

DISTANCE LEARNING CITRUS¹

J. DAVID MARTSOLF
University of Florida, IFAS
Horticultural Sciences Dept.
Gainesville, FL 32611

Additional index words. distance learning, distance education, Email, networks.

Abstract. In the Spring Semester 1994, a 2 hour course in Agricultural Meteorology (HOS 5616), was taught from Gainesville via computer network, i.e. by utilizing electronic mail [Email]. Eight students asked to take the course remotely. All but one of these communicated with each other and the instructor via VAXmail on the IFAS Computer Network [ICON]. The remaining student used a NASA supplied link to Internet and through it to ICON. The basic level of text transfer was to be used but a few used Vmail on ICON's DEC VAX in preference to the basic MAIL facility. A good textbook was found indispensable. Students were required to pick a term paper topic from within the text materials and supplemental text sent from the instructor to upgrade such subjects as global warming, cold protection, and the use of computers in microclimatology and communications. The main topic of the course, citrus cold protection, was used to provide practical applications of the radiative, convective, conductive, and latent heat transfer mechanisms that dictate the dynamics of the microclimate. One advantage of the method was the savings in student time commuting to Gainesville. Those students ranked the course as highly desirable in the standard course evaluation process. Another advantage was that each participant in the network worked on an individual schedule, the instructor included, i.e. the messages waited for responses. Procrastination is a hazard. The keyboard limits both the content and rate of most transmissions. This can be remedied to some extent on the instructor's end by tailoring course materials ahead of time including scans of graphs and color slides. The number of messages each student received and sent are documented. From this experience future courses using Email with graphics transmission capability is recommended for students who demonstrate both a desire and aptitude for such techniques.

The purpose of this paper is to document experiences gained during a course taught during the Spring Semester of 1994 from the campus of the University of Florida by a method that is being referred to as "distance learning." Since then the author has experienced more of the excitement over the possibilities in what is most often termed, "Distance Education" (Dillon, 1993). In this paper these terms refer to the same process. The particular distance learning process described is the use of electronic mail in lieu of the students traveling to a classroom on the main campus of the University of Florida in Gainesville to take a course in Agricultural Mete-

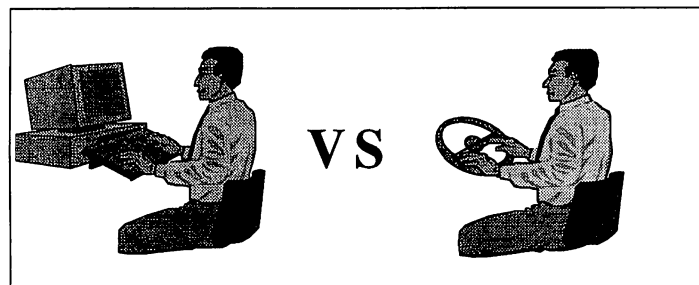


Figure 1. Electronic mail was used as a substitute for communicating. Those who saved driving time gave the method a high rating and exercised computer skills in the process.

orology (Figure 1). If there is a difference in the meaning of the terms it is in the position of the viewer, i.e. from the instructor's versus the students' view. This point of view is used to divide what the students thought about the method from what the instructor felt about the method. The students' points are documented first.

Materials

Text Materials: A good textbook [Rosenberg, et al. 1983] was found indispensable. A series of lectures, in text format, was developed to supplement the frost protection and global warming portions of the text. A publication on global warming, free for the asking, became available from the National Center for Atmospheric Research during the semester. The instructor passed the Email address and a description of the booklet to the students. All took advantage of this opportunity and commented on the booklet when it arrived.

