allows teachers and students to speak freely without the restrictions of age and power differences that sometimes arise in an office.

Computer conferencing systems have been found valuable for such adjunct mode activities as electronic office hours. Many questions are of interest and relevance to the whole class, and the use of a conference for open class discussion avoids duplication of effort for the professor. Sometimes students assist one another ... Instructors use email and computer conferencing for distributing class outlines, supplementary notes, handouts, instructions, assignments, test questions, and, sometimes, administering tests and quizzes."

This book is of interest to those educators who are interested in online learning. I recommend it.

INFORMATION ABOUT AND EVALUATION OF THE SPRING 1996

ON-LINE INTERCOLLEGIATE COURSE

"ENVIRONMENTAL AND INDUSTRIAL CHEMISTRY"

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I. INTRODUCTION

The on-line intercollegiate course is described in the Spring 1996 issue of the "Computers in Chemical Education Newsletter" pages 17 to 20. 104 students from 22 schools registered for the course. Due to computer problems six students who registered from Nanyang University were not able to participate. The on-line segment was common to each of the courses, but instructors at each of the participating schools had autonomy in determining what activities were expected of their students, how grades would be assigned and how the course was to be structured.

In order to obtain a better understanding of the different courses, an information and evaluation form was sent via e-mail to each course student. This article summarizes information from 49 of the 98 students at 17 of the 21 schools. Many of the student responses are quoted in unedited form. (Some quotes were edited. Some student responses are not included in this summary.)

Additional information about the course can be found on the World Wide Web site:
http://dirac.py.iup.edu/college/chemistry/chem-course/webpage.html
In addition, this issue of the Newsletter contains an article by James M. Beard, chair of the course organizing committee with some comments and analysis of the 1996 on-line course and some suggestions about future on-line courses.

II. SUMMARY OF INFORMATION AND STUDENT RERSPONSES

A. About the Students
71 % were seniors
24 % were juniors
2 % were sophomores
2 % were graduate students

51 % were chemistry majors
10 % were biochemistry majors
14 % were physical science majors
6 % were science majors - chemistry emphasis
2 % were environmental chemistry majors
6 % were environmental science majors
10 % were biology majors
2 % were construction engineering majors

B. Course Title:
59 % of students registered for "Environmental and Industrial Chemistry"
23 % for "Special Topics in Physical Science"
10 % for "Chemistry on the Internet"
3 % for "Advanced Topics"
3 % for "Independent Project"
3 % for "Readings in Chemistry"

67 % of the students registered for a 3 credit hour course
31 % for a 1 credit hour course
2 % for a 2 credit hour course

Course class size varied from 1 to 13.

C. Course Descriptions
From analysis of the information questionnaires it was obvious that different instructors had very different requirements for their students.

1. Before the On-Line Segment

Generally, two or three weeks before the

beginning of on-line student activities. In this initial period students became familiar with their e-mail system, the World Wide Web and signed onto tho Listserv OLCC-STU discussion list. One instructor had his student view a videotape which he had prepared on the use of the computer, software and the Internet. Some students reported 7.5 hours of class meetings each week during this period. In another case one half-hour organizational meeting occurred at the beginning and after that students and groups of students operated autonomously, but the instructor was available for consultation.

2. On-Line Segment

During the on-line segment students were expected to read the three papers written by industrial chemistry experts and two student papers which were selected by a committee of instructors. About two weeks were devoted to the discussion of each paper. Students monitored and participated in the on-line discussion. Students asked the authors of papers and other students questions and generally contributed to the on-line discussion. Students spent from 0 to 4 hours per week in class. In some instances background material was presented in class, questions were asked and discussed. In some cases questions were formulated and revised prior to sending them to OLCC-STU. Also, author's responses to questions were examined and discussed in class. In at least one course additional assignments were made in class. There were in-class quizzes in at least one course. Time was devoted to the selection and writing of a group paper in some courses. At one school students were asked to prepare a group paper and also an individual paper. In one case only one student participated. She met with the instructor when she had questions or a problem. Most of the communication between the student and instructor occurred via e-mail.

