Introduction and Course Description

CSM 10: The Scientific Method

Course No: CSM 10 (3 units)  Time: 8:00-9:15 TTh
Semester: Fall 2014  Location: FFS 208B

Instructor  Office  Phone  eMail  Office Hours
John Constable  S-316B  278-2410  jconstable@csufresno.edu  W 10-12, F 10-11, as arranged
Ulrike Müller  S-320B  278-2532  umuller@csufresno.edu  T 11-12, W 3-5, as arranged
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Catalog Description: Practice in the application of the scientific method to locally relevant problems and challenges. The evaluation of inductive and deductive arguments coupled with the evaluation of experimental data to develop and test scientific hypotheses.

Advising Notes: This course is only open to students enrolled in the STEM-First Year Experience Learning Community. It must be taken with CSM 15S and the specified sections of COMM 8 and ENGL 5A.

Required Textbooks and Materials

- Access to Blackboard & Email – We will post reference documents to Blackboard and send you notices through your campus email. You will need access to both of these sources and should check your email every day.

Course Goals – Primary Learning Outcomes

In this course you will develop essential critical thinking skills common to the use of the scientific method in many scientific disciplines. After completing this course you will be able to better understand where the concepts and theories presented in other science courses came
from and how they are used in addressing real-world problems. Students completing this course will:

1. Use inductive reasoning to form sound scientific hypotheses that show conceptual understanding based on experimental data.
2. Use deductive reasoning to predict expected experimental observations based on a scientific hypothesis.
3. Evaluate observations and experimental data to determine if a hypothesis is supported or refuted by an experiment.
4. Critically evaluate the validity of inductive and deductive reasoning and data interpretation appearing in the scientific literature.
5. Use cause-effect chains to support a reasoned explanation of experimental observations.

**GE Area A3 Learning Outcomes**

1. Recognize, analyze, evaluate and construct arguments in ordinary language.
2. Distinguish between inductive and deductive reasoning.
3. Identify common fallacies of reasoning.
4. Analyze and evaluate the various types of evidence for various types of claims.

**Course Policies**

**Syllabus Changes**

This syllabus and schedule are subject to change in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements made while you were absent.

**Grading**

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<th>Component</th>
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<tr>
<td>Attendance and Participation</td>
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<td>Assignments</td>
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<td>Unit Reports and Presentations</td>
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The letter grades assigned at the end of the course will be based on your cumulative points as follows:

- A 90-100%
- B 80-89%
- C 65-79%
- D 50-64%
- F 0-49%
We may use our assessment of improvement, participation in class, regular completion of homework, and/or consistent course performance to evaluate whether borderline scores (e.g. 89%) are moved up to the next grade bracket.

**Attendance and Participation (15%, shared grade)**

This course will be using a student driven workshop format. This active learning format has been shown to provide significantly improved student learning over conventional reading and lecture formats. Your success in this class requires your attendance and meaningful participation in team work and discussions.

To earn full marks in this portion of the course you will need to attend each session, come prepared having read any required material and completed assignments and preparation questions, share your ideas and opinions with the team, listen to the ideas of other team members constructively comment and evaluate other ideas presented by the team, and take part in team work in preparing reports and presentations. Each student is expected to be involved in each part of the team work. It is not acceptable to simply split up the work and have each student do one thing without discussion and feedback from the team.

**Assignments (10%, shared grade)**

During the course of the semester you will be given somewhere between 8 and 15 assignments to complete outside of class in addition to the research papers, service learning project, and unit reports and presentations. The nature of these assignments will vary significantly, but in each case specific instructions will be posted to blackboard and discussed in class. Many assignments will involve a mixture of preparative reading, research to find and evaluate reference information, and writing summaries of class work.

This outside of class work, will allow class time to focus on application of concepts from the course reading to real-world data and problems. Your meaningful participation in the workshop format will require that you complete assignments in a timely manner.

**Literature Search**

Effective decision making relies on gathering and assessing information from a broad array of sources some of which are more reliable than others. How to find accurate and reliable information in today’s world requires greater vigilance than in the past. You will complete two literature search assignments for these courses in addition to research as part of the four core writing assignments. Detailed instructions and requirements for the literature search assignments can be found on blackboard and will be discussed during the workshop.

