ACS Chemistry for Life™

CPT Committee on Professional Training

American Chemical Society

Survey and full data set available at www.acs.org/cptfacultystatusreport

Fall 2010

Who Is Teaching Whom?

Complete Report on the Fall 2009 CPT Survey of Chemistry Faculty Status

Significant Findings

Faculty Characteristics

- 22% of tenure-track faculty are women
- 48% of long-term, full-time faculty are women
- 61% of temporary faculty hold a PhD

General Chemistry Lecture

Percentage of students who see non-tenure-track faculty in:

- Courses suitable for majors: 33%
- Courses not suitable for majors: 60%

Organic Chemistry Lecture

Percentage of students who see non-tenure-track faculty in:

- Courses suitable for majors: 20%
- Courses suitable for non-majors: 50%

Course Staffing Trends

- 60% of programs reported that the proportion of undergraduate chemistry courses taught by tenure-track faculty has not changed in the past five years.

Introduction

While there has been considerable discussion about the apparent increase in non-tenure-track faculty at colleges and universities, no hard data have been available to measure this increase or to show how non-tenure-track faculty and instructional staff are utilized in chemistry programs.[1,2] This prompted the American Chemical Society (ACS) Committee on Professional Training (CPT) to survey 1012 chemistry programs in the United States and its territories to determine how different categories of faculty are utilized in chemistry departments and which categories of faculty chemistry students are seeing in the classroom and laboratory. This is the first survey aimed at measuring "who is teaching whom?" in chemistry programs. Department chairs from 422 chemistry programs (354 ACS-approved programs and 68 non-approved programs) provided data on faculty employment practices. The results of the survey provide a snapshot of the faculty and the courses they taught in fall 2009. The full data set used for this report can be found at www.acs.org/cptfacultystatusreport.

Quality of the Data and the Analysis

The survey results are based on self-reported data and consequently reflect the quality of the information provided by the departments. Departments were not contacted to verify the accuracy of the information provided. While all survey responses were included in the analysis, several responses to particular questions were removed when they were inconsistent with responses to other questions (e.g., instances where the number of faculty reported as teaching a course was far greater than the number of faculty in the department) or clearly impossible (e.g. 16 faculty reported to be teaching 1850 contact hours, a faculty member reported to be teaching a course with no enrollment, or a course enrollment with no faculty reported to be teaching the course). Smaller inconsistencies in the answers from several departments across the questions were also identified, but these were generally not removed from the data set. As a result, when responses to some questions are discussed in terms of percentages, the percentages do not always add up to 100%.

Institutional Data

Part I of the survey collected information about whether the department had ACS approval, the highest degree offered in chemistry, the total undergraduate enrollment, the total chemistry enrollment, and the typical annual number of BA/BS graduates from the chemistry department. This information was used to sort the survey responses to the later questions. Most of the results from the survey are categorized by responses from:

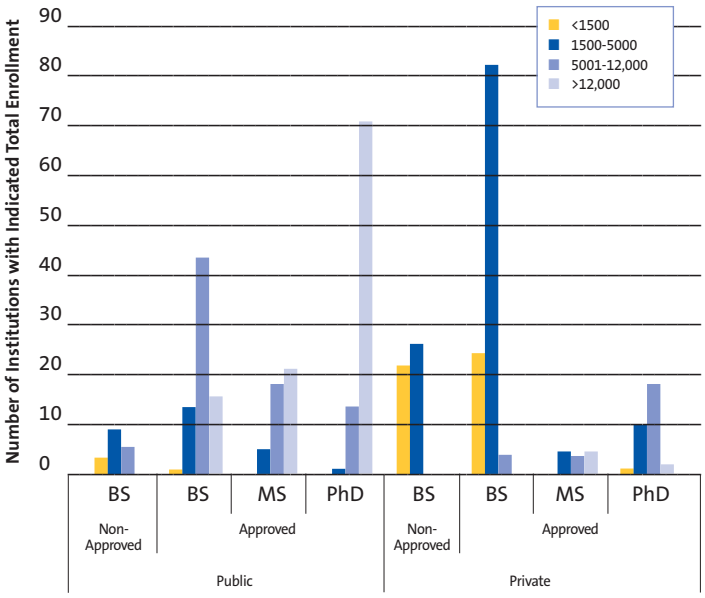
- public, ACS-approved BS/BA-, MS-, and PhD-granting departments,
- private, ACS-approved BS/BA-, MS-, and PhD-granting departments,
- public, non-ACS-approved BS/BA-granting departments, and
- private, non-ACS-approved BS/BA-granting departments.

The responses from non-ACS-approved MS- and PhD-granting departments were too small (only one response from each) to include in the analysis of results by institutional type. For simplicity, BS/BA-granting departments are referred to simply as BS-granting.

Number and Size of Institutions Responding

Figure 1 illustrates the number of departments in each of the categories responding to the survey and the total undergraduate enrollment at these institutions. The plot illustrates the breakdown according to public/private, highest degree granted, and total undergraduate enrollment. For example, the majority of public PhD-granting institutions have enrollments of over 12,000 students, while the majority of ACS-approved public and private BS-granting institutions have enrollments less than 12,000 and less than 5000 students, respectively. All but five of the non-approved, BS-granting departments have enrollments under 5000. When data is averaged for the discussion of the responses to Part II of the survey, it will be important to keep in mind the very small number of responses from non-approved public BS- and approved private MS-granting departments.

Figure 1. Number of Institutions Responding and Total Institutional Enrollment



Faculty Characteristics

Part II of the survey gathered information about the different categories of faculty and their gender and ethnicity distributions. Categories of faculty were defined as:

- tenured/tenure-track,
- long-term, full-time, non-tenure-track (LT/FT, defined as full-time, non-tenure-track faculty who had been employed in the chemistry program for more than three years or were currently under a three-year contract)
- long-term, part-time (LT/PT, part-time instructors who had been employed in the program for more than three years or were currently under a three-year contract)
- temporary (all faculty and instructors who were sabbatical replacements or held other types of short-term appointments)

The survey specifically excluded teaching assistants.

Faculty Distribution

Table 1 shows the total number of faculty and instructional staff and the gender distribution in each category at all 422 responding departments. The 4542 tenure-track faculty represent 68.5% of the instructional staff in these departments. A recent article in *The Chronicle of Higher Education* reported, using Department of Education data, that in 2007 the percentage of tenured/tenure-track faculty across all disciplines at institutions comparable to those included in the CPT survey ranged from a low of 21% at private, MS-granting institutions to a high of 49% at public, PhD-granting institutions.[3] The percentage of tenure-track faculty in the chemistry departments responding to the CPT survey is significantly higher than the national average found across all disciplines.

Table 1. Number and Gender Distribution of Faculty and Instructional Staff in Each Category at All 422 Institutions[a]

Faculty Category	Total Number of Faculty and Instructional Staff	Percentage Male Faculty and Instructional Staff	Percentage Female Faculty and Instructional Staff
Tenure-track	4542	79.5%	22.4%
Long-term, F/T	712	52.7%	48.3%
Long-term, P/T	505	57.6%	39.6%
Temporary	867	58.0%	41.3%

[a] Inconsistencies in responses from some departments prevent percentages from totaling 100%.

Gender Distribution

There are clear differences in gender distributions among the different categories of faculty. While women account for only slightly over 20% of the tenure-track faculty, their numbers are much greater in the non-tenure-track ranks, accounting for nearly 50% of the LT/FT faculty.

A further breakdown of the data by highest degree granted at public (Table 2) and private (Table 3) institutions provides more information about gender distributions:

- Overall, women make up about 22% of tenure-track faculty. This percentage is smaller (15-16%) at PhD-granting institutions and higher at both BS- and MS-granting institutions (as high as 33% at private, BS-granting institutions).