Network: Each student had to have access to the network, i.e. the ability to receive and send Electronic mail [Email] via a network (Figure 2). Initially, it was anticipated that all the

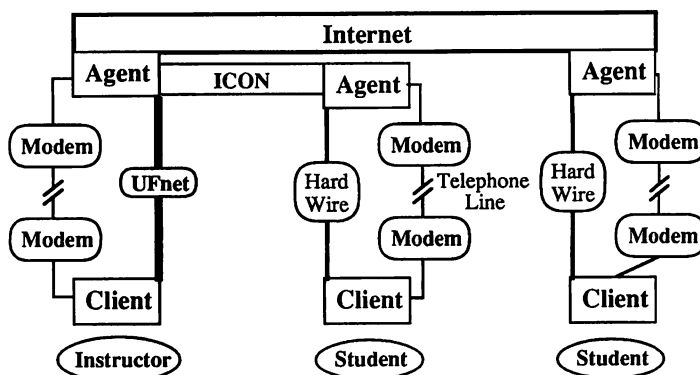


Figure 2. Diagram of the links through which Email flowed indicating that the instructor sent messages through a local microcomputer [client] which in turn could sign into a larger computer [agent] that had access to Internet and was a part of ICON. The instructor could use a hardwire connection or go through modems that permitted telephone lines to be used for this link. The students had similar possibilities, i.e. either hardwire links from the terminals or microcomputers [clients] to the agents through which they accessed the networks.

¹Florida Agricultural Experiment Station Journal Series No. N-01018. Dr. C. Terry Morrow, Professor, The Pennsylvania State University, is gratefully acknowledged for the encouragement and technical information he communicated by Email in response to questions and complaints over the past decade. Our Email addresses are jdm@gnv.ifas.unl.edu and ctm@psu.edu respectfully. Permit me to also acknowledge Mr. Norman Todd of Bob Paul, Inc., Laselle, for talking me into making this presentation to FSHS.

students could use the MAIL facilities provided by the IFAS Computer Network [ICON] but as the situation developed the desirability of the student's being able to communicate as conveniently as possible led to one student developing an agent at NASA that had Internet access. Several other students arranged to use modems so that they could call in from their home or business computers to the node of ICON at Lake Alfred. From the Lake Alfred node of ICON they could access the Gainesville node and get to Internet there.

The network was not the only communication tool used. Initially several students used the telephone and in one case a mobile telephone to communicate in lieu of the network. It was necessary to discourage some students from substituting other links for the network at first. There were 3 meetings of the course on the campus, the initial and final lecture periods as scheduled and an interim meeting in the instructor's cold protection research lab. In all these cases the lecture period was extended to 2 hours in length by mutual consent. The timing on the second and final meeting of the class was negotiated to some extent by Email.

Computers: Each student had to have access to a computer or a terminal that was linked to ICON. A personal computer with a modem at the student's home was preferable. At least 3 of the students achieved this desirable condition by mid-course and they found it much more convenient to communicate from their homes than those using computers in their offices or at the CREC [Citrus Research and Education Center, Lake Alfred]. The microcomputers used by the students were MS-DOS machines and the computers used by the instructor were Macintoshes. This is a minor problem and one that someday may be less troublesome than it is now. Each student was encouraged to find a local expert who had experience handling Email with a very similar configuration to what they were using.

Modem: Those students with computers at home promised to add a modem if they did not already have one. The modem connects the computer to a telephone line and permits the computer to call into the Network Server.

Software: A terminal application such as Pro Comm was used to emulate a VT 100 terminal on logging into ICON.

Printer: While a printer was not required at the student end it became apparent that those who could easily print out text sent to them were at an advantage. Printing facilities at the instructor's end were indispensable.

Methods

Situation: Prior to the beginning of the semester the group of 8 graduate students who declared an interest in taking the course by Email were eligible for accounts on ICON [IFAS Computer Network], and it was assumed that these accounts would be the way those students would link with the network. However, one of these students worked for NASA and a link to Internet was eventually supplied by NASA as a second method for that student to use the network. Applications were made for each of the students who did not already have an account on ICON and these accounts were granted but after several weeks of the course had passed. Waiting for the students' accounts to be activated was a problem.

