

Options for defining STEM (Science, Technology, Engineering, and Mathematics) occupations under the 2010 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.

The SOCPC formed a workgroup with members from the Department of Labor, Bureau of Labor Statistics and Employment Training Administration; the Department of Commerce, Census Bureau; the Department of Defense, Defense Manpower Data Center; the Equal Employment Opportunity Commission; the Department of Health and Human Services, Health Resources and Services Administration; the Department of Education, National Center for Education Statistics; and the National Science Foundation, National Center for Science and Engineering Statistics. The workgroup identified existing definitions of STEM used by federal agencies and major users outside of the federal government, such as academic or policy bodies. Next, a framework was developed for defining STEM occupations, consistent with the SOC Classification Principles most heavily influenced by Classification Principle 2. This framework evolved into a grid that gives users options for defining STEM occupations, while also allowing for comparison across agencies and organizations.

The SOCPC approved the workgroup recommendations in October 2011, made a preliminary recommendation to OMB in November 2011, requested outside agency review of their results in December 2011, and then finalized its recommendation to OMB in April 2012.

The STEM workgroup came to a consensus on 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 workgroup 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 2010 SOC was developed prior to this STEM exercise, to classify 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. 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 3 instances, indicated by use of the term 'part' in Attachment B:

11-9040 Architectural and Engineering Managers

17-3011 Architectural and Civil Drafters

19-4099 Life, Physical, and Social Science Technicians, 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 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 occurs when the revision process for the 2018 SOC begins in 2013. Information about the next SOC revision will be posted to [www.bls.gov/soc](http://www.bls.gov/soc) as it becomes available.