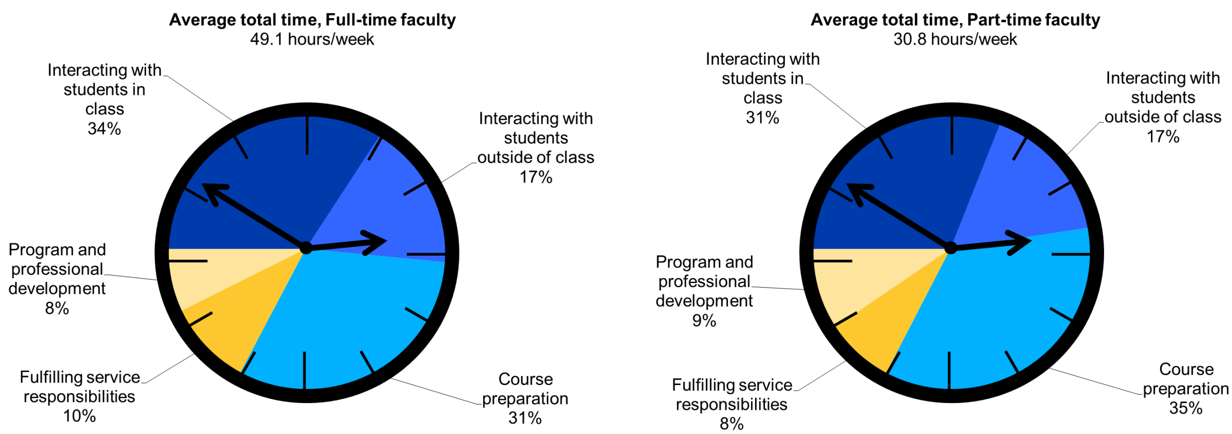
ACS Office of Two-Year Colleges

Two-Year College Chemistry Landscape 2013

Faculty Responsibilities and Practices
Survey Data and Questionnaire
Summer 2013



Activity category	*Specific activities, as listed in the survey*
Interacting with students in class	• Scheduled class time ("lecture") • Scheduled class time ("laboratory")
Interacting with students outside of class	• Meeting with students face-to-face outside of scheduled class time • Responding to student emails • Supporting students through electronic media, such as discussion boards or virtual office hours • Conducting or supervising original research with students • Advising and/or mentoring students
Course preparation	• Preparing for classroom activities • Preparing for laboratory activities • Preparing online course materials • Grading
Fulfilling service responsibilities	• Fulfilling service and administrative responsibilities to the department and/or campus
Program and professional development	• Investigating new developments in chemistry and new educational pedagogies • Participating in professional activities including conferences • Developing new courses and/or curriculum innovations

Figure 1. Average amount of time spent on professional activities, as reported by full– and part-time faculty.*

Work weeks were calculated by adding the number of hours spent on the listed activities, as pertained to chemistry education only. Thus the results do not address the work hours for faculty who teach non-chemistry courses.

Two-Year College Chemistry Landscape 2013

Faculty Responsibilities and Practices
Survey Data Tables
Summer 2013

In Spring 2013, ACS conducted the survey, *Two-Year College Chemistry Landscape 2013: Faculty Responsibilities and Practices*. The survey provided a snapshot of two-year college workloads, responsibilities, and assessment practices.

Approximately 19% of the 3,300 two-year college chemistry faculty and administrators contacted participated in the survey. Additional details on the demographics of the survey participants can be found on p. 12-13.

The following are the complete survey results and questions. Pages 1-4 feature information on how much time faculty spent on professional activities as pertain to chemistry education. The types of courses faculty reported teaching can be found on p.5. Information on institutional support for and faculty participation in various activities can be found on p. 6-7. Page 8 features responses to what students skills respondents teach and how they are assess. Pages 9-11 feature a summary of practices respondents have found particularly useful in teaching and assessing student skills. Survey questions can be found on p. 14-15.

A summary report of some selected findings can be downloaded at www.acs.org/2YColleges. For more information, please contact the ACS Office of Two-Year Colleges (2YColleges@acs.org; 1-800-227-5558, ext. 6108.)

Faculty work week

	All respondents	*Full-time faculty*	*Full-time faculty who do research*	*Full-time faculty who do not do research*	*Part-time faculty*
Scheduled class time ("lecture")	7.8	8.3	8.8	8.2	4.3
Scheduled class time ("laboratory")	8.0	8.5	9.1	8.4	5.3
Preparing for classroom activities	4.9	5.1	4.7	5.1	3.4
Preparing for laboratory activities	2.9	3.0	3.5	2.9	2.4
Preparing online course materials	1.3	1.3	1.3	1.4	1.3
Grading	5.6	5.9	5.9	5.9	3.7
Meeting with students face-to-face outside of scheduled class time	3.5	3.8	3.8	3.8	1.9
Responding to student emails	1.8	1.9	1.8	1.9	1.4
Supporting students through electronic media, such as discussion boards or virtual office hours	0.7	0.7	1.0	0.7	0.9
Conducting or supervising original research with students	0.5	0.6	3.8	0.0	0.2
Advising and/or mentoring students	1.4	1.5	2.2	1.4	0.7
Fulfilling service responsibilities to the department and/or campus	4.5	4.9	4.5	4.9	2.4
Investigating new developments in chemistry and new educational pedagogies	1.3	1.3	1.5	1.2	1.6
Participating in professional activities including conferences	0.9	0.9	1.1	0.9	0.7
Developing new courses and/or curriculum innovations	1.4	1.5	1.2	1.5	0.7
Total hours per week	***46.6***	***49.1***	***54.2***	***48.2***	***30.9***
Number of respondents	***553***	***478***	***74***	***404***	***75***

Table 1. Average number of hours respondents reported spending on professional activities, by full-time, part-time, and research status.

