STEM EDUCATION PATHWAYS

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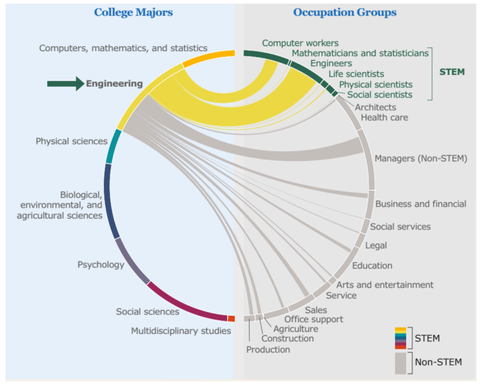
Project Objective and Motivation[1]

Data on traditional STEM (Science, Technology, Engineering, and Mathematics) pathways are well-documented and explored. The Census Bureau, for example, provides an interactive pathway map of bachelor's degrees to occupation on its website. However, half of STEM occupations do not require a bachelor's degree. Additionally, women and minorities shift to non-STEM fields more on average. We aim to understand STEM pathways, particularly non-traditional pathways with a focus on women and minorities as they enter and leave the STEM field, as well as employer expectations of the STEM workforce.

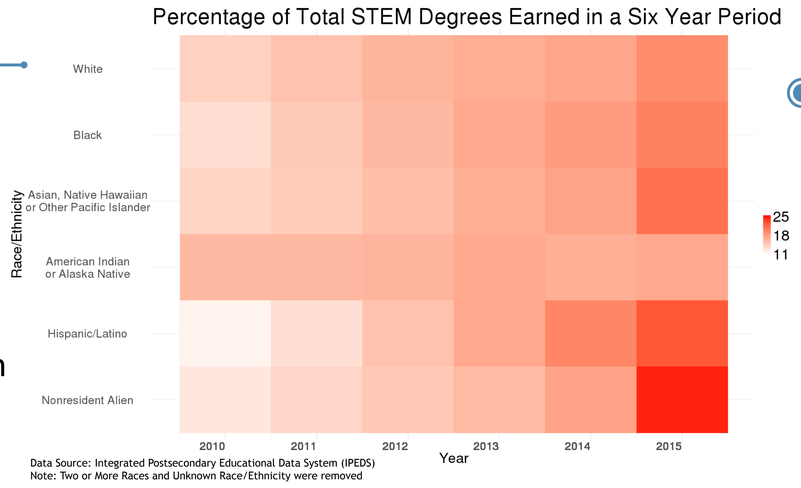


Source: U.S. Census Bureau, https://www.census.gov/dataviz/visualizations/stem/stem-html/

Exploring Education and Workforce Data by STEM Degrees and Occupations

Trends in STEM Degrees

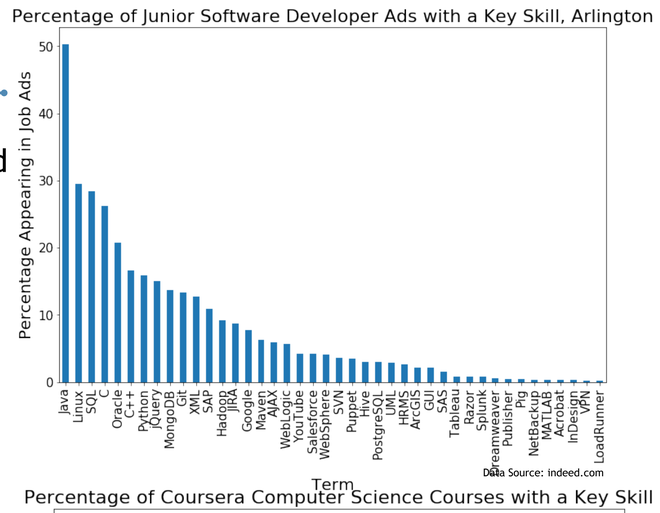
- An increasing number of STEM degrees were awarded from 2010 – 2015
- The increase was more pronounced in the black and Hispanic/Latino populations
- The proportion of the Nonresident Alien population earning sub-baccalaureate degrees is small (not shown)