Policy: The course was about Agricultural Meteorology. Protracted discussions of how to communicate with computers would have detracted from the course content and so they

were discouraged. Only a minimal level of Email capability was required: being able to receive Email messages, and print them when necessary, to send Email messages using a keyboard to convey them into the VAX MAIL facility available on ICON. To compensate for the reduction in opportunity for the students to get to know the other students and the instructor the first assignment was to exchange biographical sketches by Email. An attempt was made to encourage the students to submit drafts of first the outlines of their term papers and later initial drafts of the papers. In most cases, the students were unable to simply cut and paste these files into the mail facility and ended up typing abbreviated outlines into a mail message in order to propose a particular topic and approach for their term papers.

Responses: The instructor promised to respond to messages from the students within 24 hours. In return the students were asked to attempt to follow the same rule when possible. The rule that prevails in Email, only short messages receive complete responses, was followed. It was found that it is better to divide a more complex response into several messages than to rely upon the responder to divide up the message.

Records: The VAX MAIL facility on ICON permitted all messages to be saved on disk and for the users to recall any of the messages later. The instructor could interrogate these records from either his office or his home.

Results

From Student's View: Table 1 summarizes the responses made by the students regarding the course they took largely by Email in comparison to those made by students ranking all the courses in the Department of Horticultural Sciences and in comparison to the mean responses by students to all the courses in the College of Agriculture. Notice that the highest ranking that a student could give to particular question is 1 and conversely the lowest a 5. While 8 students took the course, one found his job too exhausting to keep up with the course and asked to complete it subsequently. Another had a conflict during the final exam period and was not present when the questionnaires were filled out by the students and delivered to the Dean's office by another route than through the instructor's office.

The 9 questions regarding the course were:

- 1] Organization of the course
- 2] Instructor's clarity of presentation
- 3] Instructor's concern that students learn
- 4] Instructor's receptiveness to questions, opinions
- 5] Fairness in testing
- 6] Fairness of grading
- 7] Value of assigned readings, problems, tests, papers, etc., as aids to mastery of course content
- 8] Student's gain in knowledge and/or competence as a result of the course
- 9] Overall rating of the course
- 10] Overall rating of the instructor

In addition to the numerical rankings of the course and instructor in each of the 10 categories listed above, the students made comments beneath 5 questions listed on the back of the course evaluation sheets:

Table 1. Students' view.

	questions	for the Course		for the Dept.		for the College	
		Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Course evaluation(s)	1 thru 9	1.33	0.54	1.39	0.66	1.60	0.87
Instructor evaluation(s)	10	1.50	0.50	1.34	0.60	1.51	0.80
Number of respondents		6		341		5109	

where 1 is the highest score and 5 is the lowest

- 1] What personal qualities of teaching skills of the instructor contributed to the success of the course?
- 2] What personal qualities or teaching practices of the instructor hindered the success of the course?
- 3] What is your opinion of the course content, including the textbook?
- 4] Add any other comment.

All 6 of the respondents answered at least 2 of these questions and most answered all of them. In general they praised the course, the text book, and the instructor. One student suggested that a more precise outline would have been preferred and another indicated that the instructor pursued some details further than necessary. Other students praised the freedom to pursue issues of interest, i.e. the relatively open structure. But there can be little doubt that the students who responded enjoyed the course and felt they had greatly benefited from the course. Several indicated in rather definite terms that they felt other courses should be taught using similar methods.

Some dislike computers: One of the students who did not fill out a course evaluation questionnaire because of a time conflict, also failed to complete the course. When pressed the student indicated that he became increasingly frustrated with the MSDOS computers in the labs on the campus and simply did not want to have any more to do with them. This student was the only undergraduate in the course. He was considering graduate work in an area that would involve computers so his decision to avoid them was a major change in direction for him. The point is that there are likely to be other students who will fail to find Email a useful tool. Nor can all teachers be expected to embrace this method. However, as experiences increase with microcomputer use, the instances of this ex-

treme dislike for the machines seems likely to decline. Microcomputers are very close to becoming a universal tool.