Table 2. Gender Distribution at Public Institutions

Faculty Category	BS			MS			PhD		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Tenure-track	721	73.9%	26.1%	544	74.8%	25.4%	1749	89.3%	16.4%
Long-term, F/T	119	43.7%	55.5%	71	52.1%	50.7%	279	60.6%	41.6%
Long-term, P/T	148	59.5%	35.1%	77	54.5%	45.5%	70	62.9%	34.3%
Temporary	220	62.7%	37.3%	153	58.2%	41.8%	165	61.2%	41.2%

Table 3. Gender Distribution at Private Institutions

Faculty Category	BS			MS			PhD		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Tenure-track	899	66.2%	33.1%	96	75.0%	25.0%	524	83.0%	15.1%
Long-term, F/T	132	40.9%	59.8%	25	52.0%	44.0%	85	57.6%	42.4%
Long-term, P/T	154	51.9%	46.8%	35	65.7%	31.4%	21	66.7%	28.6%
Temporary	255	50.6%	45.9%	28	53.6%	35.7%	35	68.6%	37.1%

- Although women account for 48% of LT/FT faculty, this percentage is smaller at PhD-granting institutions (42%) and higher at MS- and PhD-granting institutions (as high as 60% at private, BS-granting institutions).
- The percentage of female faculty in all categories is greater at private BS-granting institutions than at public BS-granting institutions.

Several conclusions can be drawn from the gender data. There are distinct differences in gender distribution across the faculty categories. In comparison to their proportion in tenure-track positions, women make up a much higher proportion of the non-tenure-track faculty at all types of institutions. In addition, women account for a lower proportion of the faculty at PhD-granting institutions.

Race/Ethnicity

Across institution and faculty type, the racial/ethnic make-up of chemistry faculty is predominately white/Caucasian. The percentage distribution of faculty among other racial/ethnic groups, shown in Table 4, remained consistent throughout the different categories of faculty and types of institution, with Asian Americans making up the largest group and Native Americans the smallest. These data are not broken down further because the results were fairly consistent among all types of institutions.

Table 4. Racial/Ethnic Distribution among Faculty and Instructional Staff at All 422 Institutions

Faculty Category	Asian American	African American	Hispanic American	Native American
Tenure-track	8.8%	3.0%	2.1%	0.8%
Long-term, F/T	6.4%	3.5%	1.9%	1.0%
Long-term, P/T	7.7%	4.0%	0.4%	0.2%
Temporary	9.3%	2.9%	2.1%	0.3%

Highest Degree Earned

The highest degree earned by faculty members at the responding departments also varies among the categories of faculty. This distribution is shown in Table 5 for all 422 responding institutions. Not surprisingly, over 98% of tenure-track faculty earned a PhD degree. This percentage decreases for the non-tenure-track faculty to a low of about 61% for temporary faculty. Nearly 13% of temporary faculty hold only a bachelor's degree.

A further breakdown of the data by highest degree granted at public (Table 6) and private (Table 7) institutions provides additional information:

- There is little difference among the different types of institutions in the tenure-track faculty since nearly all faculty hold a PhD.
- More non-tenure-track faculty in all categories hold PhD degrees at PhD-granting institutions than at any of the other types of institutions.
- At PhD-granting institutions, 84% of LT/FT faculty hold a PhD, while at private BS-granting institutions only 56% of the LT/FT faculty hold PhDs. At public BS-granting institutions, 13% of LT/FT faculty hold only BS degrees.
- At PhD-granting institutions, 87% of the LT/PT faculty hold PhD degrees, but this percentage goes as low as 46% at public BS-granting institutions. At these same public BS-granting institutions, 11% of the LT/PT faculty hold only a BS degree.
- At private PhD-granting institutions, about 86% of the temporary faculty hold PhDs while the lowest percentage of temporary faculty holding PhDs (50%) is found at public and private MS-granting institutions.
- A significant difference exists in the percentage of LT/PT and temporary faculty who hold PhD degrees at public and private BS-granting institutions. A greater percentage of these faculty hold PhD degrees at private BS-granting institutions.

Table 5. Degree Distribution among Faculty and Instructional Staff at All 422 Institutions

Faculty Category	Highest Degree Held is BS/BA	Highest Degree Held is MS	Highest Degree Held is PhD
Tenure-track	0.1%	0.9%	98.2%
Long-term, F/T	5.6%	23.2%	71.2%
Long-term, P/T	6.9%	33.1%	61.8%
Temporary	12.6%	25.0%	61.2%

Table 6. Degree Distribution among Faculty and Instructional Staff at Public Institutions

Highest Degree Offered by Institution	BS			MS			PhD		
Highest Degree Attained by Faculty	**BS**	**MS**	**PhD**	**BS**	**MS**	**PhD**	**BS**	**MS**	**PhD**
Tenure-track	0.7%	1.2%	96.3%	0.0%	0.9%	98.9%	0.0%	1.3%	97.9%
Long-term, F/T	13.4%	33.6%	57.1%	1.4%	45.1%	56.3%	1.1%	11.1%	84.2%
Long-term, P/T	10.8%	41.2%	45.9%	3.9%	42.9%	51.9%	0.0%	11.4%	87.1%
Temporary	11.8%	30.9%	59.1%	15.0%	34.6%	49.7%	12.7%	13.9%	69.7%

Table 7. Degree Distribution among Faculty and Instructional Staff at Private Institutions

Highest Degree Offered by Institution	BS			MS			PhD		
Highest Degree Attained by Faculty	**BS**	**MS**	**PhD**	**BS**	**MS**	**PhD**	**BS**	**MS**	**PhD**
Tenure-track	0.0%	0.3%	98.6%	0.0%	1.0%	99.0%	0.0%	0.0%	100.0%
Long-term, F/T	12.1%	33.3%	56.1%	8.0%	16.0%	76.0%	2.4%	15.3%	83.5%
Long-term, P/T	9.1%	34.4%	67.5%	2.9%	31.4%	60.0%	4.8%	4.8%	85.7%
Temporary	10.2%	23.5%	65.1%	3.6%	46.4%	50.0%	5.7%	0.0%	85.7%

Who Taught in Fall 2009?

Part II of the survey gathered information about how many faculty in each category had contact with students in both classroom and laboratory settings and how many contact hours they spent in each of these settings. Figure 2a illustrates the average number of faculty at each type of institution who had contact with students in all courses, both undergraduate and graduate. The faculty averages shown in Figure 2a were determined by dividing the total number of faculty in each category for each group of institutions by the total number of institutions in that group. The relatively large number of tenure-track faculty having contact with students at PhD-granting institutions probably reflects both the relatively large number of tenure-track faculty and the large size of the student bodies at these institutions. Similarly, the very small number of all faculty in all categories at non-approved BS-granting institutions reflects the small size of these institutions and departments. (The guidelines for ACS approval require that a program have at least four full-time faculty.)[4] The plot does illustrate, however, that students at all types of institutions saw faculty in all categories in their classes and laboratories.

