Revising the ACS Guidelines for Two-Year and Four-Year Programs: A Community Dialog of Issues and Opportunities

Tuesday, August 1, 2006
19th Biennial Conference on Chemical Education

Co-sponsored by the Committee on Professional Training and the Society Committee on Education

INTRODUCTION

SEGMENT 1

1:15 pm **The ACS *Guidelines for Chemistry Programs in Two-Year Colleges:* A Status Report**
Maureen Scharberg, San Jose State University

1:25 pm **Changes in the Guidelines and Evaluation Procedures for ACS Approval of Four-Year Programs: Curricular Aspects**
William F. Polik, Hope College

1:45 pm **Considering the Curricular Impact of the Guidelines**
Facilitator: William F. Polik

2:15 pm **Break**

SEGMENT 2

2:25 pm **Changes in the Guidelines and Evaluation Procedures for ACS Approval of Four-Year Programs: Student Skills and Abilities**
Joel Shulman, University of Cincinnati

2:40 pm **ACS *Guidelines for Chemistry Programs in Two-Year Colleges*: Opportunities to Focus on Student Skills and Abilities**
Richard Jones, Sinclair Community College

2:55 pm **Fostering and Evaluating the Development of Student Skills and Abilities**
Facilitator: Joel Shulman

3:25 pm **Break**

SEGMENT 3

3:35 pm **Aligning the Guidelines for Two- and Four-Year Programs: Student Mentoring and Advising**
Tamar (Uni) Susskind, Oakland Community College

3:50 pm **Aligning the Guidelines for Two- and Four-Year Programs: Faculty, Facilities and Resources**
William F. Polik, Hope College

4:05 pm **Aligning the Guidelines for Two- and Four-Year Programs: Enhancing Student Success**
Facilitator: Uni Susskind

For an overview of the proposed revisions to the ACS Guidelines for Bachelor's degree programs, visit the CPT website.

Revising the ACS Guidelines for Two-Year and Four-Year Programs: A Community Dialog of Issues and Opportunities

Committee on Professional Training (CPT)

Society Committee on Education (SOCED)

Opportunities

- **Committee on Professional Training**
  - Began major revision of ACS Guidelines for Bachelor's degree programs in 2004
  - Solicited input from community
  - Began soliciting feedback on proposed changes in Spring 2006
- **Society Committee on Education**
  - Formed task force to consider revisions to the *ACS Guidelines for Chemistry Programs in Two-year Colleges* in Spring 2005
  - Conducted an informal study in Fall 2005
  - Currently soliciting input on how best to align guidelines

Symposium Objectives

- **Consider the proposed revisions to the ACS Guidelines for Bachelor's degree programs**
- **Discuss potential impact of revisions on four- and two-year programs**
- **Identify issues and ways in which they might be addressed**

Symposium Overview – Segment 1

- **Presentations**
  - The *ACS Guidelines for Chemistry Programs in Two-Year Colleges*: A status report
  - Changes in the Guidelines and Evaluation Procedures for ACS approval of four-year programs: Curricular Aspects
- **Breakout groups**
  - Considering the curricular impact of the guidelines

Symposium Overview – Segment 2

- **Presentations**
  - Changes in the Guidelines and Evaluation Procedures for ACS approval of four-year programs: Student skills and abilities
  - ACS *Guidelines for Chemistry Programs in Two-Year Colleges*: Opportunities to focus on student skills and abilities
- **Breakout Groups**
  - Fostering and evaluating the development of student skills and abilities

Symposium Overview – Segment 3

- **Presentations**
  - Aligning the guidelines for two- and four-year programs: Student mentoring and advising
  - Aligning the guidelines for two- and four-year programs: Faculty, facilities and resources
- **Breakout Groups**
  - Aligning the guidelines for two- and four-year programs: Enhancing student success

The ACS *Guidelines for Chemistry Programs in Two-Year Colleges*: A Status Report

Maureen Scharberg

San Jose State University

Chair, SOCED Task Force on the ACS **Guidelines for Chemistry Programs in Two-Year Colleges**

History

- **1970 - *Guidelines for Chemistry Programs in Two-Year Colleges***
- **1988 - *Guidelines for Chemistry and Chemical Technology Programs in Two-Year Colleges***
- **1991 - Establishment of the Chemical Technology Program Approval Service (CTPAS)**
- **1997 - *Guidelines for Chemistry Programs in Two-Year Colleges***

www.chemistry.org/education/2year.html

Two-Year Guidelines

I. Chem. Program Mission (S1, S2)

II. Organizational Structure
participatory responsibilities (S3)

III. Financial Commitment to
Chemistry program (S4, S5)

IV. Faculty/Support Staff (S6- S17)
Load, salaries, academic
preparation, secretarial,
technical support, etc.

V. Facilities (S18- S39)
- A. Lecture Rooms & Offices
- B. Instructional Laboratories
- C. Instructional Support Facility
- D. Library/LRC