	All respondents	<100 chemistry students	100-250 chemistry students	251-500 chemistry students	>501 chemistry students
Scheduled class time ("lecture")	7.8	8.9	8.9	8.1	7.9
Scheduled class time ("laboratory")	8.0	7.6	8.4	9.3	8.3
Preparing for classroom activities	4.9	5.0	5.5	4.8	5.0
Preparing for laboratory activities	2.9	3.0	3.7	2.9	2.6
Preparing online course materials	1.3	1.8	1.1	1.2	1.4
Grading	5.6	3.9	5.6	6.4	6.4
Meeting with students face-to-face outside of scheduled class time	3.5	3.2	3.3	3.6	4.4
Responding to student emails	1.8	1.2	1.7	1.8	2.3
Supporting students through electronic media, such as discussion boards or virtual office hours	0.7	0.6	0.8	0.8	0.7
Conducting or supervising original research with students	0.5	0.6	0.6	0.6	0.6
Advising and/or mentoring students	1.4	1.6	1.5	1.4	1.6
Fulfilling service responsibilities to the department and/or campus	4.5	4.6	4.2	4.9	5.4
Investigating new developments in chemistry and new educational pedagogies	1.3	1.5	1.2	1.2	1.2
Participating in professional activities including conferences	0.9	0.7	1.0	0.8	1.0
Developing new courses and/or curriculum innovations	1.4	1.3	1.3	1.4	1.7
Total hours per week	***46.6***	***45.6***	***48.8***	***49.3***	***50.5***
Number of respondents	***553***	***65***	***122***	***112***	***179***

Table 2. Average number of hours responding full-time faculty reported spending on professional activities, by number of chemistry students enrolled at the institution.

	All respondents	Chemistry transfer degree	Transfer programs without degrees	Chemistry-based technology degree	No dedicated chemistry program
Scheduled class time ("lecture")	7.8	7.8	8.9	8.1	8.4
Scheduled class time ("laboratory")	8.0	9.3	8.4	8.2	8.0
Preparing for classroom activities	4.9	4.7	5.4	4.7	5.4
Preparing for laboratory activities	2.9	3.2	2.8	2.9	3.1
Preparing online course materials	1.3	1.4	1.5	1.0	1.4
Grading	5.6	6.1	6.5	5.8	5.0
Meeting with students face-to-face outside of scheduled class time	3.5	4.2	3.9	3.8	3.3
Responding to student emails	1.8	1.9	1.9	1.8	1.8
Supporting students through electronic media, such as discussion boards or virtual office hours	0.7	0.7	0.7	0.7	0.8
Conducting or supervising original research with students	0.5	0.6	0.3	1.0	0.6
Advising and/or mentoring students	1.4	1.5	1.6	1.5	1.6
Fulfilling service responsibilities to the department and/or campus	4.5	4.5	4.4	5.3	5.4
Investigating new developments in chemistry and new educational pedagogies	1.3	1.3	1.2	1.2	1.3
Participating in professional activities including conferences	0.9	0.9	0.8	1.2	0.8
Developing new courses and/or curriculum innovations	1.4	1.6	1.4	1.3	1.5
Total hours per week	***46.6***	***49.8***	***49.7***	***48.3***	***48.4***
Number of respondents	***553***	***120***	***138***	***82***	***138***

Table 3. Average number of hours responding full-time faculty reported spending on professional activities, by types of programs offered at the institution.

Data set includes:	• Tenure-track/permanent faculty • Long-term, full-time faculty
Total number of respondents:	478
Average work week:	49.1 hours
Range:	9.5–108 hours
	% Respondents
Work week < 35 hours:	10.0%
Work week ≥ 35 hours, ≤ 50 hours:	48.5%
Work week > 50 hours, ≤ 75 hours:	38.5%
Work week > 75 hours:	2.9%

Table 4. Additional information on the faculty work week information provided by participants who are full-time faculty.

Data set includes:	• Long-term, part-time faculty • Contingent faculty • Other positions
Total number of respondents:	75
Average work week:	30.9 hours
Range:	9–75 hours
	% Respondents
Work week <12 hours:	6.7%
Work week ≥12 hours, ≤35 hours:	60.0%
Work week > 35 hours:	33.3%

Table 5. Additional information on the faculty work week information provided by participants who are part-time faculty.

Comments on faculty work weeks

Faculty work weeks were calculated by totaling the number of hours per week respondents spent on the activities listed in Tables 1-3, as they pertained to chemistry education only. Additionally, respondents were able to comment on additional professional development activities; however, not enough respondents reported the hours spent on those activities to include them in the work week calculation. Thus, the work week calculations may not account for all professional activities.

As shown in Tables 4 and 5, a broad range of work weeks were reported for both full– and part-time faculty. Several full-time respondents whose work weeks appeared to total less than 35 hours reported teaching non-chemistry courses. Some reported they worked in an administrative capacity, such as department chair or laboratory manager.

Likewise, part-time respondents reported a variety of professional responsibilities that expanded their work weeks beyond 35 hours. These included administrative duties, part-time teaching a multiple institutions, and full-time employment as high school teachers, industry professionals, and consultants.

