sales Representatives, Services, All Other  
41-4012 - Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products  
41-4011 - Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products  
41-9041 - Telemarketers               |
<table>
<thead>
<tr>
<th>Unit of analysis</th>
<th>Standard Occupational Classifications (SOC)</th>
</tr>
</thead>
</table>
| Building and Grounds Cleaning and Maintenance Workers | 37-2019 - Building Cleaning Workers, All Other  
37-1011 - First-Line Supervisors of Housekeeping and Janitorial Workers  
37-3019 - Grounds Maintenance Workers, All Other  
37-2011 - Janitors and Cleaners, Except Maids and Housekeeping Cleaners  
37-3011 - Landscaping and Groundskeeping Workers  
37-2012 - Maids and Housekeeping Cleaners  
37-2021 - Pest Control Workers  
37-3013 - Tree Trimmers and Pruners |
| Miscellaneous Material Moving Workers | 53-7061 - Cleaners of Vehicles and Equipment  
53-7011 - Conveyor Operators and Tenders  
53-7071 - Gas Compressor and Gas Pumping Station Operators  
53-7051 - Industrial Truck and Tractor Operators  
53-7062 - Laborers and Freight, Stock, and Material Movers, Hand  
53-7033 - Loading Machine Operators, Underground Mining  
53-7063 - Machine Feeders and Offbearers  
53-7199 - Material Moving Workers, All Other  
53-7111 - Mine Shuttle Car Operators  
53-7064 - Packers and Packagers, Hand  
53-7072 - Pump Operators, Except Wellhead Pumpers  
53-7081 - Refuse and Recyclable Material Collectors  
53-7121 - Tank Car, Truck, and Ship Loaders  
53-7073 - Wellhead Pumpers |
| Miscellaneous Clerical and Admin Support Occupations | 43-3021 - Billing and Posting Clerks  
43-2099 - Communications Equipment Operators, All Other  
43-5021 - Couriers and Messengers  
43-4031 - Court, Municipal, and License Clerks  
43-4071 - File Clerks  
43-3099 - Financial Clerks, All Other  
43-3041 - Gaming Cage Workers  
43-4111 - Interviewers, Except Eligibility and Loan  
43-9051 - Mail Clerks and Mail Machine Operators, Except Postal Service  
43-5041 - Meter Readers, Utilities  
43-4151 - Order Clerks  
43-5031 - Police, Fire, and Ambulance Dispatchers  
43-5051 - Postal Service Clerks  
43-5052 - Postal Service Mail Carriers  
43-5053 - Postal Service Mail Sorters, Processors, and Processing Machine Operators  
43-5061 - Production, Planning, and Expediting Clerks  
43-9081 - Proofreaders and Copy Markers  
43-4181 - Reservation and Transportation Ticket Agents and Travel Clerks  
43-5071 - Shipping, Receiving, and Traffic Clerks  
43-5081 - Stock Clerks and Order Fillers  
43-2011 - Switchboard Operators, Including Answering Service  
43-3071 - Tellers  
43-5111 - Weighers, Measurers, Checkers, and Samplers, Recordkeeping |
<table>
<thead>
<tr>
<th>Unit of analysis</th>
<th>Standard Occupational Classifications (SOC)</th>
</tr>
</thead>
</table>
| Miscellaneous Farm, Forestry and Conservation Workers | 45-2099 - Agricultural Workers, All Other  
45-4021 - Fallers  
45-2092 - Farmworkers and Laborers, Crop, Nursery, and Greenhouse  
45-2093 - Farmworkers, Farm, Ranch, and Aquacultural Animals  
45-4011 - Forest and Conservation Workers  
45-3021 - Hunters and Trappers  
45-4023 - Log Graders and Scalers  
45-4029 - Logging Workers, All Other                                                                 |
| Business Management and Administration                | 11-3011 - Administrative Services Managers  
13-1011 - Agents and Business Managers of Artists, Performers, and Athletes  
13-1199 - Business Operations Specialists, All Other  
25-1011 - Business Teachers, Postsecondary  
