J5.2 AN INTERNET BASED AVIATION METEOROLOGY COURSE

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1. INTRODUCTION

Online classes have recently become very popular in higher education in the U.S. It is estimated that over 25% (Parry 2009) of students will take an online class during their college career. They offer students the flexibility to study at times which are convenient for them and to avoid being tied to a particular class schedule. Students also do not have to worry about the online class having a time conflict with other classes they might need to take. In addition, students do not need to be present on the campus of the school offering the online class and do not need to travel to take a class. Therefore a larger variety of classes are available to the student than might be offered locally.

Nevertheless few online classes have been offered in atmospheric science. The AMS web site lists only 3 different schools with online courses that can help meet AMS course recommendations for a bachelor's degree. Other universities have offered online courses but these offerings have often been confined to the introductory level or have only been offered sporadically.

The University of Kansas (KU) has a long history of offering introductory level meteorology courses through distance education. Traditionally these courses were delivered via correspondence but in more recent years they have been delivered via web sites. Recently the College of Liberal Arts and Sciences (CLAS) at KU has desired to develop an online degree completion program that could be available to students who have done an associate degree at a community college, wish to obtain a bachelor's degree and cannot travel to KU. CLAS encouraged the development of online courses which could be taken as part of this program. The online aviation meteorology course discussed in this paper was developed as part of this program.

Aviation meteorology courses at the college level have traditionally followed one of several approaches. One approach is "weather for pilots". This is an introductory meteorology course with no prerequisites with an emphasis on those topics of particular relevance for aviation. In some cases, topics relevant for the FAA exams are stressed but in other cases the course is more general. Another approach is a class mostly intended for meteorology majors. This course generally has one or more prerequisites and emphasizes forecasting techniques for atmospheric phenomena relevant to aviation

The course discussed in this paper attempts to blend the approaches described above. It has an introductory meteorology course as a prerequisite. Students are expected to be familiar with physical concepts covered at this level including the basics of surface and upper air analysis (including Skew-T diagrams). There is no math prerequisite although students taking a course at this level are expected to know the material in a college algebra course. With only the introductory course as a prerequisite, the course can be accessible to students who are not meteorology majors. As such the course tended to put more emphasis on physical forcing mechanisms rather than forecasting techniques per se. No effort was made to specifically include material that was part of the FAA exams.

This course is a good one for the University of Kansas because of the importance of the aviation industry in the state and therefore the interest in aviation related matters. It is a good course for me to teach because my background is in meteorology, I have a private pilot certificate, and since I own an airplane, I fly regularly. The course also adapts easily to the Internet. Some materials (e.g. COMET modules) are already available on the Internet. Since the course is not calculus based, the amount of mathematics is minimal. Some materials are descriptive and easily presented with a number of examples.

2.0 NATURE OF CLASS

CLAS had some constraints as to how it wanted the course to be set up. The course was not self paced. It was to start and end with the regular semester with specific due dates for all assignments. In addition, no provision was made for proctored examinations. Although CLAS may make such a provision in the future, all assignments would initially be open book. Since this class would be an elective for all students taking it, I did not see that this restriction would be a serious problem. CLAS also wanted the course taught with the Blackboard course management system in use at the University of Kansas. I did not foresee doing anything that Blackboard could not handle so this preference was not an issue.

Since there would be both meteorology and nonmeteorology majors in the course, the challenge was to have material which would not overwhelm the nonmeteorology majors but still be enriching for the meteorology majors. The nonmeteorology majors would require a review of basic cloud physics principles, for example. I did wish to include a lot

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more material on meteorological observations and models than has been customary in many aviation meteorology courses.

3.0 CLASS MATERIALS

One of the main differences between an online course and a classroom course is that the online course requires that all aspects of the course be explained in great detail. This process can be a time consuming one. I did not use any textbook but put together class materials from a number of sources. I began with writing some of my own material as many external sources I wanted to use required some background knowledge that I would need to provide for the students. The Cooperative Program for Meteorology Education and Training (COMET) has produced quite a number of web based modules on aviation meteorology subjects (Spangler et al. 2004). The course used some of the aviation modules and some nonaviation specific modules (e.g. Skew-T module). Four of the COMET modules on fog were used - only a fraction of what COMET has made available on the subject. Even so, one student said that we spent "forever" on fog. The required readings also included a few excerpts from the National Weather Service publication for pilots called "The Front" (NOAA 2010). Optional reference materials were provided including the FAA publications "Aviation Weather for Pilots and Flight Operations" and "Aviation Weather Services".

Meteorological observations and numerical model output are widely available on the Internet but not always in a form that is useful for aviation applications. Pilots often do not know how to use a lot of the data that are available nor are they aware of possible errors in the data. Therefore, I wanted to include a segment on data and model output in the course that would make students acquainted with the types of data available, the errors it can have, and how to display it. Since the Unidata Integrated Data Viewer (IDV) is readily available and will run on a number of different platforms (Murray et al. 2009), I decided to have the class use it for a display method. Although half of the class had not seen it before, the students were all able to install it and create simple displays with relatively little trouble.

4.0 Class Structure

The class was taught for the first time Fall 2009. All students in the class were actually on the KU campus. The University of Kansas has 15 week semesters. The class had two reading assignments per week for each week except the last one, which had one reading assignment. The reading assignment might be a written material I had done, a COMET module, an excerpt from "The Front", or some combination of these. For each reading they were required to do a quiz. For some of the COMET modules I used the quiz COMET had prepared for the module but for most readings I made up the quiz myself. The quizzes were objective questions (True/False, multiple choice, matching, ordering) which concentrated on basic knowledge and understanding.

For each week after the first one the students also did an activity. The activity included tasks such as the display and/or interpretation of data, interpretation of aviation weather products, comparison of different data types, and perhaps an essay analyzing a particular problem. Students learned to display surface data with a custom station model, sounding data, model output with contours, solid contours and isosurfaces, satellite data with enhancements, radar data (several types of displays), and profiler data. One activity used the BUFKIT program. In one activity students looked at the Channel 2-Channel 4 satellite imagery in the morning and compared it with surface visibility data. In another activity they looked for a satellite image within the last week that showed mountain waves.

Assignments were generally due Monday, Wednesday and Friday before midnight. The top 25 (out of 29) quizzes counted for a grade and the top 13 (out of 14) activities counted for a grade. There was also a midterm exercise and a final exercise. Both of these were objective questions similar (but longer) to the reading quizzes. Grades were guaranteed based on points earned with the assignments.

5.0 CONCLUSIONS

Overall the course went very well. Students were able to install and use both IDV and BUFKIT without much difficulty. Student computer problems were mostly related to general problems with their own personal computers. Students were told at the beginning of the course that problems with their personal computers were not a valid excuse for turning in an assignment late since they were all allowed to use the computers in the atmospheric science student computer resource center.

In spite of the restriction that the course not be self paced, some students had trouble with time management. A number of assignments came in right before the deadline and looked hastily done. One student ended up dropping the course and another ended up with a poor grade because they could not get assignments done on time. College students in the traditional age range often have difficulties with time management but for an online course where they did not have to come to class regularly these problems were magnified.

Although some atmospheric sciences courses would require enormous effort for effective presentation in an online format, this effort shows that others can be put online with a reasonable amount of effort. This course also shows that a program for the computer display of atmospheric data can be

used effectively in an online course by students previously unfamiliar with the program.

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