VI. Curriculum (S40 - S64)
- A. Program Development
- B. Course Scheduling
- C. Spectrum of Intro Courses
- D. Science & Engineering
- E. Prep Chem. Courses
- F. Chem. For Other Programs

VII. Advising, Articulation, Alliances
(S65 - S76)
- A. Advising
- B. Articulation and Alliances

SOCED Task Force

- **At the Spring 2005 meeting, this task force was formed and charged with exploring the revision of the *Guidelines for Chemistry Programs at Two-Year Colleges* and possible related activities.**
- **In the fall of 2005, an informal survey was conducted, to determine the extent of use and the need for revision.**

Conclusions from Survey

- **Many are not aware of the two-year guidelines**
- **Most (~85%) of those who have used the two-year guidelines have found them useful**
  - Internal reviews (~88%)
  - Institutional accreditation (~36%)
  - Collective bargaining (~20%)
  - Facilities (~14%)
- **The two-year guidelines should be revised**

"The administration is very receptive to guidelines from a professional organization for: facilities, load, curriculum, etc. Please update and make more detailed and specific."

How could the *Guidelines* be made more useful?

- **Increase awareness of them and how they can be used**

  "Use the guidelines to change the behavior and mindset of administrators and legislators [and] to assess to a rigorous standard of excellence (ACS national norm)"

- **Establish an approval / recognition program**

  "Tie some incentives, such as accreditation, to them"

- **Encourage interaction with 4-year colleges**

  "Transfer and transitions need to be emphasized"

Next Steps

- **Obtain input from BCCE symposium**
- **Map out plan for revision**
  - Obtain input from faculty at both two- and four-year institutions
  - Explore ways to align with the revised ACS Guidelines for Bachelor's degree programs
  - Prepare preliminary draft
  - Solicit feedback
  - Finalize

Task Force Members

- **Maureen Scharberg (Chair), San Jose State University, CA**
- **John Clevenger, Truckee Meadows Community College, NV**
- **Carlos Gutierrez, California State University-Los Angeles (Committee on Professional Training)**
- **Ed Kremer, Kansas City Kansas Community College (CHED Committee on Chemistry at the Two-Year Colleges)**
- **George Kriz, Western Washington University**
- **Doug Sawyer, Scottsdale Community College, AZ**
- **Uni Susskind, Oakland Community College, MI (College Chemistry Consultants Service)**
- **Linette Watkins, Texas State University (Committee on Minority Affairs)**

Changes in the Guidelines and Evaluation Procedures for ACS Approval of Four-Year Programs: Curricular Aspects

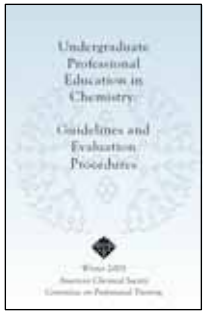
William F. Polik

Hope College

ACS Committee on Professional Training, Chair

ACS Guidelines for Baccalaureate Degrees

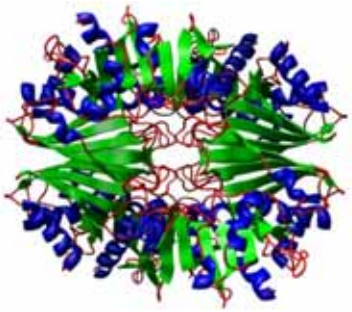
ACS Bylaws: "B. III. 3. h. 1. The SOCIETY shall sponsor an activity for the approval of undergraduate professional programs in chemistry. The Committee on Professional Training...shall act for the Board and Council in the formulation and implementation of the approval program..."



