

THE ROLE OF COMMUNITY COLLEGES IN THE EDUCATION OF RECENT SCIENCE AND ENGINEERING GRADUATES

by John Tsapogas

Community colleges play a prominent role in the educational experiences of college graduates. In recent years, enrollment at community colleges has risen, especially among minorities. From 1990 to 2000, full- and part-time enrollments at two-year institutions rose from 5.2 million to 5.9 million, an increase of 13.5 percent (NCES 2003). During the same period, enrollment of underrepresented minorities at two-year colleges increased 65 percent.

This report examines both the role of community colleges in the educational experiences of science and engineering (S&E) degree recipients and how this role differs among subgroups of the U.S. population. The likelihood of having received education at community college is examined by broad field of study, highest degree received, completion of associate's degree, reasons for attending community college, race/ethnicity, age, sex and marital and family status, parents' education, high school region, and undergraduate grade-point average. In some instances, individuals who earned associate's degrees are distinguished from other graduates who took community-college courses but did not earn an associate's degree.

Data are from the National Science Foundation's 2001 National Survey of Recent College Graduates (NSRCG; <http://www.nsf.gov/sbe/srs/snsrcc/start.htm>). The survey questionnaire asks graduates who have received bachelor's or master's degrees in science or engineering fields whether they have ever attended a community college. The data collected do not distinguish between

graduates who attended community college by taking one course and those who were enrolled full time.

Field and Level of Degree

Bachelor's and master's graduates with degrees in the social sciences, life sciences, or related sciences are more likely to have attended community college than are graduates with degrees in the physical sciences, computer and mathematical sciences, or engineering, but the differences are small. On average, 44 percent of S&E graduates attended community colleges (table 1).

Among S&E graduates, recipients of bachelor's degrees are more likely to have attended community college than are recipients of master's or doctoral degrees. In 1999 and 2000, almost half of the more

TABLE 1. 1999 and 2000 S&E bachelor's and master's degree recipients, by attendance at community college and field of highest degree: 2001

Degree field	All recipients	Attended		Did not attend	
		Number	Percent	Number	Percent
All degree fields	903,400	394,200	44	509,200	56
Computer and math sciences	115,000	47,900	42	67,100	58
Life and related sciences	172,300	78,900	46	93,400	54
Physical and related sciences	41,100	15,100	37	26,000	63
Social and related sciences	423,700	192,600	45	231,200	55
Engineering	151,200	59,800	40	91,400	61

NOTE: Details may not add to totals because of rounding.

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates: 2001.



than 740,000 S&E graduates with bachelor's degrees attended a community college. About one-third of the nearly 161,000 graduates with master's degrees in S&E did so. Among recent doctorate recipients (1996–2000), slightly more than 8 percent reported that they had attended community college before receiving their doctoral degrees (table 2).

TABLE 2. Attendance at two-year community colleges for 1996–2000 S&E doctorate recipients who are U.S. citizens or permanent residents, by race/ethnicity: 2001

Race/ethnicity	All recipients	Attended	Did not attend	Percent attending
All races/ethnicities	86,896	7,273	79,623	8
American Indian/ Alaskan Native	420	71	349	17
Asian/Pacific Islander	10,989	267	10,722	2
Black	3,012	243	2,769	8
Hispanic	3,143	346	2,797	11
Puerto Rican	733	26	707	4
Mexican American	864	156	708	18
Other Hispanic	1,546	164	1,382	11
White	65,319	5,924	59,395	9
Other	870	76	794	9
Unknown	637	45	592	7

SOURCE: National Science Foundation, Division of Science Resources Statistics, Doctorate Records File, 1996–2000.

Completion of Associate's Degree

Less than 30 percent of S&E graduates who have attended community college earn an associate's degree (table 3).¹ The rate at which these graduates earn associate's degrees varies by field of the highest degree earned. Graduates with degrees in the computer and mathematical sciences and those with degrees in the social sciences and related sciences who attended community colleges earned associate's degrees in proportionately higher numbers than graduates in other S&E fields. About 38 percent of S&E graduates with degrees in the computer and mathematical sciences and 31 percent of graduates with degrees in the social and related sciences who attended community college earned associate's degrees.

