

Spring 1999: On-line Courses



*Assessment Report to the Institute for
Distance and Distributed Learning*

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Executive Summary

This assessment study covers the ten totally online courses offered at Virginia Tech in the spring semester of 1999. Data were gathered from a single online survey administered the last week of classes. The survey had 72 multiple choice (Likert-type) questions and 4 opportunities to enter free-form comments. The enrollment of the courses totaled xxx, but individual course size varied in the extreme, from one class with 444 students and another with 198, to 5 classes with fewer than 20 students enrolled.

The Students

The students in these classes were similar in diversity to the general Virginia Tech population, but there was a somewhat disproportionate number of males who responded, (61% male versus 39% female). Unlike many distance learning enrollments, almost all (90%) of these students lived within 5 miles of campus and were likely to be enrolled in traditional resident classes. Contrast these figures with 1998 summer school students, in which nearly 30% lived farther than 100 miles from campus. It is interesting that many of the spring 1999 students were “veterans” of online learning: 23% reported having taken at least one online course before.

Satisfaction with Student Services

Providing student services (library, bookstore, registration, etc.) is typically a concern for distance learning faculty and administrators, but the very small number of students who lived far from campus made such problems a non-issue. In the survey, students were polled on their preferences for moving certain services online, and 64% said they would prefer to register online (which on-campus students have done for some time), but only 32% seemed inclined to pay tuition and fees by credit card online (22% neutral).

The Technology

As the lifeline for online students, technology support is an important issue. Survey results seemed to indicate that it was adequate; 38% said they had adequate technical support (16% neutral), while 48% did not have difficulty obtaining local help with computer problems. Interestingly, 39% said the question did not apply to them, which would seem to indicate that they had no technical problems..

On the other hand, many students’ free-form comments focused on problems with technology, primarily problems with access. Students commonly demanded “more bandwidth”, more ethernet connections in off-campus housing, and improvements in modem access during high-traffic times (early evening). Conversely, students frequently complimented the quality and speed of ethernet access on campus. Students also requested better advertising and communication of online services and courses -- and more online courses.

Overall Student Evaluations

Overall, students appeared to be highly satisfied with their courses. 92% agreed they would recommend their course to others (63% strongly agreed), and 90% would recommend their instructor (61% strongly). Overall, 93% were satisfied with their course.

Why Did Students Take an Online Course?

For this group of students, most of whom were also residents, the most often-mentioned reasons for taking their course revolved around **convenience**. 90% agreed that they were able to take the course because of the way the course used electronic communication, and 89% agreed that this made it easier to juggle course work with work/home responsibilities.

Student comments on why they took on online course varied but fell into several categories. An online course allowed them:

- the ability to take another course because of crowded class schedules
- the freedom to work where and when they chose
- to avoid bad weather, crowded parking and other problems
- to attend school despite personal disability
- to live and work a greater distance from campus
- to follow their preference for self-directed learning
- to satisfy their curiosity about online courses and “try something different”.

A few students complained that the courses required much more work and time than they had bargained for.

The Online Learning Environment

Students were asked to compare the quality of student-student interaction with that of a traditional class. Although a majority (55%) felt they were less likely to work on assignments with other students, 66% said they had the same or greater likelihood of engaging in discussion with other students. Many results were mixed: 36% said they were more likely to feel isolated from other students, while 34% were neutral and 25% were less likely. The comments seemed to indicate that students (and perhaps faculty) viewed learning as a matter of independent effort for many of these courses and student-student interaction was not a necessary component. Certainly, to be effective, interaction (e.g., discussion or chats) must be designed as part of the class, and some students indicated a preference for online discussions because they provide relative anonymity for shy students and allow time for reflection before offering an opinion. In some courses, participation in discussion was required (i.e., for a grade) as a way of guaranteeing participation, but one student commented that for many of his colleagues participation was “aimed at earning points, not sharing ideas”, and another simply did not want to be forced to participate if he lacked the requisite knowledge. One noted that instructor participation (i.e., as moderator and discussant) in online chats was crucial for process to be successful.

When comparing interaction with their instructor in a traditional course, student reaction was mixed. For example, when asked if they felt isolated from their instructor, the largest group (37.4%) was neutral, but 34.3% were more likely, while 24.6% were less likely to feel such isolation. However, a plurality (39%) thought they were more likely to receive detailed comments from their instructor (22.8% less likely; 34% neutral), and 35.4% were more likely to ask for clarification if they did not understand something (28.7% less likely, 32% neutral). 49% said that, because of the way the course used electronic communication, they felt more comfortable disagreeing with the instructor (21% said not applicable, 29% disagreed).

Student comments showed that under the right circumstances they could “connect” with their online instructor. From reading many of these comments, it would have been difficult to tell whether these were online or traditional classes because the students had clearly established a positive personal relationship with their instructor; on the other hand, one student complained he felt he was “just a number” to his instructor. Clearly, the personality, style and interest of the instructor is the key to successful interaction, whether the class is online or face-to-face.

The ease of instant communication that defines these online courses can increase the day-to-day demands on faculty, and many teachers worry that students might expect them to respond instantly to an unreasonable volume of e-mail. Our poll showed that during the normal work week, 33% of students expected a reply to their message within 0-4 (33.7% within 8-24 hours). However, 67.3% expected a reply with 8-24 hours for a message sent at night (i.e., sometime the next day), while 59.3% expected a reply within 24-72 hours to e-mail sent over the weekend.

Course Design Issues

Students appeared to quite satisfied with the design and implementation of their course. 63.2% agreed that, because of the way their course used the internet, they enjoyed studying for the course; 73.4% said they were better able to understand the course’s ideas and concepts, 78.4% agreed they were more confident they could reach their academic goals, 69.4% said they put more thought into their comments, and 72.9% said they did not have difficulty keeping up with the pace of the course. As noted previously, many students liked the online environment and interaction, but some indicated that certain new methods of interaction (notably the MOO for group interaction and discussion) required some adjustment. Many students liked the idea of being in control of their own pace through the course, notably being able to read and hear lectures more than once. Some comments specifically mentioned the usefulness of being able to encounter complex information in more than one form, such as audio, text and interactive discussion.

More than one student indicated that the self-paced nature of the courses presented a temptation to procrastinate, with the risk of getting hopelessly behind. However, more than one student noted that this same online learning regimen could be viewed as an opportunity to develop self-discipline and time management skills.

Comparing Overall Attitudes

In order to simplify the analysis, scales were created that combined similar question items into more general constructs (e.g., student-student interaction, satisfaction with the technology, etc.), which were then used as variables for comparison. An analysis was performed, using t-tests and the analysis of variance, to see if students in different demographic categories reacted differently. There were no significant differences between students by gender, ethnicity or class standing. Regression analyses were also performed to determine the unique effects of sets of independent variables on major dependent variables, such as overall satisfaction, satisfaction with the technology, professor ratings, and satisfaction with the class. Analysis showed that students tended to react the same regardless of which class they were enrolled, which seemed to justify combining all students into a group.

In general, students were more likely to be satisfied with the technology when they perceived the benefits of online courses, when they rate the professor highly and when they are satisfied with the course overall. Students who rated their professor highly also were satisfied with their assignments, believed they gained from the course, were satisfied with the technology, thought that the technology facilitated student-faculty interaction and were satisfied overall with the class. Finally, overall course satisfaction is higher for those who are more satisfied with their professor, are more satisfied with the technology, and perceive more benefits of using the worldwide web.

Introduction and Methodology

There were 10 totally online courses (one course had two sections) offered in the spring of 1999, with a total enrollment of xxx students (see Table 1, below). The assessment study gathered data from students by means of a single survey administered via the internet during the last week of classes. Students accessed the survey through a URL, just as they would any web page. After being notified by the assessment administrator (the authors), faculty posted the URL on their course web site and/or sent it to students by e-mail. The survey contained 77 multiple choice and Likert-style questions, and four opportunities to enter free-form comments (see Appendix). Response was voluntary, but many faculty offered extra credit for completing the survey following a plea from the assessment administrator; experience has shown that even a small amount of extra credit will significantly increase response rates. Students were asked to enter their name and student ID in order to award them credit, but they were assured that responses would be kept confidential. Responses were monitored closely during the week that students were asked to respond, and faculty were notified every few days about the response rate for each of the classes. The final overall response rate was xx%.

For the first time, questions from the traditional end-of-course course evaluation were included verbatim in this online survey. These results were reported separately and confidentially to departments in a similar manner to the evaluations administered in class.

The survey was written in Whiz Quest, which is part of an online quiz and survey package developed in the College of Agriculture at Virginia Tech. There were no significant problems with the survey process, although several students complained about the length of the survey itself.

Course	Enrollment	% Enrollment Responding	No. of Responses	% of Total Responses
CS 1604 Introduction to the Internet	198	52%	102	19.62%
ENGL 3624 Appalachian Literature	10	100%	10	1.92%
ENGL 3764 Technical Writing	53	87%	47	9.04%
ENT 2004 Insects in Human Society	444	62%	287	55.19%
GEOG 2034 Geography of Global Conflict	19	79%	16	3.08%
GEOG 2134 Geography of the Global Economy	14	71%	10	1.92%
MATH 1114 Elementary Linear Algebra	30	37%	11	2.12%
PSCI 3015 Ancient and Medieval Political Theory	10	100%	10	1.92%
WS 5984 Contemporary Feminist Issues	5	80%	4	.77%
PHIL 1504 Language and Logic		xx%	23	4.42%
Total	xx	xx%	520	100.00%

Analysis primarily consisted of a reporting of descriptive statistics and summaries of students' free-form comments. However, due to the large number of questions, the data was reduced by grouping similar question items into scales, which were then compared with each other. A series of t-tests and analyses of variance were performed to see if there were significant differences between the scales by gender, ethnicity and academic level. In addition, several multiple regression studies were done in order to determine the unique effects of sets of independent variables on major dependent variables, such as overall satisfaction, satisfaction with the technology, professor ratings, and satisfaction with the class. The results are reported in detail in the final section, "Measurement and Comparison of Overall Attitudes."

