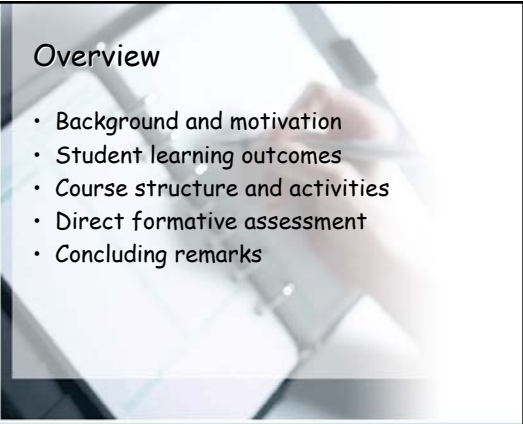




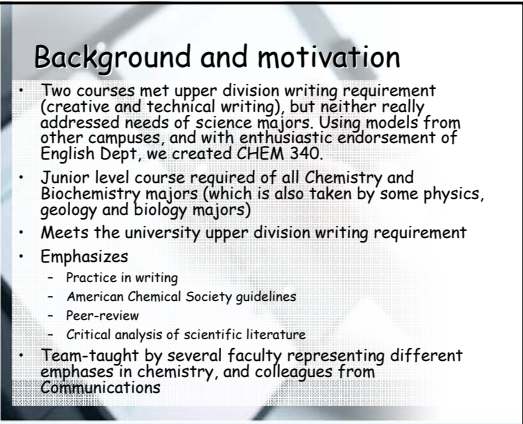
Writing for the Chemical Sciences

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Overview

- Background and motivation
- Student learning outcomes
- Course structure and activities
- Direct formative assessment
- Concluding remarks



Background and motivation

- Two courses met upper division writing requirement (creative and technical writing), but neither really addressed needs of science majors. Using models from other campuses, and with enthusiastic endorsement of English Dept, we created CHEM 340.
- Junior level course required of all Chemistry and Biochemistry majors (which is also taken by some physics, geology and biology majors)
- Meets the university upper division writing requirement
- Emphasizes
 - Practice in writing
 - American Chemical Society guidelines
 - Peer-review
 - Critical analysis of scientific literature
- Team-taught by several faculty representing different emphases in chemistry, and colleagues from Communications

Student learning outcomes

- To practice writing scientific communication in its accepted forms and the critical thinking skills that underlie good scientific writing.
- To develop skills necessary to present clearly written scientific communications, such as abstracts, journal manuscripts, grant proposals, records of invention, electronic publications, posters and seminar presentations in English, which is the universally accepted language of science.
- To organize chemical and biochemical data and communicate them clearly and effectively and according to the fields of chemistry and biochemistry, as outlined by the American Chemical Society.
- To learn to recognize, formulate, critically evaluate and convey with insight chemical and biochemical research results and hypotheses.
- To become competent in critical assessment of one's own scientific writing and the scientific writing of others using calibrated peer-review.

Course structure and activities

- **Reading**
 - Reviewing the appropriate sections of the textbook(s) as the topics are discussed in class
 - Reading, reviewing and critiquing assigned scientific literature and peer writing
- **Assignments**
 - Five major writing assignments given per semester
 - Article for the popular media
 - Grant proposal
 - Journal article
 - Review article or technical report
 - Poster and short seminar presentation
 - One to two minor writing assignments given weekly as homework
 - Sections of laboratory report or a poster
 - Meeting abstract
 - Record of invention
 - Written component of an oral presentation
 - Discussion of ethics in science
 - Audience analysis
 - At least one in-class assignment during each class period
- **Course Mechanics**
 - Written drafts are peer-reviewed by students, discussed by students and faculty, revised by students, and submitted to faculty for assessment.
 - Each student peer-reviews three grant proposals
 - Minor assignments develop skills and processes for use in major assignments.
 - MS Word® reviewing tools facilitate writing practice, peer review and assessment of learning objectives.
- **Preparing written materials**
 - MS Word® is used to prepare all written assignments (sufficient basic experience with MS Word® is an admission requirement to CSUF)
 - EndNote® is utilized to create bibliographic libraries, track references and figures within documents, produce citation lists, figure captions and tables of contents.
 - MS PowerPoint® is used to prepare seminar and poster materials.

Direct formative assessment

- All assignments are submitted and reviewed electronically
 - Rapid and frequent feedback
 - Frequent opportunities to practice
- Electronic portfolio of each student's writing
 - Monitor development of writing skills
 - Analyze writing for usage, style, structure
- Rubrics
- Analytical tracking sheets
- Peer-review evaluation forms

Concluding remarks

- Developed "Writing for the Chemical Sciences", junior level course that satisfies the upper division writing requirement and meets the needs of our chemistry and biochemistry majors
- Course has been offered seven semesters, allowing us to examine impact on student writing post-340.
 - Capstone senior research courses require submission of reports in journal style, and poster presentation, where we have seen significant improvement in writing and communication by students
 - Quality of laboratory reports in senior laboratories (biochemistry and physical chemistry) has also improved
 - Use of electronic productivity tools allows students to be more efficient and effective in communication
- Graduate (MS students) showing deficiencies in analytical writing, take this course

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