¹The 2001 NSRCG questionnaire asks graduates whether they have ever taken courses at a community college and whether they have a two-year associate's degree. It does not distinguish between receiving the associate's degree from a community college and earning it from a four-year institution.

Reasons for Community College Attendance

Many S&E graduates used community colleges for reasons other than to earn an associate's degree. In the 1999 survey cycle, 1997 and 1998 S&E graduates were asked why they decided to attend a community college. This question was not asked in the 2001 survey cycle. According to responses, the two most important reasons for attending a community college were to complete credits toward a bachelor's degree (74 percent) and to gain further skills and knowledge in an academic or occupational field (50 percent). Earning an associate's degree ranked sixth out of the nine reasons ranked (table 4).

Race/ethnicity

The likelihood that an S&E graduate attended a community college varies across major population groups. Hispanic S&E graduates are more likely to have attended a community college than any other racial/ethnic group. About 51 percent of Hispanic S&E graduates reported attending community college before receiving their bachelor's or master's degree, compared with 45 percent of American Indians/Alaskan Natives, 44 percent of blacks, 43 percent of whites, and 40 percent of Asians/Pacific Islanders. The average rate of attendance for all graduates was 44 percent.

American Indian/Alaskan Native and Hispanic doctorate holders are more likely to have attended community college than Asian/Pacific Islander, black, or white doctorate holders. Among Hispanic doctorate

TABLE 3. 1999 and 2000 S&E bachelor's and master's degree recipients who have attended community college by field of degree and whether they received an associate's degree: 2001

Degree field	All recipients	Received degree		Did not receive degree	
		Number	Percent	Number	Percent
All S&E degree fields	394,200	110,100	28	284,100	72
Computer and math sciences	47,900	18,300	38	29,600	62
Life and related sciences	78,900	15,400	20	63,400	80
Physical and related sciences	15,100	3,500	23	11,600	77
Social and related sciences	192,600	59,900	31	132,700	69
Engineering	59,800	13,000	22	46,800	78

NOTE: Details may not add to totals because of rounding.

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates: 2001.

TABLE 4. Reasons for attendance at a community college for 1997 and 1998 bachelor's and master's S&E degree recipients: 1999

Reasons for attendance	Yes		No	
	Number	Percent	Number	Percent
To complete credits toward a bachelor's degree	270,700	74	94,800	26
To gain further skills or knowledge in academic or occupational field	183,900	50	181,500	50
For leisure or personal interest	144,800	40	220,700	60
To prepare for college or increase chances of being accepted into college	142,200	39	223,200	61
For financial reasons	136,800	37	228,600	63
To complete an associate's degree	101,100	28	264,300	72
To increase opportunities for promotion, advancement, or higher salary	94,900	26	270,600	74
To change academic or occupational field	53,700	15	311,800	85
As part of high school Advanced Placement program	45,500	13	319,900	88

NOTE: S&E graduates were asked to respond with a "yes" or "no" to each category.

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates: 1999.

holders, Mexican Americans are the most likely to have attended community college, 18 percent of whom had attended community college before receiving their doctoral degrees (table 2).

Age

Older S&E graduates are more likely to have attended community college than are younger graduates. In 2001, 72 percent of 1999 and 2000 S&E graduates 50 years of age and older had attended community college, compared with 32 percent of S&E graduates 24 years of age and younger (figure 1).

Some students who are starting their postsecondary education begin by enrolling in community college. These students may choose to earn an associate's degree or certificate at a community college before entering the workplace or transferring to four-year institutions for completion of the bachelor's degree. In addition, community colleges have increasingly become colleges of choice for workers taking classes to upgrade their skills for promotions or raises or to enter new fields.² The older the graduate at the time of graduation, the higher the likelihood the graduate attended a community college to take classes to upgrade employment skills (2001 NSRCG, unpublished).

Marital and Family Status

S&E graduates who have been divorced, widowed, or separated are more likely to have attended community college than S&E graduates who either are married or have never been married. Only 39 percent of graduates

who have never been married attended a community college, compared with 76 percent of divorced graduates (table 5).

There might be an age-related effect in the higher rate of attendance among divorced, widowed, or separated graduates. Older S&E graduates are more likely to have attended community college, and they are also more likely to have experienced divorce, separation, or the death of a spouse.