The Students: Demographic and Background Information

Demographics

In general, students who enrolled in the online courses were similar in background to the general Virginia Tech population, except for a seemingly disproportionate number of males

Class standing

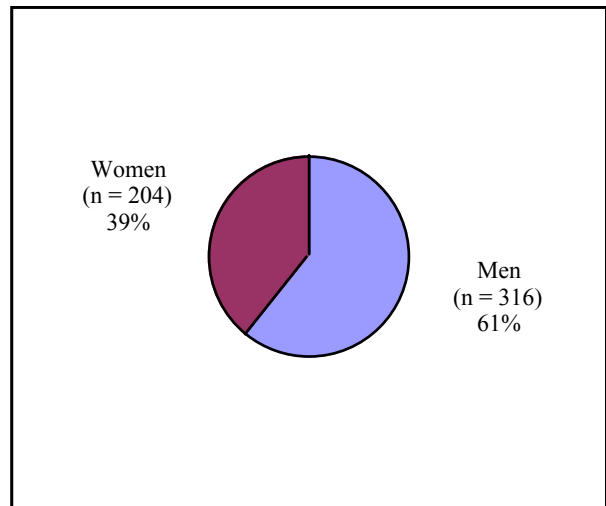
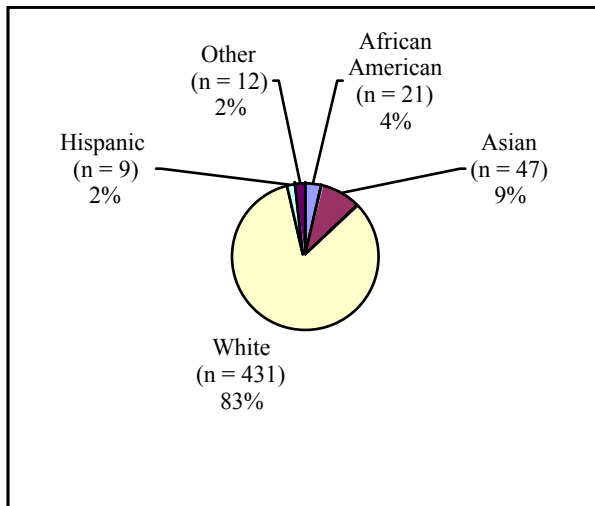
Freshman % (n)	Sophomore % (n)	Junior % (n)	Senior % (n)	Senior + % (n)	Grad % (n)
13.5% (70)	24.2% (126)	25.6% (133)	28.7% (149)	5.77% (30)	2.31% (12)

Ethnicity

African American % (n)	Asian % (n)	White % (n)	Hispanic % (n)	Other % (n)
4.04% (21)	9.04% (47)	82.9% (431)	1.73% (9)	2.31% (12)

Gender

Male % (n)	Female % (n)
60.8% (316)	39.2% (204)



Where did students live when they took the course?

On campus	0-5 miles	6-10miles	11-20miles	21-50 miles	51-100 miles	100-250 miles	200+ miles
32.9% (171)	56.7% (295)	2.88% (15)	1.54% (8)	.77% (4)	.58% (3)	2.31% (12)	2.31% (12)

Unlike many distance learning courses, very few students in this group lived far from campus. We can speculate that this will change in the years to come and when classes are offered in the summer.

Where did they go online to take the course?

At Home	Place of employment	Computer lab on campus	Remote campus	Other
91.3% (475)	2.12% (11)	5.38% (28)	.19% (1)	.96% (5)

How did they connect?

Campus ethernet	Modem to VT modem pool	Modem to ISP	Off-campus ethernet	Do not know
34.8% (181)	44.4% (231)	10.8% (56)	8.08% (42)	1.92% (10)

Note that the vast majority of students used their own computer in their dorm room or apartment to take the course. Only a few used campus computer labs as their primary method for access. Counting the fortunate 8% who had Ethernet in their off-campus apartments, almost equal numbers had access to Ethernet as those who dialed in to the Virginia Tech modem pool.

How many online courses had these students taken previously?

None	1	2	3	5
77.3% (402)	16.2% (84)	5.0% (26)	1.35% (7)	.19% (1)

Considering that totally online courses have only recently been introduced at Virginia Tech, a surprisingly large number of students were already experienced in taking courses in this mode. We can probably expect this number of “veterans” to increase in the coming years.

Why did students enroll in this course?

Required course in major field	Elective to fulfill a requirement	Free elective outside major field	Required course outside major field	Free elective in major field	n/a
6.92% (36)	40.4% (210)	35.6% (185)	12.3% (64)	4.42% (23)	.38% (2)

For a full discussion of why these students took an online course, see section on “Overall Student Evaluations”

Satisfaction with Student Services

A potential concern for many administrators is the adequacy of student support for students who take on-line courses, especially for students who live a considerable distance from campus. However, the vast majority of students who took online courses in the spring of 1999 at Virginia Tech were also enrolled in traditional courses and so were on campus to take advantage of necessary student services such as the library and the bookstore. Nevertheless, it is reassuring to find that only about 3% of students were dissatisfied with their access to student services, 63% considered them about the same and 34% – for whatever reason -- said they had *better* access.

	Much Worse	Somewhat Worse	About the same	Somewhat Better	Much Better
Please rate your overall access to student services (library, bookstore, student union, etc.)	1.15%	2.12%	62.7%	21.5%	12.5%

Perceived Access to Services

Student opinion about their access to specific student services was also reassuring. This response is gratifying because some classes did require some “hands-on” experiences. For example, the largest course (Entomology 2004, “Insects and Human Society”) required a traditional laboratory project in which students raised a milkweed bug from egg to maturity and kept a journal to document their results.

In this course, I have had adequate access to...:

	Strong disagree	Disagree	Neutral	Agree	Strong Agree	n/a
library resources	1.16%	5.03%	15.3%	18.6%	19.1%	40.8%
laboratory facilities	2.53%	3.89%	11.5%	10.7%	10.7%	60.7%
studio facilities	2.53%	3.51%	11.7%	6.24%	5.46%	70.6%
bursar's/student accounts office	2.14%	3.88%	9.71%	10.7%	10.3%	63.3%
registrar's office	1.76%	3.13%	10.8%	11.9%	10.6%	61.8%
bookstore	2.15%	2.34%	11.7%	17.4%	23.0%	43.4%

Receptiveness to Future Online Services

We also polled students on their receptiveness to online registration and fee payment, which are enhancements that are being considered by the administration. Most students were in favor of online registration, probably because registration has been computerized for quite some time and they have had considerable experience with it. However, students -- like the general population -- had mixed reactions regarding the idea of electronic commerce: 34.6% were receptive to using their credit card to pay fees online, but almost an equal number (31.6%) were wary of this innovation.

If possible, I would prefer to...

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	n/a
... register for on-line courses directly on the Virginia Tech web site	2.54%	6.84%	20.9%	23.0%	41.4%	5.27%
... pay tuition and fees for on-line courses by credit card on the Virginia Tech web site.	19.2%	12.4%	22.3%	11.4%	20.3%	14.3%

How well did the Technology work?

A realistic concern for administrators and faculty is the availability of technical support for students, which can rightfully be considered an essential issue for courses that are based totally on the Internet. A reliable computer, robust software and a working network connection are the students' and instructor's lifeline – essentially the only means through which students can study and participate in the course, and by which instructors can communicate with their students. Except for busy modem connections during high-traffic hours (see comments, below), technical problems did not appear to be much of an issue. For example, only 6% of students were dissatisfied, while over 40% answered that the topic of technical support did not even apply to them:

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	n/a
28. I have had adequate technical support when I had questions or problems with the technology used for this course.	1.17%	5.06%	15.8%	20.2%	17.5%	40.3%

When the question was asked in another part of the survey, the results were similar:

	Strongly disagree	Disagree	Agree	Strongly Agree	n/a
24. When I had computer problems, it was difficult to obtain help in my area (locally)	26.9% (139)	21.1% (109)	8.90% (46)	4.06% (21)	39.1% (202)

More to the point, did students think the technology worked well for the purpose of online learning? In other words, was it appropriate and useful? Responses to questions on this topic were overwhelmingly positive:

	Strongly disagree	Disagree	Agree	Strongly Agree	n/a
19. The technology used in this course did not work in the way it was supposed to.	53.9% (278)	31.6% (163)	8.91% (46)	5.23% (27)	.39% (2)
20. The technology used in this course was appropriate for performing the tasks required.	2.51% (13)	2.90% (15)	37.6% (195)	56.4% (292)	.58% (3)
21. The procedure for taking exams and/or quizzes in this course caused problems for me.	49.5% (257)	26.4% (137)	8.86% (46)	5.59% (29)	9.63% (50)
23. The instructor was knowledgeable about the technology used in this course.	1.74% (9)	4.06% (21)	32.3% (167)	54.9% (284)	6.96% (36)

Similarly, from other parts of the survey:

Because of the way this course uses the Internet/World Wide Web:	Strongly disagree	Disagree	Agree	Strongly Agree	n/a
45 I miss important information because the technology doesn't work correctly.	49.1% (252)	29.6% (152)	12.5% (64)	3.51% (18)	5.26% (27)

Because of the way this course used Electronic Communication (e-mail and/or the Internet/Worldwide Web):	Strongly disagree	Disagree	Agree	Strongly Agree	n/a
69 I spent too much time waiting to connect to the Virginia Tech computer network or the course website.	45.9% (234)	25.9% (132)	16.9% (86)	5.69% (29)	5.69% (29)
74 I was at a disadvantage, because I did not possess adequate computer skills.	67.5% (342)	13.2% (67)	10.5% (53)	2.56% (13)	6.31% (32)

Student free-form Comments

In the survey, students were asked to enter free-form comments in four different places. Three questions asked general opinions about the educational experience: overall satisfaction with the course, why they took an online course, and final comments about the course or the technology. Students' responses to these questions were lengthy and selected comments are reported throughout the rest of this report.

