

## Two-Year College Chemistry Landscape 2014

### Emerging trends and ACS policies

#### Summary results report, Fall 2014

In Spring 2014, ACS conducted the survey, *Two-Year College Chemistry Landscape 2014: Emerging Trends and ACS policies*. About 36% of the 1,100 two-year college campuses contacted participated.

The survey provided insight into such topics as distance education, assessments, experiential opportunities, and the impact of ACS policies. The results will be used to inform the revision of the *ACS Guidelines for Chemistry in Two-Year College Programs*, as well as develop resources for two-year colleges. Complete data tables and survey questionnaire can be found at [www.acs.org/2YColleges](http://www.acs.org/2YColleges).

#### Transferability and distance education

As shown in Figure 1, about 40% of respondents reported that all of their current chemistry sections transferred to a baccalaureate chemistry or chemistry-based technology program; 56% reported that

some (more than 0% and less than 100%) of their courses transferred, and 4% reported that none of their sections transferred. Surprisingly, campuses offering chemistry transfer programs were no more likely to report having transferrable courses than those with a chemistry-based technology program or even no dedicated chemistry program.

Some variability with size was noted. Campuses with fewer chemistry students were more likely to report that all of their courses either did or did not transfer. Campuses with more students were more likely to report that just some of their courses transfer.

As shown in Figure 2, the vast majority of respondents reported that none of their transferable chemistry sections were considered distance education. (The survey did not examine non-transferable distance education courses.) Little variation by type of program was observed. However, large institutions were more likely to report transferable distance education sections.

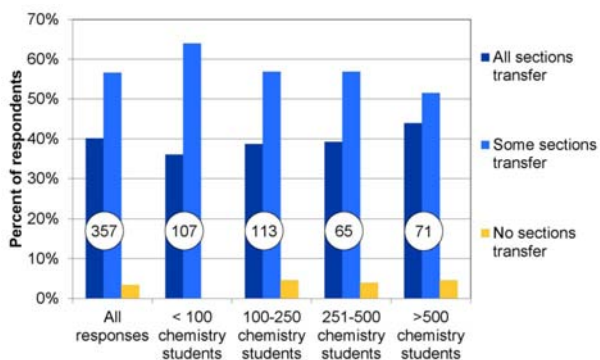


Figure 1. Percent of respondents who reported that all, some, or none of the chemistry courses offered in Spring 2014 were transferable to baccalaureate chemistry or chemistry-based technology programs, by number of chemistry students currently enrolled. The total number of respondents in each category is shown in the white circles.

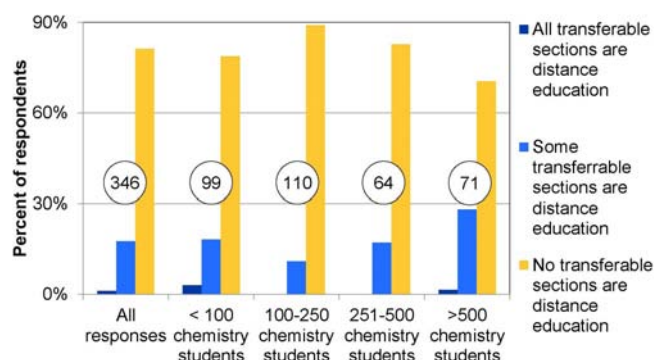


Figure 2. Percent of respondents who reported that all, some, or none of the transferable chemistry courses offered in Spring 2014 were considered distance education courses, by number of chemistry students currently enrolled at the institution. The total number of respondents in each category is shown in the white circles.

## Hands-on laboratories

Almost all of the reported transferable chemistry sections taught on-campus were also reported to have a hands-on laboratory component. Responses varied little with the type of program offered.

However, only 85% of institutions with more than 500 students reported that all on-campus transferrable chemistry sections had hands-on laboratories, and 4% reported that no

sections had hands-on labs. In contrast, over 98% of respondents with 100–250 chemistry students had hands-on lab in all sections, and only 1% of respondents with fewer than 100 chemistry students had no hands-on labs.