Other professional activities

Over 150 survey respondents provided information on professional activities other than those listed in Tables 1 and 2. Service to the institution was most commonly reported, including faculty mentorship, committee or faculty senate work, grant administration, and student club advising, Multiple respondents engaged in community outreach and volunteer activities.

Additional responsibilities reported include the following:

Work to support institution

- Hiring and mentorship of chemistry faculty
- Advisor to science or chemistry club
- Leadership in faculty association or senate
- Committee service, such as hiring, assessment, curriculum development, awards, tenure
- Oversight of laboratory renovation
- Waste management support
- Grant acquisition and management
- Chemistry seminar management
- Departmental webmaster
- Collaboration with other institutions
- Administrative work, such as department chair or chemical hygiene officer
- Participation in faculty meetings
- Laboratory management

Science outreach and volunteer work

- ACS committee member or officer
- Leadership positions in other science or education professional societies
- Paper reviewer for journals
- Outreach activities for K-12 students, such as demonstrations, science olympiad, or science fairs
- Union representative
- Mentorship and collaboration with high school chemistry teachers

Other responsibilities

- Teaching non-chemistry courses
- Teaching high school courses
- Developing learning materials for non-chemistry courses
- Consulting
- Employment in industry

Types of courses taught

	All respondents	Full-time faculty	Part-time faculty
Face-to-face chemistry courses with a hands-on laboratory experience	96.6%	97.3%	92.0%
Face-to-face chemistry courses with only computer-simulated labs	0.7%	0.8%	0.0%
Face-to-face chemistry courses with no laboratory component	10.1%	10.6%	6.7%
Hybrid/blended chemistry courses with a hands-on, on-campus laboratory experience	16.6%	17.5%	10.7%
Hybrid/blended chemistry courses with only computer-simulated labs	0.5%	0.6%	0.0%
Online chemistry courses with a hands-on, on-campus laboratory experience	6.7%	6.9%	5.3%
Online chemistry courses with a hands-on, off-campus laboratory experience	4.9%	5.2%	2.7%
Online chemistry courses with only computer-simulated labs	2.3%	2.1%	4.0%
Online chemistry courses with no lab component	2.7%	2.5%	4.0%
Other	1.3%	1.3%	1.3%
Total responses:	***554***	***479***	***75***

Table 6. Percentage of responses for the types of chemistry courses taught, by full- and part-time faculty status.

	All respondents	<100 chemistry students	100-250 chemistry students	251-500 chemistry students	>501 chemistry students
Face-to-face chemistry courses with a hands-on laboratory experience	96.6%	93.3%	97.9%	97.0%	96.5%
Face-to-face chemistry courses with only computer-simulated labs	0.7%	0.0%	1.4%	1.5%	0.0%
Face-to-face chemistry courses with no laboratory component	10.1%	10.7%	9.7%	9.1%	10.9%
Hybrid/blended chemistry courses with a hands-on, on-campus laboratory experience	16.6%	12.0%	16.6%	18.9%	16.8%
Hybrid/blended chemistry courses with only computer-simulated labs	0.5%	0.0%	1.4%	0.8%	0.0%
Online chemistry courses with a hands-on, on-campus laboratory experience	6.7%	6.7%	6.2%	7.6%	6.4%
Online chemistry courses with a hands-on, off-campus laboratory experience	4.9%	9.3%	4.8%	3.8%	4.0%
Online chemistry courses with only computer-simulated labs	2.3%	5.3%	2.1%	2.3%	1.5%
Online chemistry courses with no lab component	2.7%	2.7%	2.1%	3.8%	2.5%
Other	1.3%	0.0%	1.4%	0.8%	2.0%
Total responses:	***554***	***75***	***145***	***132***	***202***

Table 7. Percentage of responses for the types of chemistry courses taught, by number of chemistry students enrolled at institution.

	All respondents	Chemistry transfer degree	Transfer programs without degrees	Chemistry-based technology degree	No dedicated chemistry program
Face-to-face chemistry courses with a hands-on laboratory experience	96.6%	97.9%	98.7%	96.1%	93.7%
Face-to-face chemistry courses with only computer-simulated labs	0.7%	0.7%	1.3%	1.0%	0.0%
Face-to-face chemistry courses with no laboratory component	10.1%	7.1%	11.7%	14.7%	8.2%
Hybrid/blended chemistry courses with a hands-on, on-campus laboratory experience	16.6%	14.3%	15.6%	19.6%	17.7%
Hybrid/blended chemistry courses with only computer-simulated labs	0.5%	0.7%	0.6%	0.0%	0.6%
Online chemistry courses with a hands-on, on-campus laboratory experience	6.7%	8.6%	5.2%	6.9%	6.3%
Online chemistry courses with a hands-on, off-campus laboratory experience	4.9%	2.1%	6.5%	3.9%	6.3%
Online chemistry courses with only computer-simulated labs	2.3%	2.1%	0.6%	4.9%	2.5%
Online chemistry courses with no lab component	2.7%	2.1%	4.5%	1.0%	2.5%
Other	1.3%	0.0%	0.6%	2.0%	2.5%
Total responses:	***554***	***140***	***154***	***102***	***158***

Table 8. Percentage of responses for the types of chemistry courses taught, by types of programs offered at the institution.