The fourth question was more specific: "What one change could Virginia Tech do to make computer network resources more accessible?" This question triggered a number of suggestions, most of which related to improving the speed and accessibility of the network. Typical requests were for:

- More bandwidth
- More off-campus ethernet connections (in private apartments)
- Improved access through the modem pool during high-traffic times (by far the largest number of complaints concerned busy signals in the early evening);

- Removal of the time limit for individual connections.

Here is a typical comment:

"Those of us who use the modem pool have a difficult time connecting at night. There is a 4 hour period at night when sometimes I can't even connect. This is ridiculous because we pay for this and it is the only time I can do work."

On the other hand, students who had on-campus or Ethernet access were generally quite complimentary. These comments are typical:

"I don't think there is anything that Tech can do to improve the network, short of putting T3 lines all around campus. The network on campus is usually quite fast and accessible"

"Being on the LAN here I had no problems and no complaints about the network availability. I was impressed: I never found the server down, and the software always worked."

This student even attributed some of her personal success to the robust technology:

I would highly recommend this class to anyone, as it was one of the best classes that I took this semester! I also must say though, that I think a huge part of my success in this course originates from outside of myself and has to do with the technology of this course. **Having ethernet and your own personal computer is crucial to doing well**, ethernet never seems to fail and you are able to work whenever you want to, privately. I wouldn't recommend someone to take this course without these things -- otherwise just getting onto the computer could be more trouble than it's worth!!" [author emphasis]

Surprisingly, only two students requested more computer labs on campus. One said:

"More public computer labs/facilities on campus. Same thing as the math emporium, but in more locations on campus. That would be an extremely useful resource."

There were several requests that Virginia Tech better advertise or communicate the availability of online courses. A few students suggested either a welcome e-mail, a newsletter or another form of communication to describe the availability of resources. Several students simply asked for more online courses:

"As an external student I paid you good money to take this course and would want to take other on related topics, but there are no follow up courses available online (i.e. CS1604 is the only computer studies course all the others are English, geography etc. - more CS courses please). You're making it difficult for me to give you my \$, sort it out."

This person's comment reflected an inability to find much to complain about:

"Not much. There are computer labs on campus, and modem pool service, and access to all databases as a Tech affiliate through your PID. My one suggestion would be to have more publicity on the resources and services available that someone else that doesn't work for the cc [computing center] might not know."

Overall Student Evaluations

Students were overwhelmingly positive in their evaluation of online courses, and especially in regard to their specific course and their instructor. Note that by far the largest groups answered in the most positive category, i.e., “Strongly Agree”:

	Strongly disagree	Disagree	Agree	Strongly Agree	n/a
25. I would recommend this on-line course to others.	2.71% (12)	4.84% (25)	29.0% (150)	62.9% (325)	.58% (3)
26. I would recommend this instructor to others who are interested in taking an on-line course.	3.11% (16)	4.47% (23)	28.5 (147)%	61.0% (314)	2.91% (15)
27. I would recommend that others take a course that is entirely taught on the Internet/ World Wide Web.	2.72% (14)	7.39% (38)	36.6% (188)	52.9% (272)	.39% (2)

	Very Dissatisfied	Dissatisfied	Satisfied	Very Satisfied
38. Overall, regarding this course, I have been:	2.31% (14)	5.00% (26)	58.1% (302)	34.6% (180)

Students’ feelings about the experience varied across the spectrum, but most were quite positive. Some were positively ecstatic:

"I loved it I loved it I loved it!! I've been very impressed! And I have told so many people how great the class is and they should take it!"

"I felt that the online experience that I experienced in this course was awesome. I loved it and I learned a great deal more since I was able to learn at my own pace. Email was very efficient and the use of the internet as a learning aid was invaluable."

"This was a great course. I plan on taking more online classes because of the success I had with this class. Using the technology of the internet and my computer I learned more than just the material we covered, but also learned a little more about computer technology. Every course should be taught online. The advantages really out weigh the disadvantages. Online courses are safe, good for the environment and help spread enlightenment and common good to people all over the world. Schools should really look into setting up complete degree programs online."

Some students balanced their enthusiasm with reservations:

"This is the first on-line course that I have taken, and I do not feel as though I've learned as much as I would have in an actual class... but as far as the convenience of an on-line class, that was great. It was easy to work it around my schedule."

The following comment brings up several issues that will be explored later:

"This was the first online course for me and I believe that it will be the last...not because it wasn't well done but because I enjoy the human contact and because it takes much longer to wait for the lessons to come up rather than listening to them in class. Though online classes do have great advantages I personally do not like to sit in front of the computer for hours straight. This also makes me a bit more of a procrastinator. "

Why did students take an online course?

Far and away, the most often-mentioned reason for taking one of these courses was convenience. For example, on- or near-campus students (90% of our responders) could take courses to circumvent conflicts in their schedule. Similarly, students who could not move to Blacksburg were able to continue their education. In addition, the asynchronous nature of online courses enables busy and working students to juggle conflicting roles and responsibilities:

Because of the way this course used Electronic Communication (e-mail and/or the Internet/ Worldwide Web):	Strongly disagree	Disagree	Agree	Strongly Agree	n/a
62 I was able to take this course.	2.54% (13)	4.10% (21)	33.0% (169)	56.6% (290)	3.71% (19)
70 I was better able to juggle my course work with my work and/or home responsibilities.	2.76% (14)	7.10% (36)	30.2% (153)	58.6% (297)	1.38% (7)
71 I put in less time traveling to and from the campus/course delivery site.	3.56% (18)	6.52% (33)	25.9% (131)	57.5% (291)	6.52% (33)

Student Comments

The following comments are representative and an attempt has been made to group them in useful categories:

Help with crowded schedules (“time-shifting”)

"This course accomplished exactly what I hoped it would. It allowed me to do the work when I had time, and freed up 3 hours a week that I otherwise would not have had."

"I usually take a lot of hours every semester and with more hours comes more conflicts as far as class times go. This class allowed me the convenience of scheduling my own time to use for this class instead of having to work it into an already overloaded course load. "

"This type of course (online) allows so much extra flexibility in a college student's schedule. The ability to complete assignments at any time, and from anywhere allows the student to be mobile. I intend to enroll in two more online courses this semester during the summer to complete my remaining 12 credits."

"This course was an easy way to fulfill a core requirement. I could give it the time I needed as my schedule allowed instead of arranging my schedule around the class."

"It allowed me to take a class while not interfering with the schedule arrangement of my more important in-major courses."

I really wanted to take this version of the class is because I manage the women's basketball team here at Tech, and I miss a lot of classes (especially second semester) going away to games, and such, and this was a perfect way to never have to miss a class, and I could arrange everything according to my own schedule, which is crucial when you have a schedule as tight as mine can get. "

"I am working to pay for my tuition; this class offers the kind of flexibility that fits nicely into my busy work schedule. I can add to on-line class discussions at times that suit me best. Also, getting to class on time is never an issue! (I have been known to be late for lectures, but not in this class!)"

Personal work and lifestyle preferences

"I feel like I learned a lot and I loved the fact that I didn't have to leave my room."

"The main reason that I took this course was because I wanted to carry another credit, but I didn't want to be running all over campus. As it turns out, working independently really was good for me, and I think that I learned a lot, even though I was just sitting in my room."

"Convenience of a self-paced course where I can work independently at any time of the day. As a course about the Internet, this course required a lot of 'hands-on' activities, so it makes sense for it to be online."

"I enjoy the freedom of working on my own time schedule, and the convenience of working from my room."

"I chose to take this course because I was able to pick when I was comfortable listening to a lecture. When I was awake and **ready to learn**." [emphasis by the author]

"...I got sick of being classrooms with 600 other students."

Weather, parking and other problems

"I have a large family and need to be at home as much as possible."

"It saved me around 2 hours of walking time per week. I could just get out of bed and log-on to the internet."

"I don't have to get out with the cold weather. I can get on-line whenever I feel like to."

"I took an online course because I hated walking in the rain last spring..."

"I suffer from panic disorder and am afraid to go into classrooms."

Distance from campus

"1. I live in a remote (-ish) part of Africa - the nearest bookstore is 500km away. So online was the only option. 2. I am working - online gives me the flexibility to study + (more importantly) take the quizzes when I have the time (weekly quizzes were very helpful in helping me to structure my studying)."

"I chose to take this online course b/c I am finishing up my degree at VT while working and taking other classes in Richmond, VA."

"[In this course] Online resources were not utilized to their fullest. The course involved optional meetings at a Blacksburg location which is somewhat inappropriate for the nature of a 100% online course."

"I was able to work full time in Roanoke without missing a lecture or a hour of work."

Preference for self-directed learning

"I have been very satisfied with the course. I feel that I was able to study at my own pace and still learn what I needed to. I did not have to worry about missing a lecture or getting all the notes because they were online. This made it so that I could listen to lecture more than once to make sure I heard everything."

"Online courses have worked much better for me, self study has always been a preference for me."

"The course was a way to test to see how I could work on an independent basis..."

Urge to try something different"

"I wanted to try the on-line thing just to get a feel for how it worked and how I worked with it. It was definitely worth my time. "

"I just thought it would be nice to take a class online for a change. I thought it would be a neat experience that would vary from the usual 'sit in class and listen to a lecture' routine."

"I have always heard of online courses, however, I never got the opportunity to take one. Now, I would recommend taking an online course to anyone, although, he/she must keep in mind that it requires good time management skills to keep up with this course or any online course for that matter."

"I don't like going to class. I could learn at my own rate, and I wanted to try a completely on-line course."

However, learning always requires time and work, and these students discovered that convenience does not mean less work or time spent overall:

"I originally took this class because I was taking a heavy class load and wanted the freedom to budget my time. I thought that it would just consist of reading and submitting papers... I didn't know about the discussion aspect. This ended up making the class demand as much time out of my daily schedule as if I had taken it in person, so in that regard, I wish I had just taken it on campus instead of online."

