

## **Teaching Meteorology on the web : a student's perspective**

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### **1. Introduction**

Many university courses have been taught in recent years with the web as a supplemental or a primary teaching environment and learning resource (e.g. the Western Governor's concept of Virtual University; Resmer et al 1995). Many variants exist, and questions remain about the effect of web-based teaching on teaching effectiveness and on the learning process (e.g. FABIT 1995). How, for instance, does the web assist in preparing lecture material, in visualizing concepts, and in evaluating student performance? And how is the student's learning affected, in particular his/her in-depth understanding of concepts, reasoning skills, and problem-solving skills? Ultimately we should ask whether we prepare the students better for the career they are aspiring to.

Here at the ERAU, Prescott campus, we recently embarked upon an ambitious plan to build a ready-to-use, web-based teaching resource for Meteorology. Aeronautical Science students take two basic courses in Meteorology, and currently we are offering three additional courses, such that students can opt to take a Meteorology Minor. The Meteorology web pages, still in development, can be viewed at:

**<http://www.pr.erau.edu/~meteo>**

For many Meteorology students, the use of the web to study, do homeworks, prepare weather briefings, check grades, etc, is revolutionarily new. Yet Meteorology, more than any other discipline, can benefit from an orientation towards the web for at least three reasons: the ever-changing nature of the weather, the availability of a plethora of up-to-date images on the web, and the need for color visualization and animation in Meteorology, given its multi-dimensional character. Therefore Meteorology seems to be an excellent subject on which to experiment with the new, pervasive medium provided by the internet.

In this paper we examine the students' first responses to this experiment.

### **2. Survey**

In several classes we circulated a questionnaire about halfway through the semester. The introduction to this questionnaire stated: "The use of the web in a class environment is quite novel. To help us improve the web design for teaching and learning, we would appreciate your

answering of the following questions. *Note that this is not an evaluation of the instructor, but rather of the technology. Your comments will be seen by the instructor before the end of the class.*"

The questionnaire started with a number of Yes/No questions (Table 1). The only allowed answers were "Yes" and "No", yet some students responded with a "?", therefore in future surveys we will make "uncertain" a third possible answer. Alternatively, we could use a sliding scale ranging from a strong "yes" to a strong "no".

Next we asked for a number of written comments to the following questions :

- What suggestions do you have for improvement of this web-based course, with regards to (a) teaching, (b) assignments, (c) your weather briefings, and (d) your test preparations?
- What do you like most about the web-based course?
- What needs to be done first of all to improve the web-based course?
- Can you think of anything else that we should add to the web pages?

	Majority answer	AS 352, Spring	AS 201, Summer	AS 352, Summer
<i>Number of completed surveys</i>		(68)	(17)	(29)
<i>In-class facilities</i>		Percentage of students giving this answer		
1. Are the facilities arranged so that you can conveniently view the screen?	Yes	83	100	89
2. Are the printed text and graphics on the screen large and clear enough for you to read?	Yes	77	94	75
3. Is there sufficient overhead light in the classroom for you to take notes during the presentations?	Yes	61	76	64
4. Are you able to hear the instructor over the computer/projector noise?	Yes	88	100	89
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<i>Teaching and learning</i>				
5. Is the interaction between students and instructor impaired by the use of the new technology?	No	80	94	79
6. Does the computer make you less comfortable interacting with the instructor during the class?	No	88	82	93
7. Does the in-class usage of web-based material enhance the teaching effectiveness?	Yes	88	88	86
8. Does the web-based material enhance your learning effectiveness in class and at home?	Yes	76	74	75
<i>Content of the meteorology web site</i>				
9. Do the web pages for this course provide adequate supplemental information?	Yes	72	76	82
10. Do you use the web pages for studying, and preparing for tests?	Yes	62	71	71
11. We could create an email discussion group just for this class, so that you can send messages to some or all of your colleagues, and so that the instructor can send messages to you all? Would such a discussion/info medium be useful for this class?	Yes	53	67	50
12. Would you prefer to do homeworks entirely on computer, by typing in the answers in designated boxes right on the web?	Yes	76	62	82
13. Do you have any objection to having the grades up-to-date on the web?	No	100	100	100
14. Would you like to have the answers to assignments posted on the web (after the deadline of submission of the assignment of course)?	Yes	97	94	96

Table 1: Summary of the 1997 survey in which students were asked to answer 'yes' or 'no' to 14 questions. The percentage of students giving the majority answer is shown for each class.