**Unit Reports and Presentations (shared and team grade)**

The CSM 10 and 15 active learning workshops are made up of 3 core learning units centered on topics of chemical spills and hazards, biological organisms and drought, and urban ecology and environment. You will work on each of these units in teams of 4-6.

The unit reports and presentations are a culminating experience where you will apply what you have learned during the unit in answering a specific research question selected by your team in consultation with the unit instructor. Your team will communicate the results of your
research in both a written report (40 pts) and an oral poster presentation (40 pts). The final 20 citizenship points will be assigned by the instructor on the quality of your contribution to the group effort based on your preparation for the presentation, your ability to answer questions about the project, observations of in-class work, and feedback from your peers.

**e-Portfolio (5%)**

Throughout the semester you will work on building an e-Portfolio with examples of key terms and concepts in critical thinking. These examples will be drawn from our reading and in-class work along with your personal research from your writing requirement. Additional details about this assignment can be found on blackboard and will be discussed in class.

**Exams**

We will have two midterm and one final examination for this course. You will be allowed a total of two hours for each examination. Each midterm examinations will contain a mixture of questions specific to both CSM 10 and CSM 15S. You will receive two grades for each midterm exam, one for each course. The two final examinations will be course specific. Each exam will contain a combination of definition questions, short answer questions, and essay questions.

**Research Reports**

You will be required to write two individual research papers of 500 words or more. Detailed instructions, assignment requirements, and scoring rubrics are available on Blackboard. You will submit a draft of your report for peer feedback. The final version of your report will be peer reviewed.

You can earn a total of 50 points per paper: 20 participation points plus 15 honest-effort points plus 15 top-performance points. You will submit a proposal to have your project topic approved (5 participation pts). You will submit a written 1st draft (5 participation pts per draft); this first draft will receive peer (5 participation pts for providing peer feedback on first draft) and instructor feedback. You will then revise your draft and submit a written final report for peer review (5 participation pts for providing peer feedback on final report). If your final report is deemed an “honest effort”, you will receive 15 honest-effort points. If your report is deemed more than just an “honest effort”, you will receive up to 15 top-performance points. The four students who write the four best reports will give a brief talk in class about their report (or forfeit 5 of their top-performance points).

The first paper will be a research paper on a scientific topic related to:

- A question or topic connected to one of the learning units from the semester. It cannot be the same topic as our group work, but may be a related topic raised by our community partner or your own reading, but not pursued by the class.
- A question or topic related to your service project in CSM 15. It cannot be on the same topic as a paper you are writing for CSM 15, but may cover a separate issue raised in your service work.
- A topic from a published research perspectives (e.g. sciencenews.org) your group did not cover. Your paper would include some background on the problem or question, previous views on the topic, how the article answered that question, and whether
the Science News summary accurate reflected the significance of the work. The practical significance of the study should be clearly evident.

The second paper will address your reflections on how the topics presented and the skills learned in the course relate to your personal experiences and goals.

If you are not sure if your topic is appropriate, you should visit your instructor during office hours to discuss or refine your idea.

**Study Expectations**

Success in all college courses will require significant reading and study time outside of class hours. This course is no different. In general you should expect to spend 3-4 hours of outside of class work between each meeting (24-36 hours per week for the entire learning community). If you cannot allocate this time you are unlikely to be successful.

Part of this course will focus on strategies for using this time effectively. You may also find help in study skills through workshops offered by the Learning Center and Support Net.

**Support Net**

While you are primarily responsible for your own success in college, we are also committed to your success. If we are concerned that you are not making adequate progress in this or another course in the learning community we may refer you to Support Net. This office provides support to students in identifying why they may be struggling with material and directs students to free campus resources that can help you overcome those problems.

**Makeup Exams and Late Assignments**

Late assignments and make-up exams are generally not allowed unless you make arrangements with the instructor prior to the due date. In general you will be required to provide documentation of the reason for the missed exam or late assignment. You may refer to APM 232 for examples of authorized student absences.

**University Policies**

You can read important university policies regarding disabilities, disruptive classroom behavior, computers, cheating, copyright issues, and the honor code in the university catalog or at www.fresnostate.edu/academics/documents/RequiredSyllabusPolicyStatements_001.doc