I took this course because I had a busy schedule and thought this would save time. Unfortunately my schedule kept me from keeping up with the courses.... I also think that the instructors should be a little more sensitive to the fact that people have more important things to do than take a bug quiz 50 times just to get 100%. Overall the course was great -- I took it to save time, but it ended up taking up too much time!"

"I had trouble keeping up with the lectures. Some lecture sets had 40 slides and there were sometimes several lecture sets per week. I tried to set aside a time like a normal class period to get it done and it often took more than that."

The On-line Learning Environment: Interaction

Student-student interaction:

Student to student interaction and discussion is a vital component of traditional education, and is one of the Seven Principles of Good Practice in Undergraduate Education (see Chickering and Gamson, 1987; Chickering and Ehrmann, 1996). Certainly this aspect of instruction would seem to be most likely to suffer in a situation in which students never meet in the same physical space. We asked students to compare their online course to a similar traditional class, and many students confirmed these negative predictions, but a surprising number were neutral or positive:

Think about a similar course you have taken that relied primarily on face-to-face discussions for communicating. Compare that course to this course.

Because of the way this course used Electronic Communication (e-mail and/or the Internet/Worldwide Web), how likely were you to:	Much less likely	Less likely	About the same, or neutral	More likely	Much more likely	n/a
Q53 discuss the ideas and concepts taught in this course with other students.	13.3% (68)	15.3% (78)	33.5% (171)	20.4% (104)	12.5% (64)	5.09% (26)
Q54 work on assignments with other students.	30.8% (157)	24.3% (124)	23.9% (122)	6.86% (35)	4.90% (25)	9.22% (47)
Q55 feel isolated from other students.	11.8% (60)	13.2% (67)	34.4% (175)	19.6% (100)	15.9% (81)	5.11% (26)
Q56 actively participate in scheduled discussions about the course material (online compared with a face-to-face discussion in a classroom).	17.9% (91)	15.7% (80)	31.8% (162)	14.3% (73)	12.4% (63)	7.86% (40)

Although 66% said they had the same or greater likelihood of engaging in discussion with other students, a majority (55%) confirmed that they were less likely to work on assignments with other students (24% neutral; 9% said did not apply). Also, 36% said they were more likely to feel isolated from other students, compared to 25% who were less likely (34% neutral). It is possible that some students and faculty did not feel that extensive interaction was a necessary component for these elective courses, in which the traditional sections were typically taught by lecture. In many courses, learning is seen as a matter of individual effort and not dependent on others. One student expressed his ambivalence this way:

I didn't feel that this course offered any real chance to 'get to know' your professor, or to 'get to know' your classmates, and therefore I didn't really talk to either at all. When I did talk to them though, it was smooth and quick and everything went fine -- **I didn't feel more or less comfortable talking to my professor in this course in comparison to any other -- what I want to explain is that the fact that I didn't get to know them is not necessarily a positive, but it is definitely not a negative either. The whole reason that I didn't get to know anyone else from the class, or my professor for that matter, is because I didn't need to, so I didn't make any effort to.** However, at one point in the year I became sick, and missed the date that I had to turn

in my journal. At that point in time it became necessary to talk to someone about what was going on and I wrote an e-mail like with any other teacher and she responded quickly and everything was taken care of just like any other course. **So, when problems arose, contact could be made and problems taken care of just like any other course.**" [emphasis by the author]

Another student echoed this opinion but returns to the main point, convenience:

"I took one online course last summer, and enjoyed it. I never got to meet anyone, but I like the way we gathered once a week to discuss what we'd read. It's also very convenient for people who are away from campus, but still want to take a class."

Some students seem to prefer the kind of interaction available in online classes. For example, it is a well-known finding that shy or reflective students who do not speak up in a traditional classroom will often make significant contributions when offered the relative anonymity and safety of computer-mediated communication:

"I felt more comfortable making comments to the class since the class was taught over the internet and not in a classroom. If I had something to say, I never held it back, whereas I would have if it were in a classroom."

"I like to be able to go over a discussion at my computer and take time to compose a response, because I feel the discussion on the material is more well thought out and participated-in, when it is online."

"I really enjoyed this course. Sometimes I tend to be quiet in class even when I want to discuss something or know the answer. This [online discussion] allows me to be outspoken without anyone really putting a face to my name and I have the convenience to go online whenever I want, except for the scheduled chats."

One reason for a lack of interaction might be a lack of *required* discussion in some of the classes; only a minority (27%) reported being more likely to participate in scheduled discussions as part of their course. Required (i.e., for a grade) online discussions have been found to overcome student isolation and increase student-to-student interaction in online courses. Students in classes without online discussions (i.e., chats) pointed this out:

"I enjoyed the class but wish that there were more opportunities for interaction."

"I enjoyed the class but would like for future classes to incorporate more interaction among students. Maybe realtime chats or class get-togethers."

However, there are drawbacks. If discussion is required, then some students may participate only for the grade:

"Communication was minimal. All conversation seemed to be aimed at earning points, not sharing ideas. Different format needed."

"I was not as happy as I expected to be in this course. It is not because it is online, I've had online courses before. I think it was because I felt intimidated in the REQUIRED class chatroom. Sometimes I would go and not post, not because I hadn't read, but rather because I felt like everyone else was showing off knowledge that they may have had previously, or because they were more well-read in the area. In a real classroom, if I felt intimidated in this way I would not speak, but because I was attending class I would not be penalized. **With this class, I will be penalized.**" [emphasis by the author]

This student points out the role of the instructor as moderator and facilitator in a class discussion, and how it might be more crucial when the discussion is online – and required:

"The chat line would have been much more helpful if the discussion was directed by the instructor. There was a great deal of free-lancing and stream of consciousness writing on the chat line, so for me it was relatively useless. Since it was a required part of the grade I felt compelled to make comments, although I felt that some were of little value because I did not know the intended direction of the discussion."

Student-faculty interaction

Several questions asked student opinion regarding their interaction with their instructor. Again, the Seven Principles Chickering and Gamson, 1987; Chickering and Ehrmann, 1996) emphasize that quality interaction with a teacher is a key factor for student success in higher education.

*Think about a similar course you have taken that **relied primarily on face-to-face discussions** for communicating. Compare that course to this course.*

Because of the way this course used Electronic Communication (e-mail and/or the Internet/Worldwide Web), how likely were you to:	Much less likely	Less likely	Neutral/about the same	More likely	Much more likely	n/a
Q51 ask for clarification when you didn't understand something.	11.9% (61)	16.8% (86)	32.0% (164)	16.8% (86)	18.6% (95)	3.91% (20)
Q57 receive detailed comments on assignments from the instructor.	12.6% (64)	10.2% (52)	33.9% (172)	21.9% (111)	17.1% (87)	4.33% (22)
Q58 receive comments from the instructor on assignments quickly .	7.66% (39)	9.63% (49)	35.8% (182)	25.1% (128)	17.7% (90)	4.13% (21)
Q59 discuss your academic goals and/or career plans with the instructor.	33.8% (171)	14.8% (75)	30.2% (153)	6.52% (33)	4.15% (21)	10.5% (53)
Q60 feel isolated from the instructor.	8.86% (45)	15.7% (80)	37.4% (190)	19.3% (98)	15.0% (76)	3.74% (19)

When asked to compare their online course to a similar traditional course, most students were neutral, but slightly more thought they were more likely to receive detailed comments from their online instructor (39% vs 22.8%; 34% neutral), and even more (42.8% vs 17.3%) thought they were more likely to receive comments quickly (35.8% neutral). Furthermore, 35.4% said they were more likely to ask for clarification when they did not understand something than those who were less likely (28.7%; 32% neutral).

On the negative side, only 24.6% said they were less likely to feel isolated from their instructor, versus 34.3% who said they were more likely to feel such isolation (37.4% neutral). Similarly, 48.6% said they were less likely to discuss their academic goals with their instructor (33.8% said *much* less likely, compared to 30.2% neutral).

The following two questions were similar but did not specifically ask students to compare their course with a traditional course:

Because of the way this course used Electronic Communication (e-mail and/or the Internet/ Worldwide Web):	Strongly disagree	Disagree	Agree	Strongly Agree	n/a
72.I did not receive responses to my comments.	55.0% (280)	24.0% (122)	9.82% (50)	1.57% (8)	9.63% (49)
73 I felt more comfortable disagreeing with the instructor.	8.84% (45)	20.8% (106)	35.6% (181)	13.6% (69)	21.2% (108)

Students seemed to be satisfied that electronic communication was an enabling factor in their interaction with their instructor: As the table shows, 79% said that they did receive responses because of the way the course used electronic communications (both e-mail and the Internet), while only 11% said they did not (10% said the question did not apply).

Student comments show that, under the right circumstances, students can “connect” with their instructors on-line almost as well as they can in person. It is probably safe to say that most good teachers share similar qualities -- such as responsiveness, caring and communication -- no matter what the medium:

"Dr. Cook is an incredible teacher. He has the ability to promote thought and discussions. He took the time to respond to every person's thoughts and comments. He was willing to work with students. His goal is to help students succeed and learn the material and he spent much of his time trying to achieve that."

"This was one of the best classes I have taken at Virginia Tech, as I really think I have enhanced my technical writing skills. I learned a lot of basic writing fundamentals I wish I had learned prior to my senior year of college. I felt I received a lot of individual attention and instruction, even though this was an on-line class and I never stepped foot in an actual classroom. Dr. Cook offered detailed feedback, not only on our individual writing assignments, but in response to class discussion assignments as well. **I have had more professor-student interaction in this class than I have had in many traditional classes.**" [emphasis by the author]

"The class went well online because Prof Toal was always quick to respond to any web chat comments and he returned emails very quickly. I am somewhat disappointed that I did not get to hear him lecture because he seems very knowledgeable on the subject matter and I am sure his lectures would have been very interesting and beneficial."

However, the quality and quantity of interaction is in the eye of the beholder. These two comments are from students who had the same class and instructor:

"I believe that the grades weren't assigned fairly. I would have liked a little more teacher-student interaction"

"I have learned a great amount of information about this course. The instructor was very knowledgeable about the topic and readily participated in online discussions with us. It was an excellent course!!"

