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This workforce study pilot was conducted by the Pacific Education Institute in Summer 2015. It utilizes data from the *Washington State Employment Security Department Employment Projections*, which use estimates of occupational statistics from the second fiscal quarter of 2014. For more information about the data, visit fortress.wa.gov/esd/employmentdata/reports-publications/industry-reports/employment-projections.



Summary of Findings

- Washington can be divided into 3 basic regions:
 - Seattle/Tacoma/Bellevue (58% of WA workforce)
 - East Washington (21%)
 - West Washington (21%)
- Typical definitions of STEM jobs focus heavily on math and computer science, and often omit social sciences.
- Based on these definitions, more math and CS jobs exist in Seattle/Tacoma/Bellevue alone than all STEM jobs in the rest of the state *combined*.
- Based on these definitions, 78% of STEM jobs in Washington are in Seattle/Tacoma/Bellevue.
- 60% of typical STEM jobs in Washington are math/computer science jobs.
- 85% of all math/computer science jobs in Washington are in Seattle/Tacoma/Bellevue.
- PEI defines **FieldSTEM jobs**, which differ from STEM jobs in that they focus less on math/computer science, include social sciences, and provide science skills to *Fishing, Farming, and Forestry* occupations.
- FieldSTEM provides opportunities to students and businesses outside of Seattle, in Washington.
- The distribution of Life, Physical, and Social Sciences jobs (occupation group 19) most closely matches the statewide distribution of jobs.
- Future impact may be analyzed using Occupational Growth Projections (WA ESD) and Education Pipeline Models (BCG).



Occupational Groups

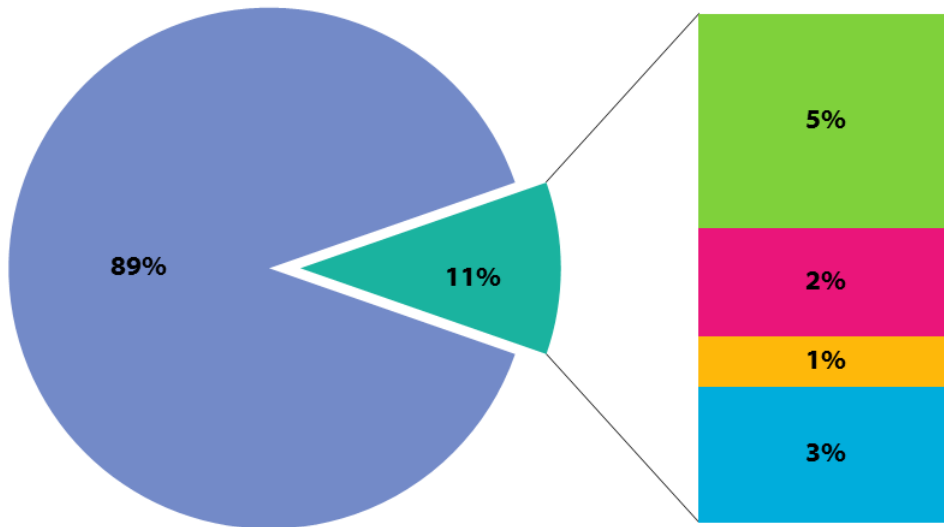
The Bureau of Labor Statistics (BLS) is the federal agency responsible for collecting and analyzing economic data in the US. Employment statistics are either grouped according to *Industry* (principal product/activity, ie manufacturing, recreation) or according to *Occupation* (principal tasks/education/skills, ie office and administrative support, healthcare practitioners). This study uses the BLS defined Occupational Classification. The occupations relevant to FieldSTEM are listed here. For an exhaustive list of occupations, see here: www.bls.gov/soc/major_groups.htm.