- 635 approved programs (196 research universities, 114 comprehensive universities, 325 baccalaureate colleges)
- Benefits of ACS-approval:
  - **Institution: public recognition of excellent program**
  - **Department: documents capabilities, leverages support**
  - **Faculty: professional development opportunities**
  - **Students: department has excellent capabilities ands resources; recognition of ACS-certified degree**
  - **Industry & Grad Schools: documents that students come from a capable chemistry program**

Rationale for Change

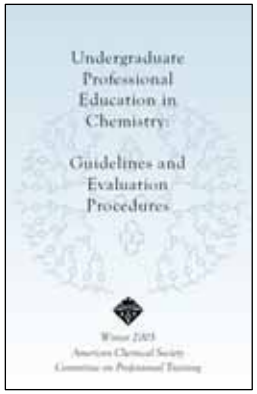
- **Chemistry is changing**
  - Interaction with other disciplines
  - Increasingly complex problems
  - More advanced techniques and instrumentation
  - Working in a global context



- **Education is changing**
  - Pedagogy is changing to reflect new research in how students learn (e.g., inquiry-based and active learning, team experiences)
  - Student population is becoming more diverse by age, gender, ethnicity and educational background

Past ACS Guidelines Changes

- **Regular change is needed to maintain the utility and relevance of guidelines**
- **Examples:**
  - 1999: All certified majors must have significant exposure to biochemistry
  - 2003: Chemistry Education option revised to increase number of high school teachers with chemistry training



Guidelines Revision Process

- **2004-05: Broad call for public comment on ACS Guidelines and possible directions for revision**
- **2005-06: In response to comments from community, CPT drafts and publicizes proposed revisions to the ACS Guidelines**
- **2006-07: Informed by comments on proposed revisions, CPT drafts and publicizes draft of new ACS Guidelines**
- **2007-08: New ACS Guidelines are released**

Goals of Current Revision

- **Simplify the ACS guidelines and procedures for approval of chemistry programs**
- **Provide greater flexibility to approved departments for designing certified degrees**
- **Encourage innovation and improvement in curriculum and pedagogy by approved departments**
- **Define faculty and infrastructure attributes that support excellent undergraduate chemistry programs**

Proposed Curriculum Changes: Foundation and In-Depth Coursework

Core and advanced course requirements will be replaced by...

- **Foundation Coursework:** Beyond introductory chemistry, five one-semester foundation courses will provide breadth of coverage in each of the five major areas of chemistry: analytical, biochemistry, inorganic, organic, and physical

- **In-Depth Coursework:** An additional twelve semester credit hours will further develop or integrate topics introduced in foundation courses
  - In-depth courses have a foundation course pre-requisite, or contain a significant amount of chemistry that is necessary for a degree track
  - Example: the second semester of a two-semester organic or physical chemistry sequence would be an in-depth course

Proposed Curriculum Changes: Laboratory Experience

500 total lab hours, including introductory, organic, inorganic, analytical/instrumentation, and physical, would be replaced by...

- **Foundation course laboratory** would be at least 180 hours, **preferably covering all five foundation areas** of chemistry
- **The total number of hours beyond the introductory chemistry experience would be 400 hours**
- **Undergraduate research** producing a comprehensive written report can be counted toward in-depth laboratory hours

Proposed Curriculum Changes: Degree Tracks

CPT-defined option degrees (chemistry, biochemistry chemical physics, environmental chemistry, materials, polymers, chemistry education) are replaced by...

- **Department-defined degree tracks:** a specialized curriculum meeting foundation, in-depth, and laboratory requirements and focuses on:
  - Chemistry, or
  - A specific chemistry sub-discipline, or
  - A chemistry-related interdisciplinary area
- **Example:** A "Chemistry degree-track" might require the second semester of organic and of physical chemistry, along with two in-depth electives
- **Other examples:** existing option degrees, bioanalytical chemistry, forensic chemistry, green chemistry, ...

Other Proposed Changes

- **Student Skills and Abilities:** Joel Shulman, 2:25pm: "Changes in the Guidelines and Evaluation Procedures for ACS approval of four-year programs: Student skills and abilities"

- **Infrastructure:** William Polik, 3:50pm: "Aligning the guidelines for two- and four-year programs: Faculty, facilities and resources"

- **Self-Assessment:**
  - An excellent program regularly evaluates the effectiveness of its curricular and pedagogical efforts and uses the evaluation results to further improve itself
  - Departments will be asked to summarize their most recent self-evaluation and outline their plans for acting upon the resulting recommendations

Summary

- **Five one-semester foundation courses in five areas of chemistry, and twelve semester credit hours of in-depth coursework**
- **180+ hours of foundation course laboratory work, totaling to 400 hours of post-introductory chemistry laboratory work**
- **Departments have flexibility to create and define degree tracks**
- **Regular self-evaluation of chemistry program for the purpose of continual improvement**

Considering the Curricular Impact of the Guidelines

Facilitator: William F. Polik

Break-out Session

1. **Assemble into groups of 4-6 people and introduce yourselves**
2. **Select a Time-Keeper and a Secretary for your group**