Participation in and institutional support for faculty activities

	Yes, I have participated in this activity with support.	*Yes, I have participated in this activity without support.*	*No, I have not participated in this activity, although support is available.*	*No, I have not participated in this activity, and support is not available.*	*Number of responses*
All responses	37.0%	20.8%	22.6%	19.6%	***552***
Chemistry transfer degree	40.7%	22.1%	18.6%	18.6%	***140***
Transfer programs without degrees	33.1%	24.0%	26.0%	16.9%	***154***
Chemistry-based technology degree	32.7%	21.8%	25.7%	19.8%	***101***
No dedicated chemistry program	40.1%	15.9%	21.0%	22.9%	***157***
<100 chemistry students	44.0%	24.0%	16.0%	16.0%	***75***
100-250 chemistry students	28.7%	23.8%	23.8%	23.8%	***143***
251-500 chemistry students	36.8%	21.1%	24.1%	18.0%	***133***
>501 chemistry students	40.3%	17.4%	23.4%	18.9%	***201***

Table 9. Percent of survey respondents who reported performing administrative duties in the past three years, by type of program offered and number of chemistry students enrolled in institution.

	Yes, I have participated in this activity with support.	*Yes, I have participated in this activity without support.*	*No, I have not participated in this activity, although support*	*No, I have not participated in this activity, and support is*	*Number of responses*
All responses	44.0%	43.5%	5.4%	7.1%	***552***
Chemistry transfer degrees	39.3%	47.1%	3.6%	10.0%	***140***
Chemistry-based technology degrees	40.6%	45.5%	9.9%	4.0%	***101***
Transfer programs without degrees	48.1%	42.2%	4.5%	5.2%	***154***
No dedicated chemistry program	46.5%	40.1%	5.1%	8.3%	***157***
<100 chemistry students	50.7%	37.3%	6.7%	5.3%	***75***
100-250 chemistry students	37.1%	47.6%	7.0%	8.4%	***143***
251-500 chemistry students	42.9%	41.4%	7.5%	8.3%	***133***
>501 chemistry students	47.3%	44.3%	2.5%	6.0%	***201***

Table 10. Percent of survey respondents who reported fulfilling service responsibilities to the department and/or campus in the past three years, by type of program offered and number of chemistry students enrolled in institution.

	Yes, I have participated in this activity with support.	*Yes, I have participated in this activity without support.*	*No, I have not participated in this activity, although support*	*No, I have not participated in this activity, and support is*	*Number of responses*
All responses	35.3%	50.4%	5.3%	9.1%	***552***
Chemistry transfer degrees	36.4%	50.7%	4.3%	8.6%	***140***
Chemistry-based technology degrees	37.6%	51.5%	6.9%	4.0%	***101***
Transfer programs without degrees	35.1%	48.1%	5.8%	11.0%	***154***
No dedicated chemistry program	33.1%	51.6%	4.5%	10.8%	***157***
<100 chemistry students	34.7%	50.7%	8.0%	6.7%	***75***
100-250 chemistry students	35.7%	52.4%	2.8%	9.1%	***143***
251-500 chemistry students	33.1%	50.4%	8.3%	8.3%	***133***
>501 chemistry students	35.3%	57.2%	3.5%	4.0%	***201***

Table 11. Percent of survey respondents who reported mentoring or advising students in the past three years, by type of program offered and number of chemistry students enrolled in institution.

	Yes, I have participated in this activity with support.	Yes, I have participated in this activity without support.	No, I have not participated in this activity, although support	No, I have not participated in this activity, and support is	Number of responses
All responses	8.5%	12.7%	15.0%	63.8%	***552***
Chemistry transfer degree	7.1%	12.9%	10.7%	69.3%	***140***
Transfer programs without degrees	7.8%	16.2%	18.2%	57.8%	***154***
Chemistry-based technology degree	13.9%	15.8%	22.8%	47.5%	***101***
No dedicated chemistry program	7.0%	7.0%	10.8%	75.2%	***157***
<100 chemistry students	5.3%	16.0%	12.0%	66.7%	***75***
100-250 chemistry students	6.3%	9.1%	14.0%	70.6%	***143***
251-500 chemistry students	10.5%	13.5%	16.5%	59.4%	***133***
>501 chemistry students	10.0%	13.4%	15.9%	60.7%	***201***

Table 12. Percent of survey respondents who reported conducting original research with students in the past three years, by type of program offered and number of chemistry students enrolled in institution.

	Yes, I have participated in this activity with support.	Yes, I have participated in this activity without support.	No, I have not participated in this activity, although support	No, I have not participated in this activity, and support is	Number of responses
All responses	34.2%	54.5%	5.4%	5.8%	***552***
Chemistry transfer degrees	33.6%	60.0%	2.1%	4.3%	***140***
Chemistry-based technology degrees	39.6%	49.5%	6.9%	4.0%	***101***
Transfer programs without degrees	34.4%	58.4%	4.5%	2.6%	***154***
No dedicated chemistry program	31.2%	49.0%	8.3%	11.5%	***157***
<100 chemistry students	33.3%	52.0%	5.3%	9.3%	***75***
100-250 chemistry students	30.1%	53.8%	9.1%	7.0%	***143***
251-500 chemistry students	37.6%	52.6%	4.5%	5.3%	***133***
>501 chemistry students	35.3%	57.2%	3.5%	4.0%	***201***

Table 13. Percent of survey respondents who reported developing or updating curricula in the past three years, by type of program offered and number of chemistry students enrolled in institution.