Figure 2a: Average Number of Faculty in Each Category Having Direct Contact with Students in the Classroom and Laboratory in All Undergraduate and Formal Graduate Courses

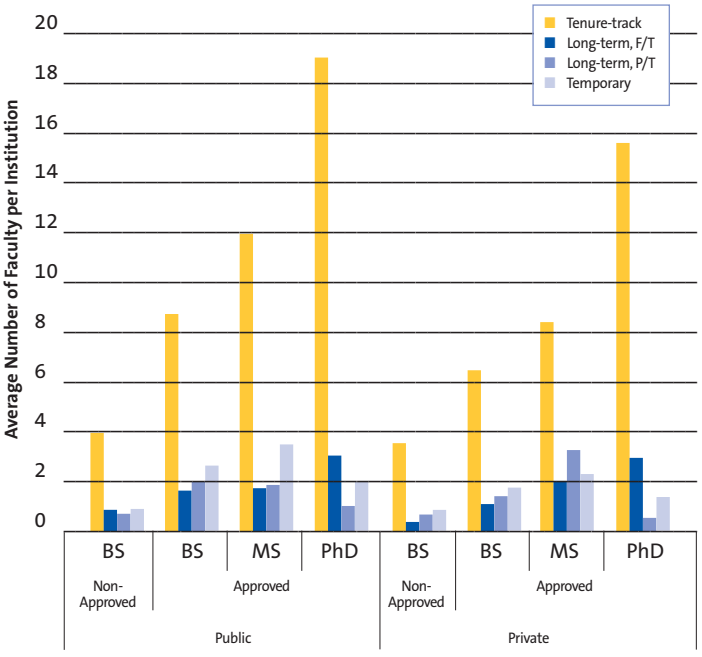


Figure 2b. Average Lecture and Laboratory Contact Hours Taught Weekly in All Undergraduate and Formal Graduate Courses per Faculty Member in Each Category

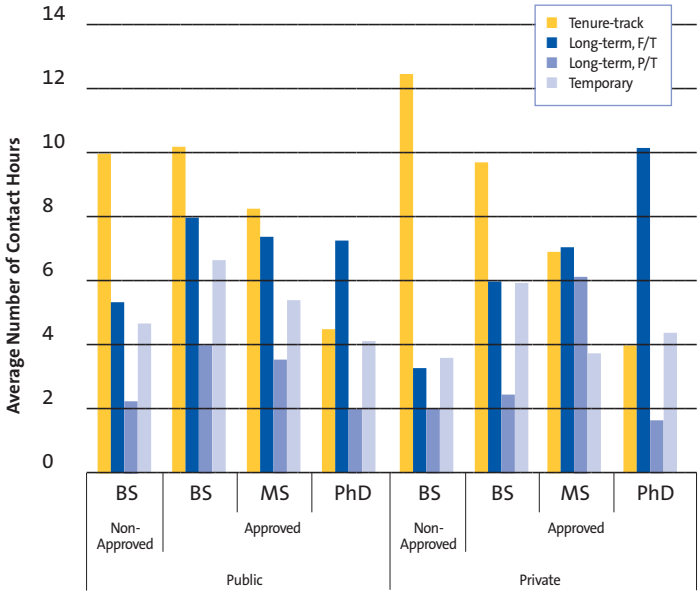


Figure 2b illustrates the average total number of undergraduate and graduate lecture and undergraduate lab contact hours taught per faculty member on a weekly basis. These averages were calculated in the following way. For each institution in a group, the total number of lecture and lab contact hours taught by all of the faculty in each category was first divided by the number of faculty in that category at the institution. These numbers were summed within each institution type and then divided by the number of institutions in that group. This calculation was performed in an attempt to compensate for the varying sizes of the institutions. At PhD-granting institutions, LT/FT faculty have higher contact hours than tenure-track faculty. At the same time, however, LT/FT faculty have lower average contact hours than tenure-track faculty at BS- and MS-granting institutions. One reason for this might be that LT/FT faculty in these programs may have other responsibilities. For example, a stockroom manager/lab director who is a LT/FT employee may teach only 3–6 contact hours of general chemistry lab each week.

Table 8 shows the average number of undergraduate contact hours taught weekly at each institution by the faculty in each category. These numbers were calculated by dividing the total number of undergraduate lecture and laboratory contact hours taught by all faculty in each group of institutions by the total number of institutions in that group. The large numbers of laboratory contact hours at BS-granting institutions probably reflects the lack of teaching assistants at these institutions.

Table 8. Average Lecture and Lab Contact Hours Taught Weekly at Each Institution by Faculty in All Categories

	Public				Private			
	Non-Approved	Approved			Non-Approved	Approved		
	BS	BS	MS	PhD	BS	BS	MS	PhD
Lecture	25.6	55.8	64.0	62.3	26.0	38.7	56.8	38.9
Lab	34.5	83.9	74.8	37.5	30.0	53.0	60.8	48.3

A breakdown of the percentages of undergraduate contact hours taught by faculty in each category is illustrated in Figures 2c and 2d. These percentages illustrate how the responsibility for teaching all undergraduate courses is distributed among the different categories of faculty. The percentages in Figure 2c show that tenure-track faculty are responsible for the majority of the teaching of undergraduate lectures. Tenure-track faculty at BS-granting departments account for the largest fraction of undergraduate lecture contact hours. In all groups of institutions, tenure-track faculty teach a larger percentage of undergraduate lecture contact hours than the combined percentages of all the other categories of faculty. This is not the case for the distribution of laboratory contact hours shown in Figure 2d, where in some cases the combined percentages of laboratory contact hours for all non-tenure-track faculty outweighs the percentages of tenure-track laboratory contact hours.

Figure 2c. Percentage of Undergraduate Lecture Contact Hours Taught per Week by Faculty in Each Category

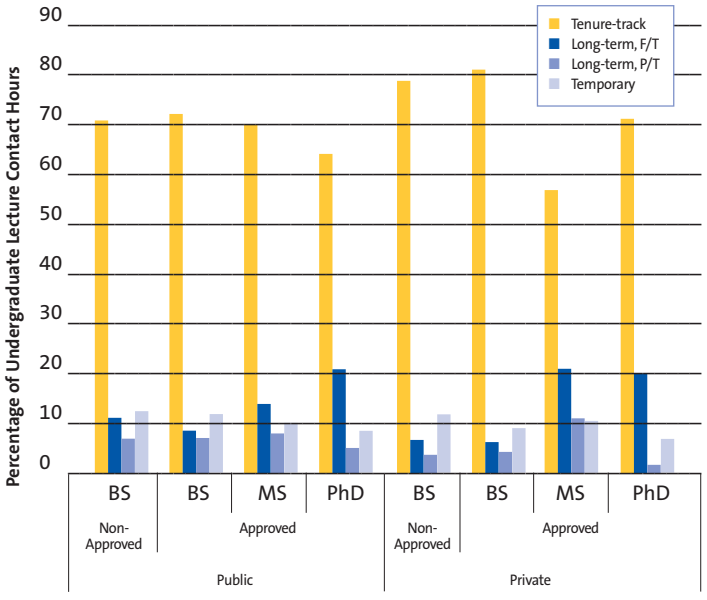
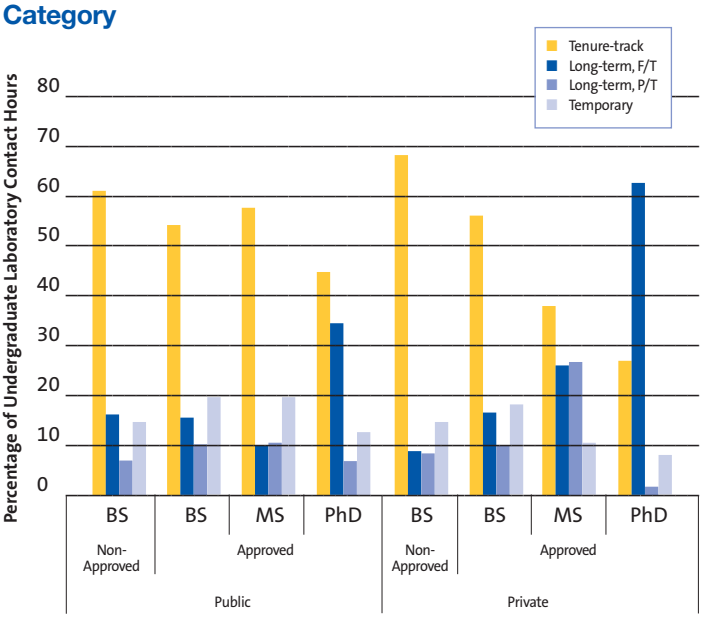


Figure 2d. Percentage of Undergraduate Laboratory Contact Hours Taught per Week by Faculty in Each Category



Who Taught the Undergraduate Courses with the Highest Student Enrollments?

