

## Feature

### From The National Science Foundation

# The Important Role of Community Colleges in Undergraduate Biology Education

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## INTRODUCTION

In 2007, the American Association for the Advancement of Science (AAAS) and the National Science Foundation (NSF) initiated a series of conversations with faculty members, administrators, and other stakeholders, seeking input on ways to improve undergraduate biology education to better prepare all students for the biology-related challenges of the twenty-first century (<http://visionandchange.org/files/2010/03/VC-Preliminary-Reports-from-Conversations1.pdf>). These were followed by a meeting (July 2009) to discuss the implications of information gathered during those conversations ([http://visionandchange.org/files/2010/03/VC\\_report.pdf](http://visionandchange.org/files/2010/03/VC_report.pdf)).

Participants included faculty representing the diverse set of institutions that constitute higher education in this country: community colleges, four-year liberal arts institutions, state colleges and universities, and research-intensive universities. A document summarizing these findings is due to be released late this year or early in 2011.

The deliberation and summation process emphasized the importance of community college contributions to undergraduate biology education and provided the impetus to undertake this article. As reported by President and CEO of the American Association of Community Colleges (AACCC), George Boggs, “From relatively modest beginnings at the turn of the 20th century, community colleges now enroll 43% of all U.S. undergraduates” (Boggs, 2010).

This article is meant to:

- Help readers better understand the structure and mission of community colleges and their increasing importance in the higher education enterprise;
- Encourage greater cooperation between community colleges

and other institutions of higher education and initiate dialogs among them to find ways of easing student transitions, and

- Increase awareness of funding opportunities to support innovative undergraduate biology educational approaches on community college campuses.

## COMMUNITY COLLEGES: INSTITUTIONS, FACULTY, AND STUDENTS

### *Institutions*

There is a paucity of information concerning the teaching of biology at community colleges. This is not unexpected, considering that publication of scholarly work is not generally anticipated in the reward and/or tenure structure for community college faculty. Therefore, educational practices at these institutions are understudied when compared with their four-year college counterparts. The national picture for community colleges is also difficult to ascertain as these institutions are very diverse. For example, the foci of biology education on many community college campuses range from preparing students for transfer as majors to four-year institutions, to preparing students for careers in allied health positions, to preparing students for positions as technicians in areas such as biotechnology or environmental technology. Each community college responds individually to local needs. Local community response can differ substantially from campus to campus in community college systems.

Community colleges typically offer programs leading to the associates of arts or sciences degree as well as a variety of vocational and technical programs offering both degrees and certificates not often found at a four-year school. These institutions also offer a wide range of continuing education courses, contract education courses that serve local industry, and community-focused activities. Some institutions have expanded their programs to include baccalaureates in applied fields, such as teacher education, and nursing (Boggs, 2010), and some now offer postbaccalaureate programs such as certificates in biotechnology for students who already hold a four-year degree. Because these colleges are typically

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open-access and low cost they tend to serve a highly diverse cross-section of the population.

Biology education at the community college is often divided into an “academic track” and a “workforce access track,” although there can be a great deal of overlap and synergy between the two. Faculty may teach courses that serve either the workforce or the academic programs. Not only is this an efficient use of staff, particularly in smaller institutions, but it also helps keep the entire life science-related faculty current with both industry practices and advances in the discipline.

### **Faculty**

Faculty hiring practices are as diverse as the institutions themselves. Faculty may be recruited from industry as well as academia. Reflecting regional accreditation requirements, most community colleges require that new hires have some graduate hours, while others require advanced disciplinary degrees. Community colleges focus primarily on the job of teaching. Because of the heavy teaching load, few faculty integrate research with their teaching, either for themselves or their students, or belong to discipline-specific professional societies, although there are exceptions (see below). An important trend is the increasing number of science, technology, engineering, and math (STEM) faculty who hold advanced degrees. As of 2010, 22% of natural sciences and engineering faculty held Ph.D.s and 62% held Master’s degrees (AACC, 2010). These faculty bring with them an understanding of the importance of authentic research experiences. As a result, some are providing research experiences for their students, and many are thinking of ways to incorporate research experiences into the traditional laboratory setting (Cejda and Hensel, 2009).

### **Students**

As reported by the AACC, the average age of a community college student is 29 years old, and two-thirds of the students attend part-time. In contrast, at four-year institutions 79% of students are enrolled full-time, and the average age of undergraduates is 26 years old. Community colleges provide access for adult students, including underrepresented populations, as well as serve an increasing number of traditional age and high school students. They serve as the access point to higher education for many underrepresented groups. Half of the students who receive a baccalaureate degree attend community college at some point in the course of their undergraduate studies ([www.aacc.nche.edu/AboutCC/Trends/Pages/studentsatcommunitycolleges.aspx](http://www.aacc.nche.edu/AboutCC/Trends/Pages/studentsatcommunitycolleges.aspx)).

This percentage reflects both the community college students and students who are enrolled at four-year institutions but take some of their course work at a neighboring community college while working toward their baccalaureate degree.

## **COOPERATION AND DIALOG AMONG COMMUNITY COLLEGES AND OTHER INSTITUTIONS ENGAGED IN HIGHER EDUCATION**

Given the increasing numbers of students attending community colleges, increased dialog and cooperation among

community colleges and their sister organizations is essential. While articulation agreements exist to ease the passage of students from one institution to another in some cases, less formal interchanges are important as well. Other institutions can benefit from the insights community colleges have gathered on serving a diverse student population with highly varied goals. Community colleges provide an important link to industry. Four-year institutions and community colleges can cooperate on undergraduate research issues. All types of institutions of higher education benefit from a better understanding of the culture and practices found on each type of campus.

## **FUNDING OPPORTUNITIES**

The Division of Undergraduate Education (DUE) at NSF has several programs that support community colleges. These include programs such as the Advanced Technological Education (ATE) program that focuses on technician education, programs in which community colleges compete for funds successfully with other types of institutions (Noyce, S-STEM, STEP, TUES), and programs that have components specifically targeted to encourage partnerships between community colleges and other institutions of higher education (TUES, STEP, Noyce). Because of this support community colleges are represented in projects that span multiple programs within DUE. Details concerning these and other recently funded projects can be found in the Supplemental Material, along with resources for more information concerning community colleges.

If the “Change” portion in “Vision and Change” is to be realized for undergraduate biology students, all of the institutions engaged in higher education need to be involved and engaged. The authors hope that this article will spur faculty to work together to effect the change we need to see in undergraduate biology education.

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