Teaching and assessing student skills

	Communication	Ethics	Laboratory safety	Problem-solving	Teamwork	Use of chemical literature	None	Other	***Number of respondents***
All responses	87.1%	52.9%	94.3%	98.5%	85.0%	45.8%	0.7%	9.1%	***541***
All full-time faculty	87.6%	52.1%	94.4%	98.7%	86.1%	45.9%	0.6%	9.4%	***479***
Full-time faculty who do research	90.3%	66.7%	94.4%	98.6%	86.1%	55.6%	0.0%	8.3%	***72***
Full-time faculty who do not do research	87.1%	49.5%	94.4%	98.7%	86.0%	44.2%	0.8%	9.4%	***407***
Part-time faculty	84.0%	57.3%	93.3%	97.3%	78.7%	45.3%	1.3%	8.0%	***75***
<100 chemistry students	85.3%	57.3%	94.7%	98.7%	77.3%	46.7%	1.3%	8.0%	***75***
100-250 chemistry students	84.5%	53.5%	94.4%	97.9%	85.9%	40.8%	1.4%	7.7%	***142***
251-500 chemistry students	88.4%	46.5%	93.8%	98.4%	84.5%	49.6%	0.8%	8.5%	***129***
>501 chemistry students	88.7%	54.9%	94.4%	99.0%	87.7%	46.7%	0.0%	11.3%	***195***
Chemistry transfer degrees	87.5%	52.9%	94.9%	100.0%	83.8%	50.0%	1.5%	7.4%	***135***
Transfer programs without degrees	89.3%	55.3%	94.0%	98.0%	88.7%	49.3%	0.7%	8.0%	***150***
Chemistry-based technology degrees	91.0%	58.0%	94.0%	100.0%	88.0%	54.0%	0.0%	14.0%	***100***
No dedicated chemistry program	81.9%	47.1%	94.2%	96.8%	80.6%	33.5%	0.6%	9.0%	***155***

Table 14. Percent of survey respondents who reported integrating the above student skills into their teaching, by faculty and research status, number of chemistry students enrolled at the institution, and types of program offered.

	Incorporation into course quizzes and/ or exams	Lab reports or essays	Topic-specific quizzes and/or exams	Topic-specific papers and/or presentations	Evaluation rubrics, including self-evaluation	Lab practical evaluations	Instructor observation	None	Other	***Number of respondents***
All responses	90.4%	91.1%	64.1%	37.8%	29.4%	40.7%	61.9%	0.9%	3.7%	***541***
All full-time faculty	90.5%	90.8%	63.7%	39.4%	29.7%	38.7%	60.9%	0.9%	3.7%	***479***
Full-time faculty who do research	93.1%	94.4%	75.0%	48.6%	31.9%	48.6%	66.7%	0.0%	2.8%	***72***
Full-time faculty who do not do research	90.1%	90.1%	61.6%	37.7%	29.3%	36.9%	59.8%	1.0%	3.8%	***407***
Part-time faculty	89.3%	93.3%	66.7%	28.0%	28.0%	53.3%	68.0%	1.3%	4.0%	***75***
<100 chemistry students	89.3%	96.0%	49.3%	32.0%	32.0%	29.3%	70.7%	0.0%	6.7%	***75***
100-250 chemistry students	89.4%	90.1%	61.7%	32.6%	27.7%	40.4%	59.6%	2.1%	2.8%	***142***
251-500 chemistry students	89.9%	92.2%	66.7%	42.6%	25.6%	40.3%	58.9%	0.8%	3.1%	***129***
>501 chemistry students	91.8%	89.2%	69.7%	40.5%	32.3%	45.6%	62.1%	0.5%	3.6%	***195***
Chemistry transfer degrees	90.4%	90.4%	72.8%	39.0%	25.0%	45.6%	64.7%	0.0%	2.2%	***135***
Transfer programs without degrees	92.0%	92.7%	72.0%	41.3%	34.7%	36.7%	64.7%	0.7%	5.3%	***150***
Chemistry-based technology degrees	91.0%	92.0%	67.0%	44.0%	40.0%	51.0%	59.0%	2.0%	5.0%	***100***
No dedicated chemistry program	88.3%	89.6%	46.8%	29.2%	21.4%	33.8%	58.4%	1.3%	2.6%	***155***

Table 15. Percent of survey respondents who reported using the above tools to assess student skills, by faculty and research status, number of chemistry students enrolled at the institution, and types of program offered.

Useful assessment and teaching tools

In a free-response question, survey participants were asked to share practices they found to be effective for the assessment of student skills. Over 140 participants responded to the question, describing both assessment mechanisms and ways to integrate technical and non-technical skills into the curriculum.

Lab reports and classwork

In addition to traditional lab reports, several respondents reported that having students keep traditional laboratory notebooks, in which students write all their procedures, observations, and calculations, provided a useful assessment tool. They also reported that guided inquiry labs were reported to provide opportunities to students and assess their learning.

Some respondents favored group work to build team skills; several reported using laboratory activities in which teamwork was critical to success. One respondent assigned students to specific roles to better track the skill development of individuals. Another respondent preferred having students work independently, to gain more hands-on experience.