11-1011 - Chief Executives  
11-1021 - General and Operations Managers  
11-3051 - Industrial Production Managers  
13-1111 - Management Analysts  
11-3061 - Purchasing Managers  
11-2022 - Sales Managers                                                                 |
| Truck and Bus Driving                                  | 53-3022 - Bus Drivers, School or Special Client  
53-3021 - Bus Drivers, Transit and Intercity  
53-3032 - Heavy and Tractor-Trailer Truck Drivers  
53-3033 - Light Truck or Delivery Services Drivers                                                                 |
| Miscellaneous Personal Service Workers                | 39-6011 - Baggage Porters and Bellhops  
39-6012 - Concierges  
39-4021 - Funeral Attendants  
39-5093 - Shampooers  
39-9021 - Personal Care Aides  
39-9099 - Personal Care and Service Workers, All Other  
39-9041 - Residential Advisors  
39-7011 - Tour Guides and Escorts                                                                 |
| Computer Systems                                       | 15-1111 - Computer and Information Research Scientists  
11-3021 - Computer and Information Systems Managers  
15-1143 - Computer Network Architects  
15-1152 - Computer Network Support Specialists  
51-4012 - Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic  
15-1199 - Computer Occupations, All Other  
15-1131 - Computer Programmers  
25-1021 - Computer Science Teachers, Postsecondary  
15-1121 - Computer Systems Analysts  
15-1151 - Computer User Support Specialists  
15-1141 - Database Administrators  
15-1122 - Information Security Analysts  
15-1142 - Network and Computer Systems Administrators                                                                 |
| Food Preparation                                       | 35-2011 - Cooks, Fast Food  
35-2012 - Cooks, Institution and Cafeteria  
35-2015 - Cooks, Short Order  
35-1012 - First-Line Supervisors of Food Preparation and Serving Workers                                                                 |
| Secretarial                                            | 43-6011 - Executive Secretaries and Executive Administrative Assistants  
43-6014 - Secretaries and Administrative Assistants, Except Legal, Medical, and Executive                                                                 |
<table>
<thead>
<tr>
<th>Unit of analysis</th>
<th>Standard Occupational Classifications (SOC)</th>
</tr>
</thead>
</table>
| **Bookkeeping**                          | 43-3031 - Bookkeeping, Accounting, and Auditing Clerks  
43-4011 - Brokerage Clerks  
43-3051 - Payroll and Timekeeping Clerks  
43-9111 - Statistical Assistants  
13-2082 - Tax Preparers                                                                |
| **Computer Engineering**                 | 17-2061 - Computer Hardware Engineers  
15-1132 - Software Developers, Applications  
15-1133 - Software Developers, Systems Software                                        |
| **Line Supervision**                     | 53-1011 - Aircraft Cargo Handling Supervisors  
47-1011 - First-Line Supervisors of Construction Trades and Extraction Workers  
45-1011 - First-Line Supervisors of Farming, Fishing, and Forestry Workers  
53-1021 - First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand  
49-1011 - First-Line Supervisors of Mechanics, Installers, and Repairers  
51-1011 - First-Line Supervisors of Production and Operating Workers  
53-1031 - First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators |
| **Miscellaneous Construction and Extraction Workers** | 47-4099 - Construction and Related Workers, All Other  