BLS Occupation Code	Group Title	Occupations Included
15	Computer and Math Occupations	Computer & Information Research Scientists, Computer & Information Analysts, Software Developers & Programmers, Database and Systems Administrators and Network Architects, Computer Support Specialists, Miscellaneous Computer Occupations
17	Engineering Occupations	Architects, Surveyors, Cartographers, Photogrammetrists, Aerospace Engineers, Agricultural Engineers, Biomedical Engineers, Chemical Engineers, Civil Engineers, Computer Hardware Engineers, Electrical and Electronics Engineers, Environmental Engineers, Industrial Engineers, Marine Engineers, Naval Architects, Materials Engineers, Mechanical Engineers, Mining & Geological Engineers, Nuclear Engineers, Petroleum Engineers, Miscellaneous Engineers, Drafters, Engineering Technicians, Mapping Technicians
19	Life, Physical, and Social Scientists	Agricultural and Food Scientists, Biological Scientists, Conservation Scientists and Foresters, Medical Scientists (not Practitioners), Miscellaneous Life Scientists, Astronomers, Physicists, Atmospheric and Space Scientists, Chemists, Material Scientists, Environmental Scientists, Geoscientists, Miscellaneous Physical Scientists. Urban and Regional Planners, Anthropologists, Archeologists, Geographers, Historians, Political Scientists, Sociologists & Psychologists, Biological Technicians, Environmental Science and Protection Technicians, Forest Science Technicians, Forest and Conservation Technicians
45	Farming, Fishing, and Forestry Occupations	Supervisors, Agricultural Inspectors, Animal Breeders, Graders and Sorters, Miscellaneous Agricultural Workers, Fishing Workers, Hunters and Trappers, Forest and Conservation Workers, Logging Workers



Jobs Breakdown, Statewide

Total Jobs in Washington: **3.5 million**

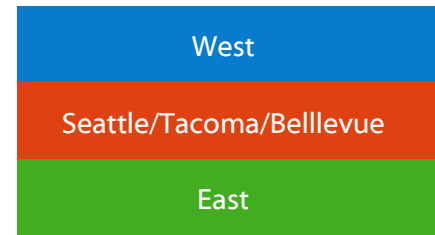
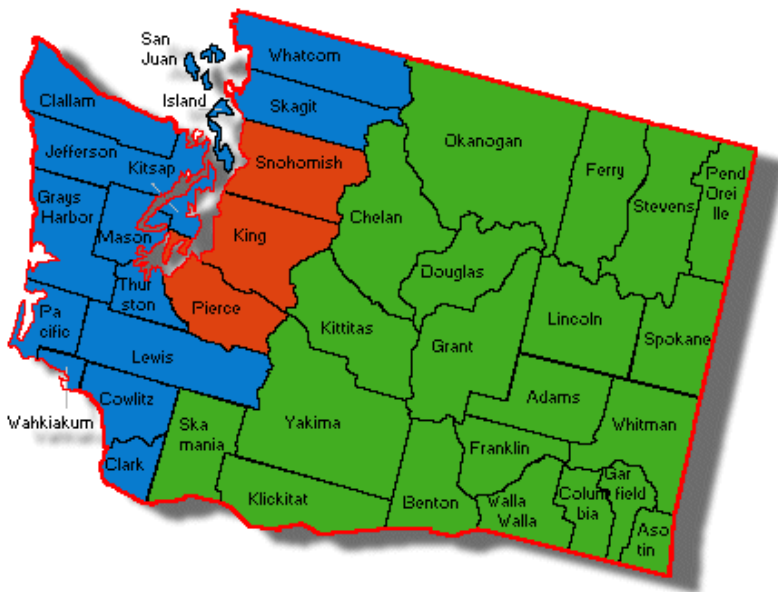




Regions in Washington

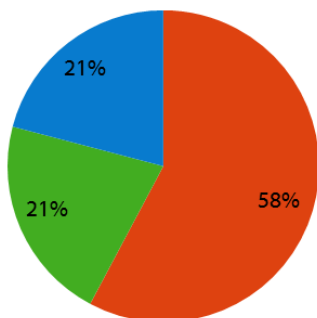
The Bureau of Labor Statistics provides state-wide and national statistics on employment. Additionally, BLS works with state agencies to provide statistics of within-state regional employment. This varies from state agency to state agency, but typically BLS employs *Metropolitan and Nonmetropolitan Area Estimates*. These statistical areas represent concentrations of populations around specific cities or population centers.

