Reading and Understanding the Scientific Literature: ACE 10 Course: Biochemistry 435 Advanced Topics

Ed Harris
University of Nebraska - Lincoln, eharris5@unl.edu

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Reading and Understanding the Scientific Literature

ACE 10 Course: Biochemistry 435 Advanced Topics
Edward N. Harris

Learning Objectives

Writing: Students will generally be writing in a scientific format for the first time. This may be very different from prior writing in the university. This will come from discussions in the classroom sessions and from feedback on the course paper chapters that are submitted during the progress of the course.

Oral Communication: This is reinforced by the presentation of relevant papers from the scientific literature during most of the class periods. Students need to learn to master the content of such papers, prioritize the important elements, and present them in a coherent fashion. The student effort receives intrinsic feedback during the process by questions and comments from the instructor and from the other students.

Critical Thinking: Critical thinking can only be done once a student has mastered a significant amount of foundational literature. Students at the start of the topic will have little ability to carry out critical thinking about the course theme. As students read more of the primary literature and seek out other references to flesh out certain aspects and to reconcile contradictory reports, they will be encouraged to reflect on the methodology of the conclusions.

Ethics: Each section of the class involves one class session related to an ethical issue. This usually involves a case study that is read prior to the class and a group discussion. In some cases, it is productive to have students attempt to present differing viewpoints, but in for other topics, students seem able to grasp the diverse social impacts.

How are the learning objectives embedded in the course? This course focuses on the broad discipline of biological chemistry that runs across the various life science disciplines. Students receive a few lectures of introduction, and then start reading journal articles selected by the instructor. Then, most of the remainder of the semester is comprised of students searching the primary literature and collecting relevant articles with information to build a coherent paper that progresses the direction of future research in one aspect of the general topic. Students learn to make presentations of their selected papers and reflect on how the data reported represents an incremental increase in knowledge and understanding. The individual sections of this course are taught by different instructors, thus the topics do vary.

Writing sample: A key aspect for critical thinking is for students to clearly write about the subject material. In this course, students must read numerous research articles in their specific chosen subject and synthesize a paper reviewing current status of the research and what needs to be done in order to progress the field. This involves evaluating the research methods, outcomes, and impact of the research in that particular field.

To assess the student’s writing, the specific sections of the review paper are sent to the instructor in electronic format over the course of the semester. The instructor then goes through the written work and uses the “Track Changes” feature in order to edit and make comments. The students revise their work and should learn their own weaknesses in writing/thinking about their subject. Below is an example of the introduction part of the paper where the students are given feedback and the student sent it in and received back from the instructor. By the end of the semester, the entire paper is evaluated and graded with the rubric (see top middle section). The rubric was adapted from http://www.ace.niu.edu/ntc/2007/TUCRudaw.pdf.

Each instructor for each section provides the college with the syllabus and samples of student work. Samples of the written review papers are uploaded in Blackboard and the current standard is to provide two samples of very good papers, two samples of average papers, and two samples of poorly written/poorly thought out papers.

Findings

Broad range of topics for each section of BIOC435

The college (CASNR) keeps all of the current archived data. The department currently has not used any quantitative data from the ACE 10 courses to formulate correction, revisions, or additions to other biochemistry courses. The department is currently building an assessment tool to measure student knowledge of biochemistry from freshman to senior years. All the instructors have noted that the writing proficiency varies widely among the student body from barely proficient to very good.

Improving ACE 10 Learning

The Dept. of Biochemistry is always seeking to maintain a high quality of instruction with their undergraduates. The BIOC435 course was originally intended to expose students to the primary scientific peer-reviewed research articles and foster literacy across a broad range of topics. The observation from all of the instructors is that despite the core-curriculum from the prior 3 years of instruction, including ACE 1-9, student preparation for this course is quite variable. Several improvements have been made including:

- Teaching students how to read a research article: This means breaking the article apart with the students and putting the parts back together one at a time.
- Instruction of new material begins with reviewing some of the material that the students learned in BIOC431/432 for familiarity.
- The use of new teaching methods in the classroom such as Just-In-Time teaching (JITT) or peer instruction (PI)
- Development of BIOC205, a new pilot course for biochemistry majors that utilizes the scientific literature to demonstrate how basic research enhances human therapeutics.