Some instructors required each of their students to keep a journal of electronic mail transactions, questions, research, a summary and analysis of the papers. This journal was turned in at the end of the course. Other instructors had no such requirement. One instructor required a short report on a herbicide, fungicide, rodenticide or pesticide. Some instructors discussed research and the preparation of papers. One instructor assigned and discussed articles dealing with critical thinking skills. Another assigned additional readings on ozone depletion. Another instructor required students

to read a considerable amount of additional material and answer detailed questions. Some students were asked to make formal presentations in class. A number of major environmental problems were identified by one class. A broad overview of industrial chemistry and relevant environmental laws was considered in one course.

3. Post On-Line Segment

Most of the participating schools had 1 to 3 weeks of the semester left after the on-line discussion of papers. Some schools held no class meetings after the conclusion of the on-line segment, and others devoted 1 to 9 hours of class time. Some classes summarized and tried to integrate the diverse topics discussed on-line and in the classroom. Summary papers and final papers were completed. In one case additional time was used for further discussion of environmental issues and of scientific ethics. In another case there were tests and at one school there was a final examination. At another school students turned in a portfolio, poster and research paper.

4. Student Papers

80 of the students prepared a paper for their course. Most papers were group efforts involving from two to twelve students. A list of suggested topics was distributed by a committee of instructors at the beginning of the course. In some cases the course instructor suggested a topic or topics. In one case, the World Wide Web and other Internet resources were used to determine which topics would have abundant research information. Three or four topics were identified and one topic was selected. In another instance the class listed possible topics on the board. The list was narrowed to two topics. A search was made to determine how much information was available on these two topics and the topic was selected by class vote.

The titles of some of the papers were:

1. Vitrification of High Level Radioactive Waste at the West Valley Demonstration Project
2. Superfund: Expanding Opportunities for Lawyers, Chemists and Bulldozers!
3. An Assessment of Reformulated Gasoline
4. Three Mile Island: Tragedy or Warning?
5. What Happens When You Harness the Atom: Evaluating Current Disposal and Storage Options as Well as Today's Environment
6. Methyl Bromide

7. DNAPLS and Ground Water
8. Bhopal: The Disaster and the Aftermath
9. The Bhopal Incident and Its Effect on Pregnant Women
10. Stratospheric Ozone Depletion: Why it is an issue?
11. Bioremediation
12. The Destiny of Plastics
13. Recycling Plastics
14. Biodegradable Plastics - A Cure for a Consumer Society
15. Love Canal: An Overview of the Toxic Waste Dump That Brought the Chemical Industry to Its Knees
16. Study of an Industrial Accident
17. Effects of Toxins on Tributaries of Lake Erie, Buffalo River and the Niagara River
18. A Summary of the Clean Air Act as Amended in 1990
19. Warfarin - How to Build a Better Mousetrap
20. Risk Assessment of Toxic Chemicals: The EPA Regulations and Procedures
21. Study of Chemical Fire and Subsequent Chlorine Release

D. Summary of Additional Student Responses

1. Distribution of Papers Via the World Wide Web

Was the format of papers as they appeared on the WWW satisfactory?
46 responses - 93 % WWW satisfactory
7 % WWW unsatisfactory

2. OLCC-STU

This Listserv was designed to provide interaction between authors and students, and between students. Students used this to ask questions of authors, authors used it to answer questions and perhaps to ask questions of students. Also, OLCC-STU was used for discussion.

Was the operation of OLCC-STU satisfactory?
47 responses - 96 % OLCC-STU satisfactory
4 % OLCC-STU unsatisfactory

Did you use the digest or mail mode?
40 responses - 95 % used mail mode
5 % used digest mode