From the Instructor's Viewpoint: There were 27 messages sent to the class as a whole (Table 2). No attempt was made to separate the responses to those general messages from the responses to messages to the individual. The individual messages were stored in electronic files under the individual's name and general messages under the course in course file. Later the messages to the student were separated into a separate file so that the counts reported in Table 2 were taken quite simply by displaying the number of messages in each file. While the students gave permission to use their names in reports about the course, they are referred to as numbers in Table 2 to avoid their having to defend their participation which, as far as number of messages were concerned, is quite variable. Some of the variability in the data is due to differences in the individual student's style of response. Knowing that message number data were being kept and being reported periodically back to the students in general as a way to encourage some who seemed to be falling behind in their correspondence, there were some students who used very short and frequent message techniques whereas others would send longer messages covering numerous points.

Discussion

One of the observations is that students who request Email techniques in lieu of commuting are delighted with the option. They rated the course as high if not a bit higher than the average of all the courses taught in the Horticultural Sciences Department and much higher than the average of all courses taught in the College (Table 1). But the method does not suit everyone. Some students and likely some faculty may not become proficient enough on microcomputers to communicate efficiently and effectively through them.

The time that one works on the course, be it instructor or student, is unstructured. This benefits students who carry on other responsibilities that are time structured. In this case the students were production managers and service providers. But the disadvantage is that if those responsibilities capture all the student's attention the course suffers and this happened in 1 out of the 8 cases. Since an extension of the course is a burden for both the student and the instructor this is likely to be a serious disadvantage of the method, but it should be admitted that such delays are not restricted to this teaching method alone. This instructor has had students for good reason request extensions in the deadlines for their papers in many of the courses he has taught by conventional methods.

The message numbers are high, in part, because there's a rule of thumb among Email users that network messages are more effective if kept short and to a point. Some of the messages from the instructor to class in general failed to follow that rule. The lectures developed to update the text on cold protection methodology, and global warming for example, were sufficiently long that they were split into 2 and 3 sections. The point is that most of the messages were relatively short and should not be used as an indicator that an inordinate amount of time was used in the communications. Students differed extensively in the number of messages that they generated. This is indicative of the uniqueness that characterized the manner in which each student communicated with the instructor and to some extent with the other students. This does increase the time that the instructor must commit but it is rec-

Table 2. Number of messages sent and received during the semester.

Student Number	Total	Student	
		From	To
1	14	6	8
2	29	13	16
3	33	14	19
4	17	10	7
5	120	53	67
6	32	13	19
7	64	28	36
8	127	51	76
Class Msgs	27	0	27
Total	463	188	275
Std Dev	43.3	19.2	24.9

ognized that any teaching method which takes into consideration the variability of student personalities increases the time commitment of the instructor significantly, until tools for dealing with students in a variety of ways are developed and exercised.

Instructor's time commitment to a course is not a simple matter. There is a lot of concern about the time that it takes to convert from one teaching style to another and certainly, that time is going to have to come at the expense of something else that the instructor may prefer to or be expected to do (Dillon, 1993). It is likely that a course taught largely by Email will be more time consuming than one taught by conventional methods, especially if the one handled conventionally is organized rather loosely in time left after other tasks are permitted priority. Courses of similar quality are not likely to require dissimilar time commitments after the initial period of change, in the opinion of this instructor.

One of the concerns that has been registered by questions from other instructors about the technique is the commitment of time to the dialogues that develop. There is no doubt that one can get caught up in the process and spend more time than may be warranted or that can be justified on the correspondence. But there are ways to handle the questions with dispatch and still handle them effectively. There are opportunities to "can" some of the expected responses or to tailor some previous information on file and readily available to be called out of storage and used. Since these frequently used descriptions or explanations do not need to be generated through the keyboard in response to each question some of the instructor's time is conserved. The microcomputer is becoming a more and more effective tool in handling such information and bringing it to light quickly.

