

ATTEMPTING TO IMPROVE COMMUNICATIONS SKILLS:
A SENIOR CAPSTONE SEMINAR COURSE IN METEOROLOGY

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1. INTRODUCTION

When students enter the workforce in the atmospheric or related sciences, several factors will determine their success, such as technical background, analytic ability and effective communication skills. While most quality undergraduate programs in the atmospheric and related sciences prepare their students well in the technical and analytic aspects of their discipline, they sometimes neglect to develop the ability of their students to communicate their technical knowledge to others (Houghton et al., 1996). The justification for this omission is that the curriculum is already too full or it should be the responsibility of the Humanities faculty to cultivate such skills. Unfortunately, this attitude removes the individuals with the technical expertise from the communication-learning process and thus sends a message to the students that the communication of the scientific knowledge is of little importance. This is a notion that is not lost on employers, as many note that recent graduates often have inadequate oral and written communication skills required for professional interactions.

Recognizing these deficiencies, some programs have designed courses to better prepare students for communicating in the professional workplace (Carr et al, 2002). For example, in order to promote better research and communication skills of its majors the Oceanography Department at the United States Naval Academy has both a writing and speaking continuum embedded in its undergraduate program, with a sequence of written assignments and public speaking in each of its oceanography and meteorology courses (Smith and Gunderson, 1994). This continuum culminates in a senior capstone requirement for all Oceanography majors, the purpose of which is to demonstrate the students' mastery of the subject matter in their undergraduate major as well as their ability to write coherently and to speak confidently about their topic.

Until last year, the Oceanography Department's capstone requirement was integrated into two mandatory senior-level dynamics courses (one during the Fall Semester and one during the subsequent Spring Semester). In order to allow for a more focused treatment of the capstone requirement, last year the Oceanography Department instituted four new courses

entitled Senior Capstone Seminars. Each of those seminar courses concentrates on one of following four sub-disciplines: Meteorology, Physical Oceanography, Biological Oceanography or Geographical Information Systems. Students are required to enroll in one of the four seminar courses during the Spring Semester of their senior year. That seminar course replaces a department elective that previous Oceanography majors were required to fulfill. This paper will focus on aspects of the Senior Capstone Seminar in Meteorology and student response to this course.

2. ASPECTS OF THE COURSE

2.1 Course Objectives

The objectives of the Senior Capstone Seminar in Meteorology are fourfold:

- a. provide a proper forum for capstone papers;
- b. improve written and oral communications;
- c. provide an opportunity for assuming leadership role in an academic setting; and
- d. provide an opportunity for advanced material not covered in other courses.

2.2 Course Structure

The course is conducted in seminar format with approximately 12-16 students per session. The course is worth three credits, meeting for 42 sessions during the semester. The course structure can be subdivided into the following categories:

- 1 class for instruction from an English Department faculty member
- 2 classes for instruction from the Science Librarian
- 3 classes for student status reports
- 5 classes for miscellaneous administrative activity
- 6 classes for analysis of research paper components (Abstracts, Introduction, Methodology, Results, Graphics, Conclusions)
- 8 classes for presentations on a topic of choice from available COMET modules
- 8 classes for final presentations of research papers
- 9 classes for library research and discussions with the course instructor

The role of the instructor is to serve as the facilitator for the course and to provide guidance to the students. This approach is very similar to that of a research advisor for a Masters thesis. While most capstone papers do not represent original research products such as is required for a graduate degree, they constitute a significant review of the literature of their topics. Thus,

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the process does provide students a preview of what they are likely to face in graduate school.

There are two significant aspects of the course to assist the students with this literature review research process. Those are presentations from the Science Librarian and a faculty member from the Naval Academy English Department.

Working collaboratively with the faculty, the Science Librarian provides two seminars focused on the research resources available to students through the Naval Academy library, interlibrary loan, and the Internet. The first seminar is designed to reinforce and expand the students' existing knowledge of how to locate and evaluate appropriate resources, with particular emphasis on the characteristics of scientific journals, the peer review process, databases (e.g., *Meteorological and Geophysical Abstracts*), and search interfaces (e.g., *AMS journals search interface*). The second seminar focuses on the importance of proper citation and avoiding plagiarism. Web-based library research guides serve to reinforce concepts and provide access to recommended information resources.

The faculty member from the English Department leads a discussion on important aspects of technical writing, especially for scientific topics. He distributes an information packet reviewing the research techniques for the writing of a successful paper in meteorology. The messages contained therein are: one must be thorough, seek recent and solid academic support for a hypothesis, and write clearly to communicate the product of the research.

By drawing on the expertise of the Oceanography Department, the Science Librarian, and the technical writing expert, this team approach demonstrates to the students the importance of effective research and communication skills within the discipline.