3. On-Line Questions and Discussion

Did you find the scheduling of questions and discussion to be satisfactory?
44 responses - 82 % scheduling satisfactory
18 % scheduling somewhat

unsatisfactory

4. Some Evaluations

Evaluation scale 1 to 5 -
1 is Poor, 3 is Average and 5 is excellent
a. Overall evaluation of on-line segment of course —
Average evaluation = 3.93, S.D. ave. = 0.11, n = 47

b. Overall evaluation of OLCC-STU questions, answers and discussion —
Average evaluation = 3.86, S.D. ave. = 0.10, n = 48

c. Overall evaluation of course —
Average evaluation = 4.13, S.D. ave. = 0.10, n = 46

d. Best Paper
43 responses - 60 % rated one of the three Expert papers best
The average rating from those who rated the paper best was 4.5.
40 % rated one of the two student papers best
The average rating from those who rated the student paper best was 4.4

e. Best Discussion of Paper
36 responses - 45 % rated discussion of one of the Expert papers best.
The average rating from those who rated the discussion best was 3.9
55 % rated discussion of one of the student papers best.
The average rating from those who rated the discussion best was 4.5

f. What Liked Best About the Course
1. All the information on the WWW and different insights by different students
2. This was the first time I could actually direct questions and comments about an article to the author.
3. Opportunity to communicate with a class of my peers from around the country
4. Expert papers
5. I enjoyed learning about things which are going on in our world today.
6. The direct contact between writers of papers and students

7. Convenience of meeting time, interacting with students who have had different backgrounds in chemistry
8. Additional computer and Internet experience - vast amount of information out there - Freedom to come and go when you feel like it
9. I could ask the authors questions.
10. Being able to discuss these questions with students from different parts of the country
11. The ability to utilize technology in a created learning environment
14. Wide range of questions, get to ask questions
15. Reading the papers and the background information presented in class - Class discussions - Learning to use the Internet
16. being on-line and having discussion with students across the country - I liked that this class was not too technical even though it was a chemistry course.
17. Freedom to participate as much as I wanted - I liked preparing our own paper on a topic we chose, and the learning experience of the Internet.
18. Reading the expert and student papers
19. Being able to question something an author wrote and getting feedback - As well as reading other people's questions and comments
20. The opportunity to ask questions of the authors and to become familiar with the Internet
21. The fact that I could see how other people reacted to the same materials that I read.
22. I liked the points raised by the other students when a question was answered that didn't coincide with the information in the paper.
23. The papers themselves
24. Liked the on-line portion
25. The web sites used and the topics of the papers
26. Learning more about what goes on in the industrial world
27. Interacting with a new media for educational purposes
28. The in class discussion of the on line papers
29. I enjoyed the way that this class functioned. Everyone was responsible for keeping up with their e-mail and reading assignments (papers). The discussions were very thought provoking. These discussions helped me focus on some important concepts in chemistry.
30. Information
32. The mixture of student and expert papers

33. Flexibility
34. Using the net, having access to such a diverse group of people, background reading for the papers and the papers - that there was a group of experts willing to take the time for the on- line course
35. Accessing the Internet
36. The fact that I was able to look at how many of the chemical techniques I have learned are applied in real life situations - The fact that I was able to go into the web to research topics without going to the library - The fact that there was not the restriction of a classroom - The fact that it incited an interest in finding out more about the topics
- As for the course itself, it showed me the application of chemistry to the real world - I also enjoyed looking at the fact that even science requires tolerance and emotional distance. For the chemist, this may mean adapting to a changing world by combining progress for man's happiness with necessities of his security. Above all, I enjoyed the trust that my professor had in me by allowing me to explore the topics independently, and the fact that he showed extraordinary patience with me as I familiarized myself with the computer system.
37. Opportunity to see what is really being done in industry, learn to use the Internet and "talk" to students at other schools
38. Learning to use the Internet as an educational tool and a reference source
39. Learning to use the WWW, as well as getting e-mail
40. I liked using the computer to find out new and exciting information.
42. The ability to get feedback from students all around the country
43. Getting involved with others that I normally would never interact with
44. The interaction between people in industry that deal with chemistry and the public every day and the educational world that deals with chemistry in the purist form
45. Hearing the opinion of other students
46. I liked the interaction that was able to occur, sometimes within minutes.
47. To be very honest I enjoyed doing the research via the Internet. Even when our group was answering a question it was fun to go looking for the information. It was also kind of novel that we were participating in a class nationwide.