   Time-Keeper: Keep group on-task to produce an answer in 15 minutes
   Secretary: Record group conclusions and report out one key point
3. **Based on the symposium talks and your collective experience, answer the selected question**
4. **For the first 15 minutes, the Secretary will record key points**
5. **During the final 15 minutes, the Secretary will proceed to a microphone and report out ONE key point (that has not already been reported out by another group)**
6. **Turn in the sheet at the end of reporting out**

Break-out Question

A. How would your current chemistry curriculum fit within the proposed new ACS guidelines?

or

B. What curricular innovations could you implement within the proposed new ACS guidelines?

Changes in the Guidelines and Evaluation Procedures for ACS Approval of Four-Year Programs: Student Skills and Abilities

Joel Shulman

University of Cincinnati

ACS Committee on Professional Training

What Do We Mean By "Student Skills and Abilities?"

Can be termed:

- Process skills
- Soft skills
- Employability skills
- Nontechnical professional competencies

Everything beyond the core chemistry knowledge and abilities that students learn in a chemistry curriculum.

Examples of Student Skills and Abilities

- **Laboratory safety**
- **Communication, both oral and written**
- **Team skills**
- **Problem solving/Critical thinking**
- **Knowledge integration**
- **Professional ethics**
- **Social responsibility**

Why Are We Emphasizing These Skills and Abilities?

- **“Motherhood and apple pie”**
- **Industry, where 40% of new B.S. graduates go, has identified “outages,” especially**
  - Communication skills
  - Team skills
- **Success in graduate school depends on problem-solving ability and knowledge integration**

So, What Will Be New About The Proposed *Guidelines?*

- **Current *Guidelines* discuss all of these process skills**

- **What's new is that CPT will now assess:**
  - Whether chemistry programs are developing these skills in their graduates
  - How they are doing this
  - How they assess success in doing it

What Do Students Need To Demonstrate?

LABORATORY SAFETY

- **"Students should develop a high degree of safety awareness, beginning early in the core courses…"**
  - Are aware of good laboratory safety practices
  - Understand responsible disposal techniques
  - Comply with OSHA regulations
  - Understand and use MSDS
  - Recognize and minimize potential chemical and physical hazards in the laboratory

What Do Students Need To Demonstrate?

COMMUNICATION

- **"Effective written and oral communication skills… are no less essential to the well-trained scientist than to the humanist."**
  - Present information in a clear and organized manner
  - Use appropriate technology (*e.g.*, poster preparation, PowerPoint, word processing, chemical drawing programs)
  - Write well-organized and concise reports in a scientifically appropriate style, with correct spelling and grammar
  - Respond effectively to questions in an oral presentation

What Do Students Need To Demonstrate?

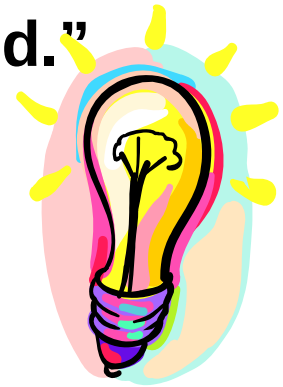
TEAM SKILLS

- **"The ability to work in multidisciplinary teams is essential for a well-educated scientist today."**
  - Work effectively in a group to solve scientific problems
  - Are able to lead portions of an activity and be effective followers
  - Interact effectively with a diverse group of peers

What Do Students Need To Demonstrate?

PROBLEM SOLVING/CRITICAL THINKING

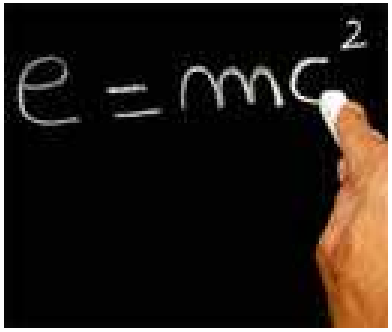
- **"A strength of chemistry as general education as well as professional training is that problem-solving skills are emphasized and developed."**
  - Analyze problems clearly
  - Develop a testable hypothesis
  - Design and execute experiments
  - Sort through data and draw appropriate conclusions
  - Demonstrate the ability to critically evaluate literature articles
  - Understand the fundamental uncertainties in experimental measurements



What Do Students Need To Demonstrate?

KNOWLEDGE INTEGRATION

- **"Chemistry faculty [can] improve student learning by…having students build from their past experiences."**
- **"…encourage integrating the subareas of chemistry…"**
  - Draw on understanding of all branches of chemistry to reach conclusions
  - Apply mathematical concepts as appropriate
  - Use appropriate laboratory skills and instrumentation to solve problems
  - Use scientific literature effectively



What Do Students Need To Demonstrate?

