



## ***Vision and Change in Undergraduate Biology Education: a Call to Action***

[www.visionandchange.org](http://www.visionandchange.org)

Mary Lee S. Ledbetter  
[msledbet@nsf.gov](mailto:msledbet@nsf.gov)

National Science Foundation  
Directorate for Education & Human Resources  
Division of Undergraduate Education (DUE)

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## History of Vision and Change

- 1961 – Bruner “The Act of Discovery” (Harvard Educational Review)
- 1984 – Novak and Gowin Learning how to Learn (Cambridge University Press)
- 1989 – Science for All Americans (AAAS)
- 1991 – “What works: Building Natural Science Communities”(Project Kaleidoscope)
- 1996-2010 – A series of influential reports from the National Research Council



## History of Vision and Change

- 2006 – NSF staff from two Directorates (BIO and EHR) formed a working group to explore a shared “vision” for the biology community. Asked AAAS to assist in coordinating a series of conversations.
- 2007 – Regional conversations including ~200 stakeholders including students. Represented all sorts of colleges, all subdisciplines, various faculty expertise, funding agencies, professional societies
- 2009 – Major invitational conference to make recommendations for change



## Outline of report

1. Undergraduate Biology Education for All Students. “The biology we teach should reflect the biology we practice.”
2. Cultivating Biological Literacy. Offers a framework for biology education that identifies **5 core concepts and 6 core competencies**.
3. Student-centered Undergraduate Biology Education. Identifies evidence-based innovations that improve student learning.
4. Preparing Campuses for the Challenges Ahead. Seeks improved reward system for educational research and innovation.





## How to proceed? The student-centered classroom

- Goals: What should student know and be able to do at the end of a unit or course?
- How can you recognize proficiency and mastery?
- How could I be persuaded that a student has achieved proficiency and mastery and **what evidence would convince my colleagues?**



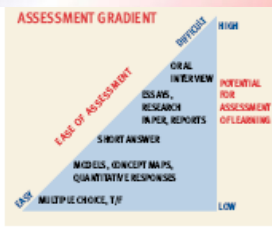
## Backwards design

- Identify goals
- What level of performance would indicate achievement of goals?
- What is needed to elicit that level of performance?
- The role of assessment



Some assessment instruments and what they measure.

Figure 3.2: Assessment Gradient (from Janet Batzli, Biology Core Curriculum, University of Wisconsin-Madison and Tammy Long, Plant Biology, Michigan State University).



## What is next? CHANGE

- Nurture future faculty through formal programs and enrichment opportunities.
- Address needs of current faculty, providing development opportunities and incentives.
- Move both from individual courses to departmental adoption of best practices
- Make the student-centered approach a hallmark of the institution's identity





## What can professional societies do?

- Provide a forum for conversation about education in meetings and journals
- Manage and vet “best practices” in the discipline
- Take a leadership role in promoting institutional change by identifying exemplary role models
- ASM is featured in the Vision and Change report precisely for its support of ASMCUE.

**IN PRACTICE**

**PROFESSIONAL SOCIETIES TO THE RESCUE**

In 2016, the American Society for Microbiology (ASM) established the annual ASM Conference for Undergraduate Education (ASMCUE) to support the education sector at the ASM conference. Conference organizers often exhibited the program to, and receive feedback on, the general ASM meeting, usually at a local college campus. These initial findings have been consolidated by the 2016 ASM survey to participate in two different meetings. Over the years, ASMCUE has evolved from a meeting that disseminated teaching strategies, such as presented in a student Mentoring session. It was that session more generally the scholarship of teaching and learning in biology.

In 2016, the society created sessions in 10 year programs. These sessions offered an insight into the outcomes of ASMCUE efforts to support undergraduate biology education efforts.

- Eighty-two percent of respondents changed their content or program on the basis of information presented at the conference. The respondents shared information with colleagues locally, increased online resources (70%), increased their experience research about ASMCUE (particular problems (44%)), added new course materials from the conference (41%), and increased their experience with teaching and learning (37%).
- More than half of the respondents (51%) attended to collect more materials, and about one-third attended new laboratory sessions to develop new skills, attend career laboratory sessions with the guidelines, and attended inquiry-based learning sessions (30%).
- Participants submitted in several ways. Fifty-two percent submitted abstracts from a pre-conference abstract session, and 41% completed an online abstract submission after the conference. Another 30% submitted abstracts, and 41% submitted abstracts in their original format. Abstracts submitted were submitted to the conference, and 41% submitted abstracts for their original format. Abstracts submitted were submitted to the conference, and 41% submitted abstracts for their original format.

Conference organizers also distributed post-conference surveys, with an average return rate of 17%. From the data collected for these surveys and from registration data, the following is known about more recent ASMCUE annual attendees:

- ASMCUE serves more than 100 biologists annually. Thirty-two percent represent community colleges, 21% come from research undergraduate institutions, and 17% come from universities that grant masters or doctoral degrees.
- Twenty-five percent of participants teach in 2-year colleges, 21% teach in teaching and health sciences majors, and 20% teach introductory biology. In general, nearly 20% teach introductory or general biology, 13% teach general microbiology, 10% teach reproductive biology, and 17% teach human anatomy and physiology.
- About 90% were attending the conference for the first time, suggesting that they are early career faculty. On the basis of the large number of participants in voluntary sessions on active learning and assessment, it appears that many attend to learn points of discussion teaching tips and to interact with a supportive community.

ASMCUE has become an important resource for biologists who are involved in undergraduate biology education. Attendees have reported or measured outcomes, attended new laboratory experiences or new approaches to teaching, developed new courses, and have recognized for their efforts by obtaining faculty recognition awards and grants. Many attendees reported that ASMCUE improved their thinking and approach to teaching, and 17% indicated that it improved the quality and scope of the content in their courses and programs.

Although more than 100 biologists attended the conference, faculty attendees continue to take the conference goals to more scholarly heights. In the previous six years, a growing number of biologists have called for more research opportunities around their teaching. Under the leadership of several College Scholars in Biology and Chemistry, and in response to biologists' needs, ASM, with the support of the NSF, established the Biology in Biotech program in 2016. The program focuses on biologists' knowledge about the scholarship of teaching and learning and encourages them to publish their teaching-related research in biology education journals, such as *Journal of Microbiology & Biology Education*.

Another important ASMCUE innovation in teaching those attendees who have collected assessment data (demonstrating gains in student learning based on a specific teaching approach) is present a portion of the conference. In 2016, the program published ASMCUE poster abstracts to the journal of *Journal of Microbiology & Biology Education*, providing authors with status of their work, and those who did not attend the conference with access to the work presented. It is expected that ASMCUE participants will continue to use knowledge and understanding in biology education as they develop professional skills and that they will be recognized and rewarded for these efforts, leading to greater value in undergraduate biology education.

**The more information, visit**  
<http://www.asmcon.org/>  
[www.undergrad.org](http://www.undergrad.org/)  
<http://teach.asm.org/>



## So what is next?

Let's talk....

- NSF funding opportunities for educational projects
- Invitation to participate in peer review of those projects
- Other questions or comments.