Another advantage of the method that applies to both the students and the instructor is that the course can go forward even if one or more participants is badly impaired. The instructor, in this case, had a problem with a ruptured disk in his back that led to an extended period of bed rest followed by an operation, hospital time, and recovery. Previous experience with a portable microcomputer during hospital stays permitted the instructor to keep us with the course when it is likely that he would not have been able to meet the course in the classroom for a period of at least a month.

However, on the student's side, it is apparent that time is saved. Obviously the commuting time is saved. The savings in cost of transportation offset some of the costs associated with the computer, modem, linkage to Internet. At the University there is a small savings in parking space but this is a problem of such magnitude that any savings is greatly welcomed. It seems likely that the cost of the computer can be shared among many services it provides beyond those associated with distance learning. Being able to use a computer at home was obviously an advantage over using one provided at work or at the Educational Center. The objective of the experiment was to see if Email could be substituted for commuting (Figure 1). From that standpoint the experiment was a huge success and the students who reaped that benefit were delighted with the opportunity. It may be that this is the particular niche in which this method is at its best. One graduate student who joined the course knowing that the possibility for handling

the course by Email was to be voted upon, voted for the experiment even though he was located in the same building, i.e. Fifield Hall, where the course would have been taught if taught in a conventional manner. He was also delighted with the method because it freed up his schedule and he was one of the most enthusiastic supporters of the method. This may indicate that there are students who do not need to avoid the commute but yet would benefit sufficiently to feel, as this student did, that the course was a success. But experiments involving a larger number of such students are needed to test this possibility.

Future

The future is bright for distance learning, i.e. communication between students and teacher in spite of distances between their work places. While not a panacea, electronic mail as a tool in distance learning is likely to become easier to use, more readily available and capable of transferring images in color [Anonymous, 1994]. It was difficult to finish this paper in view of all the exciting news about information becoming available by network.

It has become apparent that the students can interface with their instructors by commercial networks such as CompuServe, AOL, GENie, etc. which provide access to Internet [e.g. Elmer-Dewitt, 1994]. While there are charges for these services they are small in comparison to the cost of commuting to class. Since one of the students linked to ICON by Internet from a NASA owned server where he worked, the other students got a demonstration of how this worked and how to use Internet addresses [Engst, 1993].

Summary

When students request a course taught through Email in lieu of commuting from their jobs to the campus they are grateful for the opportunity and seem to work very hard to make it effective. This may be a particular niche in which such a method is justified. There is also a freedom of scheduling one's time that is attractive, i.e. the instructor and the students do not have to meet at a prescribed time. However, this lack of time structure places a larger burden on both student and instructor to keep the course moving at an acceptable pace.

Literature Cited

- Anonymous, 1994. Netwatch: News, Culture, Controversy on the Internet; Tomorrow's TV Today. Time 144(15):24. timestaff@aol.com
- Dillon, C. L. 1993. Speaking Personally - with Barbara A. White. The Amer. J. of Distance Education 7(2):73-79.
- Engst, Adam C. 1993. Internet Starter Kit. Hayden Books, Indianapolis, IN, 641 pp. hayden@hayden.com
- Elmer-Dewitt, P. 1994. Hooked Up to the Max. Will America Online, Prodigy and CompuServe loose their clout when the Internet comes to town. How Internet was tamed. Time 144 (13); 58-60.
- Martsolf, J. D. 1994. Transferring GOES Image Technology to Potential Users in Agriculture. Preprint Vol. 7th Conf. on Satellite Meteorol. and Oceanography, Amer. Meteorol. Soc., Boston, Mass. pages 459-462.
- Rosenberg, N. J., B. B. Blad, and S. B. Verma. 1983. Microclimate, the Biological Environment, 2nd Edition. John Wiley & Sons, New York. 495 pages.