Chemistry departments typically have large service-teaching responsibilities for other majors, particularly in introductory and organic chemistry. Therefore, departments were asked to provide information on four groups of courses taught in fall 2009 that likely have the highest student enrollments. These included:

- introductory chemistry courses that a student could count toward a chemistry degree,
- all other introductory chemistry courses,
- introductory organic chemistry courses that a student could count toward a chemistry degree,
- all other introductory organic chemistry courses.

Respondents to the questions about these courses were instructed to include all sections of these courses taught in fall 2009. If the courses were taught as a two-semester or multiple-quarter sequence and multiple parts of the sequence were taught in fall 2009, departments were asked to include all of these sections in their responses.

Introductory Chemistry Courses That Can Count Toward a Chemistry Degree

Information for this group of courses is displayed in Table 9 and Figures 3a - 3c. The average number of contact hours shown in Table 9 was calculated the same way as those in Table 8. While student enrollment in these courses probably increases from BS- to PhD-granting departments, there is little variation in the number of lecture contact hours at the approved programs. This suggests an increase in class size from BS- to PhD-granting institutions. The relatively large number of laboratory contact hours at BS-granting institutions again probably reflects the lack of teaching assistants.

Table 9. Introductory Courses in Which a Chemistry Major Could Enroll: Average Contact Hours Taught Weekly at Each Institution by Faculty in All Categories

	Public				Private			
	Non-Approved	Approved			Non-Approved	Approved		
	BS	BS	MS	PhD	BS	BS	MS	PhD
Lecture	11.1	20.1	17.6	21.1	8.5	14.6	15.0	15.8
Lab	16.6	40.1	26.5	25.5	12.7	22.3	15.9	16.1

A breakdown of the percentages of contact hours taught by faculty in each category is illustrated in Figures 3a and 3b. The percentages in Figure 3a show that tenure-track faculty account for the majority of classroom contact hours, although LT/FT faculty account for about 30% of classroom contact hours at PhD-granting institutions. The distribution of laboratory contact hours in Figure 3b shows that except for most BS-granting programs, non-tenure-track faculty in all categories teach the majority of laboratory contact hours. Only at PhD-granting institutions do LT/FT faculty teach the majority of laboratory contact hours.

Figure 3a. Introductory Courses in Which a Chemistry Major Could Enroll: Percentage of Lecture Contact Hours Taught Weekly by Faculty in Each Category

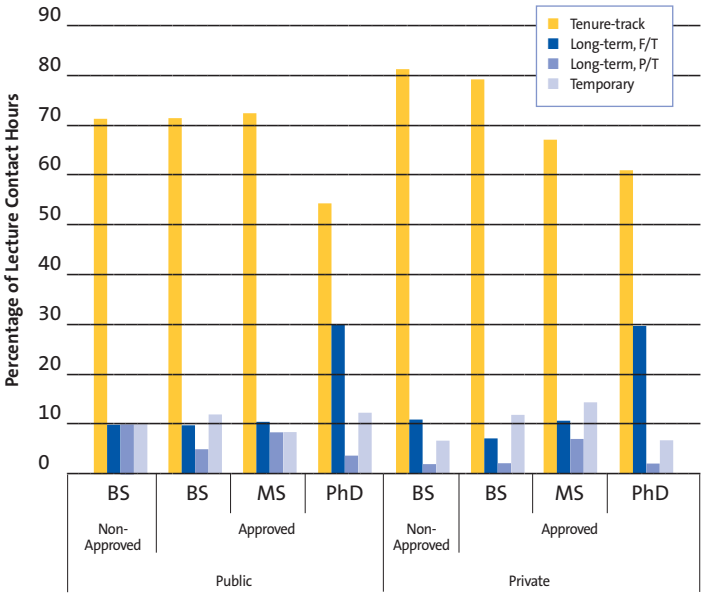


Figure 3b. Introductory Courses in Which a Chemistry Major Could Enroll: Percentage of Laboratory Contact Hours Taught Weekly by Faculty in Each Category

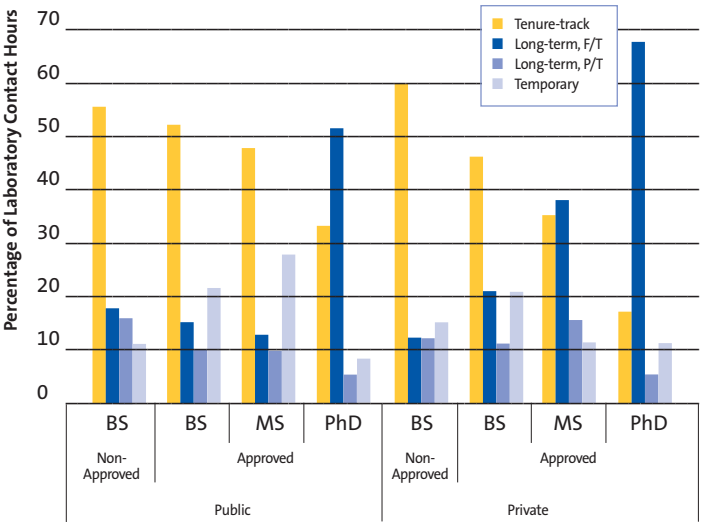
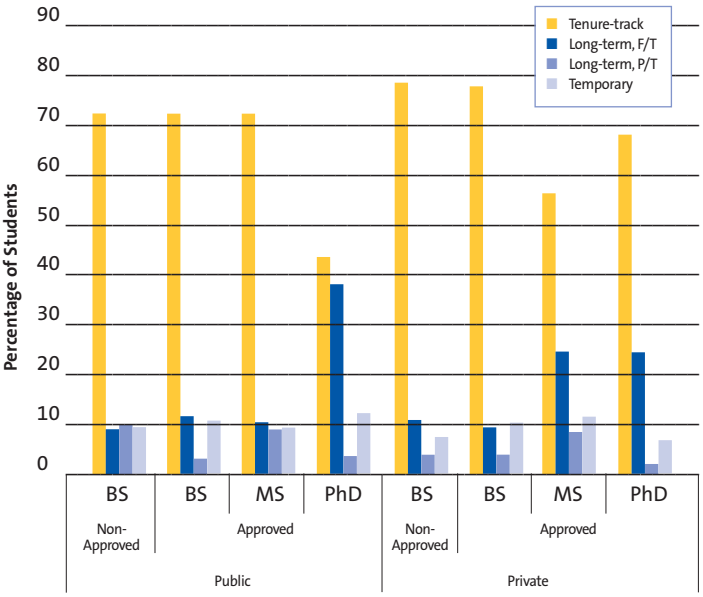


Figure 3c. Introductory Courses in Which a Chemistry Major Could Enroll: Percentage of Students at All Institutions Who See Faculty in Each Category in Lecture



The percentage of students at all institutions who see faculty in each category in the classroom is shown in Figure 3c. These percentages were calculated in the following way. For each group of institutions, the total number of students enrolled in courses taught by faculty in each category was divided by the total number of students enrolled in introductory courses at all institutions in that group. Except for public PhD-granting institutions, where 55% of students see non-tenure-track faculty in lecture, the majority of students see tenure-track faculty in the classroom.