In comparison, of the 65 respondents who reported having distance education courses that transferred to a baccalaureate chemistry program, 51 reported that all sections included a hands-on laboratory component; 5 more reported that some sections had a hands-on laboratory component.

ACS policies<sup>1-3</sup> state that hands-on experiences are essential to learning chemistry. While laboratory simulations can be useful supplements to the curriculum, they have not been found to be adequate replacements for hands-on learning.

## Assessment of courses and programs

Figures 3 and 4 report the percentages of respondents who reported using the listed tools to assess the quality of the chemistry courses and overall education programs on their campuses. Other assessment tools included capstone courses, evaluation of student learning outcomes, embedded exam questions, observations of students, full program reviews, student presentations, and surveys of former students.

<sup>1</sup>"Importance of Hands-on Laboratory Activities." ACS public policy statement. (online) 2011. [www.acs.org/content/acs/en/policy/publicpolicies/invest/computersimulations.html](http://www.acs.org/content/acs/en/policy/publicpolicies/invest/computersimulations.html) (accessed July 2014)

<sup>2</sup>American Chemical Society, Society Committee on Education. *ACS Guidelines for Chemistry in Two-Year College Programs*. ACS: Washington, DC, 2009; [www.acs.org/2YGuidelines](http://www.acs.org/2YGuidelines) (accessed September 2014).

<sup>3</sup>American Chemical Society, Committee on Professional Training. *ACS Guidelines and Evaluation Procedures for Bachelor's Degree Programs*. ACS: Washington, DC, 2008; [www.acs.org/cpt](http://www.acs.org/cpt) (accessed September 2014).

Participants reported using tools for multiple purposes, possibly viewing assessment as a continuum, rather than a series of discrete steps. For example, respondents reported using the ACS exams to evaluate both course and program quality.

98%

Respondents that reported some or all of transferable on-campus chemistry courses include hands-on laboratory experiences

86%

Respondents with transferable distance education chemistry courses that reported some or all these courses include hands-on laboratory experiences

Responses were fairly consistent across different types of programs and different program sizes, with two exceptions:

- Almost 50% of respondents from chemistry transfer degree programs used ACS exams, while only 37% of all respondents reported using them.
- Almost 60% of chemistry-based technology programs used departmental or institutional assessments to evaluate program quality, compared to 45% for all respondents.

Some variance with size was noted. Among respondents from institutions with fewer than 100 chemistry students, about 25% used ACS exams and 35% used departmental or institutional program assessments. Among respondents from institutions with more than 500 chemistry students, 47% used ACS exams and 58% used departmental or institutional program assessments.

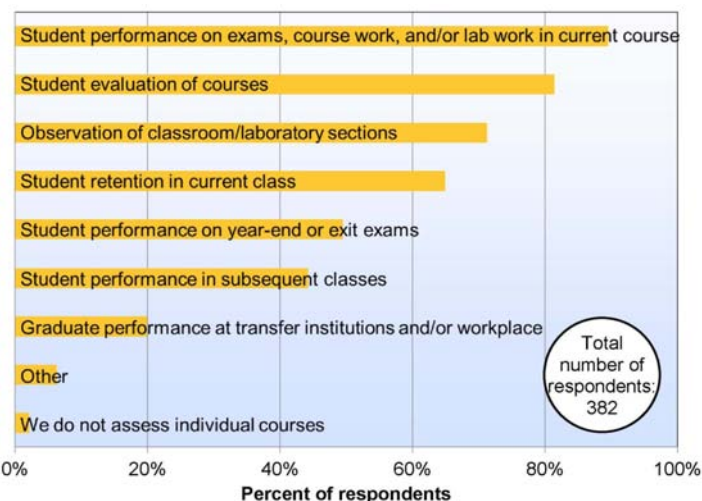


Figure 3. Percent of respondents who use selected tools to assess the quality of chemistry and chemistry-based technology courses on their campus.