Other mechanisms for assessing students in the laboratory included:

- Use of end-of-lab “concept questions” that students must complete and submit before leaving the laboratory; students receive credit for the laboratory only if the questions are checked by the instructor, giving the instructor an opportunity to clear up misconceptions
- Assigning a performance score for each laboratory exercise in addition to the usual grade; students lose points for poor attendance and lab practices, and they gain points for “proactive” behavior

As with laboratory work, a number of respondents found student-centered teaching methods, such as Process Oriented Guided Inquiry Learning (POGIL) and Peer-Led Team Learning (PLTL), provided ample opportunity to observe and assess student skills in class. Devoting class time to problem-solving independently or in groups, especially when students presented their results to the class, was also mentioned several times.

Other mechanisms for engaging and assessing students in class included:

- Devoting ⅛ of the course to safety and finding information independently
- Making mistaking in writing formulas and equations to keep students thinking and asking questions
- Concept mapping of chemical concepts
- Relating class topics to student interests, so they are more likely to respond
- Having students complete class summary sheets

Quizzes and exams

Quizzes and exams were the most commonly reported method of assessment. Tests could be written or oral, broad or topic-specific. Some participants found the ACS exams useful. Unannounced pop quizzes and cumulative final exams were also reported. Several participants reported that using open-ended questions revealed a great deal about student learning but were cumbersome to evaluate in large classes.

Other suggestions for getting more out of tests and quizzes included the following:

- Use of “clickers” for quick, in-class quizzes that can track student understanding of the material
- Quizzes based on supplemental online videos (such as the Khan Academy series)
- Quizzes that have an individual and group component
- Quizzes that are simple to help build confidence in material
- Take-home quizzes randomly generated using Excel and mail merge in Word perfect so no two students have the same quiz. The answers are also generated in Excel.
- Use of oral “mini-exams” to determine whether student do not understand the material or simply do not express their understanding well on written exams.
- “Weakest person” quiz in which students are assigned lab problems too large to solve without teamwork
- Having students keep a problem-solving portfolio that they are allowed to use on the exams
- Increasing the number of points associated with a particular skill set and letting the students know that it will be valuable
- Use of task-driven assessment, or requiring students to demonstrate proficiency in a given skills
- Use of Chem21Labs, an online resource that provides timed-repetitive quizzes to support and assess student development of teacher-assigned skills
- Assessing student knowledge both at the beginning and end of a unit, experiment, or course

Instructor observations

Classroom discussions and direction observation of students, especially in the laboratory, enabled many respondents to assess student learning. As noted above, some respondents reported that inquiry-based pedagogies provided more time for interacting with students for observational assessment.

Other mechanisms that respondents found useful for building on instructor observations included the following:

- Use of an institutional mentoring program in which students meet with a faculty member and student tutor two hours per week. While participation is voluntary, the respondent added 3% to the final course grade for those students who participated.
- Beginning each class with a discussion of review problems from previous chapter
- Enforcing rules on speech, attire, and interaction to develop professional skills
- Discussion of the ACS Molecule of the Week in organic chemistry classes
- Including checkpoints in laboratory exercises in which students must demonstrate a laboratory technique for the instructor
- Asking laboratory students, "Why are you doing what you're doing now?"

Lab practical evaluations

A number of survey respondents reported using lab practical examinations to evaluate students' laboratory skills.

Ideas for taking full advantage of this assessment mechanism included the following:

- Giving students an unknown sample to analyze
- Having students use their own observations, organizations, and calculations to write a report of their conclusions
- Observing students one-on-one to assess skills, especially with older equipment
- Setting up stations for individual skills
- Allowing students to develop their own experimental procedures

Papers and presentations

Respondents reported assigning reports, posters, and presentations for both class and laboratory work. Respondents commented that it is an effective method for assessing students' communication and problem-solving skills. One respondent who assigned group poster projects based on literature searches noted that the "ease of finding partners is usually correlated with [students'] skill at working in a group and their flexibility."

Respondents also noted that the assignments supported student understanding of the course material. A respondent who graded students' organic laboratory reports on the quality of their discussion commented that the discussion section forced students "to think about the experiment as a whole and not just" the yield and purity.

Practices used in paper and presentation assignments included:

- Reports analyzing, comparing, and contrasting experiments in a given field
- Short papers based on a variety of literature, such as *Chemical & Engineering News*, the Journal *of Chemical Education*, and the *New York Times*
- Presentations on the research of a Nobel Prize winner
- Use of an online platform for assessment and peer-review of writing assignments

Evaluation rubrics, including self-evaluation

Respondents reported developing evaluation rubrics for assessing papers, projects, presentation, and laboratory work and reports. The following additional suggestions for maximizing the utility of the rubrics were noted.

- Sharing the rubrics with the students
- Basing the rubric on student learning outcomes developed for each course
- Including student skills, such as ethics, teamwork, and problem-solving, on the rubrics
- Constructing a skill matrix for each laboratory project that includes a level of mastery for each skill

Student self-evaluations were reported to benefit both student and faculty. Some respondents issued self-assessments in every class, some at the beginning of each chapter, others less frequently. Peer evaluations were found to be helpful, especially for group projects and presentations. Frequently, students were given rubrics to guide their assessments.

One respondent reported a mid-term group evaluation in which students are asked to consider what has helped them learn chemistry, what they can do to improve their learning, how the instructor can help them learn, and what formats they would like to use to demonstrate their learning. The respondent indicated this technique helped counter some students' arguments that they did not "test well."