g. What Liked Least About the Course

1. Volume of mail
2. Being overwhelmed with e-mail messages every morning
3. Being in a room with 120 students all talking at once, the net effect of the mailing list segment of the course, and the poor participation of the faculty of this university
4. Trying to send messages (never learned to do so)
5. It took a lot of time
6. Discussions seemed off topic for a chemistry course
7. Time-consuming to sort through messages - more organization/ better method of identifying the content of the message in the subject line
8. Frustration with local computer system
9. Handling the mail
10. Computer glitches
11. Plodding through hundreds of mail messages
13. Only one credit hour for the amount of reading
14. Waiting for answers and losing them
15. Format of the messages - Too much garbage before and after body of the message
16. I found it hard to sort through the messages in the beginning because the format for the subject line was not followed. Also, the way the responses from author were formatted made it difficult to match them to the appropriate questions. The 2nd and 3rd e-mail sessions were easier to manage.
17. The constant flow of information through questions and answers was a little overwhelming at first.
18. Discussion of the student papers
19. Not much discussion between students
20. Topics too specialized, the volume of messages was too much to handle
21. People should have been clearer and more concise with their messages.
22. The many messages I received every day!!!!
23. Most of the student postings
24. Nothing except this evaluation of the course
25. Keeping up with the number of messages
26. The large number of questions for the first paper
27. Confusion over technical difficulties
28. On-line questions and comments
29. The hardest part of this course was finding the time to read my e-mail. Another problem was the high volume of mail.
30. Lots of messages
31. The lack of technical information forthcoming from some of the authors
32. There was not enough time for each paper.

33. Problems with returning my messages
34. The format of the on-line answers and questions - As mentioned earlier, a consistent format as suggested should be used right from the beginning to make it easier to sort and put into perspective.
35. The duplication of questions . . .
36. There should have been more time between papers for questions, answers and comments.
37. Jumble of topics and messages - hard to remember what the answer was in response to sometimes and what has already been said
38. The volume of e-mail messages (Were some students graded according to how many comments/questions they posted? If so, that's a bad idea; it adds to unnecessary traffic on the list.)
43. Too many messages about too many seperate topics
46. At first, all the information was very overwhelming and a little intimidating.
47. I found it hard to use my e-mail account for what I had been using it for. I could no longer use it to communicate with friends or family.

h. Advantages of On-Line Courses
   1. Different views from all over the country - Contact with individuals, such as industrial chemists, that we would not get in the classroom setting
   2. Work can be done at my convenience rather than during the scheduled class time.
   3. Wide range of input
   4. Can access information and other student's thoughts from all over
   5. The computer has basically all you need - No running around, etc.
   6. Fast, inexpensive communication
   7. Access to experts
   8. Develop your own analytical thinking skills - The freedom to work at your own pace
   9. Can ask questions of the authors - Discuss papers among students
   10. There is a broader base of people discussing topics - you might not find this in the normal classroom.
   11. It allowed students from diverse backgrounds to discuss topics with experts in their fields.
   12. A lot of topics
   13. Variety of issues
   14. It can offer students the opportunity to take courses not offered at their home university. Explorations on WWW
   15. Wider variety of comment, opinions, concerns, issues raised, ideas presented

16. I have a home computer and was able to access my messages from home. I had an advantage over my classmates. Additionally, I like the non- traditional atmosphere of this type of course.
17. To learn practical issues addressed through chemistry in industry and the use of the Internet
18. Many points of view
19. Learning about other places, e.g. Love Canal - I would never know about it otherwise.
20. Opportunity to interact with students outside our college and improve Internet skills - Also, this type of course, if run properly, would reduce the amount of paper used in class. I could work when it was convenient for me (outside of class time).
21. One can learn a lot more from group discussion of a paper/topic then from reading texts and articles alone.
22. Working with computers and the WWW and such things will help me in the future with my career and research opportunities.
23. The ability to ask questions directly to the world's experts in various fields.
24. More people with diverse opinions and open minds
25. Easy communication of both students at my college and other ones
26. It gives students a chance to interact with other universities and to learn how businesses, laws and industry work together.
27. Broad and immediate interaction with other students and scientists
28. If we had a serious question the authors of the papers could respond or suggest further sources
29. The biggest advantage of on-line courses is the ability to communicate with others. In this course we were able to communicate with students from different states and other countries. Another advantage was the uniqueness of this course and the computer skills that were taught by this course.
31. The students are able to answer each others questions
32. The ability to have discussions with students from other universities
33. You don't have to be in a classroom environment and very advantageous to handicapped people
34. The number of people and variety of opinions
35. Learning from other people who had other sources to access
36. It allows one to learn about the Internet and become more adept with computers.
37. Very new material and access to new ideas