Washington State has an interesting population distribution, which makes division into Metropolitan/ Nonmetropolitan areas slightly more complicated. There is an incredibly high proportion of the state's population in only a few metropolitan areas. To reflect this notion, we divide the state into three regions based on data available from various Washington Metropolitan and Nonmetropolitan areas:



Let's examine how many jobs are in each of the three regions. This allows us to see what percentage of the entire state's workforce works in each region.

West	Seattle/Tacoma/Bellevue	East
733,016	2,025,121	746,728



Nearly 60% of Washington's employed work in Seattle/Tacoma/Bellevue! We find that an almost equal number of people work to the East and to the West of these metropolitan areas (21% each).



Washington State’s STEM (Science, Technology, Engineering, and Mathematics) economy is among the fastest growing in the country. Silicon valley and the tech boom have brought significant educational and job opportunities, particularly to the Puget Sound. But what is really meant by the term “STEM”? Which jobs are STEM jobs? Do we risk excluding certain students and industries by focusing so heavily on certain fields? These are the kinds of questions we aim to answer here.

The Georgetown University Center on Education and the Workforce (CEW) is a preeminent research group in economic statistics. Their definition also uses the *Bureau of Labor Statistics Occupational Classification System*. CEW breaks down all of America’s jobs into various categories, one of which is **STEM**. According to CEW, STEM jobs are any jobs that fall under groups:

<i>Georgetown University Center on Education and the Workforce</i> STEM Occupations	
15	Math & Computer Science
17	Engineering
19.1	Life Sciences (Agriculture, Biology, Conservation, Medical)
19.2	Physical Sciences (Astronomy, Physics, Chemistry, Environmental, Geoscience)

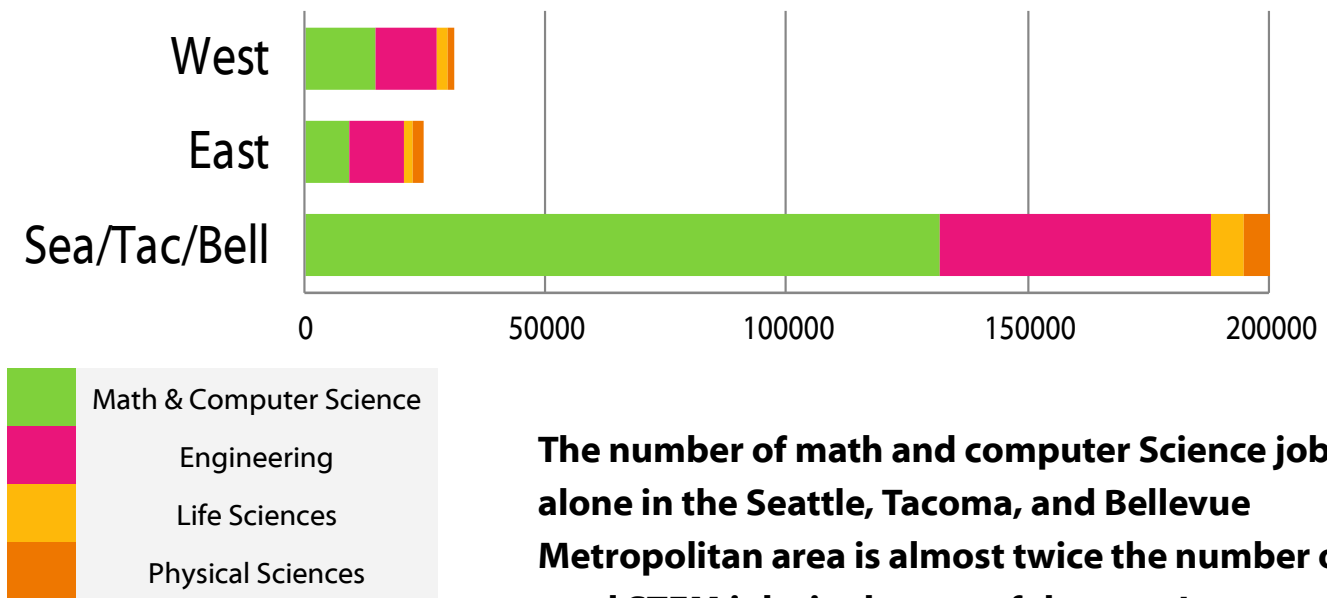
Note that CEW omits Social Science fields from STEM, and considers primarily science fields with strict, rigorous, and academic processes. An extensive list of occupations belonging to each group can be found on the *Occupational Groupings* page.