Other practices

Group and individual projects were reported to be a useful mechanism for assessing student skills. Assigned projects included:

- "Crime scene" analysis, in which students review and analysis evidence in group, then write individual reports
- Individual synthetic laboratory activity with a full report
- Keeping a weekly "learning journal" that is submitted electronically
- 120 hours of internship activity at a pharmaceutical, biotechnology, government, quality control, or environmental laboratory
- Theoretical background research of a student-selected topic resulting in a laboratory demonstration
- Poster based on a literature search of primary research on a topic; project is proceeded by a laboratory assignment to identify primary research papers on a student-selected topic in a non-primary article

- Review of a Material Safety Data Sheet (MSDS), followed by a series of questions on the material and MSDS; project is worth 6% of total grade
- Group laboratory projects, followed by formal reports and seminar presentations
- Working with analysis procedures followed by analysis of a unique unknown

Many, though not all, of the respondents who reported using homework as an assessment tool used online homework and learning management systems. Other assignments included the following:

- Draft annotated bibliography on a topic of the student's choice; only research articles may be used
- Writing short summary of science articles
- Complete four open-ended questions after each laboratory, designed to evaluate the experiment and what might happen if parameters were changed.

Several respondents mentioned the use of student portfolios to assess student learning. One respondent reported that the institution's assessment committee required the portfolios and used them to provide feedback to the instructors.

One respondent reported meeting regularly with teaching peers to discuss student learning outcomes and students' progress. Another reported arranging math review sessions with students on an as-needed basis.

Demographics

	Number of responses	Percentage
Certificate or associate's degree in chemistry	246	38.4%
Certificate or associate's degree in a chemistry-based technology (e.g., chemical technology, process technology, biotechnology, etc.)	127	19.8%
Certificate or associate's degree in natural sciences, physical sciences, and/or a chemistry-related field	318	49.7%
Transfer programs (without degrees) in chemistry or chemistry-based technology	351	54.8%
General degree program that can be transferred to a four-year program in chemistry or chemistry-based technology	377	58.9%
None of the above	14	2.2%
Total responses:	***640***	

Table 16. Number and percentage of respondents who reported their institutions offered the above courses.

Survey respondents were asked what types of programs were offered by their institutions; the responses are shown in Table 16. Respondents were allowed to indicate more than one type of program offered by their institution. In order to assemble non-overlapping data groups, responses were separated into the following categories:

- ***Chemistry transfer degrees:*** certificate or associate's degree in chemistry, excluding chemistry-based technology degree programs
- ***Transfer chemistry programs without degrees:*** Transfer programs (without degrees), excluding chemistry transfer degrees and chemistry-based technology degree programs
- ***Chemistry-based technology degree programs:*** Certificate or associate's degree in a chemistry-based technology
- ***No dedicated chemistry program:*** all responses that did not match fit in the above categories

When separated into the categories described, the distribution shown in Table 17 was achieved.

Table 18 shows the distribution of responses by number of chemistry students at the respondents' institutions. To maintain consistency with previous Landscape surveys, responses from all institutions with more than 500 chemistry students were grouped together.

	Number of responses	Percent distribution
Chemistry transfer degrees	170	26.6%
Transfer chemistry programs without degrees	171	26.7%
Chemistry-based technology degree programs	127	19.8%
No dedicated chemistry program	172	26.9%
Total responses:	***640***	

Table 17. Number and percentage distribution of respondents by type of program offered at their institution.

	Number of responses	Percent distribution
< 100 students	85	13.3%
100-250 students	164	25.6%
251-500 students	151	23.6%
501-1,000 students	135	21.1%
1,001-1,500 students	43	6.7%
1,501-2,500 students	31	4.8%
> 2,500 students	31	4.8%
Total responses:	***640***	

Table 18. Number and percent distribution of respondents, by number of chemistry students enrolled at their institution.

Demographics, cont'd

	Number of responses	Percent distribution
Tenure-track/permanent faculty (e.g., tenured and pre-tenured faculty, faculty with unlimited contracts and other types of effectively permanent employment agreements)	420	65.6%
Long-term, full-time (e.g., full-time, non-tenure-track faculty and instructional staff with contracts of one year or longer)	129	20.2%
Long-term, part-time (e.g., part-time, non-tenure-track faculty and instructional staff with contracts of one year or longer)	17	2.7%
Contingent (Full- or part-time adjunct or other non-permanent faculty with contracts of less than one year)	57	8.9%
Other	17	2.7%
Total responses:	***640***	

Table 19. Number and percent distribution of respondents, by faculty position.

	Number of responses	Percent distribution
1	41	77.4%
2	8	15.1%
3	4	7.5%
More than 3	0	0.0%
Total responses:	***53***	

Table 20. Number and percent distribution of respondents who identified themselves as contingent faculty in Table 19, by number of intuitions at which they reported teaching.

Responses to questions regarding faculty positions are shown in Table 19. Respondents who identified themselves as contingent faculty were additionally asked the number of institutions at which they taught; their responses are shown in Table 20. When calculating the number of hours per week spent on professional responsibilities, respondents who reported teaching at more than one institution were asked to consider the total amount of time spent on professional activities.

Two-Year College Chemistry Landscape 2013

Faculty Responsibilities and Practices Survey Questionnaire

The following are the questions asked regarding faculty workloads, responsibilities, and assessment techniques.‡ Responses can be found in the data tables indicated in parentheses after each question.