38. It's great to be able to get input from other students at other universities in these discussions. This gave me views from some perspectives that my class here at Samford might have never considered. Having access to discussion directly with the expert authors was also a great advantage which would not be found at most individual universities. Also, students can access the information via the web-page whenever needed.
39. Ease of communication
40. The fact that I can get on line whenever I want
42. Being able to get responses from not only specialists, but input from students as well
43. It is very nice to have almost instant access to people.
44. The interaction with people across the world about subjects that effect people differently around the world
45. Interaction with other students and reading articles that were of interest
46. It was a fresh approach to learning. It was not like any paper/pencil class. I also believe that I will remember discussions that we have had in this course a lot longer than the information I get from the traditional class.
47. I feel that this allows students to look at each other and ask questions. I do not believe that the computer is a substitute for actual in-class learning. However, I would have never learned any of the material covered in this class in a real classroom.

i. Disadvantages of On-Line Course
1. Mail volume, no uniform course requirement - Lack of face-to-face communication
2. Lack of person-to-person communication
3. Little real instructor involvement, I learn from listening, not from reading and taking notes
4. Not a lot of face-to-face interaction
5. It took a lot of time
6. Lack of computer literacy may hinder participation
7. Sometimes questions fell through the cracks, often the discussion seemed disjointed.
8. It would have been beneficial to meet once every 2 weeks just to briefly discuss each paper with the group and talk about problems or concerns.
9. Too much mail - Not everyone may prepare for discussion to the same extent.
10. Sorting out all the mail
13. scratching the surface of the issues
14. lack of direct interaction

15. Message format - needs work to make it easier to follow threads

16. Text only computers were a real disadvantage. Sometimes, after discussion of a paper had ended, I would realize that I had a question, but it was too late to post it - but that was the exception.

17. Having students participating who are not chemistry majors - This is not to say they should not be permitted to take the class, but maybe they should have looked a little more into chemistry issues before asking a question that could have been answered from most textbooks.

18. Immense amount of mail to read

19. Not really knowing people you are discussing things with

20. Lack of face-to-face communication

22. The jumping around between papers and the end of one and beginning of another

23. The inability to get immediate feedback

24. Lack of direct personal contact

25. The scientific backgrounds of the students varied

26. A large amount of mail each day

27. Difficult to organize

28. Debate via e-mail I find a real step backwards - The discussion is hard to follow and I lose interest in a debate over several days.

29. The biggest disadvantage would be waiting for replies. Sometimes a response would take up to four days while others were out within the next day. This slow response time broke some of the discussion threads.

30. Time consuming

31. Significant time is necessary to prevent all messages from being a big garble.

32. For the number of papers there was not enough time to fully discuss them.

33. Severe thunderstorms

34. The jumble of messages made it more time consuming than expected.

35. Not being able to talk face to face

37. Never getting to meet your classmates

38. Not all students participate as fully in on-line discussion as they might in classes at their own schools. This also might be helped by smaller discussion groups.

39. Confusion

40. There was not a formal class meeting. It took me a while to get used to this.

42. The fact that it takes a few days to hear the responses from the experts.

43. Schools with sub-par computer systems 44. Not being able to see the people on the other end of the computer screen and their body gestures and tones of voice that add a lot to a question or answer - I think that the absense of these things can lead to a lot of misunderstandings and doubts of questions and answers.

45. There really didn't seem to be enough time and effort, on my part, to research each topic more so that I could ask questions - we did not meet with our class.