In summary, while the majority of classroom contact hours in introductory courses suitable for majors are taught by tenure-track faculty, LT/FT faculty teach about 30% of these hours at PhD-granting institutions. Except for most BS-granting institutions, non-tenure-track faculty in all categories account for a majority of lab contact hours. The percentages of students seeing faculty in each category in the classroom suggests that a student is more likely to see a LT/FT faculty member in the classroom at a PhD-granting institution than at either a BS- or an MS-granting institution.

Introductory Chemistry Courses That Cannot Count Toward a Chemistry Degree

Not all institutions reported teaching courses of this type in the fall of 2009. The percentage of institutions in each group who did report teaching such a course is shown in Table 10. It is interesting to note the difference in the number of public and private PhD-granting institutions who offer such a course (90% versus 52%, respectively). This likely reflects the more diverse student population and career preparation pathways at the public institutions. The very low response rate from non-ACS-approved BS-granting programs should be noted as we discuss the responses about this course.

Table 10. Introductory Courses Not Suitable for a Chemistry Major: Percentage of Programs Reporting That They Taught Such a Course in Fall 2009

Public				Private			
Non-Approved	Approved			Non-Approved	Approved		
BS	BS	MS	PhD	BS	BS	MS	PhD
18%	68%	91%	90%	16%	62%	91%	52%

Data for these courses are shown in Table 11 and Figures 4a through 4c. The averages in Table 11 were calculated in the same way as those in Table 8. The decrease in contact hours for this course compared to the contact hours in the introductory course suitable for chemistry majors reflects the lower enrollments in this course.

Table 11. Introductory Courses Not Suitable for a Chemistry Major: Average Contact Hours Taught Weekly at Each Institution by Faculty in All Categories

	Public				Private			
	Non-Approved	Approved			Non-Approved	Approved		
	BS	BS	MS	PhD	BS	BS	MS	PhD
Lecture	6.9	11.3	12.8	9.0	6.6	5.9	17.8	4.2
Lab	9.6	13.5	23.5	4.3	5.4	4.9	12.2	2.8

Although faculty spend fewer contact hours teaching this course, comparisons of Figure 4a (distribution of lecture contact hours) and Figure 4b (distribution of lab contact hours) with Figures 3a and 3b show that the distributions are quite different in the two categories of introductory chemistry courses. At most institutions, the majority of contact hours in the courses not suitable for chemistry majors are accounted for by non-tenure-track faculty. In addition, while LT/FT faculty accounted for a large portion of the non-tenure-track lecture hours in introductory courses in which a chemistry major might enroll, this is not the case here. In the non-majors course, LT/PT and temporary faculty generally teach a larger portion of the non-tenure-track faculty lecture contact hours. The data in Figure 4b show that non-tenure-track faculty in all categories also teach a large proportion of laboratory contact hours.

Figure 4a. Introductory Courses Not Suitable for a Chemistry Major: Percentage of Lecture Contact Hours Taught Weekly by Faculty in Each Category

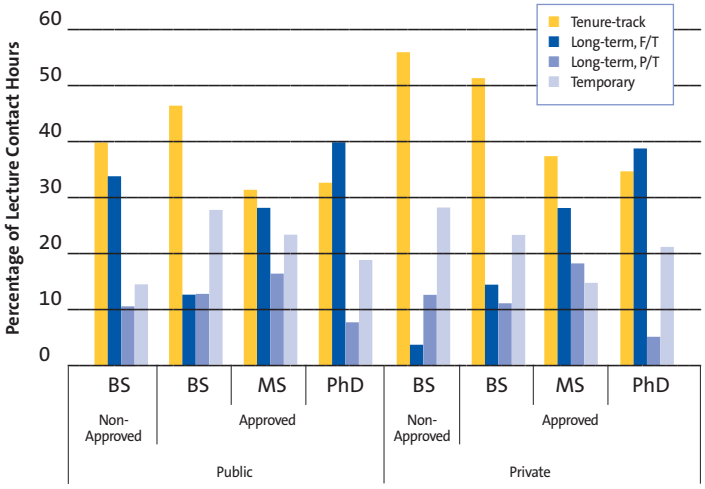


Figure 4b. Introductory Courses Not Suitable for a Chemistry Major: Percentage of Laboratory Contact Hours Taught Weekly by Faculty in Each Category

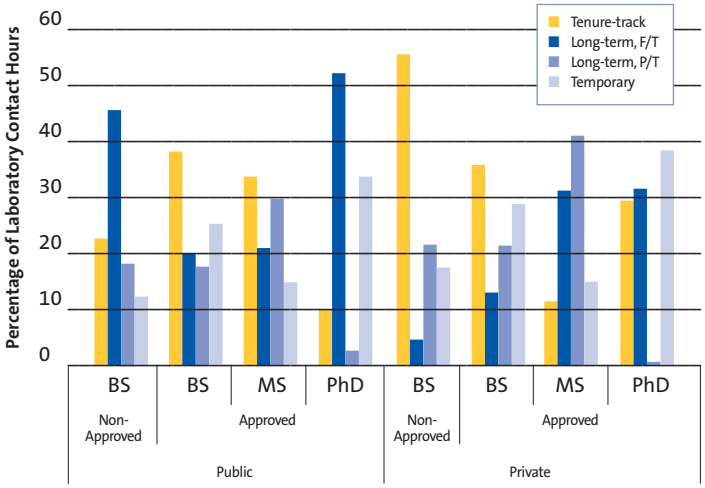
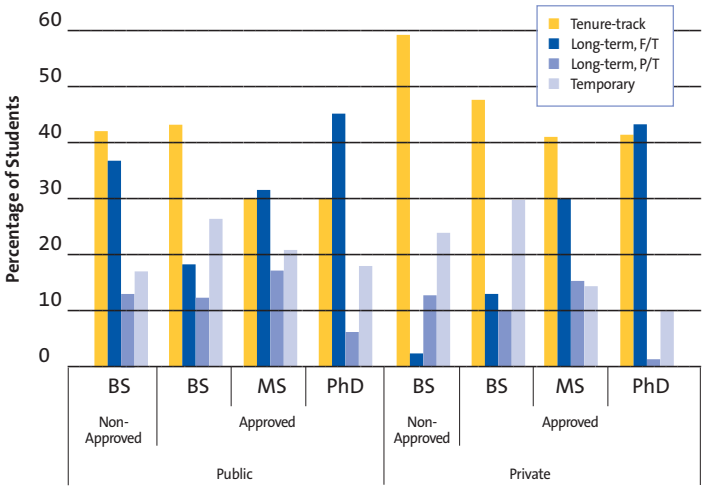


Figure 4c. Introductory Courses Not Suitable for a Chemistry Major: Percentage of Students at All Institutions Who See Faculty in Each Category in Lecture



As might be expected from the contact hour information, the percentages in Figure 4c show that at all groups of institutions (other than at private non-approved BS-granting institutions) over 50% of the students enrolled in these courses see non-tenure-track faculty in lecture. At approved public MS- and PhD-granting institutions, 70% of the students see non-tenure-track faculty.

In summary, non-tenure-track faculty in all categories represent a large proportion of the faculty teaching these courses, and students in these courses are much more likely to have contact with non-tenure-track faculty in both lecture and lab than they might in introductory courses in which chemistry majors might enroll.

Introductory Organic Chemistry Courses That Can Count Toward a Chemistry Degree

An introductory organic chemistry course of this type was defined in the survey as the first organic course using a dedicated organic chemistry textbook. Information for these courses is shown in Table 12 and

Table 12. Introductory Organic Courses in Which a Chemistry Major Might Enroll: Average Contact Hours Taught Weekly at Each Institution by Faculty in All Categories

	Public				Private			
	Non-Approved	Approved			Non-Approved	Approved		
	BS	BS	MS	PhD	BS	BS	MS	PhD
Lecture	4.4	8.0	8.6	11.0	4.1	6.9	6.1	7.8
Lab	8.3	16.9	15.6	13.6	7.6	14.6	16.4	12.6

Figures 5a through 5c. The numbers in Table 12 were calculated as in Table 8. The lower number of average contact hours spent in this course also reflects the decrease in enrollment relative to the introductory courses.