We’d like to ask the following question: What is the breakdown of CEW-defined STEM jobs in Washington? Does the distribution of STEM jobs approximately equal the distribution of all jobs in Washington? If not, there is some kind of disparity between the STEM economies in different regions of Washington.



STEM Jobs Breakdown

Total CEW STEM Jobs in Regions of Washington, broken down by Occupational Group



The number of math and computer Science jobs alone in the Seattle, Tacoma, and Bellevue Metropolitan area is almost twice the number of total STEM jobs in the rest of the state!

Share of Washington's STEM Jobs



Indeed, 78% of all CEW STEM jobs in Washington are in Seattle/Tacoma/Bellevue.

The disparity can be observed from the fact that the share of STEM jobs in Seattle (78%) is even greater than Seattle's share of the general working population (58%).



Math and Computer Science Jobs

How can educators, economists, and industries account for the heavy disparity in the types of STEM jobs available regionally in Washington? Taking a closer look at math and computer science jobs (the T and M of our STEM) reveals some clues.

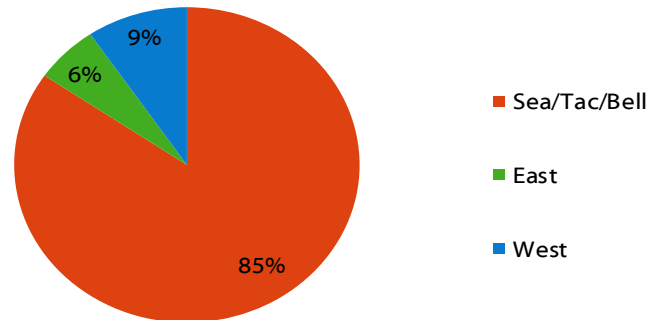
15. Math & Computer Science Occupations

Total Jobs: 157,928

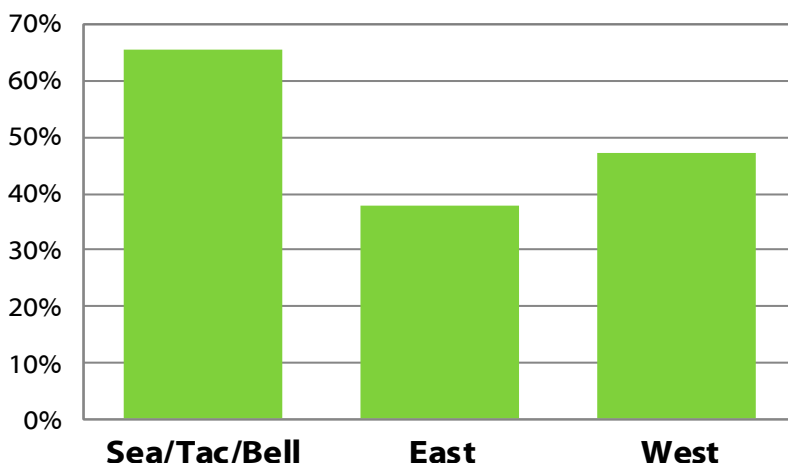
4.5% of All Washington Jobs

60% of all CEW STEM Jobs in Washington

A staggering **85%** of all math and computer science jobs in Washington State are in the Seattle/Tacoma/Bellevue Metropolitan Area. This is even more lopsided than the distribution of CEW STEM jobs.



Not only are there simply significantly more math and computer science jobs in the greater Seattle area, but, as a percentage, more of the available STEM jobs are math and computer science in Seattle than anywhere else in the state! Let's try to see what this means:



What Percentage of CEW STEM Jobs are Math/Computer Science, Regionally?

In the Seattle area, math and computer science make up almost 70% of CEW defined STEM jobs. Elsewhere in the State, less than half of STEM jobs are math. computer science.



From STEM to FieldSTEM

Certainly, programs which provide pathways in math and computer science STEM fields are crucial in Washington’s education landscape. These jobs are among the most numerous and within the fastest growing fields. However, as we have seen, these programs provide an overwhelming bias towards employers (and subsequently students and future employees) in the greater Seattle metropolitan area.