Data Source: Integrated Postsecondary Educational Data System (IPEDS)
Note: Two or More Races and Unknown Race/Ethnicity were removed

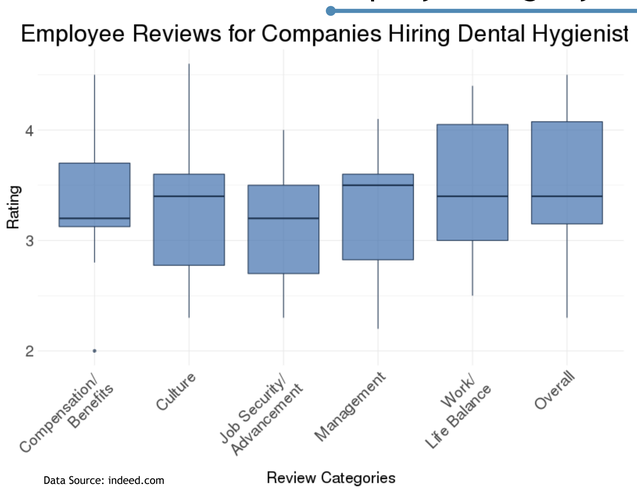
Skills Assessment of Software Developers

- Employee skills sought by employers can be compared to skills taught in STEM classes
- Programming languages taught in online computer science courses may not align with programming languages in demand by employers



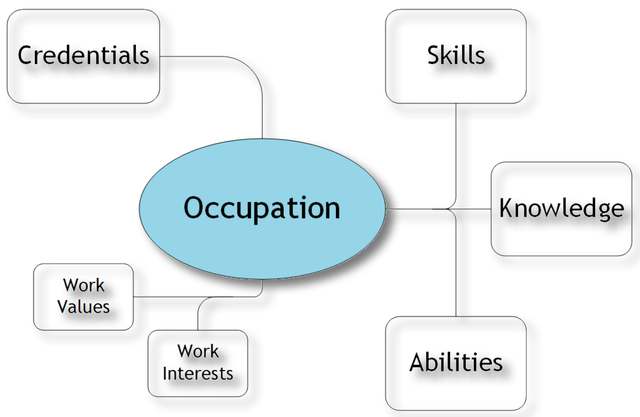
Data Source: indeed.com

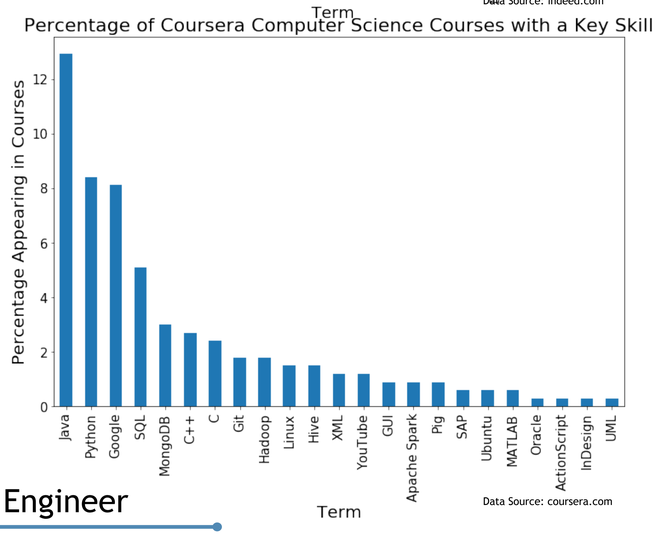
Company Ratings by Employees on Work Values



Data Source: indeed.com

- Work values and work interests are individual preferences that enhance retention and persistence in an occupation[2]
- Employees at dentists' offices rate their employers lowest on Job Security and Advancement