As in the introductory course suitable for chemistry majors (Figure 3a), the distribution of lecture contact hours in Figure 5a shows that the majority of lecture contact hours are accounted for by tenure-track faculty. Although the average number of contact hours taught by all faculty in the organic course is lower than in the introductory course, the percentage of lecture contact hours for tenure-track faculty is higher in the organic course than in the introductory course. As in the introductory course, LT/FT faculty account for a significant percentage of the lecture contact hours at PhD-granting institutions. The distributions of laboratory contact hours in Figure 5b show that non-tenure-track faculty contribute a significant portion of laboratory contact hours. A comparison of Figure 5b with Figure 3b for the introductory course shows that at all groups of institutions except those granting PhD degrees, tenure-track faculty teach a larger percentage of laboratory contact hours in the organic course than in the introductory course. At PhD-granting institutions, LT/FT faculty teach a large percentage of laboratory contact hours in the organic course.

Figure 5a. Introductory Organic Courses in Which a Chemistry Major Might Enroll: Percentage of Lecture Contact Hours Taught Weekly by Faculty in Each Category

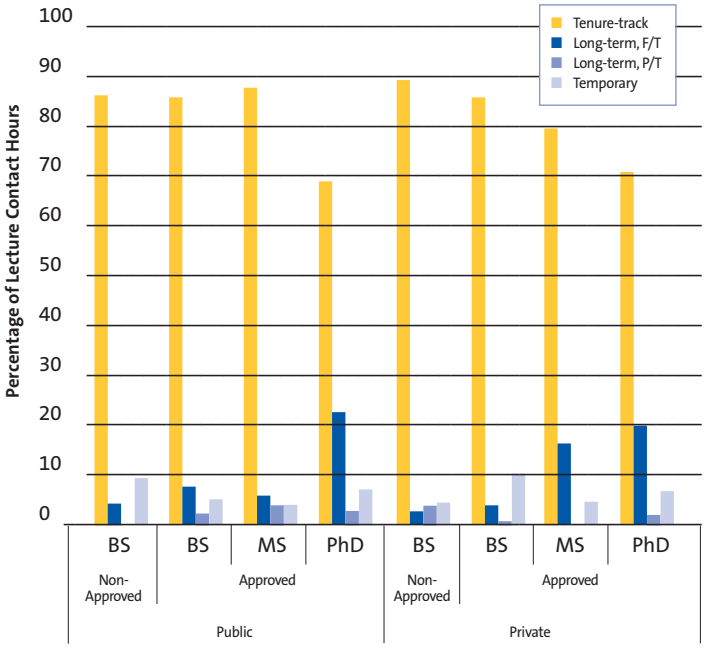


Figure 5b. Introductory Organic Courses in Which a Chemistry Major Might Enroll: Percentage of Laboratory Contact Hours Taught Weekly by Faculty in Each Category

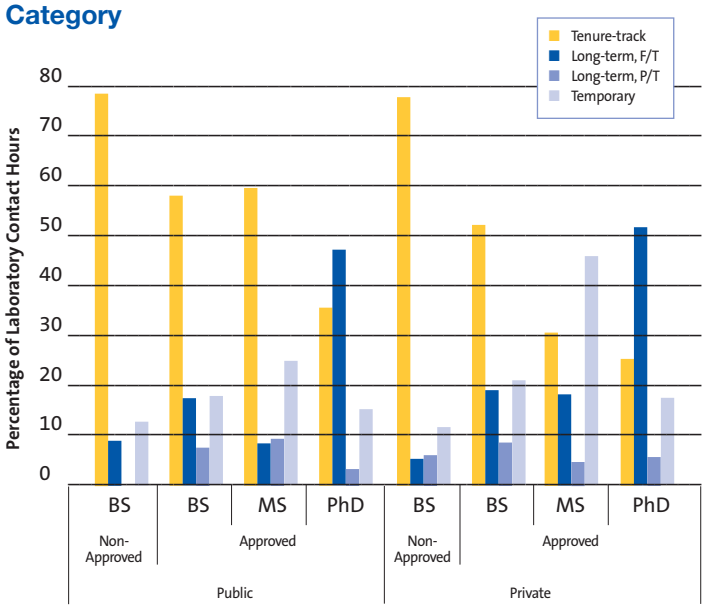
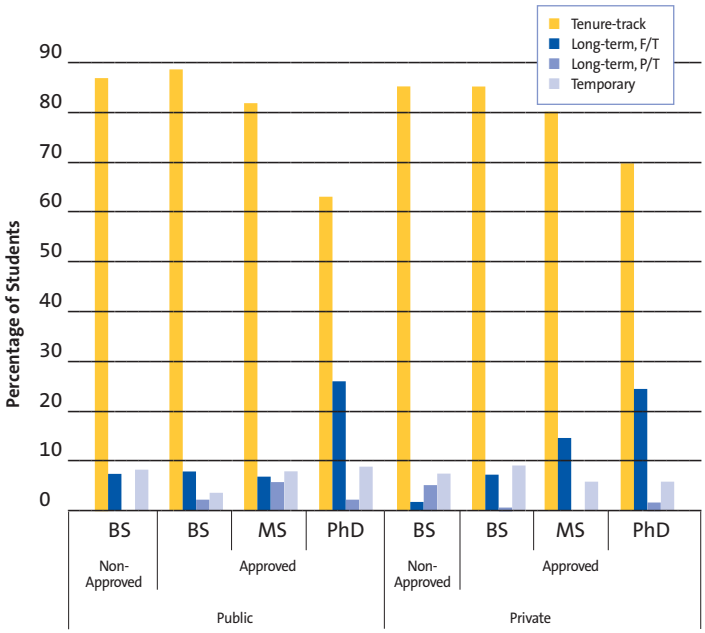


Figure 5c. Introductory Organic Courses in Which a Chemistry Major Might Enroll: Percentage of All Students Who See Faculty in Each Category in Lecture



The percentages in Figure 5c show that in six of the groups of institutions, 80% or more of the students see tenure-track faculty in the classroom. As in the introductory courses, fewer students at PhD-granting institutions see tenure-track faculty in lecture (only 60-70%). A higher percentage of students at all institutions see tenure-track faculty in lecture in this course than in the introductory course. As in the introductory course, however, a higher percentage of students at PhD-granting institutions see LT/FT faculty in lecture in this course than in any of the other groups of institutions.

In summary, a higher percentage of total contact hours in these courses is accounted for by tenure-track faculty than in the introductory courses. At PhD-granting institutions, however, the students are more likely to see LT/FT faculty in both the classroom and laboratory than at any of the other groups of institutions.

Introductory Organic Chemistry Courses That Cannot Count Toward a Chemistry Degree

A relatively small number of the responding institutions taught a course of this type in fall 2009. In some cases, these institutions may teach this course later in the year as part of a sequence for non-chemistry majors. The percentage of institutions in each group who reported teaching this course is shown in Table 13.

Table 13. Introductory Organic Courses Not Suitable for Chemistry Majors: Percentage of Programs Reporting That They Taught Such a Course in Fall 2009.