47-2061 - Construction Laborers  
47-4031 - Fence Erectors  
47-3019 - Helpers, Construction Trades, All Other  
47-3011 - Helpers--Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters  
47-3012 - Helpers--Carpenters  
47-3013 - Helpers--Electricians  
47-5081 - Helpers--Extraction Workers  
47-3015 - Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters  
47-3016 - Helpers--Roofers  
47-4051 - Highway Maintenance Workers  
47-5051 - Rock Splitters, Quarry  
47-5061 - Roof Bolters, Mining  
47-4091 - Segmental Pavers  
47-2082 - Tapers                                                                      |
| **Miscellaneous Recreation and Entertainment Workers** | 39-3091 - Amusement and Recreation Attendants  
39-3092 - Costume Attendants  
39-3099 - Entertainment Attendants and Related Workers, All Other  
39-1021 - First-Line Supervisors of Personal Service Workers  
39-3012 - Gaming and Sports Book Writers and Runners  
39-3011 - Gaming Dealers  
39-3019 - Gaming Service Workers, All Other  
39-1011 - Gaming Supervisors  
39-3093 - Locker Room, Coatroom, and Dressing Room Attendants  
39-3021 - Motion Picture Projectionists  
39-1012 - Slot Supervisors  
27-2023 - Umpires, Referees, and Other Sports Officials  
39-3031 - Ushers, Lobby Attendants, and Ticket Takers |
| **Chef**                                | 35-1011 - Chefs and Head Cooks  
35-2019 - Cooks, All Other  
35-2013 - Cooks, Private Household  
35-2014 - Cooks, Restaurant                                                              |
<table>
<thead>
<tr>
<th>Unit of analysis</th>
<th>Standard Occupational Classifications (SOC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbering/Cosmetology</td>
<td>39-5011 - Barbers</td>
</tr>
<tr>
<td></td>
<td>39-5012 - Hairdressers, Hairstylists, and Cosmetologists</td>
</tr>
<tr>
<td></td>
<td>39-5091 - Makeup Artists, Theatrical and Performance</td>
</tr>
<tr>
<td></td>
<td>39-5092 - Manicurists and Pedicurists</td>
</tr>
<tr>
<td></td>
<td>39-5094 - Skincare Specialists</td>
</tr>
<tr>
<td>Miscellaneous Production Workers</td>
<td>51-9191 - Adhesive Bonding Machine Operators and Tenders</td>
</tr>
<tr>
<td></td>
<td>51-9192 - Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders</td>
</tr>
<tr>
<td></td>
<td>51-9121 - Coating, Painting, and Spraying Machine Setters, Operators, and Tenders</td>
</tr>
<tr>
<td></td>
<td>51-9193 - Cooling and Freezing Equipment Operators and Tenders</td>
</tr>
<tr>
<td></td>
<td>51-9021 - Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders</td>
</tr>
<tr>
<td></td>
<td>51-9031 - Cutters and Trimmers, Hand</td>
</tr>
<tr>
<td></td>
<td>51-9032 - Cutting and Slicing Machine Setters, Operators, and Tenders</td>
</tr>
<tr>
<td></td>
<td>51-9041 - Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders</td>
</tr>
<tr>
<td></td>
<td>51-9051 - Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders</td>
</tr>
<tr>
<td></td>
<td>51-9022 - Grinding and Polishing Workers, Hand</td>
</tr>
<tr>
<td></td>
<td>51-9198 - Helpers--Production Workers</td>
</tr>
<tr>
<td></td>
<td>51-4051 - Metal-Refining Furnace Operators and Tenders</td>
</tr>
<tr>
<td></td>
<td>51-9023 - Mixing and Blending Machine Setters, Operators, and Tenders</td>
</tr>
<tr>
<td></td>
<td>51-9195 - Molders, Shapers, and Casters, Except Metal and Plastic</td>
</tr>
<tr>
<td></td>
<td>51-9111 - Packaging and Filling Machine Operators and Tenders</td>
</tr>
<tr>
<td></td>
<td>51-9123 - Painting, Coating, and Decorating Workers</td>
</tr>
<tr>
<td></td>