S&E graduates with children attended community college at a higher rate than did those without children.³ Forty-six percent of female graduates attended a community college. Among female graduates, 62 percent with children in the household had attended a community college, compared with 44 percent of those without children in the household. Male graduates attended community college at a lower rate than female graduates did, 41 percent. Among male graduates, the attendance rate was 51 percent for those with children in the household and was 39 percent for those without children in the household.

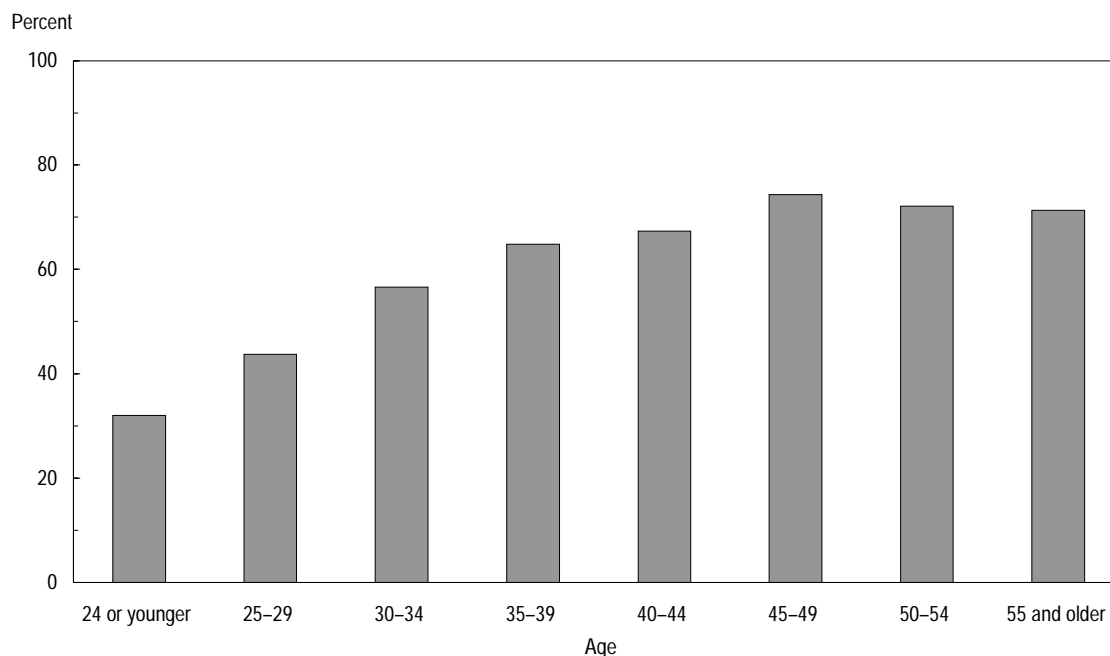
Parent's Education

Studies have shown that the children of highly educated parents have a higher likelihood of enrollment in college (NCES 2001). This pattern cannot be ascertained from data from the NSRCG because this survey includes only

³S&E graduates are surveyed one or two years after receipt of the degree and might not have had children at the time they received their degrees or during their attendance at community college. 2001 survey respondents who reported having children had at least one child living in the household during the week of April 15, 2001.

²American Association of Community Colleges website (<http://www.aacc.nche.edu/>).

FIGURE 1. Percentage of 1999 and 2000 S&E bachelor's and master's graduates who have attended community college, by age: 2001



SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates: 2001.

those graduates with at least a four-year S&E degree. It is possible, however, to use NSRCG data to examine whether parental education levels are related to the likelihood of attending a community college before receiving an S&E bachelor's or master's degree.

About 57 percent of the S&E graduates who reported that their fathers had less than a high school diploma had attended community college, whereas only 36 percent of those reporting that their fathers had some graduate or professional school had attended community college

TABLE 5. 1999 and 2000 S&E degree recipients by attendance at community college and marital status: 2001

Marital status	All recipients	Attended		Did not attend	
		Number	Percent	Number	Percent
All statuses	903,400	394,200	44	509,200	56
Married	247,400	126,700	51	120,700	49
Widowed	1,500	900	63	500	37
Separated	5,200	2,900	57	2,200	43
Divorced	28,000	21,300	76	6,700	24
Never married	621,400	242,400	39	379,100	61

NOTE: Details may not add to totals because of rounding.