### 3. Results

The responses to the yes/no questions are shown in Table 1. The lighting and layout of the classroom were not designed for computer-based instruction. Several students commented that it was either too dark to take notes, or too bright to discern the details on the screen. Our projector/computer system was placed on a cart. We believe that a ceiling-mounted projecting system is advantageous, because it reduces the background noise, and it does not challenge the 'high touch' (close interaction between teacher and students) that characterizes Embry-Riddle.

Most students agree that both teaching and learning benefit from the use of the new technology (Table 1). The students are slightly less unanimous when asked about learning effectiveness. One student mentioned that the web meant entertainment for him, and that it was not a good learning environment. Another student commented that it is more convenient (and faster) flipping through pages of a book, than surfing the web. Several students apparently simply print out all the web pages, and use the hardcopies as study aid at home and in class.

In addition, for several students it is plainly inconvenient to find the time and a decent computer to browse the web pages. Only 41% of the students we surveyed have access to a linked computer at home. For the younger group in AS 201, that percentage is 65%. Perhaps this difference represents a trend across generations, however we had only 17 respondents in the AS 201 group. Some students expressed interest in a crash course on the internet (for instance, of the type suggested by Schiller 1994). Such course would cover web access, web search, downloading images (ftp), installing plug-ins, print web frames, access to newsgroups and email lists, and also instructions to use email.

Questions 9-12 in Table 1 are not answered with overwhelming concord. With regards to supplemental information on the web pages, some students wanted more detail and more continuity in the lecture notes (e.g. <http://www.pr.erau.edu/~meteo/as352/class/chap10/chap10.html>). Those details are not there at this time simply because I use the lecture notes in class, and the details are provided orally. Some students are tempted to skip classes and learn exclusively from the web. Other students, however, feared an information overload as a consequence of widespread use of the web as a teaching resource.

The fairly low scores on question 10 (Table 1) reflect the limited accessibility of the web pages for some students. One student wrote that the reliance on the web discriminates between the 'haves' and the 'have-nots'. Students were nearly evenly divided on the institution of a LISTSERV facility to initiate discussions and circulate messages. Again, we interpret this as a reluctance of the students to become too computer-dependent; in addition, students have a demanding work schedule and may see this email list as an additional work load.

With regards to homeworks (question 12), students currently read their assignment on the

web, and usually the assignment contains links to external sites. Yet they hand in their assignment on paper. Again, there is some reluctance to do all the work on the web. More than the logistics (access to a computer), this may reflect a mind set: many students still rather work with book and paper than right on the screen. We are confident that this attitude is changing rapidly, and that in a few years virtually all students will be more computer-minded than most of their teachers.

There is some legitimate concern about posting individual grades on the web, when the students are identified by their social security number or any other form of ID. Yet none of the surveyed students voiced this concern (question 13). One student did say that a hardcopy of the syllabus should be distributed at the beginning of class, because the syllabus is a contract, and the instructor should not be able to alter it arbitrarily in the course of the semester. In addition to answers to assignments (question 14), students also wanted access to an archive of assignments from previous years.

Finally, some students commented about the use of designated presentation software (such as MS Powerpoint) versus plain html. The drawbacks of plain html for presentations are that graphics often are too large or too small (and this is computer-dependent), and that more clicks and cursor manipulation are required than for MS Powerpoint. On the other hand, Powerpoint presentations are less elegant when transferred to web, because they don't offer a structural hierarchy: one can only progress linearly through slides, and students cannot print out just a select top level of the hierarchy.

#### 4. Conclusions

The survey gives us strong support that we are moving in the right direction, even in the mind of aviation-oriented students who typically not as keen with computers as the average college student. However, the survey does raise some questions and warnings. Here are some recommendations we gained from the students' feedback:

- We suggest an optional, brief training course to all entry-level students, a basic course on how to use the internet;
- We should proceed cautiously, to ensure that we reap educational benefits at every step and that we are not unfairly giving advantage to one learning style; and to avoid any discrimination between the computer 'haves' and 'have-nots', and to reduce the growing gap between these two groups;
- It is essential that the lighting and design of the classroom be suited for computer-based instruction;
- The mindset of us teachers should become more computer-oriented, in tandem with the observed evolution amongst students.

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