Student skills in the 2015 two-year guidelines

Amina Khalifa El-Ashmawy

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Overview

- What do we mean by student skills?
- Student skills in 2009 guidelines
- Considerations
- Changes implemented in the 2015 guidelines
What do we mean by “student skills”?

• Beyond the chemical concepts and lab training
• Mastery of lifelong skills that result in successful, effective, productive professionals
• Basic workplace competencies aside from technical knowledge
  - “Soft skills”, “employability skills”, “higher order skills”
  - Examples: communication, critical thinking, leadership
Changes were informed by what the two-year college community
Relevance of student skills

- 74% of new chemistry graduates go into industry\(^1\)
- Half of employers have trouble filling positions because recent graduates lack these skills\(^2\)

the 2013 Two-Year College Chemistry Landscape survey asked faculty which students skills they taught in their classes. The responses are shown here. Percentages indicate the percent of respondents who reported they incorporated each skill.

The survey reports can be accessed through www.acs.org/2YColleges. Click on the “Two-year college surveys” link.
Considerations

• Are there student skills missing from the list?
• Is problem solving sufficient? Critical thinking and qualitative analysis? “Understanding the answer” or being able to apply a concept?
• Skills pertinent to chemistry-based technology programs
• The use of smart devices and students’ fairly advanced skills in online searching
• The expected level of resources at two-year colleges
Considerations

- Skills listed in same order as that in the 4-yr guidelines. Is this the order most applicable to two-year colleges? Does the order of the skills listed convey a relative importance?
- Stronger emphasis on teaching methods?
- How are skills assessed? Assessment is a critical piece missing from guidelines.
- Missing: faculty increasingly addressing career preparation skills, such as networking, resume-writing, and interviewing.
Changes were informed by what the two-year college community
Critical thinking recommendation has not changed much. ACS has always highlighted critical thinking as an important student skill; however, it was hidden, because the more assessable term, "problem-solving" was used instead. Obviously, both are skills that serve both chemistry and non-chemistry students.

Some measurable aspects of the skills are shown here.
Regardless of the career trajectory of your students, they will need effective communication skills. Students pursuing advanced academic work will need to be able to write papers for peer-reviewed journals, give presentations at scientific conferences, prepare a thesis, and write grant proposals.

Students who go into industry will need to communicate in a manner that is almost the exact opposite of academic communication. Industry’s focus on the bottom line and the diverse background of students’ future colleagues and bosses require written and oral communication that focuses on results, rather than processes and procedures. Students should be able to prepare written and oral reports and possibly even patents (though patents tend to be written by lawyers).

The importance of informal communication is also gaining prominence. The ability to effectively communicate chemistry concepts to non-chemists contributes significantly to an informed general population and helps combat chemophobia and false
science trends.

Show Competency by:
Being concise; using simple words and short sentences
Following rules of grammar and spelling correctly
Using your own words; or quoting verbatim using quotation marks and acknowledging your source.
Using words correctly; avoiding jargon
Citing sources
Clear and accurate visual representation of data
Team building allows for sharing of ideas, cooperation, reciprocity, & people skills. The revised Guidelines emphasize the importance of both leadership skills and contributing as a non-leader. Both are useful skills in virtually all career paths.
What do we mean by “ethics”?  

- Be able to  
  - Display high personal standards and integrity  
  - Demonstrate an awareness of contemporary issues related to chemistry  
  - Recognize ethical applications of chemistry in industrial, governmental, and/or societal settings  
- The most ethical course of action is often the most difficult.

[Note: this section is unchanged from previous version.] The ACS has adopted a code of ethics (The Chemist’s Code of Conduct) that governs acceptable/unacceptable behaviors. 

The ACS has a Committee in Ethics 
Progress in chemistry relies on complete honesty, openness, trustworthiness, and reproducibility of experimental results.

**Falsification**: Changing Data (LYING)  
But what about data averaging or data smoothing???

**Fabrication** of data: Making up data (CHEATING)  
Inexcusable under any conditions

**Plagiarism**: Using words or ideas without proper attribution (COPYING)  
Other ideas should be paraphrased or summarized. Exact words must be in “quotation marks”, referencing the source
Previously, this section was called “Chemical literature.” However, chemists now collect information from a variety of print and electronic sources, so the Guidelines were updated to reflect that. Students need to be able locate relevant information, differentiate between reputable and disreputable sources, and manage the data they collect, both electronically and offline.

Determine and access needed information.
Retrieve Specific Information.

- Journal articles, reviews, handbooks, etc.
- Use chemical abstracts (when appropriate)

Use both library and electronic sources
Evaluate technical articles when appropriate.
Most of the respondents who selected “other” in the previous slide indicated that they included some type of career-preparation in their courses. Career-building activities are especially important for chemistry-based technology programs, where the students are prepared to seek employment immediately upon graduation. However, virtually all students will seek a job at some point, making these skills valuable for everybody.

Through career centers and/or coursework, students should be taught how to identify and pursue employment, maintain an active network, apply for and obtain a job, and so on.

Learning does not need to be limited to coursework. Experiential opportunities, such as research, internships, and job-shadowing, are great ways to learn critical skills. Activities like student clubs also help.
Changes implemented

• Overall language change to actionable statements
• The section heading changed from “Development of Student Sills” to “Development of Student Skills for Academic and Professional Success”
• Reordering of subsections to reflect relative importance
• Laboratory skills and communication skills subsections formatting change for clarification
• Problem solving skills section updated language
• Changed from “chemical literature skills” to “chemical information acquisition and management skills”
• Added a career preparation subsection
Changes were informed by what the two-year college community
Thank you!

Questions?