<td>51-9151 - Photographic Process Workers and Processing Machine Operators</td>
</tr>
<tr>
<td></td>
<td>51-5113 - Print Binding and Finishing Workers</td>
</tr>
<tr>
<td></td>
<td>51-9199 - Production Workers, All Other</td>
</tr>
<tr>
<td></td>
<td>51-9012 - Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders</td>
</tr>
<tr>
<td></td>
<td>51-9197 - Tire Builders</td>
</tr>
<tr>
<td>Carpentry</td>
<td>47-2031 - Carpenters</td>
</tr>
<tr>
<td>Teaching Assisting</td>
<td>25-9041 - Teacher Assistants</td>
</tr>
<tr>
<td>Health, Physical Education and Fitness</td>
<td>27-2021 - Athletes and Sports Competitors</td>
</tr>
<tr>
<td></td>
<td>27-2022 - Coaches and Scouts</td>
</tr>
<tr>
<td></td>
<td>39-9031 - Fitness Trainers and Aerobics Instructors</td>
</tr>
<tr>
<td></td>
<td>25-1193 - Recreation and Fitness Studies Teachers, Postsecondary</td>
</tr>
<tr>
<td>Nurse Assisting</td>
<td>31-1014 - Nursing Assistants</td>
</tr>
<tr>
<td>Miscellaneous Transportation Workers</td>
<td>53-6031 - Automotive and Watercraft Service Attendants</td>
</tr>
<tr>
<td></td>
<td>53-6011 - Bridge and Lock Tenders</td>
</tr>
<tr>
<td></td>
<td>53-3031 - Driver/Sales Workers</td>
</tr>
<tr>
<td></td>
<td>53-3099 - Motor Vehicle Operators, All Other</td>
</tr>
<tr>
<td></td>
<td>53-5022 - Motorboat Operators</td>
</tr>
<tr>
<td></td>
<td>53-6021 - Parking Lot Attendants</td>
</tr>
<tr>
<td></td>
<td>53-5011 - Sailors and Marine Oilers</td>
</tr>
<tr>
<td></td>
<td>53-3041 - Taxi Drivers and Chauffeurs</td>
</tr>
<tr>
<td></td>
<td>53-6041 - Traffic Technicians</td>
</tr>
<tr>
<td></td>
<td>53-6061 - Transportation Attendants, Except Flight Attendants</td>
</tr>
<tr>
<td></td>
<td>53-6051 - Transportation Inspectors</td>
</tr>
<tr>
<td></td>
<td>53-6099 - Transportation Workers, All Other</td>
</tr>
<tr>
<td>Unit of analysis</td>
<td>Standard Occupational Classifications (SOC)</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Nursing</td>
<td>29-1161 - Nurse Midwives</td>
</tr>
<tr>
<td></td>
<td>29-1171 - Nurse Practitioners</td>
</tr>
<tr>
<td></td>
<td>25-1072 - Nursing Instructors and Teachers, Postsecondary</td>
</tr>
<tr>
<td></td>
<td>29-1141 - Registered Nurses</td>
</tr>
<tr>
<td>Building Maintenance</td>
<td>49-9071 - Maintenance and Repair Workers, General</td>
</tr>
<tr>
<td>Accounting</td>
<td>13-2011 - Accountants and Auditors</td>
</tr>
<tr>
<td></td>
<td>13-2061 - Financial Examiners</td>
</tr>
<tr>
<td></td>
<td>13-2081 - Tax Examiners and Collectors, and Revenue Agents</td>
</tr>
<tr>
<td>Real Estate</td>
<td>13-2021 - Appraisers and Assessors of Real Estate</td>
</tr>
<tr>
<td></td>
<td>11-9141 - Property, Real Estate, and Community Association Managers</td>
</tr>
<tr>
<td></td>
<td>41-9021 - Real Estate Brokers</td>
</tr>
<tr>
<td></td>
<td>41-9022 - Real Estate Sales Agents</td>
</tr>
<tr>
<td>Security Services</td>
<td>33-9032 - Security Guards</td>
</tr>
<tr>
<td></td>
<td>33-3052 - Transit and Railroad Police</td>
</tr>
<tr>
<td></td>
<td>33-9093 - Transportation Security Screeners</td>
</tr>
<tr>
<td>Miscellaneous Management and Management Support Occupations</td>
<td>11-9041 - Architectural and Engineering Managers</td>
</tr>
<tr>
<td></td>
<td>13-1041 - Compliance Officers</td>
</tr>
<tr>
<td></td>
<td>11-9199 - Managers, All Other</td>
</tr>
<tr>
<td></td>
<td>11-9121 - Natural Sciences Managers</td>
</tr>
<tr>
<td>Adult and Continuing Education</td>
<td>25-3011 - Adult Basic and Secondary Education and Literacy Teachers and Instructors</td>
</tr>
<tr>
<td></td>
<td>25-3021 - Self-Enrichment Education Teachers</td>
</tr>
<tr>
<td></td>