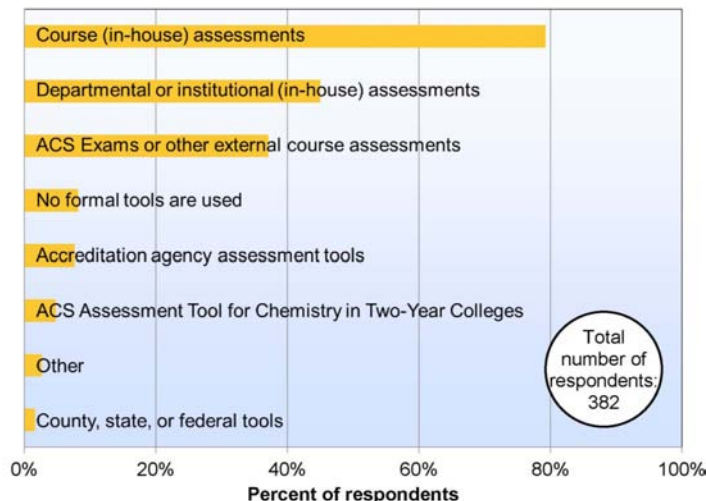


Figure 4. Percent of respondents who use selected tools to assess the overall quality of chemistry and chemistry-based technology education on their campuses.

### Experiential opportunities

Survey respondents were asked about the availability of experiential opportunities for students, such as original research, internships, and long-term projects. As shown in Figure 5, responding institutions with dedicated programs were generally more likely to offer experiential opportunities than those without a dedicated program.

Internships were more prevalent among institutions with dedicated chemistry programs. This is likely due to the inclusion of chemistry-based technology programs in this group; internships are a common component of such programs.

About one quarter of respondents reported having research opportunities for students, regardless of the type of program offered. However, transfer degree programs were more likely to offer long-term projects than other types of programs.

### ACS guidelines and policies

Participants were asked about impact of the ACS *Guidelines for Chemistry in Two-Year College Programs*, which are being revised to keep current with evolving ACS policies and emerging trends in the two-year college chemistry community.

About 57% of respondents reported that the Guidelines had one or more of the impacts listed in Figure 6. In addition to the listed impacts, several participants reported using the Guidelines to improve laboratory safety, acquire safety

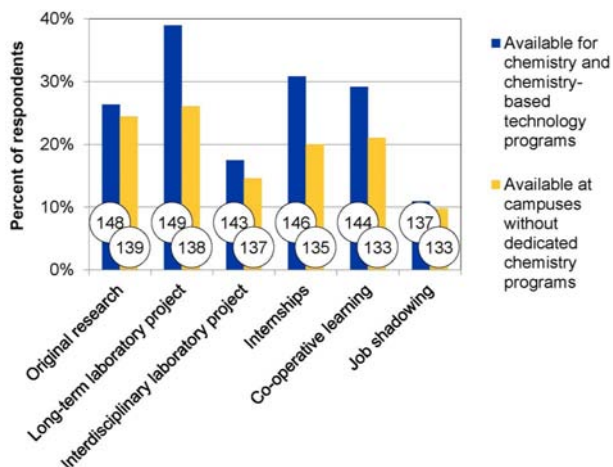


Figure 5. Percent of respondents whose institutions offer the listed experiential opportunities for students, by type of program offered. Numbers of respondents for each category are shown in white circles.

equipment, and support retention of hands-on laboratories over computer simulations. One respondent used the Guidelines to develop a research program.

About one third of respondents reported they had experienced no barriers to implementation. However, lack of time and lack of administrative support challenged 26% and 21% of respondents, respectively. A few respondents reported that faculty had not approached administration regarding implementation. Multiple responses cited a lack of resources, personnel, and funding as barriers. Some others felt the Guidelines did not address relevant topics or were unsure how to use them. A

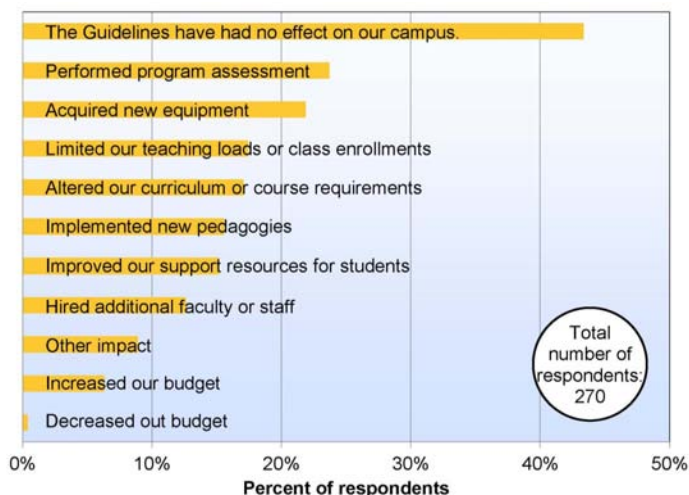


Figure 6. Number of respondents, out of 270, who reported the listed impacts of the Guidelines.