Keeping in mind not to neglect math and computer science (a very low risk in the current education climate), how can we design programs to enable STEM pathways in other areas of Washington, where the economic situations are often more challenging in terms of poverty rates, education levels, and regional industries?

Here, the Pacific Education Institute proposes a new science education paradigm: FieldSTEM. FieldSTEM is born from the intuition that many jobs and industries in Washington outside of Seattle rely on natural resource and environmental sciences. These positions are variously classified by the BLS, but often do not meet the qualifications for what is considered a “STEM” discipline. Subsequently, these fields are ignored or fall the wayside when choosing STEM education programs for funding. This unfortunately propagates the more difficult educational and economic situations outside of the Seattle Metropolitan Area, where rural and coastal communities often experience much higher poverty and lack of education resources. Let’s define FieldSTEM Jobs according to the BLS Occupational Classification System. To see specifically which jobs belong to these categories, see *Occupational Groups*.

<i>Pacific Education Institute</i> FieldSTEM Occupations	
17	Engineering
19	Life, Physical, and Social Sciences
45	Farming, Fishing, and Forestry

Total FieldSTEM Jobs: 217,795

Percent of all WA Jobs: 6.2%

Total CEW STEM Jobs: 259,203

Percent of all Wa Jobs: 7.4%

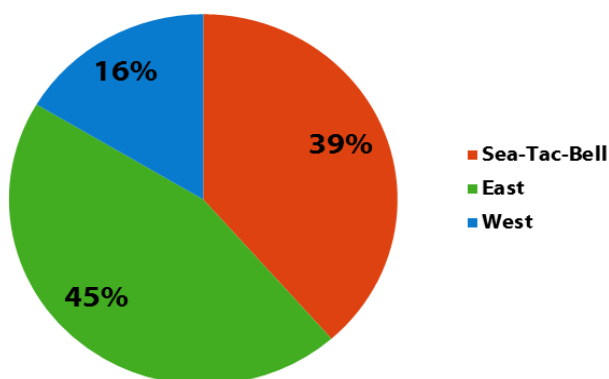
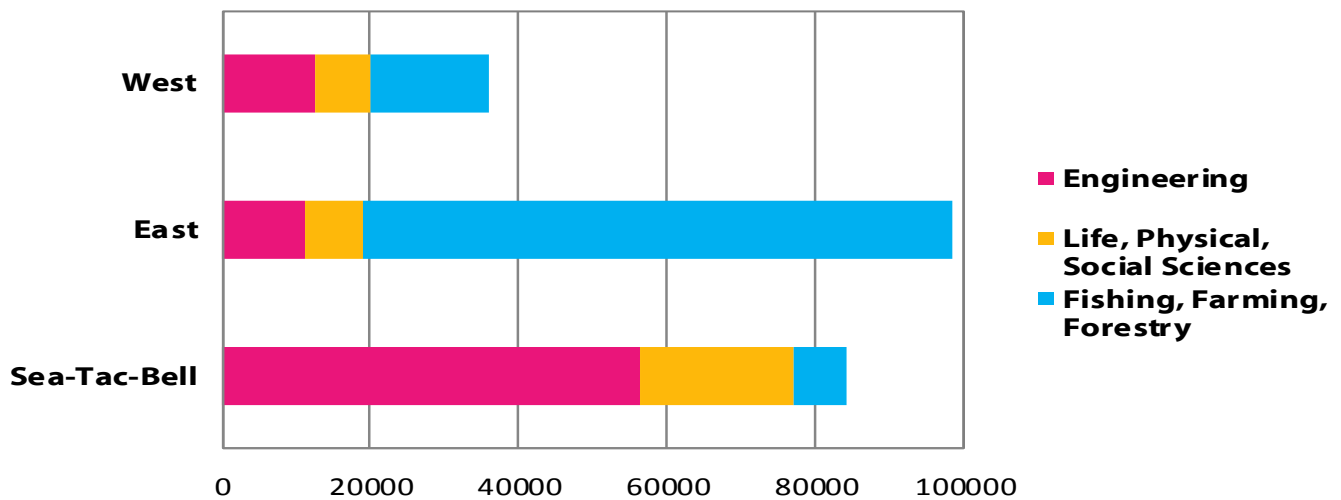


From STEM to FieldSTEM

There are subtle but important distinctions between the CEW STEM occupation and the PEI FieldSTEM occupation. Firstly, while CEW omits occupations in fields that are considered *social sciences*, PEI includes these occupations. Such workers might include Urban and Regional Planners, Geographers, and Archaeologists.