PROFESSIONAL ETHICS & SOCIAL RESPONSIBILITY

- **"Chemistry is a discipline in which high standards of conduct must be exemplified…in ways that students cannot fail to observe and adopt."**
  - Display high personal standards and integrity
  - Demonstrate an awareness of contemporary issues related to chemistry
  - Recognize applications of chemistry in industrial, governmental, and/or societal settings

How Can Chemistry Programs Impart and Assess These Skills and Abilities?

- **Separate "mini" courses**
  - Safety
  - Writing
  - Ethics
  - Capstone seminars
- **Incorporation into existing course(s)**
  - University of Cincinnati experience
    - Senior lab or biochem lab
    - Poster session based on project, with literature component

How Can Chemistry Programs Impart and Assess These Skills and Abilities?

- **Undergraduate research**
  - Written and oral reports
- **Exams go beyond knowledge to integrate and utilize information**
- **Conscious design of team projects**

How Will CPT Assess Evaluate Programmatic Successes?

- **Still in the planning stages**
  - Narrative to include how process skills are incorporated into curriculum
    - Examples from multiple courses demonstrating how process skills are taught and assessed
    - Examples of innovative pedagogies which help develop process skills
  - Directed questions relating to process skills
  - Evaluation of course examinations
  - Evaluation of comprehensive written reports from undergraduate research projects

ACS *Guidelines for Chemistry Programs in Two-Year Colleges*: Opportunities to Focus on Student Skills and Abilities

Richard Jones

Sinclair Community College

Student Skills and Abilities

- **Essential to student success**
- **Need to be considered when developing articulation agreements and transfer programs**
- **Must be discussed by faculty at both transferring and receiving institutions**
- **Can be aligned by focusing on learning outcomes**

Articulation/Transfer Frameworks

- **Critical to the success of higher education**
- **Facilitate access to higher education**
- **Not just developed by administrators and registrars**
- **Must respond to the "swirling" of students among institutions at both the institutional and departmental level***

***See "Paving the Pathways for Tomorrow's Chemistry Students" in the Spring 2006 CPT Newsletter (www.chemistry.org/education/cpt)**

Articulation/Transfer Frameworks

- **Focus on the movement of students and their courses from one institution to another**
- **Not a point to point linear sequencing**
- **Includes admission, exclusion, readmission, advising, counseling, mentoring, planning, curriculum, course and credit evaluation**

The American Community College, Cohen and Brawer, 1996

Articulation/Transfer Models

1. Legislated articulation policies: (30 states)
2. Institution-to-Institution Agreements: (40 states)
3. Transfer Data Reporting: (43 states)
4. Statewide Articulation Guides: (26 states)
5. Incentives/Rewards: e.g. financial aid, guaranteed transfer of credit, priority admission (18 states)
6. Statewide Gen. Ed. Common Core: (30 states)
7. Common Course Numbering: (14 states)

Education Commission of the States (2001) and American Assoc of State Colleges & Universities (Vol 2; No. 7, 2005)

Creating Seamless Transfer in Ohio

- **Legislatively driven**
- **No common numbering system**
- **Transfer Modules (TMs)**
  - Started in 1990
  - Focus on general education
  - Equivalent of one year of course work?
- **Transfer Assurance Guidelines (TAGs)**
  - Started in 2004
  - Focus on the first two years of coursework for a major

Framework for Ohio TMs and TAGs

- **Ohio Articulation Numbers**
  - Virtual common numbering system
  - Will be part of Course Applicability System (CAS)
  - Based on learning outcomes (70% rule)

Learning Outcomes

A general statement defining what a student should know or be able to do as a result of some learning activity

Example:

Explain the theoretical and experimental basis of the periodic table and the correlation between the elements' position and their properties

Competencies

Competencies are specific activities used to measure a student's mastery of a learning outcome

Example:

Explain the decrease in atomic radii as you go across the main group second period

Assessment

Assessment at Sinclair is the shared process of purposeful, systematic measurement used to document, reflect upon, and improve student learning.

Assessment Method: Locally developed exams

Performance Criteria: 70% success or better

Improving Student Study Skills

- **Assessment**

  Faculty member gives test back to student with advice on how to study better.

- **Evaluation**

  Faculty member assigns a numerical grade to a test.

Improving Work Ethics

- **Assessment**

  Class attendance record indicates a student has missed class multiple times. Faculty member advises student.

- **Evaluation**

  Class attendance is used as part of the final grade.