46. — BOOKKEEPING! It was hard to keep up with all the information at times. It did help when we got to know each other, and began using abbreviations like "CAM-C- . . ."

47. It relies upon instruments like computers to be stable enough to have constant communication. It also has very limited abilities. For example, this set-up would never allow for more students than there already are. Imagine what it would look like if 200 people were submitting questions.

j. Suggested Changes to Improve

1. Make a uniform course requirement like at least one semester of organic chemistry so students are approximately on the same level. Do not increase the class size. I think the size and mail are somewhat manageable.

2. Choose more generalized paper topics which students already have an idea about, or at least have a general concern about. Have a better way (which is followed) to title the subject line so all the mail doesn't have to be looked through in order to find an answer to a specific question.

3. Well, I seem to be in a minority here. I've never been one to let that stop me though. While I found the course to be right on as far as discussion materials and the level of interest go, I think that the forum was poorly chosen. The implementation of a list-server environment created what was to me a hectic jumble of messages where often the point of replies and the train of thought was lost because there was little to make them coherent. This is, by no means, a fault of the persons writing. What frightens me is that I am fairly experienced with electronic communication. I can't imagine the impression the course might have had on those less experienced with the Internet. To lend a positive light to this, what the directors/coordinators of the course might consider would be using a Telnet accessable news reader/group to support the input side of the course along

with a mailing list for messages and administration. The use of a news-server rather than a list-server would allow students and faculty alike to access the discussions in an easy to follow threaded form from either a newsreader they are used to, or via Netscape's news feature.

5. The volume of questions should have been further reduced. That way we could have concentrated on a few topics in depth rather than having an unorganized discussion about petty discrepancies.

6. Use bulletin board format

7. Perhaps Newsgroup rather than a Listserv

8. Meet every two weeks

9. Require authors to ask questions of students, as a teacher would in class.

11. Make the discussion some kind of bulletin board.

12. No changes

14. Response techniques improved considerably - use more student papers

15. Message format

16. I would reduce the number of papers to 4 (instead of 5) so that discussion sessions would last longer. I could have contributed more if there had been more time.

17. Some way of controlling the amount of mail - Our server went down at times and when it came back we were swamped with messages.

18. Decrease the group size and cut out a student paper.

19. Schedule time for students to have discussions with students.

20. Choose papers that are written with us (the students) in mind. Papers with topics that generate discussion. Find a way of organizing the messages, not all need to "hear" every question asked.

21. Maybe break the students into groups on different Listservs.

22. Stricter codes about subject headings and discussion times.

23. I would recommend that all students be asked to read a certain set of materials before beginning the on-line discussion. That way, they can identify the relevant points of the on-line paper that is to be discussed, and know something about the topic before they approach it. This would generate better discussion.

24. It was a good course. The only change I would make is to have to a more expanded mail account at the individual colleges for the students.

25. Only to place more guidelines on the questions and make sure the schedule for all colleges is the same.

26. I don't know if this is possible, but it would be nice to organize the questions based on topics.

27. For my particular course, I would have enjoyed a few lessons on the use of the Internet at the beginning.

28. Concentrate more on in-class discussion and less on discussion on-line. If the overall purpose of this course was to familiarize us with the Internet maybe have students write papers using sources found on the Internet. Not only would this give students practical experience using the Internet, but students would be forced to discriminate information from the Internet because of the often unknown or unreliable sources putting it on the web. I feel this is a good experience in itself since we so often believe anything we hear especially from the media and in the area of science they are often misleading if not wrong.

29. Smaller groups might be one way to improve this on-line course. Less expert papers and more student papers might also improve this course.

30. None

31. some more effective way of sorting the postings than the abbreviations in the subject line

32. Have fewer papers that are more detailed

33. A handout perhaps

35. Instead of only papers, perhaps a real life problem (fairly simple one) from an industry to solve. Even if they already had the answer.

36. There could have been more time for each paper so that more time was allowed for the questions, answers and comments.

37. Assign background reading first, before on-line portion.

38. . . . the coursemasters might consider adding an additional expert paper to the course.