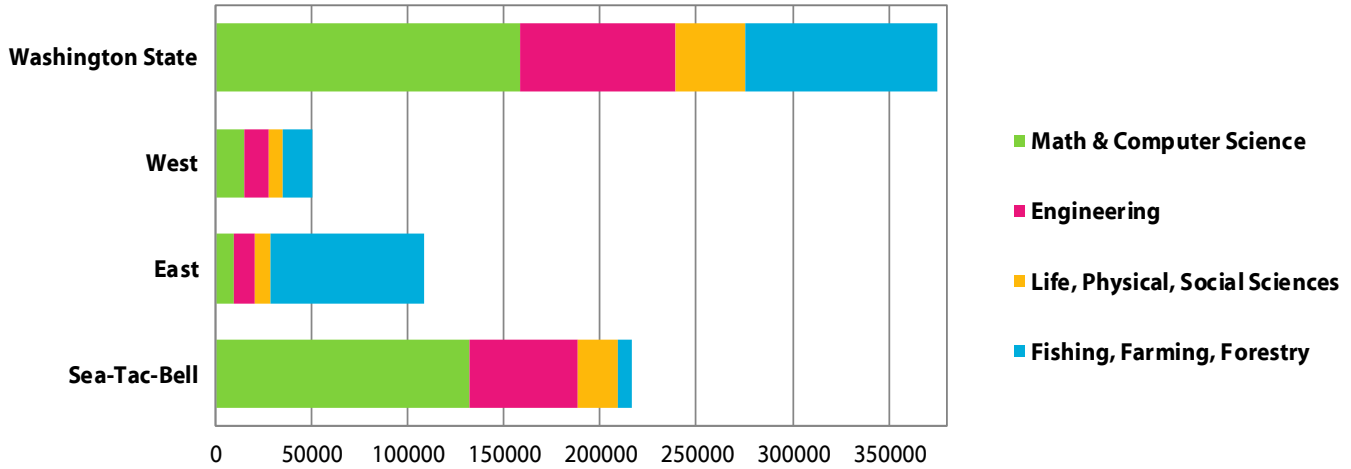
Second and perhaps crucially, PEI includes **Occupational Group 45: Farming, Fishing, and Forestry**. These jobs are very rarely considered STEM, and CEW even classifies them as “blue collar”. While it is true that physical labor is a component of this work, and also that educational expectations might be lower in these fields, it is perhaps too often neglected that these occupations provide pathways to other STEM careers, and in many cases employ STEM skills themselves. For instance, Conservation Scientists and Foresters are considered Life Scientists (widely included in STEM), while Forest and Conservation Workers are considered Farming, Fishing, and Forestry occupations. These jobs require STEM skills, and almost certainly provide a pathway to Life Science careers. Likewise, educational programs that improve FieldSTEM expertise may provide an accelerated route for students in rural areas of Washington (outside of Seattle) to access Life Science careers.