Improving Communication Skills

- **Assessment**

  A student delivers an oral presentation. Faculty member critiques delivery and content so student can improve.

- **Evaluation**

  A student delivers an oral presentation. Faculty member assigns grade for delivery and content.

Improving Communication Skills

- **Assessment**

  Faculty member analyzes results of oral communication checklists completed for all students to see which area(s) need improved teaching and learning.

- **Evaluation**

  Faculty member uses results of oral communication checklists to assign grades.

Improving Critical Thinking and Communication Skills

- **Assessment**

  Students read each others lab reports and give feedback to the author.

- **Evaluation**

  Faculty member reads student's feedback on another student's lab report and assigns a grade.

Improving Laboratory and Safety Skills

- **Assessment**

  Students are videotaped titrating a base with an acid. Faculty member reviews tape with each student**.**

- **Evaluation**

  Students are videotaped titrating a base with an acid. Grades are assigned.

Improving Courses

- **Assessment**

  A faculty team learns that the periodic table questions score low and change curriculum.

- **Evaluation**

  Pop quizzes given in class to see if section on periodic table was read and a grade is assigned.

Lessons Learned

- **Focus in articulation is shifting from general education to disciplinary courses**
- **Each state has a framework for articulation that involves both two- and four-year institutions**
- **Faculty need to be involved in discussions about articulation/transfer**
- **Use of learning outcomes helps focus on student skills and abilities**

Ohio Board of Regents
www.regents.state.oh.us

Sinclair Community College
www.Sinclair.edu

Fostering and Evaluating the Development of Student Skills and Abilities

Facilitator: Joel Shulman

Break-out Session

1. **Assemble into groups of 4-6 people and introduce yourselves**
2. **Select a Time-Keeper and a Secretary for your group**

   Time-Keeper: Keep group on-task to produce an answer in 15 minutes

   Secretary: Record group conclusions and report out one key point
3. **Based on the symposium talks and your collective experience, answer the selected question**
4. **For the first 15 minutes, the Secretary will record key points**
5. **During the final 15 minutes, the Secretary will proceed to a microphone and report out ONE key point (that has not already been reported out by another group)**
6. **Turn in the sheet at the end of reporting out**

Break-out Question

Part 1 - In what ways can the development of student skills and abilities be demonstrated and assessed?

Part 2 - What resources will be needed for such assessment?

Aligning the Guidelines for Two- and Four-Year Chemistry Programs: Student Mentoring & Advising

Tamar (Uni) Susskind

Oakland Community College

SOCED Recommendation

Representatives from the SOCED Task Force on the ACS *Guidelines for Chemistry Programs in Two-Year Colleges* and the Committee on Professional Training explore ways in which four-year chemistry programs can be encouraged to interface with the institutions from which students transfer.

Strategies

- **Align revisions to the ACS *Guidelines for Chemistry Programs in Two-Year Colleges* with the revisions being made to the ACS Guidelines for Bachelor's degree programs**
- **Involve representatives from four-year institutions in the revisions to the ACS *Guidelines for Chemistry Programs in Two-Year Colleges***

Need for Alignment

Role of two-year colleges in higher education:

- **Over 50% of all undergraduates are enrolled in a two-year college**
- **Many students are low-income, high-risk, and minorities with a diverse set of needs.**
- **Approximately 1/4 of students seeking a bachelor's degree are transfer students**

NCES, Digest of Education Statistics, 2002, 2006;
CNN Student News, 2003

Need for Alignment

Role of two-year colleges in science education:

- **Percentage of 1999 and 2000 graduates (bachelor's and master's) who attended community college**
  - 44% all science and engineering
  - 37% physical and related sciences
  - 40% engineering
  - 42% computer and math sciences
  - 45% social and related sciences
  - 46% life and related sciences

John Tsapogas, "The Role of Community Colleges in the Education of Recent Science and Engineering Graduates", NSF InfoBrief, April 2004.