On the downside, some students did not “connect” and definitely missed the type of interaction and implied discipline that comes with the physical presence of an instructor:

"I felt very uncomfortable discussing anything with the instructor. I am just a number to him, he knows nothing about me, and vice versa. It made it difficult to feel that this was a fair course."

"Though it defeats the purpose of online classrooms, I think it is a good idea to have a real class for students held once a week so students who are more comfortable communicating with people, and not machines, can ask questions or at least communicate with other students/professors."

"[This] was a great class to have on-line. Much of the information is easy to understand and you can read along at your own pace. However, I definitely DO NOT recommend placing many courses on line. There is no interaction between students and professors, and people will fall behind in their work."

On-line communications: the pressure on faculty

The matter of responding to student queries can be a difficult and sensitive issue, because some instructors of online courses can rightfully feel overwhelmed with the volume of e-mail they receive from students. They also might resent demands from students who, working on their own personal timetable, expect immediate responses at all hours of the night or over the weekend. For this reason, we polled students as to their opinion of the speed with which their instructor should respond to their e-mail, according to when the student sent the note:

When you send e-mail to your instructor/T.A. [at the times listed below], they should respond:	Within 0-2 hours	Within 2-4 hours	Within 4-8 hours	Within 8-24 hours	Within 24-72 hours	n
...during normal work week	12.8% (66)	19.8% (102)	25.4% (131)	33.7% (174)	3.49% (18)	4.8 (2)
...at night	2.73% (14)	4.48% (23)	10.5% (54)	67.3% (345)	7.99% (41)	7.0 (3)
...over the weekend	.97% (5)	3.31% (17)	4.09% (21)	25.0% (128)	59.3% (304)	7.4 (3)

If their query was made during the “normal work week”, students’ notion of a timely response seemed to be evenly spread across the spectrum. However, most students seemed to allow for more time in responding if the query were made outside of the normal workday. For example, 67% expected a response within 8-24 hours if they sent a note at night, while 59% would allow 24-72 hours if they sent a note over the weekend.

The On-line environment: Course Design Issues

A myriad of issues confront faculty and administrators designing online classes and who are transforming traditional courses for delivery on the Worldwide web. It is probably safe to say that despite the rapid growth of the Internet, we are still in an experimental stage of development. Nevertheless, students were generally positive in their evaluation of the design and administration of these classes:

	Strongly disagree	Disagree	Agree	Strongly Agree	n/a
21. The procedure for taking exams and/or quizzes in this course caused problems for me.	49.5% (257)	26.4% (137)	8.86% (46)	5.59% (29)	9.63% (50)
22. I had difficulty keeping up with the pace of the course.	45.2% (234)	31.7% (164)	16.6% (86)	6.37% (33)	.19% (1)

Because of the way this course uses the Internet/World Wide Web :	Strongly disagree	Disagree	Agree	Strongly Agree	n/a
44 I am more confident that I can reach my academic goals.	3.31% (17)	10.5% (54)	45.1% (232)	33.3% (171)	7.78% (40)
46 I am better able to understand the ideas and concepts taught in this course.	4.47% (23)	18.8% (97)	49.9% (257)	23.5% (121)	3.30% (17)
47 I enjoy studying for this course.	11.8% (61)	22.5% (116)	43.6% (225)	19.6% (101)	2.52% (13)
49 I am acquiring skills that will be useful in my chosen profession.	20.1% (104)	21.1% (109)	34.0% (176)	19.3% (100)	5.42% (28)
50. I had difficulty keeping up with the pace of the course (readings, assignments, projects).	41.9% (216)	31.0% (160)	19.8% (102)	6.20% (32)	1.16% (6)

Because of the way this course used Electronic Communication (e-mail and/or the Internet/Worldwide Web):	Strongly disagree	Disagree	Agree	Strongly Agree	n/a
63 I put more thought into my comments.	7.24% (37)	19.4% (99)	43.8% (224)	25.6% (131)	3.91% (20)
64 I spent more time studying.	15.3% (78)	38.8% (198)	33.1% (169)	11.2% (57)	1.57% (8)
68 I wasted too much time communicating with others on topics that are not directly related to my course work.	41.0% (209)	25.5% (130)	16.5% (84)	2.16% (11)	14.9% (6)

As these results show, students appeared to be quite enthusiastic about their courses and learning online. As the table above shows, 63.2% agreed that, because of the way their course used the Internet/Worldwide Web, they enjoyed studying for their course; 73.4% said they were better able to understand the ideas and concepts from the course, and 78.4% agreed that they were more confident that they could reach their academic goals. 69.4% said they put more thought into their comments because of the way the course

used electronic communication, yet 72.9% said they did not have difficulty keeping up with the pace of their online course. Similarly, 66.5% (41% strongly) did **not** think they wasted too much time communicating with others on irrelevant subjects.

On the other hand, students were somewhat ambivalent when asked if the way the course used the Internet was helping them acquire skills useful in their future profession (41.1% agreed, 53.3% disagreed).

These students' spontaneous remarks about the online environment reflect their reaction to learning methods that were new and different to them:

"It was definitely different. It was also quite weird and hard at first. I was so lost at first but eventually got the hang of the MOO's. They were sometimes a bit confusing and hard to keep up with because they are so fast paced and everyone is writing at once"

"I liked the course, but had difficulty keeping up with the MOOs. Everything flies by so quickly that its hard to actually speak up, and its also difficult to get into great depth. So many people throwing out their ideas all at once, makes it dificult to follow a single train of thought for very long. Not sure what the best opinion is. Bulletin boards where you were required to add 2-5 posts a week could work, but it loses the dynamic aspect, and requires that you keep checking back to see if anyone has added anything you want to answer, but it does allow you to take your time, and fully express your ideas."

"I love the online learning environment. I wish Tech offered a lot more classes that were online"

The use of multimedia in the online environment demonstrates a key principle of instructional design, that giving students the opportunity to encounter complex information in more than one form – *and under their own control* – is useful in increasing understanding:

"It is an excellent resource to have all of the class information, material, lectures, etc. on the web. I found myself learning much more after viewing/reading/hearing things several times over. I am comparing this to the standard way of going to a class and getting the lecture ONCE."

"I feel that the material presented in this course was presented in a fair and easy to understand way. Many textbooks are extremely difficult to follow, however, when there was something that I found difficult to understand in the lecture notes that were posted, the audio lectures usually more than covered any questions that I had, and if they didn't, there was always the discussion forum, where you can post any question that you like and it will be answered for you there."

"This course was very informing. It is taught in a manner that presents the material to the student in a fun entertaining way. The man behind the voice [i.e., in Realaudio lectures] is very knowledgeable of the subject and relates material to the students so they can identify with it. Well done. "

"I am easily getting an A in this class, while my friends are taking the on campus version, and they are studying the same things and doing poorly."

"The C-D was wonderful as a supplement to the text. The interactive nature of the C-D gave an almost classroom type of experience."

"The supplementary CD-Rom in this course was extremely helpful and key for me to understanding some of the harder parts of logic."

While some students felt that the online, self-paced environment was a recipe for disaster and procrastination, others looked upon it as a worthwhile challenge to exercise their personal discipline and time management skills:

"It was great for this course and my needs but I don't think that all courses should be taught by a computer and I think that a student should only be able to take up to 3 online classes a semester - otherwise he or she may fall far behind"

"I definitely recommend taking an online course to anyone. Working at your own pace is great and not only do you learn the material within the course, you also learn a lot about time management and setting goals for yourself. It really was a good experience."

"This course was very fair, but unless you are self disciplined it is very easy to fall behind. And once you are behind, it is difficult to catch up."

"It's easy to get behind. Having access to lectures (Powerpoint) causes slack note-taking."

Measurement and Comparison of Overall Attitudes

A common problem with long surveys, such as this one, is the sheer volume of information that results. Frequently, several different questions ask about different aspects of the same general opinion or feeling. In the interest of clarity and simplicity, it is useful to group similar question items into a more general, overarching construct.

Scales

To this end, and to provide a wider perspective on the results, similar items in this survey were grouped into *scales*. These scales were then compared to each other in order to uncover underlying relationships and influences. Creating scales has two main advantages: (1) they limit the number of analyses needed; and (2) they more fully tap the construct underlying a group of similar items. For example, rather than comparing overall course satisfaction with each of the ten questions that ask about different aspects of student-student interaction, one can compare course satisfaction with one overall score on student-student interaction. Doing so also moves the results to a more general level: rather than saying that students who work on assignments together are more satisfied with the course, then making another assertion about the next correlation and so on, one can say in general that increased student-student interaction leads to increased satisfaction.

To create scales, items that appeared to tap the same construct were provisionally grouped together. Because not all items were scored on the same metric, all items within a group were given the same scale (e.g., a 1-5 scale was transformed to a 1-4 scale). Once on the same metric, each group of items was subjected to a principle components analysis to identify those items that most strongly "hung together" (i.e., that most clearly tapped a single underlying construct). Table B1 shows the items and associated component loadings for the 8 scales to emerge from these analyses. The mean was taken of each group of items to represent the scale. Only those students who answered every question within a scale were included in the final measure.

In addition to these eight combined scales, *overall access to university services* and *overall satisfaction with the courses* were left as single item measures. The 70-item questionnaire, then, was distilled down to 10 variables (see Table B1 for a list of these variables and their component items) reflecting student opinion and satisfaction:

- Professor rating
- Satisfaction with assignments
- Perceived gains (e.g., in knowledge, skills) from course
- Satisfaction with the technology
- Benefits of the WWW
- Student-student interaction
- Student-Faculty interaction
- Benefits of the on-line course (e.g., convenience)
- Access to university services (single item/question)
- Overall satisfaction with the course (single item/question)

Demographic Comparisons

Gender

Table C1 shows the results of t-tests performed on these 10 variables. There were only two significant differences: Women ($M = 3.46$) were more satisfied with the technology than were men ($M = 3.33$); and women ($M = 3.44$) perceived more benefits of on-line courses than did men ($M = 3.32$). These differences, however, were small and of no practical significance. Overall, then, we can conclude that:

- men and women viewed their classes in the same way.