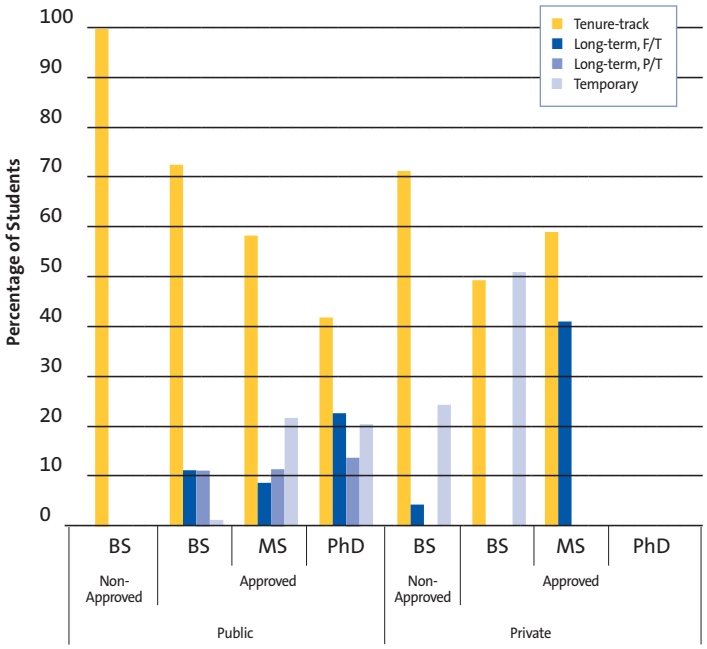
Public				Private			
Non-Approved	Approved			Non-Approved	Approved		
BS	BS	MS	PhD	BS	BS	MS	PhD
18%	27%	48%	44%	16%	4%	18%	0%

The overall low percentages limit the reliability of this data, particularly the faculty lecture and contact hours. It is useful, however, to look at the percentages of students who see each type of faculty in the classroom. These percentages are shown in Figure 6. It is probably most meaningful to look at the percentages at public MS- and PhD-granting institutions. Students are very likely to see non-tenure-track faculty in the classroom at these institutions with around 45% and 60% of the students at public MS- and PhD-granting institutions, respectively, seeing non-tenure-track faculty in lecture

Summary: Who Is Teaching Whom?

Non-tenure-track faculty play a significant role in both classroom and laboratory teaching in chemistry programs. Overall, in both the introductory and organic courses in which a chemistry major might enroll, non-tenure-track faculty contribute most to laboratory teaching but also contribute significantly in lecture courses. In these courses, tenure-track faculty account for the majority of lecture contact hours, but non-tenure-track faculty (particularly LT/FT faculty at PhD-granting institutions) account for a significant percentage of lecture contact hours. Overall, at all types of institutions, about 70% of students in the introductory course suitable for majors see

Figure 6. Introductory Organic Courses Not Suitable for Chemistry Majors: Percentage of All Students Who See Faculty in Each Category in Lecture



tenure-track faculty in lecture. At public PhD-granting institutions, however, less than half of the students in this course see tenure-track faculty with nearly 40% of students seeing LT/FT faculty. The overall percentage of students who see tenure-track faculty in lecture increases to over 80% in the introductory organic course, but about 25% of students in this course at PhD-granting institutions see LT/FT faculty in lecture.

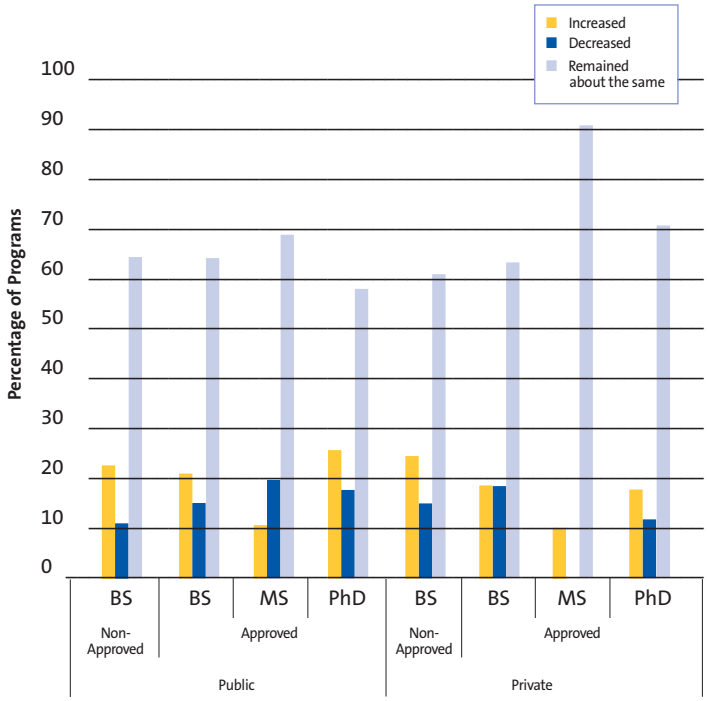
The picture is different for the introductory and organic courses not suitable for chemistry majors. The distribution of faculty lecture contact hours in the introductory course looks quite different from that in the course in which a chemistry major might enroll. In the introductory course not suitable for majors, non-tenure-track faculty in all categories teach the majority of lecture contact hours, and the majority of students see non-tenure-track faculty in lecture. While the limited data on the organic course not intended for majors precluded a detailed analysis of the data, it does suggest that a larger percentage of students see non-tenure-track faculty in this course than in the organic course in which a chemistry major might enroll.

Course Staffing Trends

In Part III of the survey, respondents were asked whether, in the last five years, the proportion of undergraduate courses taught by tenure-track faculty had increased, decreased, or stayed the same. The responses, shown in

Figure 7, indicate that, on average, over 60% of programs of all types reported that this number has stayed the same. Over 15% of programs reported that the proportion has decreased, but more than 20% of programs reported that the proportion has increased. This increase may reflect an increase in teaching loads due to faculty attrition or cutbacks at some institutions.

Figure 7. Change in Proportion of Undergraduate Courses Taught by Tenured or Pre-Tenured Faculty in the Last Five Years



Sabbatical Replacements

Part III of the survey also gathered information about sabbatical replacements, non-tenure-track faculty who were teaching at more than one institution, and how many faculty had a reduced teaching load through a mechanism to obtain release time or a reduced teaching load. The data in Table 14 show that the percentage of faculty on sabbatical at private institutions is two to three times larger than at public institutions. The data also show the percentage of all temporary faculty in each group of institutions who were replacements for faculty on sabbatical. While 15% of temporary faculty were sabbatical replacements at private BS-granting institutions, less than 10% of temporary faculty were sabbatical replacements at all other types of institutions. Considering the larger overall number of tenure-track faculty in comparison to the number of temporary faculty in each group of institutions (Tables 2 and 3), few faculty on sabbatical appear to be replaced by temporary faculty.

Table 14. Faculty on Sabbatical and Faculty Sabbatical Replacements

	Public			Private		
	BS	MS	PhD	BS	MS	PhD
Percentage of tenure-track faculty on sabbatical	2.7%	3.3%	3.8%	6.6%	8.3%	5.5%
Percentage of temporary faculty who are sabbatical replacements	5.9%	5.2%	12.1%	15.1%	7.1%	8.6%

Employment of Non-Tenure-Track Faculty at Multiple Institutions

Table 15 shows the percentages of non-tenure-track faculty at all institutions in each group who were reported to be teaching at more than one institution. Very few of the LT/FT faculty were employed at more than one institution, but the percentage increases for LT/PT and temporary faculty, particularly at BS- and MS-granting institutions. The percentages reported for private, MS-granting institutions should be viewed with caution since only 11 institutions in this category responded to the survey, but a significant percentage of LT/PT and temporary faculty at non-PhD-granting institutions were teaching at more than one institution.