Need for Four-Year Involvement

Transfers go in many directions:

- **Regular Transfer: 2-Yr. $\Rightarrow$ 4-Yr.**
- **Reverse Transfer: 4-Yr. $\Rightarrow$ 2-Yr.**
- **Lateral: 2-Yr $\Rightarrow$ 2-Yr &/or 4-Yr. $\Rightarrow$ 4Yr.**
- **Swirling Students: School A $\Leftrightarrow$ School B**
  Co-enrolled at more than one institution
- **Gypsy Transfer: student who transfers multiple times between institutions**

Need for Four-Year Involvement

For student transfer to be successful, all parties need an understanding of the:

- **Different student demographics**
- **Different missions and capacity issues**
- **Different general education requirements**
- **Different curricula**
- **Different cultural attitudes and perceptions**

Alignment of the Guidelines

Considerations for revision:

- **Curricular aspects**
- **Faculty, facilities, and resources**
- **Student mentoring and advising**

Partnerships and alliances play a critical role in all of these areas

Focus on AAA: Advising, Articulation, and Alliances*

A successful articulation program is complex:

- **entailing many components, players & activities**
- **requiring ongoing communication, collaboration and coordination among the various players**

*** Section VII (Standards 65-76) of the *Guidelines for Chemistry Programs in Two-Year Colleges***

Facilitating Student Transfer

Successful partnerships involve:

- **Relevant and current information for**
  - Students
  - Counselors and advisors
  - Faculty
- **Regular communication about**
  - Curricular objectives
  - Prerequisites
  - Course requirements
  - Student needs

Facilitating Student Transfer: Students' Responsibilities

Working with a counselor/academic advisor:

- **Identify transfer as a potential goal**
- **Seek appropriate chemistry courses for transfer.**
- **Identify chemistry as a potential major**
- **Identify potential receiving institution(s)**

Facilitating Student Transfer: Community Colleges' Responsibilities

To provide:

- **Student support programs**
  - counseling, guidance, peer mentoring, orientation, academic development, and financial aid
- **Career and personal development opportunities**
  - career exploration, college fairs, multicultural awareness, workshops
- **Sufficient courses**
  - allow students to complete transfer in a timely fashion
  - include remedial and honors programs
- **Consistent up-to-date information to advisors and students**

Facilitating Student Transfer: Receiving Institutions' Responsibilities

To provide:

- **Student outreach**
  - meetings/programs, peer assistance
- **Student orientation**
  - physical, social, and academic environment
- **Information about science/chemistry major preparation**
  - consistent and up-to-date
- **Training for all involved in articulation**
- **Provide timely transfer credit evaluations**
  - ensure a clear path to science/chemistry major and the Baccalaureate degree

Facilitating Student Transfer: Shared Responsibilities

Transferring and receiving institutions should:

- **Hold joint faculty meetings**
  - align lower division chemistry courses
  - set goals, objectives, timelines to facilitate transfer
- **Disseminate consistent up-to-date information**
  - to all students
  - to the service and support staff at both institutions
- **Form collaborations/partnerships**
  - e.g., research, dual enrollment, share facilities, Student Affiliates, peer-mentoring systems, learning communities, grant-writing

Alignment of the Guidelines

Both sets of guidelines could:

- **Refer to the need to facilitate student transfer**
- **Acknowledge variation in student transfer programs and policies**
- **Promote formation of partnerships**
- **Incorporate key responsibilities for facilitating student transfer**

Aligning the Guidelines for two- and four-year programs: Faculty, facilities and resources

William F. Polik

Hope College

ACS Committee on Professional Training, Chair

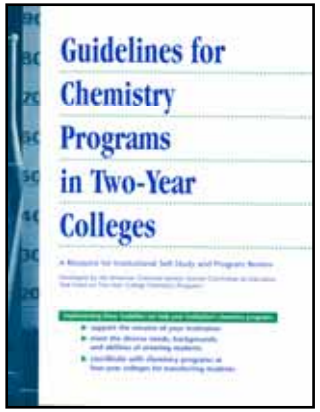
2-Year vs. 4-Year ACS Guidelines

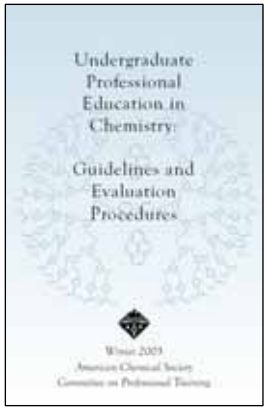
2-Year Guidelines

- First developed in 1970
- No approval program, i.e., advisory in nature
- Currently considering revisions

4-Year Guidelines

- First developed in 1939 by CPT
- 635 currently approved 4-year programs
- In the midst of a major revision





Summary of Proposed Curricular Changes in 4-Year Guidelines

- Five one-semester **foundation courses** in five areas of chemistry, and twelve semester credit hours of **in-depth coursework**
- 180+ hours of foundation course laboratory work, totaling to **400 hours of post-introductory chemistry laboratory work**
- **Departments create and define degree tracks**
- **Regular self-evaluation of chemistry program for the purpose of continual improvement**