Racial/Ethnic Background

Table C2 shows the results of general linear model (GLM) analyses of variance (ANOVAs) on ethnic/racial differences. As seen in the table, there were only two significant differences: African Americans ($M = 3.38$) were, overall, more satisfied than were those who classified themselves as "other" ($M = 2.95$); and Asians ($M = 3.62$) reported having greater overall access to services than did African Americans ($M = 3.00$). Because these differences were small, one may conclude that:

- students of all ethnic and racial backgrounds viewed their classes in the same way.

Academic Level

As seen in Table C3, GLM ANOVAs for academic level revealed only one significant difference: Graduate students ($M = 2.56$) reported having gained more from their course than did juniors ($M = 2.18$). Because all the graduate students were enrolled in a single course, however, this difference may simply be due to the course, rather than academic level per se. Therefore,

- students of all academic levels viewed their classes in the same way.

Predicting Satisfaction

As seen in Table D1 all the variables were strongly intercorrelated, with no correlation failing to reach traditional levels of significance (i.e., $p < .05$). To help make sense of these correlations—i.e., to determine the unique effects of each of the variables—a series of regression analyses were run. Multiple regression analysis will not only tell us the total influence (called “variance accounted for”) of a set of independent variables, but also the individual contributions (beta weights) of each of the individual independent variables. This analysis is often used to predict the extent to which a set of different independent variables will influence an outcome (the dependent variable).

Two general models, each with two steps, were tested in sequence for each of the key dependent variables (satisfaction with the technology, professor ratings, and overall satisfaction). The first model does not include as predictors overall satisfaction and/or professor ratings, which were considered the two more global reactions. These variables are included in the second model to determine if the effects observed in the first model are mediated by the more global reactions. That is, if any significant predictors in model

1 are not significant in model 2, then it can be said that those predictors do not add to the prediction of the dependent variable above and beyond the global reactions.

Each of these models was tested hierarchically in two steps. The main predictor variables were entered on step 1. Then, to see if student opinion differed because of their membership in a particular class, eight dummy coded variables (representing the nine different online classes) were entered. A significant increase in the proportion of variance accounted for in the criterion variable at step 2 (i.e., ΔR^2) indicates that the criterion can be predicted from which class a student was in, above and beyond any effects specific classes have on the other predictor variables. In other words, if the ΔR^2 is not significant, then class membership was inconsequential and any variance due to the classes can be accounted for by the other predictors: This method established the following sequence: class influenced the predictors, which influenced the criterion.

(Note that because none of the Women's Studies students had values for satisfaction with the technology, these students were not included in these analyses).

Predicting Satisfaction with the Technology

Table D2 shows the results of predicting satisfaction with the technology. In model 1, without overall satisfaction or professor ratings in the equation, the seven predictors accounted for 35% of the variance in satisfaction with the technology, $F(7, 161) = 12.49$, $p < .001$. Satisfaction with assignments ($\beta = .29$, $p < .001$) and perceiving benefits of on-line classes ($\beta = .37$, $p < .001$) were the only significant predictors. Adding class to the equation did not add significantly to the variance explained ($\Delta R^2 = .02$), and had virtually no effect on the beta weights of the other predictors. Therefore, students' satisfaction with the technology did not differ according to the class in which they were enrolled.

Including overall satisfaction and professor ratings in the equation accounted for 48% of the variance in satisfaction with the technology, $F(9, 158) = 16.26$, $p < .001$. Both of these were significant predictors ($\beta = .17$, $p < .05$, for overall Satisfaction; $\beta = .38$, $p < .001$, for professor ratings). Whereas perceiving benefits of on-line classes remained a significant predictor ($\beta = .30$, $p < .001$), however, satisfaction with assignments did not ($\beta = .08$). This suggests that satisfaction with assignments influences satisfaction with the technology through overall satisfaction and professor ratings. Surprisingly, perceiving gains from the course was negatively related to satisfaction with the technology ($\beta = -.18$, $p < .05$). To the extent that good technology results in gains, the regression equation appears to be controlling for the effect of technology. In support of this contention, removing gains from the equation substantially changed neither the beta weights nor the R^2 . Including gains in the equation has the effect of adjusting for outcomes of the technology: the satisfaction of those who perceived many benefits is therefore reduced, whereas the satisfaction of those who perceived few gains remains unchanged. So although those who perceive gains from the course are more likely to be satisfied with the technology (based on the raw correlation), the regression equation adjusts for this influence.

As for model 1, including class did not significantly improve prediction ($\Delta R^2 = .02$), and the beta weights remained largely unchanged.

Overall, then, students are more likely to be satisfied with the technology when:

- they perceive benefits of on-line courses;
- they rate their professor highly;
- and when they are satisfied with the course overall.

Predicting Professor Ratings

The seven question items that make up “Professor ratings” are taken verbatim from the end-of-semester evaluation given in most classes at Virginia Tech. The results from predicting this construct are shown in Table D3. Model 1 accounted for 55% of the variance, $F(8, 159) = 24.53, p < .001$, with satisfaction with assignments ($\beta = .33, p < .001$), gains from the course ($\beta = .21, p < .01$), satisfaction with the technology ($\beta = .39, p < .001$), and believing that technology facilitates student-instructor interaction ($\beta = .22, p < .01$) as significant predictors. Adding class to the equation added only 3% to the explained variance (*ns*), and did not strongly affect the beta weights of the other predictors.

The significant predictors in Model 1 were also significant in Model 2, with similar magnitudes. Overall satisfaction was also significant ($\beta = .30, p < .001$), helping boost the percentage of variance accounted for to 30%, $F(27.42, p < .001$). Adding class to the equation resulted in another 2% of the variance explained, although this increase was not significant, and the pattern of beta weights did not change. Again, students rated their professors using similar guidelines, regardless of which class they were in.

Taken together, these results show that students who rate their professors highly also:

- are satisfied with assignments;
- believe they gained skills and knowledge from their course;
- are satisfied with the technology;
- believe that the technology used in their course facilitated student-instructor interaction;
- and, most generally, are satisfied overall with their class.

Predicting Satisfaction with the Class

Table D4 shows the results of predicting overall satisfaction with the class. Although the variables in Model 1 accounted for 37% of the variance in satisfaction, $F(8, 160) = 11.51$, only satisfaction with the technology was a significant predictor ($\beta = .34, p < .001$). Adding class to the equation did not significantly add to the prediction ($\Delta R^2 = .05$), and did not change the pattern of beta weights.

Including professor ratings as a predictor increased the proportion of variance accounted for to 45%, $F(9, 158) = 14.31, p < .001$. Professor rating was therefore a significant

predictor ($\beta = .42, p < .001$) of satisfaction with the class. At the same time, the strength of the relation between satisfaction with the technology and overall course satisfaction decreased ($\beta = .18, p < .05$), indicating that part of the effect satisfaction with the technology has on course satisfaction is mediated by satisfaction with the professor. Including professor rating also increased the effect of perceiving benefits of the WWW to significance ($\beta = .18, p < .05$). This suggests that professor ratings account for some of the error in the measurement of perceiving benefits of the WWW; this reduces the error term of the latter, which results in a stronger beta weight. Adding class to the equation did change these results, and accounted for only an additional 3% of the variance (*ns*). As in previous instances, students in all classes rated their class satisfaction along similar guidelines:

These results suggest that overall course satisfaction is higher for those who:

- are more satisfied with their professor;
- are more satisfied with the technology;
- and perceive more benefits of using the WWW.

Summary and Recommendations

Virginia Tech's offering of a set of online courses during the regular term has clearly been a success. Unlike most distance learning students and those who enrolled in the 1998 online summer courses, few of these students were non-residents. Nevertheless, the courses were welcomed as an alternative to traditional classes. Most reasons cited by students focused on the convenience inherent in courses that did not meet at a set time in one physical place, but clearly many liked the style of online interaction and valued their ability to control the pace, timing and location of their study.

Just as clearly, Virginia Tech has provided the strong technological infrastructure required for serving online courses. With the computer requirement assuring that students have client capabilities, adequate computer workstations for students who want to work on campus, and robust servers and software in place, there were few complaints about lack of access. Computer support (4HELP) appears to be doing a good job. The only exception was the ever-present demand (echoed in society at large) for "more bandwidth", that is, faster access to the internet. Also, a number of students continued to complain about busy signals when trying to connect to the modem pool during high traffic periods, which is a problem that never seems to go away.

Because most students are residents, there were no complaints about lack of student services. It remains to be seen if services will be adequate for summer students, many more of whom will live far from campus.

Course design appears to be serving student needs. Although faculty were not surveyed or interviewed as part of this assessment, support for course development appears to be adequate, helped by a series of grant cycles from Virginia Tech's Center for Innovation in Learning, and other sources. Also, Virginia Tech (through Educational Technologies and the Faculty Development Institute) has made available robust and relatively easy to use online courseware development packages, such as Blackboard and Web CT, and provided training in their use. These tools have made development, deployment, maintenance and troubleshooting of online courses much simpler. Finally, many of these faculty are veterans of online courses and have offered these courses several times before. Nevertheless, support should be maintained if the number of online courses – as demanded by students – is to continue growing.

Some course design issues remain to be adjusted, although complaints were few in number and generally anecdotal. Interaction among students and between students and faculty is recognized as a hallmark of good practice in higher education (Chickering and Gamson, 1986; Chickering and Ehrmann, 1992) and electronic mail has become a staple of university life. The courseware tools mentioned above make the offering of live and asynchronous chat sessions a routine procedure, but the protocol for interaction over a network remains in the formative stage. Many faculty require participation in chats as a way to ensure active learning and involvement, but in order to avoid token and empty contributions (i.e., merely to "get the grade"), faculty monitoring and participation is strongly recommended. When faculty do participate and respond to students in a supportive manner, the experience for students appears to equal and can even exceed that of a traditional, face-to-face experience. Some students were caught off guard by the demands of these courses, which easily equal those of traditional classes, and some students clearly missed

the kind of face-to-face interaction of traditional classes. Some communication regarding the personal demands (i.e., time management and self-discipline) of an online course might be warranted to avoid an excessive drop-out rate, because this kind of attrition is commonly described in the literature as a consequence of self-paced courses.

