



Association of American Universities Five-Year Initiative for Improving Undergraduate STEM Education

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The Association of American Universities (AAU) will undertake a five year initiative on undergraduate teaching in the science, technology, engineering, and mathematics (STEM) fields, particularly focused on the first two years of college. The goals of the initiative are to help higher education institutions assess the quality of teaching in these fields, share best practices, and encourage departments and faculty members to use the most effective teaching methods in their classes. AAU's effort will complement efforts already underway on many of our institutions' campuses, as well as efforts by other groups.

The STEM fields are critical to generating the new ideas, companies, and industries that drive our nation's competitiveness, and will become even more important in the future. Improving undergraduate STEM education is both a national need and a long-term challenge. Many AAU institutions are among those at the forefront of addressing this need.

This issue has taken on new resonance in recent years as the nation's need for more STEM graduates has increased. Along with the publication of several high-level reports that have identified deficiencies and potential solutions, new scholarship on teaching and learning has led to the development of techniques that have been demonstrated to be more engaging and more effective at helping students learn.

To help guide this initiative, AAU is assembling a technical advisory committee composed of experts in undergraduate STEM teaching and learning. The technical advisory committee will assist AAU in meeting the following goals:

1. Develop an effective analytical framework for assessing and improving the quality of STEM teaching and learning, particularly in the first two years of college.
2. Create a demonstration program at a subset of AAU universities to implement the framework. Activities will include developing tools to survey and assess: a) the quality of teaching and learning in STEM classes; b) the extent to which effective teaching methods are being used by academic departments; and c) the effects of improved teaching on retention of STEM majors and completion of STEM degrees.
3. Explore mechanisms that institutions and departments can use to train, recognize, and reward faculty members who want to improve the quality of their STEM teaching.
4. Work with federal research agencies to develop mechanisms for recognizing, rewarding and promoting efforts to improve undergraduate learning.

5. Determine how best to evaluate and develop effective means for sharing information about promising and effective undergraduate STEM education programs, approaches, methods, and pedagogies.

AAU will ask Presidents and Chancellors, or their representatives, to be part of a new task force that will also help guide efforts on these issues and play a key role in the demonstration program for the framework.

AAU will work closely both with our own institutions and with other groups that are already engaged in complementary efforts, including:

- the Association of Public and Land-grant Universities (APLU), which has undertaken major efforts to expand the number and quality of K-12 STEM teachers and to redesign gateway courses at universities and community colleges using online learning tools;
- the Business-Higher Education Forum (BHEF), which has launched major initiatives to improve college readiness, access, and success and to address issues relating to STEM workforce needs;
- the Howard Hughes Medical Institute (HHMI), which is a major funder of efforts to improve undergraduate biology teaching and learning through its HHMI Professors Program and other initiatives;
- the President's Council of Advisors on Science and Technology (PCAST), which has formed a working group on these issues and is expected to release a major report with recommendations: and
- Various disciplinary societies, including the American Physical Society (APS), which has programs to help new faculty learn to implement more effective methods of teaching and assessment.

One of the strengths of U.S. research universities is the integration of teaching and research, and bringing these together in the classroom benefits student learning. Different organizations must contribute to efforts to enhance STEM education. But, by working together in a coordinated fashion, higher education associations, individual universities, disciplinary societies, federal agencies, and the business community can bring about major improvements in STEM education and retention at all levels.