

Options for defining STEM (Science, Technology, Engineering, and Mathematics) occupations under the 2018 Standard Occupational Classification (SOC) system

SOC Policy Committee recommendation to the Office of Management and Budget (OMB)

The acronym “STEM” is widely used in discussions across government, academia, and business, given increased emphasis on innovation and its implications for the economy and labor market. The discussion and analyses quickly get confounded since there is no commonly agreed upon definition of STEM. In July 2011, OMB asked the SOC Policy Committee (SOCPC) to recommend options for defining STEM occupations based on the 2010 SOC in order to enhance comparability of data across statistical agencies and organizations studying the STEM workforce for policymaking purposes, including educational and workforce planners. Information regarding the process for developing the 2010 SOC STEM list is available at:

<https://www.bls.gov/soc/2010/#crosswalks>.

With the publication the 2018 SOC, the SOCPC initiated an update to their recommendation on STEM occupations. To maximize the comparability of data, the SOCPC agreed to maintain the same framework as used in the 2010 STEM occupations recommendation. The framework gives users options for defining STEM occupations, while also allowing for comparison across agencies and organizations. The SOCPC approved the updated recommendation in December 2018 and then finalized its recommendation to OMB in June 2019.

The STEM framework consists of 2 major STEM domains. Each domain includes 2 sub-domains, as follows:

Science, Engineering, Mathematics, and Information Technology Domain

1. Life and Physical Science, Engineering, Mathematics, and Information Technology Occupations
2. Social Science Occupations

Science- and Engineering-Related Domain

3. Architecture Occupations
4. Health Occupations

Further, as shown in the grid in Attachment B, within each of these 4 sub-domains (represented by columns 1-4), 5 types of STEM occupations were identified (represented by rows A-E):

- A. Research, Development, Design, or Practitioner Occupations
- B. Technologist and Technician Occupations
- C. Postsecondary Teaching Occupations
- D. Managerial Occupations
- E. Sales Occupations

Thus, the grid in Attachment B consists of 4 domains/sub-domains cross-cut by the 5 types of occupations. Each cell of the grid represents the intersection of a domain and type of occupation and is labeled accordingly, e.g., 1.A, 2.A, 1.B. The grid lists the aggregate SOC occupation groups or, in some cases, detailed occupations that the SOCP includes in each cell on the grid. In its discussions on how to populate the grid with detailed SOC occupations, the SOCP relied mainly on SOC Classification Principle 2, which states, "Occupations are classified based on the **work performed** and, in some cases on the skills, education, and/or training needed to perform the work at a competent level." Attachment C lists the detailed SOC occupations identified by the SOCP as included in the STEM domains and types of occupations. For each occupation, its corresponding cell on the STEM definition options grid is indicated, e.g., 1.A, 2.A, 1.B.

The SOC classifies all workers and jobs into occupational categories for the purposes of collecting, calculating, analyzing, or disseminating data. Because SOC occupations are classified based on the work performed, some detailed SOC occupations combine work activities that are appropriate to more than one STEM sub-domain or type of occupation. That is, the SOC definition for that occupation is broader than a single point on the grid. The SOCP understands that this raises some difficulties in applying data to STEM categories, and users will have to determine how to address this difficulty. Specifically, this challenge occurs in 8 instances, indicated by use of the term 'part' in Attachment B:

- 11-9040 Architectural and Engineering Managers
- 15-1299 Computer Occupations, All Other
- 15-2099 Mathematical Science Occupations, All Other
- 17-3011 Architectural and Civil Drafters
- 17-3019 Drafters, All Other
- 19-4099 Life, Physical, and Social Science Technicians, All Other
- 29-9020 Health Information Technologists and Medical Registrars
- 29-9099 Healthcare Practitioners and Technical Workers, All Other

In the first instance, 11-9040 Architectural and Engineering Managers includes jobs in two sub-domains: (1) Architecture Occupations, and (2) Life and Physical Science, Engineering, Mathematics, and Information Technology Occupations. Users who want to include only the second sub-domain in their analyses, but not the first, will need to determine whether and how to split employment in this occupation between sub-domains. In this case, one option is to examine the distribution of industry employment data within NAICS 5413 Architectural and Engineering Services, where employment in the occupation is concentrated, then apportion combined occupational employment accordingly. However, available NAICS industry employment data do not help in determining the breakout for 19-4000 Life, Physical, and Social Science Technicians in a similar manner, requiring that some other method be used, perhaps involving a comparison of the relative employment size of occupational minor groups 19-1000 Life Scientists, 19-2000 Physical Scientists, and 19-3000 Social Scientists and Related Workers.

The next opportunity to incorporate lessons learned from the challenges faced when applying a STEM framework to the existing SOC occupational structure will occur during a future revision period which is still to be determined. Information about the next SOC revision will be posted to <https://www.bls.gov/soc/> as it becomes available.