Higher Education: the Future

Professional societies have an important role in education as new technologies and approaches are implemented

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More and more, higher education is transforming from closed, instructor-led classrooms to open, student-directed communities of learning. College-level content is accessible anywhere and anytime. Formal courses, such as those from MIT OpenCourseWare and the Open University (United Kingdom), are available to all of us. In addition, learning resources from collections such as the National Science Digital Library, Open Educational Resources, and Public Knowledge Project bring up-to-date information to the public. Wikipedia, YouTube, and Flickr convert and organize content into accessible formats for students from diverse learning, lingual, and cultural backgrounds. New communities in Facebook, LinkedIn, and WordPress facilitate sharing and discussions. Smart phones and other mobile devices bring content and people to students continuously. I believe these platforms and others will continue to transform the lives of college students, faculty, and others involved in science. Anyone wanting to discover new content and attempt new experiences will do so using emerging technologies, information, and experts from the Internet.

College Students. I envision college students controlling their own learning. Students will seek new content as they gain deeper understanding and perform new tasks as they develop skills. Learning will be augmented through new technologies to create and simulate the real world. The only deciding factor for students to acquire new content and develop skills is their own motivation to persevere.

No longer will scientists be invisible to students. The websites of faculty and university research teams as well as sponsors of such research will proliferate on the Internet, and such exposure will give students access to scientists, research teams, laboratories, and collaborators from around the world. Students will be able to form expansive networks of peers, experts, and mentors to augment their understanding, develop research projects, and practice skills. They will not only call upon assigned advisers but also reach out to multiple mentors in their network for knowledge and guidance. With the Internet and services such as Skype, mentors will not be limited by geographical or temporal boundaries.

College students will become more efficient learners due to instruments such as VARK and Honey and Mumford that help identify their unique learning styles or preferences (e.g., how they obtain or give up information). Once students are cognizant of their preferences, they can select from a variety of modalities for optimal learning: readings and discussions (blogs); audio recordings or visual presentations (Powerpoint or YouTube); problems sets and simulations; and field studies and team projects.

College students will look to higher education for broader and more balanced training than strict subject-matter content. The workplace will become even more competitive; prospective employees will need to be critical and analytical thinkers, better communicators, and collegial team players in a global society. Thus, students will seek new skills. For future scientists, these skills will encompass personal (e.g., financial, educational, and career planning) to the professional (e.g., presentations, grantsmanship, publishing, teaching and mentoring, career transitioning, and ethics) and global (e.g., language and cultural) training.

Faculty. Faculty members will be masters of engagement; their previous role of presenting a series of unconnected facts about biology will be replaced by challenging students with real world, global problems and guiding them in learning. No longer will faculty need to present foundational knowledge because relevant content—from course syllabi to instructor handouts to e-textbooks and entire courses—will be available...
through the Internet. Time will be spent guiding students through problem sets and leading group discussions, debate, and discourse in on-site and virtual communities. Faculty will become effective guides of content, mentors to students about science and careers, curriculum developers, and scholars in teaching and learning. Open content, a trend that began in 2001–2002 with the MIT Open Courseware Initiative, is reaching mainstream use. Open content is particularly important where the cost of education is prohibitive or access to education is inconvenient or not available.

College faculties will be skilled at identifying prior understanding among students and tailoring instruction to incorporate student interests, learning goals, and preferred modalities of learning. They will become “learning scholars,” continuously and rigorously monitoring student acquisition of subjects and responding immediately and effectively to their learning needs. Gaps in understanding or challenges to mastering information will be disclosed immediately using clickers, for example, which make monitoring student understanding a dynamic process. Teaching will be dependent upon continuous evidence that student understanding deepens. Successful faculty members will continuously modify their instruction to meet student needs and successfully guide students to greater understanding of their personal interests.

College faculties will be skilled at advising and leading discussion groups, shepherding students to deeper understanding about biology. They will genuinely support all students to (i) master a foundational knowledge about the natural world, (ii) solve real world problems on a global scale, and (iii) pursue their own interests and select the best career option among the diversity of opportunities in biology. Successful faculty will guide students to become scientifically literate about the microbial world and its influence on the global world.

Science Curricula. College science curricula will be driven by solving real problems locally, across regions, and spanning countries and continents. Content will no longer be delivered in small chunks of unrelated, unconnected, and irrelevant material. Learning will be driven by seeking solutions to challenges that threaten our health, education, livelihood, and national security. Instruction will break apart the big challenges and focus on small scale, but interconnected and interesting, questions to study.

Course content and instruction will be built around smaller groups of subject matter experts, experts-in-training, and novices collectively and collaboratively sharing ideas, researching topics, gaining knowledge, identifying solutions, drawing consensuses, and developing solutions to unique problems. What will sustain them as a learning community is a common goal to solve the same problem.

A Vision of the Future. For such a future to happen, the role of ASM must be to foster a dynamic community of practice. The community must be driven by a vision for the future where all members adhere to the highest standards of teaching and mentoring just as they do to scientific inquiry; they actively encourage the entrance and success of all students in microbiology; they mentor students and advise the public about microbiology for the common good; and they embrace the scholarship of teaching. What role will ASM play in this future? Specific milestones I’d like to see in the next 20 years include:

- ASM journals, conferences, colloquia, and public policies advance scholarly teaching in microbiology and excellence in science education as vigorously as they advance scholarly research in microbiology and excellence in science discovery.
- The American Academy for Microbiology recognizes and rewards the scholarship of teaching and learning as it does the scholarship of discovery through nominations, awards and colloquia.
- All members are informed about the diversity of careers—from entry-level positions requiring no degrees to highly technical positions requiring postgraduate training—and use this knowledge to guide students at every level of development.
- All members in colleges, universities and professional schools assume responsibility for ensuring that all students, particularly first- and second-year undergraduate students in all disciplines, understand the nature of science and appreciate the significance of the microbial world.
- All members model for the public a respect for the natural world, recognizing both the beneficial and destructive roles of microorganisms.