Table 15. Percentage of Non-Tenure-Track Faculty Teaching at More Than One Institution

Faculty Category	Public			Private		
	BS	MS	PhD	BS	MS	PhD
Long-term, FT	3.4%	0.0%	1.1%	2.3%	0.0%	0.0%
Long-term, PT	20.9%	28.6%	8.6%	16.8%	5.7%	4.8%
Temporary	16.8%	15.7%	9.1%	19.7%	39.3%	11.4%

Faculty Release Time

Table 16 shows the percentage of departments that reported having a mechanism for faculty to obtain release time or a reduced teaching load and the percentage of the total number of faculty in each group of institutions that

Table 16. Departments Reporting a Mechanism for Faculty to Obtain a Reduced Teaching Load and the Percentage of All Faculty Taking Advantage of This Mechanism

	Public			Private		
	BS	MS	PhD	BS	MS	PhD
Percentage of departments with such a mechanism	84.6%	95.5%	90.6%	75.6%	100%	96.8%
Percentage of tenure-track faculty with reduced teaching loads	30.4%	42.3%	15.3%	18.4%	40.6%	12.6%

Table 17. Percentage of Departments Reporting Benefits Offered to Different Categories of Faculty

Benefit	Tenure-track	Long-term, F/T	Long-term, P/T	Temporary
Private office space	98.6%	60.2%	29.9%	40.5%
Shared office space	3.8%	12.1%	24.6%	38.6%
Private computer access	98.1%	65.2%	37.7%	54.7%
Shared computer access	8.3%	7.1%	16.6%	24.4%
Mailboxes	97.9%	66.6%	50.9%	71.8%
Parking	78.0%	52.4%	38.2%	57.6%
Private telephone	98.6%	65.4%	34.1%	47.4%
Shared telephone	3.8%	5.9%	18.0%	30.6%
Photocopy access	97.6%	67.1%	52.1%	74.9%
Library privileges	98.1%	66.8%	51.9%	74.2%
Secretarial support	92.2%	63.0%	48.1%	67.5%
Advance notice of course assignments	95.7%	66.1%	48.1%	63.7%
Participation in departmental faculty meetings	98.1%	57.3%	25.6%	34.1%
Travel support to professional meetings	90.5%	41.0%	9.2%	14.0%
Teacher development	81.3%	49.3%	26.3%	35.3%
Other professional development	78.7%	42.4%	18.5%	24.4%
Salary increases	83.9%	53.3%	27.0%	30.3%
Eligible to compete for institutional education and/or research grants	96.4%	45.7%	14.2%	16.1%
Eligible to compete for external education and/or research grants	97.4%	46.7%	14.7%	16.1%
Access to research space	96.0%	35.3%	12.8%	20.9%
Medical plan monthly premiums: employer paid	23.0%	14.9%	5.5%	7.1%
Medical plan monthly premiums: employee paid	10.4%	5.9%	4.0%	5.2%
Medical plan monthly premiums: employer/employee shared payment	86.0%	57.1%	21.3%	31.8%
Retirement plan	97.2%	60.7%	20.1%	24.2%
Life insurance	89.3%	57.1%	15.6%	22.3%

had a reduced teaching load in fall 2009 through this mechanism. While the majority of departments do provide such a mechanism, many more faculty at BS- and MS-granting departments take advantage of these opportunities. This probably reflects the fact that the normal teaching load is higher in these departments than the teaching load in PhD-granting departments.

Employee Benefits

Part IV of the survey asked programs to provide information about benefits offered to each group of faculty. The percentage of programs providing various benefits is shown in Table 17. Among non-tenure-track faculty, LT/FT faculty receive the most generous benefits, but there is considerable disparity between the benefits received by LT/FT and tenure-track faculty. Far fewer LT/FT faculty than tenure-track faculty have private computer access, private offices, secretarial support, photocopy access, or even library privileges. Less than 60% of departments include LT/FT faculty in faculty meetings. Of the two other groups of non-tenure-track faculty, temporary faculty fare better than LT/PT faculty. In many cases, temporary faculty receive benefits comparable to those received by LT/FT faculty. LT/PT faculty receive the fewest of what might be considered quality of life benefits: private office space, computer access, parking, secretarial support, photocopier access, library privileges, or a medical plan of any kind. These faculty, many of whom are teaching at more than one institution at the same time, clearly enjoy the fewest benefits of any of the non-tenure-track faculty.

Concluding Remarks

The survey results offer a number of insights into chemistry instruction and "who is teaching whom." While the percentage of tenure-track faculty in chemistry

departments of all types appears to be higher than in other disciplines across campuses,[3] the gender and ethnic/racial make-up of the faculty do not reflect that of our society as a whole. In comparison to their percentage in tenure-track positions (22%) at all institutions responding to the survey, women make up a much higher proportion of the non-tenure-track faculty at all types of institutions (nearly 50% of LT/FT faculty). In addition, women account for a lower percentage of the faculty in all categories at PhD-granting institutions. Across institution and faculty type, the racial/ethnic make-up of chemistry faculty remains predominantly white/Caucasian. The percentage distribution of faculty among other racial/ethnic groups remains relatively small and consistent across the different categories of faculty.

Although tenure-track faculty make up the majority of faculty in chemistry departments, non-tenure-track faculty play a large role in teaching in both the classroom and the laboratory. For the courses covered by the survey, the teaching trends are quite different depending on the role the course plays in the curriculum. In the introductory course that a student could count toward a chemistry degree, non-tenure-track faculty teach about 30% of the lecture contact hours and 57% of the laboratory contact hours. On average, about 33% of students see non-tenure-track faculty in the lecture component of this course, although at public PhD-granting institutions around 55% of students see non-tenure-track faculty. In the organic course suitable for chemistry majors, the fractions of non-tenure-track lecture and lab contact hours are 20% and 47%, respectively. On average, about 20% of students in this course see non-tenure-track faculty in lecture, but more students (close to 45%) see non-tenure-track faculty at PhD-granting institutions. In both courses, LT/FT faculty account for the majority of non-tenure-track contact hours at PhD-granting institutions.

In the introductory course that cannot count toward a chemistry major, non-tenure-track faculty teach about 60% of the lecture contact hours and 68% of the laboratory contact hours. On average, about 60% of students see non-tenure-track faculty in lecture. As in the two courses suitable for chemistry majors, non-tenure-track faculty account for a larger percentage of both lecture and laboratory contact hours at PhD-granting institutions than the overall average for all types of institutions. The limited data for organic courses that cannot count toward a chemistry degree precluded a detailed analysis of the data for these courses.

While very few LT/FT faculty hold positions simultaneously at more than one institution, a significant percentage of LT/PT and temporary faculty do teach at more than one institution. In addition, all non-tenure-track faculty receive fewer benefits than tenure-track faculty, with LT/PT faculty receiving the fewest benefits.

1 "Tracking the Invisible Faculty," *The Chronicle of Higher Education* (December, 2006) http://chronicle.com/article/Tracking-the-Invisible-Faculty/35173/ (accessed Aug 2010).

2 University of Michigan report "Non Tenure-track Faculty: The Landscape at U.S. Institutions of Higher Education," (2006)

3 "Increasingly, Faculty Members are Part-Time and Nontenured," *The Chronicle of Higher Education* (August 22, 2010). Note: the numbers used for the calculations reported in this article did not include teaching assistants.

4 American Chemical Society, Committee on Professional Training, *Undergraduate Professional Education in Chemistry: ACS Guidelines and Evaluation Procedures for Bachelor's Degree Programs* (ACS: Washington, DC) 2008.

The Committee on Professional Training wishes to thank Suzanne Harris for her leadership in organizing this survey and writing the reports of the results. The Committee also recognizes the contributions of GaryWoods in compiling and analyzing the data collected in this survey.