Which of the following are offered on your campus? Check all that apply. (Tables 16 and 17)

- Certificate or associate's degree in chemistry
- Certificate or associate's degree in a chemistry-based technology (e.g., chemical technology, process technology, biotechnology, etc.)
- Certificate or associate's degree in natural sciences, physical sciences, and/or a chemistry-related field
- Transfer programs (without degrees) in chemistry or chemistry-based technology
- General degree program that can be transferred to a four-year program in chemistry or chemistry-based technology
- None of the above

What is the current total student enrollment for all chemistry courses on your campus? (Table 18)

- < 100 students
- 100-250 students
- 251-500 students
- 501-1,000 students
- 1,001-1,500 students
- 1,501-2,500 students
- > 2,500 students

Which of the following best describes your current position? (Table 19)

- Tenure-track/permanent faculty (e.g., tenured and pre-tenured faculty, faculty with unlimited contracts and other types of effectively permanent employment agreements)
- Long-term, full-time (e.g., full-time, non-tenure-track faculty and instructional staff with contracts of one year or longer)
- Long-term, part-time (e.g., part-time, non-tenure-track faculty and instructional staff with contracts of one year or longer)
- Contingent (full- or part-time adjunct or other non-permanent faculty with contracts of less than one year)
- Other (specify):

‡*Survey participants were also asked a series of questions regarding their use of the* **ACS Guidelines for Chemistry in Two-Year College Programs**. ***These questions were intended for internal use and are not being disseminated at this time.***

[Contingent faculty only] At how many different institutions are you currently teaching? (Table 20)

- 1
- 2
- 3
- More than 3 (specify)

Which of the following types of chemistry courses are you currently teaching? Check all that apply. (Table 6-8)

- Face-to-face chemistry courses with a hands-on laboratory experience
- Face-to-face chemistry courses with only computer-simulated labs
- Face-to-face chemistry courses with no laboratory component
- Hybrid/blended chemistry courses with a hands-on, on-campus laboratory experience
- Hybrid/blended chemistry courses with only computer -simulated labs
- Online chemistry courses with a hands-on, on-campus laboratory experience
- Online chemistry courses with a hands-on, off-campus laboratory experience
- Online chemistry courses with only computer-simulated labs
- Online chemistry courses with no lab component
- Other (describe briefly):

Enter the number of hours, to the nearest 0.5, per week that you currently spend on each of the following student-focused, professional activities. If an activity does not apply to your situation, enter "0" (zero). Hint: you may find it helpful to consider the amount of time you spend per month, then divide by four. (Tables 1-5)

- Scheduled class time ("lecture")
- Scheduled class time ("laboratory")
- Preparing for classroom activities
- Preparing for laboratory activities
- Preparing online course materials
- Grading
- Meeting with students face-to-face outside of scheduled class time
- Responding to student emails
- Supporting students through electronic media, such as discussion boards or virtual office hours
- Conducting or supervising original research with students
- Advising and/or mentoring students

Enter the number of hours, to the nearest 0.5, per week that you currently spend on each of the following non-student-focused, professional activities. If an activity does not apply to your situation, enter "0" (zero). Hint: you may find it helpful to consider the amount of time you spend per month, then divide by four. (Tables 1-5)

- Fulfilling service responsibilities to the department and/or campus
- Investigating new developments in chemistry and new educational pedagogies
- Participating in professional activities including conferences
- Developing new courses and/or curriculum innovations

Briefly describe any other professional activities that you currently engage in, along with the number of hours per week you spend on these activities.

In the past three years, have you participated in any of the following activities, with or without institutional support (such as a sabbatical, reduction in teaching assignments, or financial support)? (Tables 9-13)

- Performing administrative duties
    - ◊ Yes, I have participated in this activity with support.
    - ◊ Yes, I have participated in this activity without support.
    - ◊ No, I have not participated in this activity, although support is available.
    - ◊ No, I have not participated in this activity, and support is not available.
- Fulfilling service responsibilities to the department and/or campus
    - ◊ Yes, I have participated in this activity with support.
    - ◊ Yes, I have participated in this activity without support.
    - ◊ No, I have not participated in this activity, although support is available.
    - ◊ No, I have not participated in this activity, and support is not available.
- Mentoring or advising students
    - ◊ Yes, I have participated in this activity with support.
    - ◊ Yes, I have participated in this activity without support.
    - ◊ No, I have not participated in this activity, although support is available.
    - ◊ No, I have not participated in this activity, and support is not available.
- Conducting original research with students
    - ◊ Yes, I have participated in this activity with support.
    - ◊ Yes, I have participated in this activity without support.
    - ◊ No, I have not participated in this activity, although support is available.
    - ◊ No, I have not participated in this activity, and support is not available.
- Developing or updating curricula
    - ◊ Yes, I have participated in this activity with support.
    - ◊ Yes, I have participated in this activity without support.
    - ◊ No, I have not participated in this activity, although support is available.
    - ◊ No, I have not participated in this activity, and support is not available.

Which of the following student skills do you integrate into your teaching? Select all that apply. (Table 14)

- Communication
- Ethics
- Laboratory safety
- Problem-solving
- Teamwork
- Use of chemical literature
- I do not formally address student skills in my teaching.
- Other student skills (please specify):

How do you assess student skills in your courses? Select all that apply. (Table 15)

- Incorporation into course quizzes and/or exams
- Lab reports or essays
- Topic-specific quizzes and/or exams
- Topic-specific papers and/or presentations
- Evaluation rubrics, including self-evaluation
- Lab practical evaluations
- Instructor observation
- I do not formally assess student skills.
- Other (specify):

Briefly describe any practices you have found to be effective for assessment of student skills. (Pages 8-10.)

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