As mentioned in the narrative, the day-to-day demands on faculty for these courses can be very high, especially when the courses are highly interactive and a great deal of email traffic and chat room activity takes place. Students had few to no complaints about lack of response by faculty, and student expectations of response are apparently being satisfied. Therefore, until faculty voice a contrary opinion, student expectations of faculty response times (see earlier section, “Online Communications: The Pressure on Faculty”) appear to be reasonable. A full assessment of the faculty experience with online courses should be conducted in order to understand how extensive these demands are and how veteran faculty are coping. This assessment would be invaluable as a guide for faculty who are contemplating developing an online course.

Appendix

Table A: Frequencies (except demographics)

Because of the way this course uses the Internet/World Wide Web:	Strongly disagree	Disagree	Agree	Strongly Agree	n/a
44 I am more confident that I can reach my academic goals.	3.31% (17)	10.5% (54)	45.1% (232)	33.3% (171)	7.78% (40)
45 I miss important information because the technology doesn't work correctly.	49.1% (252)	29.6% (152)	12.5% (64)	3.51% (18)	5.26% (27)
46 I am better able to understand the ideas and concepts taught in this course.	4.47% (23)	18.8% (97)	49.9% (257)	23.5% (121)	3.30% (17)
47 I enjoy studying for this course.	11.8% (61)	22.5% (116)	43.6% (225)	19.6% (101)	2.52% (13)
48 I spend too much time trying to access the course site on the World Wide Web.	7.2% (293)	26.0% (133)	9.57% (49)	2.15% (11)	5.08% (26)
49 I am acquiring skills that will be useful in my chosen profession.	20.1% (104)	21.1% (109)	34.0% (176)	19.3% (100)	5.42% (28)
50 had difficulty keeping up with the pace of the course (readings, assignments, projects).	41.9% (216)	31.0% (160)	19.8% (102)	6.20% (32)	1.16% (6)
Because of the way this course used Electronic Communication (e-mail and/or the Internet/Worldwide Web):	Strongly disagree	Disagree	Agree	Strongly Agree	n/a
62 I was able to take this course.	2.54% (13)	4.10% (21)	33.0% (169)	56.6% (290)	3.71% (19)
63 I put more thought into my comments.	7.24% (37)	19.4% (99)	43.8% (224)	25.6% (131)	3.91% (20)
64 I spent more time studying.	15.3% (78)	38.8% (198)	33.1% (169)	11.2% (57)	1.57% (8)
65 I felt more comfortable asking an awkward question.	8.63% (44)	18.0% (92)	37.8% (193)	28.8% (147)	6.67% (34)
66 It was difficult to relate to the other students in this class.	14.7% (75)	29.9% (153)	31.7% (162)	14.3% (73)	9.39% (48)
67 It was easier to work with someone from a racial or cultural background different from my own.	16.6% (85)	12.5% (64)	22.9% (117)	7.62% (39)	40.4% (207)
68 I wasted too much time communicating with others on topics that are not directly related to my course work.	41.0% (209)	25.5% (130)	16.5% (84)	2.16% (11)	14.9% (6)
69 I spent too much time waiting to connect to the Virginia Tech computer network or the course website.	45.9% (234)	25.9% (132)	16.9% (86)	5.69% (29)	5.69% (29)
70 I was better able to juggle my course work with my work and/or home responsibilities.	2.76% (14)	7.10% (36)	30.2% (153)	58.6% (297)	1.38% (7)

71 I put in less time traveling to and from the campus/course delivery site.	3.56% (18)	6.52% (33)	25.9% (131)	57.5% (291)	6.52% (33)
72.I did not receive responses to my comments.	55.0% (280)	24.0% (122)	9.82% (50)	1.57% (8)	9.63% (49)
73 I felt more comfortable disagreeing with the instructor.	8.84% (45)	20.8% (106)	35.6% (181)	13.6% (69)	21.2% (108)
74 I was at a disadvantage, because I did not possess adequate computer skills.	67.5% (342)	13.2% (67)	10.5% (53)	2.56% (13)	6.31% (32)

Think about a similar course you have taken that **relied primarily on face-to-face discussions** for communicating. Compare that course to this course.

Because of the way this course used Electronic Communication (e-mail and/or the Internet/Worldwide Web), how likely were you to:	Strong disagree	Disagree	Neutral	Agree	Strong Agree	n/a
Q51 ask for clarification when you didn't understand something.	11.9% (61)	16.8% (86)	32.0% (164)	16.8% (86)	18.6% (95)	3.91% (20)
Q52 communicate with people from outside Virginia Tech and/or around the world.	10.4% (53)	10.6% (54)	33.7% (172)	20.6% (105)	13.7% (70)	11.0% (56)
Q53 discuss the ideas and concepts taught in this course with other students.	13.3% (68)	15.3% (78)	33.5% (171)	20.4% (104)	12.5% (64)	5.09% (26)
Q54 work on assignments with other students.	30.8% (157)	24.3% (124)	23.9% (122)	6.86% (35)	4.90% (25)	9.22% (47)
Q55 feel isolated from other students.	11.8% (60)	13.2% (67)	34.4% (175)	19.6% (100)	15.9% (81)	5.11% (26)
Q56 actively participate in scheduled discussions about the course material (online compared with a face-to-face discussion in a classroom).	17.9% (91)	15.7% (80)	31.8% (162)	14.3% (73)	12.4% (63)	7.86% (40)
Q57 receive detailed comments on assignments from the instructor.	12.6% (64)	10.2% (52)	33.9% (172)	21.9% (111)	17.1% (87)	4.33% (22)
Q58 receive comments from the instructor on assignments quickly .	7.66% (39)	9.63% (49)	35.8% (182)	25.1% (128)	17.7% (90)	4.13% (21)
Q59 discuss your academic goals and/or career plans with the instructor.	33.8% (171)	14.8% (75)	30.2% (153)	6.52% (33)	4.15% (21)	10.5% (53)
Q60 feel isolated from the instructor.	8.86% (45)	15.7% (80)	37.4% (190)	19.3% (98)	15.0% (76)	3.74% (19)
Q61 discuss the ideas and concepts taught in this course with the instructor.	17.2% (87)	18.9% (96)	35.7% (181)	17.0% (86)	7.30% (37)	3.94% (20)

Table B1
Scale Composition and Factor Analyses

Scale and Items	λ
Professor Rating	
10. Overall rating of this instructor.	.93
5. Success in communicating or explaining subject matter.	.78
9. Administration of the course and organization of materials.	.72
6. Degree to which subject was made stimulating or relevant.	.68
7. Concern and respect for students as individuals.	.67
8. Fairness in assigning grades.	.62
4. Apparent knowledge of subject matter.	.57
Satisfaction with Assignments	
12. Educational value of course assignments.	.85
11. Adequacy of textbook, web site and other study materials.	.80
13. Time and effort required.	.74
Gains from Course	
16. Knowledge of principles, theories, techniques, etc.	.86
17. Logical thinking and problem solving ability.	.65
18. Appreciation of the subject matter and discipline field.	.58
Satisfaction with the Technology	
20. The technology used in this course was appropriate for performing the tasks required.	.72
45. I miss important information because the technology doesn't work correctly. (R)	.71
21. The procedure for taking exams and/or quizzes in this course caused problems for me. (R)	.62
19. The technology used in this course did not work in the way it was supposed to. (R)	.61
48. I spend too much time trying to access the course site on the WWW. (R)	.61
23. The instructor was knowledgeable about the technology used in this course.	.52
Benefits of the WWW	
46. I am better able to understand the ideas and concepts taught in this course.	.81

44. I am more confident that I can reach my academic goals.	.81
49. I am acquiring skills that will be useful in my chosen profession.	.57
Student-Student Interaction	
53. discuss the ideas and concepts taught in this course with other students.	.80
56. actively participate in scheduled discussions about the course material (online compared with a face-to-face discussion in a classroom).	.79
52. communicate with people from outside Virginia Tech and/or around the world.	.56
54. work on assignments with other students.	.56
66. It was difficult to relate to the other students in this class. (R)	.53
67. It was easier to work with someone from a racial or cultural background different from my own.	.42
55. feel isolated from other students. (R)	.34
Student-Instructor Interaction	
61. discuss the ideas and concepts taught in this course with the instructor.	.79
57. receive detailed comments on assignments from the instructor.	.78
58. receive comments from the instructor on assignments quickly.	.75
51. ask for clarification when you didn't understand something.	.71
65. I felt more comfortable asking an awkward question.	.66
73. I felt more comfortable disagreeing with the instructor.	.65
59. discuss your academic goals and/or career plans with the instructor.	.65
60. feel isolated from the instructor. (R)	.49
Benefits of the On-Line Course	
70. I was better able to juggle my course work with my work and/or home responsibilities.	.70
71. I put in less time traveling to and from the campus/course delivery site.	.63
74. I was at a disadvantage, because I did not possess adequate computer skills. (R)	.61
62. I was able to take this course.	.61
69. I spent too much time waiting to connect to the Virginia Tech computer network or the course website. (R)	.58
63. I put more thought into my comments.	.36

Note. λ = component loading. (R) = reverse coded item. Item numbers indicate the position within the survey.