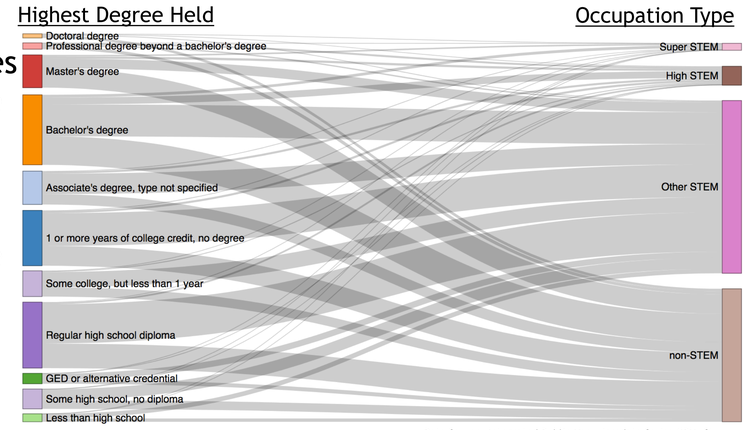




Data Source: coursera.com

Educational Pathways of Women to STEM Occupation

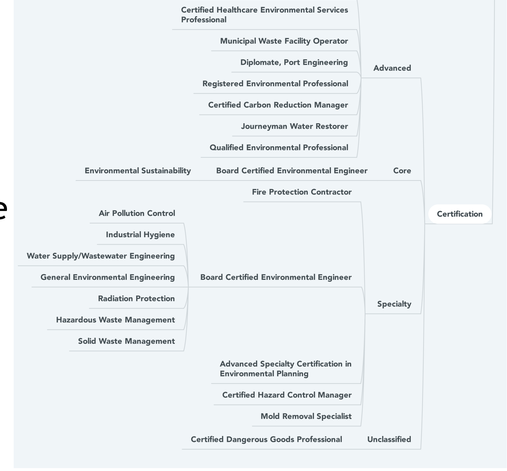
- Majority of female STEM employees have less than a bachelor's degree
- "Other STEM" contains jobs classified by Bureau of Labor Statistics as STEM but that do not have a high STEM knowledge score from Occupational Information Network (O*NET) data
- Calculation of High-STEM and Super-STEM from Rothwell (2013)[1]

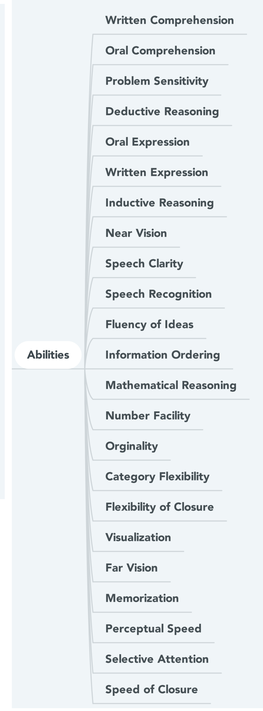


Data Source: Integrated Public Use Microdata Series (IPUMS)

Mind Map of Environmental Engineer

- Employers expect workers to have certain knowledge, skills, and abilities (KSAs)
- Employees earn credentials that are a proxy for KSAs
- Cognitive competencies like abilities are clustered lists
- Certifications are branched pathways





Data Source: O*NET Online U.S. Department of Labor

Next Steps

- Create pathway map to explore patterns within race/ethnicity
- Explore additional longitudinal surveys (e.g., Early Childhood Longitudinal Study-Kindergarten, Baccalaureate and Beyond:2008) that may contain more information for pathway maps
- Web-scrape content to explore the connection between educational objectives and O*NET cognitive competencies
- Develop a quantitative definition of STEM occupation levels and extend the definition to academic awards

Sources
1. Rothwell (2013) "The Hidden STEM Economy"
2. Carnevale (2011) "STEM"