couple of respondents found the Guidelines difficult to use or found disconnects between the Guidelines and institutional goals or state requirements.

Resources that participants selected as being potentially useful in implementing the Guidelines are shown in Figure 7. Other suggestions included promoting the Guidelines directly to administrators and providing funding to support implementation.

About 85% of survey respondents proposed topics that they would like to see addressed or expanded in ACS policies and guidelines. Curriculum development, experiential opportunities, and support for non-chemistry majors were the most commonly selected. Participants were especially interested in developing student learning outcomes, developing curricula for distance education courses, and incorporating student skills (such as teamwork, safety, and use of chemical literature) into the curriculum.

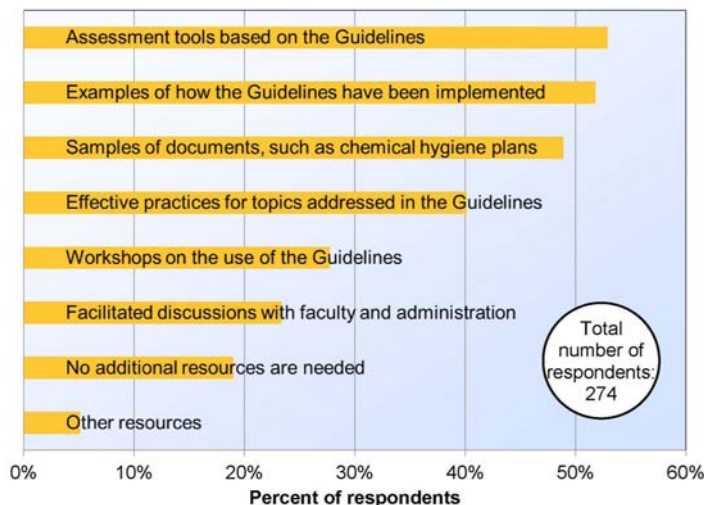
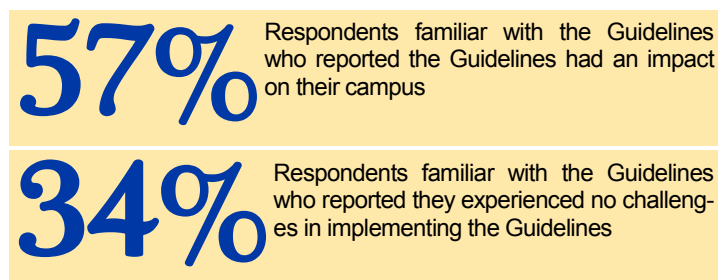
Participants sought also advice on how to provide hands-on laboratory experiences for their online students. Resisting pressure to replace hands-on laboratories with computer simulations was another concern.

A number of participants were interested in guidance on how to provide experiential opportunities, such as research and internships. Several were specifically interested in how to find the right partners or how to provide such opportunities in isolated regions or with limited resources.

### ACS support

Participants had a number of suggestions for how ACS could help them provide high-quality chemistry education. Responses fell into the following groups:

- ACS recognition of excellence in two-year college programs
- Assistance with laboratory infrastructure, equipment, and safety
- Curriculum development and course transfer
- Faculty professional development opportunities



**Figure 7. Percent of respondents who felt that the listed resources would help them implement the Guidelines.**

- Ways to provide better support for students
- Improved communication with funding agencies, four-year institutions, administrations, and employers

The suggestions, comments, and concerns reported in the survey are being evaluated by ACS

staff and volunteers. More information can be found at [www.acs.org/2YColleges](http://www.acs.org/2YColleges).

### Acknowledgements

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