Table C1
Gender Comparisons

	Mean	SD	N	t
Overall Satisfaction				
Female	3.28	0.67	204	
Male	3.23	0.64	315	0.76
Professor Ratings				
Female	3.40	0.52	203	
Male	3.36	0.57	312	0.89
Satisfaction with Technology				
Female	3.46	0.46	159	
Male	3.33	0.55	248	2.34*
Overall Access				
Female	3.48	0.83	204	
Male	3.38	0.74	315	1.38
Satisfaction with Assignments				
Female	3.19	0.52	204	
Male	3.11	0.63	315	1.49
Gains from Course				
Female	2.30	0.47	203	
Male	2.24	0.49	314	1.35
Benefits of WWW				
Female	2.87	0.65	168	
Male	2.93	0.61	279	1.04
Student-student Interaction				
Female	3.06	0.76	92	
Male	3.12	0.60	174	0.63
Student-faculty Interaction				
Female	2.98	0.79	128	
Male	2.94	0.73	222	0.55
Benefits of OL Class				
Female	3.44	0.44	161	
Male	3.32	0.46	220	2.72**

* $p < .05$. ** $p < .01$.

Table C2
Racial/Ethnic Group Comparisons

	Mean	SD	N	F
Overall Satisfaction				
African American	3.38 a	0.80	21	
Asian	3.06 a b	0.67	47	
White	3.28 a b	0.63	430	3.40*
Other	2.95 b	0.80	21	
Professor Rating				
African American	3.33	0.61	21	
Asian	3.28	0.56	47	
White	3.40	0.53	426	2.09
Other	3.07	0.76	21	
Satisfaction with Technology				
African American	3.21	0.77	14	
Asian	3.23	0.40	35	
White	3.41	0.51	344	2.20
Other	3.23	0.55	14	
Overall Access				
African American	3.00 a	0.84	21	
Asian	3.62 b	0.90	47	
White	3.43 a b	0.77	430	3.49*
Other	3.24 a b	0.44	21	
Satisfaction with Assignments				
African American	3.10	0.58	21	
Asian	3.09	0.59	47	
White	3.16	0.58	430	1.33
Other	2.91	0.72	21	
Gains from Course				
African American	2.21	0.61	21	
Asian	2.29	0.46	47	
White	2.27	0.48	428	0.34
Other	2.18	0.59	21	
Benefits of WWW				
African American	2.96	0.69	17	
Asian	2.82	0.61	39	
White	2.93	0.61	372	1.56

	Mean	SD	N	F
Overall Satisfaction				
Other	2.65	0.77	19	
Student-student Interaction				
African American	3.12	0.66	13	
Asian	3.18	0.54	23	
White	3.10	0.67	219	0.64
Other	2.85	0.80	11	
Student-faculty Interaction				
African American	2.70	0.60	14	
Asian	2.90	0.75	31	
White	2.98	0.76	292	0.87
Other	2.80	0.86	13	
Benefits of OL Class				
African American	3.37	0.50	15	
Asian	3.17	0.46	35	
White	3.39	0.45	317	2.02
Other	3.47	0.51	14	

* $p < .05$.

Table C3
Academic Level Comparisons

	Mean	SD	N	F
Overall Satisfaction				
Freshman	3.27	0.56	70	
Sophomore	3.27	0.70	126	
Junior	3.26	0.68	133	
Senior	3.23	0.64	148	0.07
Senior +	3.23	0.50	30	
Grad	3.25	0.87	12	
Professor Rating				
Freshman	3.39	0.57	69	
Sophomore	3.41	0.57	123	
Junior	3.31	0.57	133	
Senior	3.35	0.53	148	1.78
Senior +	3.41	0.51	30	
Grad	3.77	0.23	12	
Satisfaction with Technology				
Freshman	3.38	0.51	61	
Sophomore	3.42	0.55	105	
Junior	3.31	0.53	105	
Senior	3.38	0.50	109	1.26
Senior +	3.46	0.45	19	
Grad	3.73	0.32	8	
Overall Access				
Freshman	3.31	0.69	70	
Sophomore	3.54	0.85	126	
Junior	3.35	0.76	133	
Senior	3.39	0.76	148	1.67
Senior +	3.53	0.78	30	
Grad	3.75	0.87	12	
Satisfaction with Assignments				
Freshman	3.23	0.67	70	
Sophomore	3.17	0.60	126	
Junior	3.08	0.58	133	
Senior	3.12	0.57	148	1.58
Senior +	3.08	0.56	30	

Grad	3.47	0.39	12	
Gains from Course				
Freshman	2.35 a b	0.49	70	
Sophomore	2.26 a b	0.48	126	
Junior	2.18 a	0.49	132	
Senior	2.27 a b	0.48	147	2.33*
Senior +	2.33 a b	0.45	30	
Grad	2.56 b	0.41	12	
Benefits of WWW				
Freshman	2.93	0.57	60	
Sophomore	2.90	0.61	114	
Junior	2.87	0.63	113	
Senior	2.92	0.70	124	0.53
Senior +	2.92	0.34	26	
Grad	3.20	0.53	10	
Student-student Interaction				
Freshman	3.03	0.60	35	
Sophomore	3.04	0.73	72	
Junior	3.02	0.66	66	
Senior	3.24	0.62	75	1.27
Senior +	3.11	0.49	13	
Grad	3.38	0.73	5	
Student-faculty Interaction				
Freshman	2.90	0.67	43	
Sophomore	2.92	0.74	91	
Junior	2.88	0.86	89	
Senior	3.10	0.75	98	1.24
Senior +	2.78	0.47	19	
Grad	3.09	0.78	10	
Benefits of OL Class				
Freshman	3.32	0.44	52	
Sophomore	3.42	0.45	99	
Junior	3.34	0.49	94	0.73
Senior	3.35	0.45	105	
Senior +	3.41	0.43	23	
Grad	3.55	0.30	8	

Note. Means with different letters are significantly different at $p < .05$.

* $p < .05$.

Table D1.
Correlations Among Main Variables

	1	2	3	4	5	6	7	8	9	10
1. Overall Satisfaction	—									
2. Professor Rating	.62	(.87)								
3. Overall Access	.19	.20	—							
4. Satisfaction with Assignments	.50	.64	.18	(.71)						
5. Gains from Course	.35	.44	.23	.50	(.73)					
6. Satisfaction with Technology	.54	.61	.11	.45	.21	(.70)				
7. Benefits of WWW	.49	.43	.20	.49	.41	.38	(.54)			
8. Interaction with Students	.32	.31	.16	.33	.30	.25	.42	(.67)		
9. Interaction with Professor	.42	.46	.15	.46	.28	.33	.53	.68	(.84)	
10. Benefits of OL Class	.42	.33	.11	.35	.24	.51	.33	.15	.34	(.67)

Note. These correlations are for the data without WS students, who did not respond to these items. No correlation using the full data set varied from these by more than .02. Coefficient α reliability is given along diagonal (the two data set did not differ within 2 decimal places).

$r_s \geq .11, p < .05$. $r_s \geq .16, p < .01$.

Table D2.
Regression Results for Predicting Satisfaction with the Technology

	Model 1			Model 2		
	<i>SE(b)</i>	Step 1	Step 2	<i>SE(b)</i>	Step 1	Step 2
		β	β		β	β
Overall Satisfaction	—	—	—	.06	.17*	.19*
Professor Rating	—	—	—	.08	.38***	.39***
Overall Access	.05	-.06	-.07	.04	-.09	-.11
Satisfaction with Assignments	.07	.29***	.27***	.07	.08	.07
Gains from Course	.09	-.11	-.13	.08	-.18*	-.21**
Benefits of WWW	.08	.13	.14	.07	.11	.11
Interaction with Students	.07	.06	.05	.06	.05	.05
Interaction with Professor	.07	.03	.02	.06	-.06	-.06
Benefits of OL Class	.08	.37***	.37***	.07	.30***	.30***
R^2		.35***	.37***		.48***	.50***
F		12.49	6.07		16.26	8.89
df		7, 161	15, 153		9, 158	17, 150
ΔR^2 when class was added			.02			.02
F			0.64			0.79

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table D3.
Regression Results for Predicting Professor Ratings

	Model 1			Model 2		
	<i>SE(b)</i>	Step 1	Step 2	<i>SE(b)</i>	Step 1	Step 2
		β	β		β	β
Overall Satisfaction	—	—	—	.05	.30***	.28***
Overall Access	.04	.10	.11	.04	.08	.09
Satisfaction with Assignments	.06	.33***	.33***	.06	.29***	.30***
Gains from Course	.07	.21**	.22**	.07	.18**	.19**
Satisfaction with Technology	.07	.39***	.38***	.07	.29***	.29***
Benefits of WWW	.07	-.08	-.06	.06	-.13	-.11
Interaction with Students	.06	-.06	-.08	.05	-.09	-.10
Interaction with Professor	.06	.22**	.21**	.05	.22**	.21**
Benefits of OL Class	.07	-.03	-.04	.07	-.05	-.05
R^2		.55***	.58***		.61***	.63***
F		24.53	13.27		27.42	14.93
df		8, 159	16, 151		9, 158	17, 150

ΔR^2 when class was added	.03	.02
F	1.45	0.95

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table D4.
Regression Results for Predicting Satisfaction with the Class

	Model 1			Model 2		
	$SE(b)$	Step 1	Step 2	$SE(b)$	Step 1	Step 2
		β	β		β	β
Professor Rating	—	—	—	.10	.42***	.38***
Overall Access	.05	.05	.07	.05	.01	.03
Satisfaction with Assignments	.09	.12	.10	.09	-.02	-.02
Gains from Course	.10	.06	.11	.10	-.01	.03
Satisfaction with Technology	.10	.34***	.34***	.10	.18*	.19*
Benefits of WWW	.10	.14	.16	.09	.18*	.19*
Interaction with Students	.08	.10	.07	.08	.13	.11
Interaction with Professor	.08	.00	.00	.08	-.10	-.09
Benefits of OL Class	.10	.07	.05	.09	.08	.07
R^2		.37***	.42***		.45***	.48***
F		11.51	6.83		14.31	8.22

<i>df</i>	8,160	16,152	9,158	17,150
ΔR^2 when class was added		.05		.03
<i>F</i>		1.73		1.21

* $p < .05$. ** $p < .01$. *** $p < .001$.