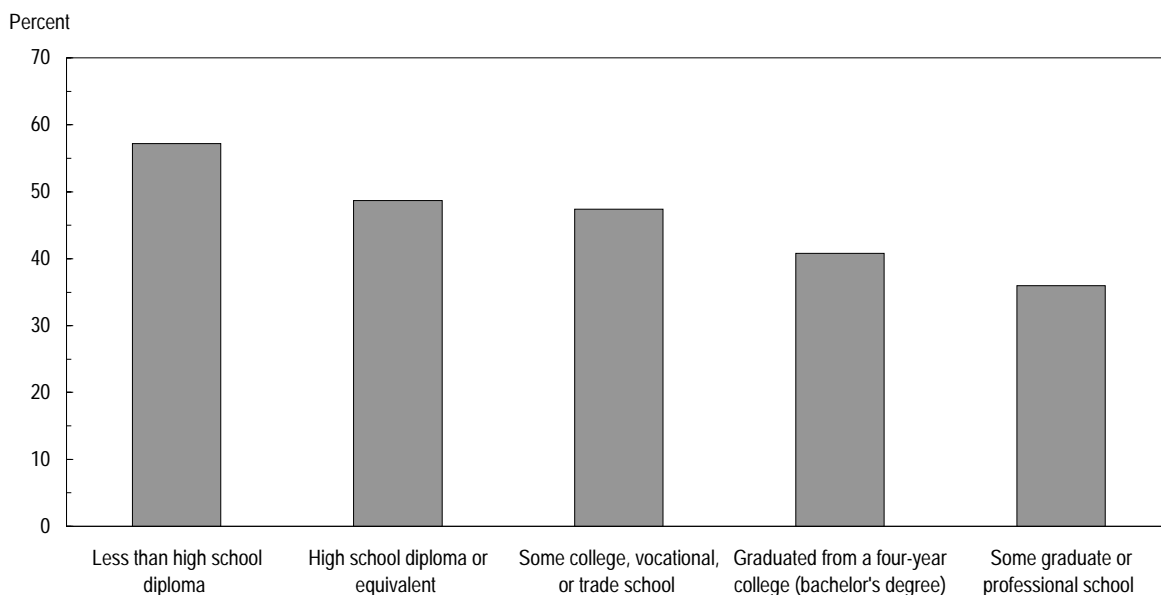
SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates: 2001.

(figure 2). The same patterns hold true when examining the mother's educational attainment. The higher the educational attainment of the mother, the lower the likelihood of attendance at a community college.

High School Geographic Division

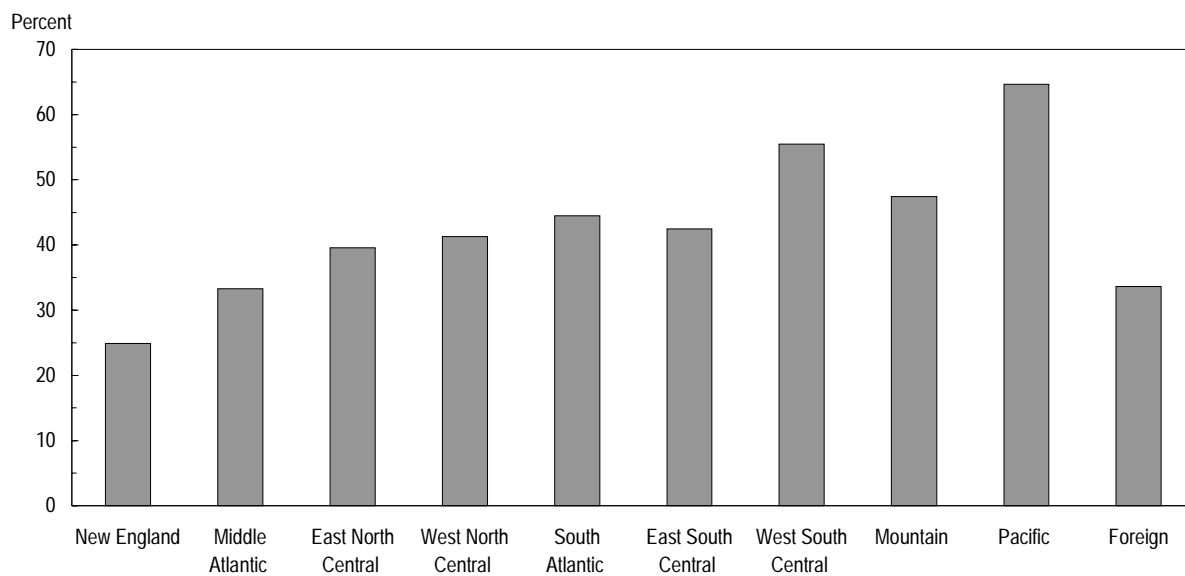
The likelihood that a recent S&E graduate attended community college varies by where the graduate attended high school. S&E graduates who attended high school in the Pacific geographic division, which includes Alaska, California, Hawaii, Oregon, Washington, and outlying areas, are more likely to have attended a community college than are graduates in other regions of the United States. This may be a reflection of California's extensive community college system, which encourages or requires the use of these institutions. Through California's articulation agreements, community college credits can easily be transferred to four-year institutions in the state (see http://www.curriculum.cc.ca.us/Curriculum/Resources/CAN_Guide.htm). About 65 percent of the S&E graduates who received their high school diplomas in the Pacific division and who responded to the 2001 NSRCG reported that they had attended community college (figure 3). The West South Central

