About Science and Engineering Indicators

Science and Engineering Indicators (SEI) is first and foremost a volume of record comprising the major high-quality quantitative data on the U.S. and international science and engineering enterprise. SEI is factual and policy neutral. It does not offer policy options, and it does not make policy recommendations. SEI employs a variety of presentation styles—tables, figures, narrative text, bulleted text, Web-based links, highlights, introductions, conclusions, reference lists—to make the data accessible to readers with different information needs and different information-processing preferences.

The data are "indicators." Indicators are quantitative representations that might reasonably be thought to provide summary information bearing on the scope, quality, and vitality of the science and engineering enterprise. The indicators reported in SEI are intended to contribute to an understanding of the current environment and to inform the development of future policies. SEI does not model the dynamics of the science and engineering enterprise, and it avoids strong claims about the significance of the indicators it reports. SEI is used by readers who hold a variety of views about which indicators are most significant for different purposes.

SEI is prepared by the National Science Foundation's National Center for Science and Engineering Statistics (NCSES) under the guidance of the National Science Board (Board). It is subject to extensive review by outside experts, interested federal agencies, Board members, and NSF internal reviewers for accuracy, coverage, and balance.

SEI includes more information about measurement than many readers unaccustomed to analyzing social and economic data may find easy to absorb. This information is included because readers need a good understanding of what the reported measures mean and how the data were collected in order to use the data appropriately. SEI's data analyses, however, are relatively accessible. The data can be examined in various ways, and SEI generally emphasizes neutral, factual description and avoids unconventional or controversial analysis. As a result, SEI almost exclusively uses simple statistical tools that should be familiar and accessible to a college bound high school graduate. Readers comfortable with numbers and percentages and equipped with a general conceptual understanding of terms such as "statistical significance" and "margin of error" will readily understand the statistical material in SEI. A statistical appendix aids readers' interpretation of the material presented.

SEI's Different Parts

SEI includes an overview, seven chapters that follow a generally consistent pattern, and an eighth chapter, on state indicators, presented in a unique format. The chapter titles are as follows:

♦ Elementary and Secondary Mathematics and Science Education

♦ Higher Education in Science and Engineering

♦ Science and Engineering Labor Force

♦ Research and Development: National Trends and International Comparisons

♦ Academic Research and Development

♦ Industry, Technology, and the Global Marketplace

♦ Science and Technology: Public Attitudes and Understanding

♦ State Indicators

An appendix volume, available online at http://www.nsf.gov/statistics/indicators/, contains detailed data tables keyed to each of the eight chapters. SEI includes a list of acronyms and abbreviations and an index.

The National Science Board authors one or more companion pieces, which draw on the data in SEI and offer recommendations on issues of concern for national science and engineering research or education policy, in keeping with the Board's statutory responsibility to bring attention to such issues. In addition, the Board publishes the *Science and Engineering Indicators Digest*, a condensed version of SEI comprising a small selection of important indicators. The digest serves two purposes: (1) to draw attention to important trends and data points from across the chapters of SEI and (2) to introduce readers to the data resources available in the main volume of *SEI 2014* and associated products.

The Overview

The overview is a selective synthesis that brings together patterns and trends that unite data in several of the substantive chapters. The overview helps readers to synthesize the findings in SEI as a whole and draws connections among separately prepared chapters that deal with related topics. It is intended to serve readers with varying levels of expertise. Because the overview relies heavily on figures, it is well adapted for use in developing presentations, and presentation graphics for the figures in the overview are available on the Web. Like the core chapters, the overview strives for a descriptive synthesis and a balanced tone, and it does not take or suggest policy positions.

The Seven Core Chapters

Each chapter consists of contents and lists of sidebars, text tables, and figures; highlights; introduction (chapter overview and chapter organization); a narrative synthesis of data and related contextual information; conclusion; notes; glossary; and references.

Highlights. The highlights provide an outline of major dimensions of a chapter topic. Each highlight starts with a statement that summarizes a key point made in the chapter. Bulleted points supporting the key point follow.

Introduction. The chapter overview provides a brief explanation of the importance of the topic. It situates the topic in the context of major concepts, terms, and developments relevant to the data reported. The introduction includes a brief narrative account of the logical flow of topics within the chapter.

Narrative. The chapter narrative is a descriptive synthesis that brings together significant findings. It is also a balanced presentation of contextual information that is useful for interpreting the findings. As a descriptive synthesis, the narrative aims (1) to enable the reader to assimilate a large amount of information by putting it in an order that facilitates comprehension and retention and (2) to order the material so that major points readily come to the reader's attention. As a balanced presentation, the narrative aims to include appropriate caveats and context information such that (3) a nonexpert reader will understand what uses of the data may or may not be appropriate, and (4) an expert reader will be satisfied that the presentation reflects a good understanding of the policy and fact context in which the data are interpreted by users with a range of science policy views.

Figures. Figures provide visually compelling representations of major findings discussed in the text. Figures also enable readers to test narrative interpretations offered in the text by examining the data themselves.

Text Tables. Text tables help to illustrate and to support points made in the text.

Sidebars. Sidebars discuss interesting recent developments in the field, more speculative information than is presented in the regular chapter text, or other special topics. Sidebars can also present definitions or highlight crosscutting themes.

Appendix Tables. Appendix tables, available online (http://www.nsf.gov/statistics/indicators/), provide the most complete presentation of quantitative data, without contextual information or interpretive aids. According to past surveys of SEI users, even experienced expert readers find it helpful to consult the chapter text in conjunction with the appendix tables.

Conclusion. The conclusion summarizes important findings. It offers a perspective on important trends but stops short of definitive pronouncements about either likely futures or policy implications. Conclusions tend to avoid factual syntheses that suggest distinctive or controversial viewpoints.

Notes. Information that augments points of discussion in the text is presented as endnotes.

Glossary. The glossary defines terms used in the chapter.

References. SEI includes references to data sources cited in the text, stressing national or internationally comparable data. SEI does not attempt to review the analytic literature on a topic or summarize the social science or policy perspectives that might be brought to bear on it. References to that literature are included where they help to explain the basis for statements in the text.

The State Indicators Chapter

This chapter consists of data that can be used by people involved in state-level policy making, including journalists and interested citizens, to assess trends in S&T-related activities in their states. No interpretive narrative synthesizes overall patterns and trends. SEI includes state-level indicators to call attention to state performance in S&T and to foster consideration of state-level activities in this area.

Indicators are drawn from a range of variables, most of which are part of the subject matter of the seven core chapters. The text explains the meaning of each indicator and provides important caveats about how to interpret it. Approximately three to five bullets highlight significant findings covering a 10-year span, when available. Data for the indicators are graphically displayed in state-by-state tables, in United States maps that code states into quartiles, and in histograms that show how state values are distributed. A small number of appendix tables for this chapter can be found online. The online state data tool (http://www.nsf.gov/statistics/seind14/c8/interactive) provides additional data on state S&T over the past 20 years.

Presentation

SEI is released in printed and electronic formats. The printed volume provides the full content except for the appendix tables. The complete content of SEI is posted online at https://www.nsf.gov/statistics/indicators/ in html format and PDF, with text tables, appendix tables, and source data for each figure available in spreadsheet (MS Excel) format. In addition, selected figures are also available in presentation-style format as MS PowerPoint and JPEG files.