

CHEM 4060
Advanced Biochemistry

Motivation

- Biochemistry majors were not being exposed to some topics relevant for the last 10-20 years of scientific advances
 - Details of transcription/translation
 - Advanced topics in RNA structure/function
 - Organelle biochemistry
- CHEM 4160 (Enzymology) was covering topics too advanced/less relevant for undergraduate majors
- Senior comprehensive exam (Major Field Test) does not assess biochemistry knowledge

Rationale for CHEM 4060

Advanced Biochemistry

- Replace CHEM 4160 as requirement, while keeping relevant topics from the course
- Introduce students to the topics not being covered in other chemistry courses
- Provide students with greater exposure to recent scientific literature
- Provide a mechanism for assessing biochemistry majors

Course Structure

- Both instructors present for all class meetings; each was responsible for a block of lectures
- Minimal traditional lecture, with some brief presentations by students
- Required in-class participation in discussions
- Daily discussion questions, one selected as written assignment (1-2 paragraphs) due the following class
- Weekly reading quizzes (online)
- Final paper on any related topic
- 3 in-class exams
- Final exam as ACS Biochemistry standardized exam (not for grade)

Spring 2016 (Implementation)

- 5 students enrolled, 4 completed and passed
- Each student made 3 in-class presentations
- Last third of class was based mostly on primary scientific literature

Changes in Spring 2017

- 12 students enrolled, 11 completed and passed
- Each student made 2 in-class presentations

Assessment

- University course evaluations
 - Clarity of course objectives, agreement between material taught and objectives, and opportunity for learning were all scored well above CAS mean
- Student comments (major strengths):
 - Develop critical thinking skills and accept and think about others ideas
 - Topics discussed were interesting
 - Flipped classroom provides more learning
 - [Instructor] teaches through questioning and analyzing, not rote learning
- Some students reported struggling with identifying “correct” answers from discussions

Assessment

- Custom Blackboard survey
 - Self-reported gains of “good” or “great” on most topics
 - Complaints about number of assignments, total work
- Class averaged 70-80% on all types of graded work both semesters, with few students averaging below 60% or above 90% on any type of assignment

Assessment

- ACS Biochemistry exam

Semester	Score range (out of 60)	Mean
S2016	19-37	27.5
S2017	13-40	23.8

Course Material	Range (mean) [taken]	Range (mean) [not taken]
CHEM 3130 (27)	7-24 (11.7)	N/A
CHEM 3130L (6)	1-4 (2.5)	0-5 (2.5)
CHEM 4140 (27)	7-19 (12.0)	4-13 (7.7)
CHEM 4060 (5)	1-4 (2.5)	N/A
CHEM 4150L (8)	2-6 (4.3)	3-7 (4.4)
Not covered (2)	N/A	0-1 (0.6)

- Some questions covered in multiple classes
- Question breakdown: 17% “trivia”, 17% methods, 40% important facts, 27% important concepts

Future Plans

- Course will be offered again in Spring 2018
 - Expected to be offered every spring
 - Enrollment increased from 2016 to 2017; course was an upper level elective for majority of students enrolled in 2017, and free elective for two biology majors
- Need to gather more data but the ACS Biochemistry exam does not appear to be useful as senior comprehensive
- Plan to make only minor revisions and streamlining for the next iteration
 - As instructors rotate through teaching the course, particular topics can be added/removed