

**INTEGRATION OF EDUCATION IN THE SCIENCES, ENGINEERING, AND MEDICINE WITH
THE ARTS AND HUMANITIES AT THE UNDERGRADUATE AND GRADUATE LEVELS**

**A Project of the
Board on Higher Education and Workforce**

May 2016

An ad hoc committee overseen by the Board on Higher Education and Workforce (BHEW), in collaboration with other units of the National Academies of Sciences, Engineering, and Medicine, will produce a consensus report that examines the evidence behind the assertion that educational programs that mutually integrate learning experiences in the arts, humanities and STEM lead to improved educational and career outcomes for undergraduate and graduate students. In particular, the study will examine the following:

- Evidence regarding the value of incorporating curricula and experiences in the humanities—including the arts, history, literature, philosophy, culture and religion --into college and university STEM education programs, in order to understand whether and how these experiences: (1) prepare STEM students and workers to be more effective communicators, critical thinkers, problem-solvers and leaders; and (2) prepare STEM graduates to be more creative and effective scientists, engineers, technologists and health care providers, particularly with respect to understanding the broad social and cultural impacts of applying scientific and technical knowledge to address challenges and opportunities in the workplace and in their communities.
- Evidence regarding the value of incorporating more STEM curricula and labs into the academic programs of students majoring in the humanities and liberal arts in order to understand the following: (1) how STEM experiences provide important knowledge about the scientific understanding of the natural world and the characteristics of new technologies, knowledge that is essential for all citizens of a modern democracy; (2) how major technological dimensions are essential to make sound decisions across all professional fields; and (3) how STEM experiences develop the skills of scientific thinking (a type of critical thinking), innovation and creativity that may complement and enrich the critical thinking and creativity skills developed by the humanities, as graduates in such fields enter the workforce and build careers.

- New models and good practices for mutual integration of the humanities and STEM fields at 2-year colleges, 4-year colleges, and graduate programs, drawing heavily on an analysis of programs that have been implemented at Harvard, Dartmouth, MIT, Princeton, Stanford, Florida International, Montgomery College, Arizona State University, SUNY-Binghamton, and many other institutions of higher education.

The outcomes of the project will include the following:

- An analysis of the evidence of the benefits of more integrated educational experiences in the arts, humanities and STEM on the education and career experiences of students and workers.
- An Academies consensus report, including specific, evidence-based recommendations aimed at encouraging the creation of more effective integration of the arts, humanities and STEM in our nation's 2-year and 4-year colleges and universities—as well as in our nation's high schools and informal education environments. The audiences for such a report will include colleges and universities, K-12 schools and school districts, policymakers at the federal and state levels, government agencies, business and industry, and foundations and other nonprofit organizations.
- A major dissemination effort focused on sharing the report and its findings and recommendations with broad audiences—drawing upon the outreach and communications capabilities of the institutions and organizations that will be involved in shaping the report.

As BHEW and other divisions and units within the Academies embark on new projects aimed at improving the understanding and application of science, engineering and medicine toward the social, economic and cultural well-being of the nation and world, we believe it is critical to work with partners in the arts and humanities for their input and engagement. While our focus is developing policy recommendations that improve science, engineering and health education and training in our nation's colleges and universities, a broader goal is to enable all citizens to have enriching and meaningful careers and lives. As such, we believe that more effective integration of educational experiences in all disciplines—particularly in the arts, humanities, sciences, engineering, and medicine—will benefit all of our nation's citizens.

A December 2, 2015 workshop in Washington, DC, hosted by BHEW, funded by the Andrew W. Mellon Foundation, and attended by more than 110 scientists, engineers, artists, humanists, educators, policymakers and industry executives, was the initial step in this effort. Mellon has now agreed to provide generous funding to support this larger study, and additional funding is also being sought from other sources to support the 18-24 month project.