3. COURSE ASSESSMENT

Because the Senior Capstone Seminar in Meteorology is a new course, the instructors were eager to acquire student feedback on the content and the pedagogical approach. Thus, a series of questions was presented to the students at the conclusion of the course to assess its effectiveness in accomplishing the course objectives. The following is a summary of the results of that assessment. Unless stated otherwise, the results presented below represent a composite of two separate classes (of 16 and 14 students each).

First, students were asked to state their expectations and rate their degree of satisfaction with the course. The vast majority indicated that their primary expectation was to receive guidance on how to write their capstone research paper. When asked if the course met their expectations, 81% responded yes and 4% responded that the course partially met their expectations. 92% responded that they were satisfied with the course as a whole, while 4% were partially satisfied.

Next the students were asked to rate the individual components of the course. Each item was rated on a ten-point scale from 1 (Very Poor) to 10 (Outstanding),

with 5 being average. The following is the listing of the eight course components, and the mean ranking for each:

Status report of capstone paper	7.9
Library research presentation	6.9
Tips on technical writing	7.0
Proper Documentation/Plagiarism	7.3
Breakdown of Scientific Journals	7.5
COMET module presentations	7.7
Tips on giving presentations	7.4
Capstone presentations	8.5

It should be noted that the composite results have little variation from the results of each class section. While most students indicated satisfaction with all components of the course, there was clear preference for the classes in which their classmates presented their papers orally. The lower scores on library research and technical writing were likely due to the students' perceptions that they have had adequate coverage of these components in previous courses. However, in many instances early drafts of their papers suggested otherwise.

Students were then surveyed on the sequencing of the course components and whether a proper amount of time was devoted to each component. 92% responded that the sequencing of course material was appropriate. While only 54% responded that the amount of time devoted to each topic was appropriate, there was a mixed response on how the time should be redistributed. The topic on which students felt too much time was spent was the analysis of the components of scientific papers. This is surprising, since undergraduates generally have little experience reading scientific journals. When asked where they would like to see more time in the course, the response was generally more class time to devote to research of their topic in the library. Nine of the 42 periods were provided to students for library research or to meet with the instructor to discuss their projects. While the students were told at the beginning of the course that some time would be made available, some had rather unrealistic expectations that they would be given unlimited class time for research and paper presentation.

An area where there was marked difference between the two sections of this course involved multiple readings of the papers by the instructor as is generally done in a graduate thesis. In one section 11 of 16 students (68%) sought more than just a review of the first draft and final submission. In some instances, there were as many as 4 or 5 submissions to refine the final product. As one would expect, the final grade generally reflected the numbers of iterations with the course instructor. In the other section, only one of ten respondents submitted more than the required number drafts.

The final questions sought input on the final outcome and whether this course was a worthwhile evolution. When asked if the overall process resulted in a higher final grade than expected, 88% responded that

it did. When asked if given the opportunity to take this course or another elective with no formal course structure to support the capstone process, 88% said they would elect to take the capstone seminar. Finally, when asked if this course should be required for all Oceanography majors, or should be an elective offering available for those students who feel they need such a course, 62% responded that it should be a required course for all students in the major. Those who indicated the course should be an elective offering stated that some students have the required skills to do their own work without benefit of the course. However, nearly all students indicated that some of the material was valuable for all students.

4. CONCLUSIONS

The United States Naval Academy Oceanography Department has a capstone requirement for all of its seniors. The purpose of this requirement is the demonstration of the seniors' knowledge of the department's subject matter and their ability to communicate that knowledge, in both oral and written format.

In order to better facilitate the capstone requirement, the Oceanography Department recently instituted four new courses entitled Senior Capstone Seminar. Each seminar course concentrates on one of following four sub-disciplines: Meteorology, Physical Oceanography, Biological Oceanography or Geographical Information Systems. Students are required to enroll in one of the four seminar courses during the Spring Semester of their senior year. This paper focused on aspects of the Senior Capstone Seminar in Meteorology and student assessment of that course.

The course is divided into eight categories whose sum goal is to provide students with a framework upon which to build their capstone requirement. Students overwhelmingly agreed that the course met their expectations, that they were satisfied with the course.

5. REFERENCES

- Carr, F.H., K.K. Droegemeier, and J.F. Kimpel, 2002: "A new M.S. in Professional Meteorology Degree Program at the University of Oklahoma", *Preprints of the 11th Symposium on Education*, Amer. Meteor. Soc., Boston, MA, 139-142.
- Houghton, D.D., T.S. Glickman, J. Dannenberg and S.L. Marsh, 1996: "Results of the 1995 AMS Private Sector Survey", *Bull. Amer. Meteor. Soc.*, 325-323.
- Smith, D.R. and C.R. Gunderson, 1994: "Physical Oceanography and Meteorology Curriculum at the United States Naval Academy: Preparing Future Naval Officers for the Operational Environment in the 21st Century". *Preprints of the 3rd AMS Symposium on Education*, Amer. Meteor. Soc., Boston, MA, 49-52.