Summary of Proposed Student Skills and Abilities Changes in 4-Year Guidelines

- **Skills and abilities that a graduate should gain are explicitly listed:**
  - safety
  - communication
  - teamwork
  - problem solving
  - knowledge integration
  - ethics
- **Chemistry departments will list how these skills and abilities are being developed among their students**
- **Chemistry departments should develop means for evaluating the success of their students in gaining these skills and abilities**

Proposed Faculty Changes in 4-Year Guidelines: Minimum Faculty Size

The requirement of four full-time faculty positions would become…

- A minimum of **five full-time faculty** are required for an approved program
  - Currently approved four-member departments would remain approvable until their size increases as their institution permits
- The rationale for this change is to
  - Reflect the breadth of modern chemistry
  - Observe appropriate teaching contact hour limits
  - Offer professional development opportunities
  - Prevent excessive use of adjunct or part-time faculty

But as before…

- **Teaching contact hours may not exceed 15 contact hours per week** per faculty member, and significantly lower loads are recommended especially if directing undergraduate research is an expectation

Proposed Facilities and Resources Changes in 4-Year Guidelines: Little to None

Infrastructure requirements remain relatively unchanged...

- **Instrumentation.** High quality, recent, working instrumentation must be available for student use, including an NMR spectrometer

- **Computational Capabilities and Software.** Appropriate facilities and software for modeling and predicting chemical properties and phenomena

- **Chemical Information.** Chemical literature and chemical abstract searching must be available for student and faculty use; online access is becoming increasingly prevalent

Alignment of 2- and 4-Year Guidelines on Curriculum

Proposed 4-Year Guidelines	Current 2-Year Guidelines
• Foundation course and lab work	• Must offer courses that are consistent with ACS-certified coursework (VII.B.)
• Department-defined degree tracks	• Institution should develop chemistry program in accordance with mission statement and purposes (S41)
• Regular self-evaluation for purpose of continual improvement	• Innovation and experimentation coupled with a strong assessment component preserve vitality of chemistry education (S41)

Alignment of 2- and 4-Year Guidelines on Skills and Abilities

Proposed 4-Year Guidelines	Current 2-Year Guidelines
• Explicit list of skills and abilities	• Not explicitly listed
• Departments describe how these skills and abilities are developed in students	• Not explicitly requested
• Departments evaluate success of students in acquiring skills and abilities	• Innovation and experimentation coupled with a strong assessment component preserve vitality of chemistry education (S41)

Alignment of 2- and 4-Year Guidelines on Faculty

Proposed/Current 4-Year Guidelines	Current 2-Year Guidelines
• Minimum of 5 full-time faculty	• Faculty size adequate to teach full range of chemistry courses (S9) >75% of credit hours taught by full-time faculty (S10)
• 15 contact hours per week maximum; significantly lower recommended	• Normal teaching load is 15 contact hours per week or less (S14)
• Regular opportunities for faculty development and renewal must be provided	• Budgetary allocations for professional development and sabbatical leave (S4)

Alignment of 2- and 4-Year Guidelines on Facilities and Resources

Current 4-Year Guidelines	Current 2-Year Guidelines
• Major instrumentation, including NMR	• Spectrophotometers appropriate to the curriculum (S56)
• Computational chemistry capabilities	• Not mentioned
• 14+ chemistry journals, access to Chem Abstracts searching	• Library holding commensurate with size and nature of chemistry offerings and research activities (S38)

Alignment of 2- and 4-Year Guidelines on Articulation

Current 4-Year Guidelines

- **Not addressed**

Current 2-Year Guidelines

- **All chemistry offerings are articulated with all potential transfer institutions (VII.B.)**
- **College provides mechanism for communicating articulation agreements to students and faculty (S70)**

Aligning the Guidelines for Two- and Four-Year Programs: Enhancing Student Success

Facilitator: Uni Susskind

Break-out Session

1. **Assemble into groups of 4-6 people and introduce yourselves**
2. **Select a Time-Keeper and a Secretary for your group**

   Time-Keeper: Keep group on-task to produce an answer in 15 minutes

   Secretary: Record group conclusions and report out one key point
3. **Based on the symposium talks and your collective experience, answer the selected question**
4. **For the first 15 minutes, the Secretary will record key points**
5. **During the final 15 minutes, the Secretary will proceed to a microphone and report out ONE key point (that has not already been reported out by another group)**
6. **Turn in the sheet at the end of reporting out**

Break-out Question

In what ways can the guidelines encourage institutions to address concerns about student transfer and enhance student success?

Thank you for your input!

Additional thoughts, questions and suggestions can be sent to:

cpt@acs.org

or

education@acs.org