FIGURE 2. Percentage of 1999 and 2000 S&E bachelor's and master's degree recipients who attended community college, by father's education level: 2001



SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates: 2001.

FIGURE 3. Percentage of 1999 and 2000 S&E bachelor's and master's degree recipients who have attended community college, by geographic division of high school: 2001



SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates: 2001.

division had the next highest percentage of attendance at community colleges, at 56 percent. States included in the West South Central division are Arkansas, Louisiana, Oklahoma, and Texas.

Bachelor's Grade Point Average

S&E graduates with lower undergraduate grade point averages (GPA) were more likely to have attended community college than were graduates with higher grade point averages. Fifty percent of S&E graduates with less than a 2.24 GPA (mostly Cs) reported that they had attended community college before receiving their S&E degrees, compared with 42 percent of those with an undergraduate GPA of 3.75–4.00 (mostly As) (table 6).

Conclusion

Community colleges are important institutions in the educational lives of science and engineering graduates. Open admissions, proximity to jobs and family, and low tuition and fees make community colleges attractive to a large number of students.

More than 40 percent of recent S&E graduates have attended community colleges at some point in their educational paths. Hispanics have attended community colleges in greater proportions than have whites, blacks, or Asians/Pacific Islanders.

Female graduates in S&E fields are more likely than their male counterparts to have attended community college. This is especially true of married women with children living in the household. In addition to lower

TABLE 6. 1999 and 2000 S&E bachelor's and master's degree recipients, by attendance at community college and bachelor's grade point average: 2001

Bachelor's grade point average	All recipients	Attended		Did not attend	
		Number	Percent	Number	Percent
All grade point averages	903,400	394,200	44	509,200	56
3.75–4.00	155,400	65,300	42	90,100	58
3.25–3.74	341,000	138,400	41	202,600	59
2.75–3.24	323,900	149,600	46	174,400	54
2.25–2.74	68,500	33,900	50	34,500	51
Less than 2.24	13,000	6,500	50	6,500	50
Courses not graded	1,700	500	31	1,100	69

NOTE: Details may not add to totals because of rounding.

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates: 2001.

tuition and fees, the location of a community college, usually close to the student's home, may contribute to higher attendance by women who are attempting to manage families, education, and, sometimes, jobs.

Questions related to the dynamics of attendance at community college and the impact on developing science and engineering talent cannot be answered with these data. For example, what role did community college location play in S&E graduates' decisions to attend? Community colleges are excellent sources of remedial education, especially reading and writing skills. Were these course offerings a factor in S&E graduate decisions to attend these institutions? Why do Hispanics who earn S&E degrees attend community colleges in disproportionately higher numbers than other racial/ethnic groups? How does the intensity of community college utilization vary among S&E graduates? These important questions deserve further scrutiny.

References

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