Regional FieldSTEM Jobs Breakdown

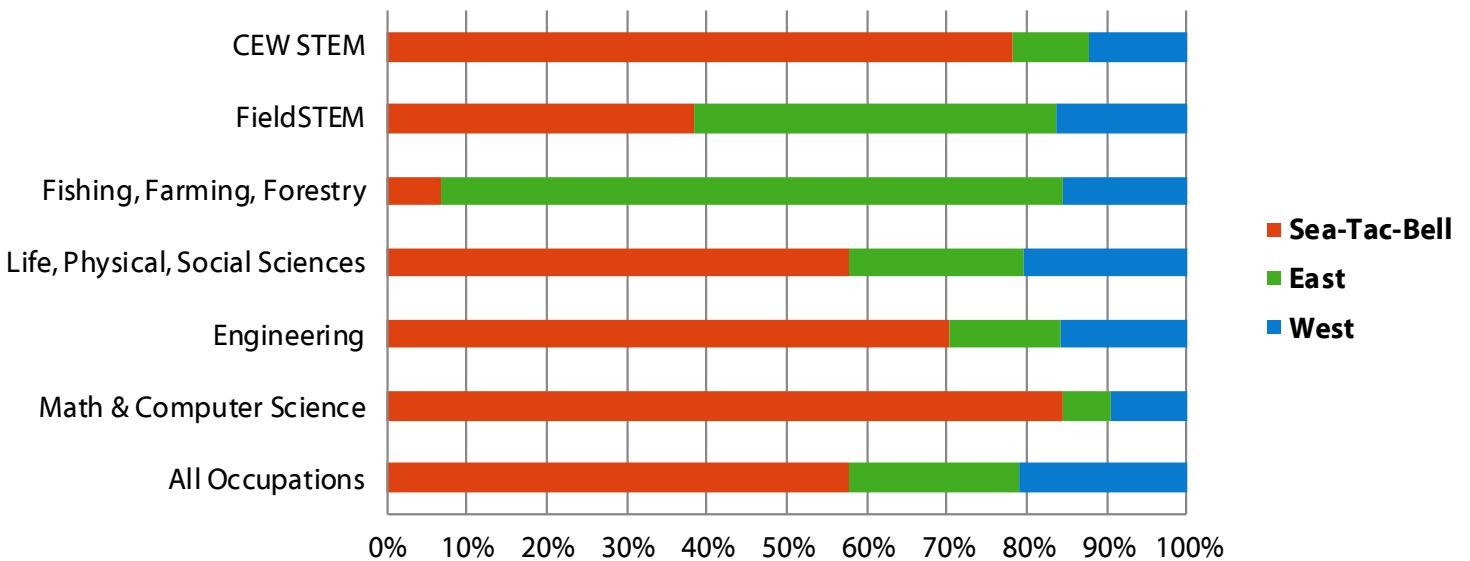


Share of Washington's FieldSTEM Jobs

All Occupation Groups, Regional Breakdown



Regional Percentage of Given Job Category in Washington



This last graph provides a great conceptualization of what we are getting at here. Different categories of jobs are broken down based on what the percentage distribution is across the different regions in Washington. The last row is for *All Occupations*. This corresponds to our *Regions in Washington Jobs Breakdown*. If we compare different job occupations to the statewide row, we can see whether the proportion of a given type of workers in a region is roughly equal to the proportion of those workers in the whole state. This is most true for Life, Physical, and Social Scientists (which matches the distribution for All Occupations almost perfectly). Mathematics and engineering occupations are generally heavily biased towards the greater Seattle area, which is usually reflected in STEM job classifications. Fishing, farming, and forestry is heavily biased towards East Washington, which is reflected in the distribution of PEI-defined FieldSTEM jobs through Washington.



There are several avenues for next steps. The *Boston Consulting Group Opportunity for All Report* asks how improving the STEM education pipeline in Washington state, from pre-K through post-graduate, might also improve the preparedness of Washington’s students to enter STEM careers. Likewise, it is worth investigating whether FieldSTEM programs, specifically K-12, may improve FieldSTEM career readiness in Washington’s students. These programs would help bridge income gaps as well, because FieldSTEM jobs are often in areas that face greater poverty rates and other social challenges.

Similarly, the *CEW Recovery 2020 Report* forecast economic growth and education requirements over the next 5-10 years for various Occupational Groups. Their big finding is that (CEW) STEM and medical fields will be the most rapidly growing throughout the country, and particularly in Washington State. Indeed, math and computer science jobs may increase by as much as 25% by 2020, while fishing, farming, and forestry occupations are expected to stay stagnant. This means investment in math and computer science makes sense in terms of growing workforces, however it is worth investigating how the job landscape of Washington in 10 years will still rely on fishing, farming, forestry, and life science occupations. Indeed, the *Washington State Employment Security Department Employment Projections* data includes 5 and 10 year projections by occupation and region.