<td>25-1194 - Vocational Education Teachers, Postsecondary</td>
</tr>
<tr>
<td>Child Care</td>
<td>39-9011 - Childcare Workers</td>
</tr>
<tr>
<td>Clerical Supervision and Management</td>
<td>43-1011 - First-Line Supervisors of Office and Administrative Support Workers</td>
</tr>
<tr>
<td>Human Resources Management</td>
<td>11-3111 - Compensation and Benefits Managers</td>
</tr>
<tr>
<td></td>
<td>13-1141 - Compensation, Benefits, and Job Analysis Specialists</td>
</tr>
<tr>
<td></td>
<td>11-3121 - Human Resources Managers</td>
</tr>
<tr>
<td></td>
<td>13-1071 - Human Resources Specialists</td>
</tr>
<tr>
<td></td>
<td>13-1075 - Labor Relations Specialists</td>
</tr>
<tr>
<td></td>
<td>11-3131 - Training and Development Managers</td>
</tr>
<tr>
<td></td>
<td>13-1151 - Training and Development Specialists</td>
</tr>
<tr>
<td>Law Enforcement</td>
<td>33-3011 - Bailiffs</td>
</tr>
<tr>
<td></td>
<td>33-3012 - Correctional Officers and Jailers</td>
</tr>
<tr>
<td></td>
<td>25-1111 - Criminal Justice and Law Enforcement Teachers, Postsecondary</td>
</tr>
<tr>
<td></td>
<td>33-3021 - Detectives and Criminal Investigators</td>
</tr>
<tr>
<td></td>
<td>33-1011 - First-Line Supervisors of Correctional Officers</td>
</tr>
<tr>
<td></td>
<td>33-1012 - First-Line Supervisors of Police and Detectives</td>
</tr>
<tr>
<td></td>
<td>33-3031 - Fish and Game Wardens</td>
</tr>
<tr>
<td></td>
<td>19-4092 - Forensic Science Technicians</td>
</tr>
<tr>
<td></td>
<td>33-3051 - Police and Sheriff’s Patrol Officers</td>
</tr>
<tr>
<td></td>
<td>33-9021 - Private Detectives and Investigators</td>
</tr>
<tr>
<td></td>
<td>33-9099 - Protective Service Workers, All Other</td>
</tr>
<tr>
<td>Unit of analysis</td>
<td>Standard Occupational Classifications (SOC)</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Finance and Financial Management Services | 13-2031 - Budget Analysts  
13-2041 - Credit Analysts  
13-2071 - Credit Counselors  
13-2051 - Financial Analysts  
11-3031 - Financial Managers  
13-2099 - Financial Specialists, All Other  
13-2072 - Loan Officers |
| Elementary Education                  | 25-2021 - Elementary School Teachers, Except Special Education                                             |
| Metal/Plastic Machine Work            | 51-4011 - Computer-Controlled Machine Tool Operators, Metal and Plastic  
51-4031 - Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic  
51-4032 - Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic  
51-4021 - Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic  
51-4022 - Forging Machine Setters, Operators, and Tenders, Metal and Plastic  
51-4033 - Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic  
51-4034 - Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic  
51-4192 - Layout Workers, Metal and Plastic  
51-4041 - Machinists  
51-4199 - Metal Workers and Plastic Workers, All Other  
51-4035 - Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic  
51-4072 - Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic  
51-4081 - Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic  
51-4193 - Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic  
51-4052 - Pourers and Casters, Metal  
51-4023 - Rolling Machine Setters, Operators, and Tenders, Metal and Plastic  
51-4194 - Tool Grinders, Filers, and Sharpeners |
| Marketing Management and Research     | 13-1161 - Market Research Analysts and Marketing Specialists  
11-2021 - Marketing Managers |
| Bartending                           | 35-3011 - Bartenders                                                                                         |