39. Some people have suggested a newsgroup, but I am not really sure how that would work. I think as long as everyone is clear in the subject line of the message which paper they are responding to, and if it is a question, answer or discussion, things will be okay.

40. A little more interaction with a professor on campus.

44. Some way for faster and more frequent interaction on questions and comments.

45. Maybe more class meetings.

46. I can't really think of any.

47. More time for questions to experts. I also feel like there was five weeks wasted for us here at MWSC. It would also be nice if there was more time to write student papers.

k. Additional Comments
1. I enjoyed the class
3. Overall, I do feel that I benefitted from the course. I just think that the flood of messages combined with the volume and variety of responses, with no real way to organize them, created a distraction. I would like to thank those who organized the on-line chemistry course, and all of the students and professionals whose papers were the topics of discussion, for an interesting experiment in education.
5. I thought the course went well. It was interesting to read material from experts and my peers. It was an interesting idea.
15. This on-line course would not have been successful without the classroom guidance, background presentations, discussions and focus.
16. The student papers were not as professionally written, as expected, as the expert papers. I may have higher expectations than most, but I was disappointed in the English composition-type problems that I noticed in the papers. Did their instructor proofread their paper? I would have been embarassed to post some of those! (I am picky!!)
23. Thank you for keeping us students up to date on what was going on on in the course. Also, my thanks for providing this course in the first place. It was an opportunity for much learning.
27. I hope this course is continued in the future. Despite a need for some improvements, I feel this type of educational medium will be even more widely used. I'm glad to have been a part of this in the beginning.
29. This was a very good experience and well worth all of the time that it took!
34. Was a worthwhile class hope it is offered again
36. Perhaps the questions could have been filtered.
38. I hope that similar courses will continue to be offered. This has been a unique experience, and I appreciate all of the work of the coursemasters and faculty members in putting it together. Thanks!

I. TIME SPENT
Average time/week is 5.3 hrs., S.D. = 0.43, n=34 (min. = 1 hr, max. = 12 hr)
Max. time/week is 11.8 hrs., S.D. = 1.8, n = 43 (min = 1 hr, max = 75 hr)
Min. time/week is 2.9 hrs., S.D. = 0.31, n = 42 (min = 0 hr, max = 9 hr)

% Time spent in class is 28.0 %, S.D. = 4.0, n=35 (min = 0 %, max = 80 %)
% Time spent reading and writing by self is 32.4 %, S.D. = 3.6, n = 33 (min = 10 %, max = 90 %)
% Time spent at the computer is 53 %, S.D.= 4.0, n = 33 (min = 20 %, max = 100 %) working collaboratively is 20.4 %, S.D. = 3.9, n = 31 (min = 0 %, max = 80 %)

Comments:
17. Maximum time spent when writing the paper and then when answering the questions about our paper.
19. The week I was finishing the paper, I was averaging 15 hour days.
25. The percentages varied when we wrote the student paper and first got on the Listserv.
34. Both working together, on-line, and by self was beneficial.
38. This is hard to answer because the amount of time varied from week to week, especially when we were writing our papers.
39. It was very helpful to be able to work in a group.

m. PERCENTAGES OF PAPERS AND DISCUS-SION READ
Average 98 % of papers read, S.D. = 0.85, n = 42
36 of 42 respondents read 100 % of papers

Average 88 % of questions and discussion read, S.D = 2.3, n = 42
18 of 42 respondents read 100 % of questions and discussion

Comments:
21. Read 60 of on-line questions and discussion. The rest I skimmed through because of lack of time.
23. Many of the questions and comments got no more than a glance-over to see if they were worth further reading.
33. Some questions were good, while some were well elementary level.
44. The amount of on-line questions and discussion read dropped off at the end of the class due to my other class loads.

40 responses -

83 % Indicated amount of work required about
right

17 % Indicated amount of work required excessive

Comments:

2. The in-class presentations were extremely
helpful in understanding the paper discussed
on-line.
3. Too little - As far as my university was
concerned. I have spoken to the office here
and expressed my exasperation with the total
lack of instructor involvement in the class.
Excessive - As far as the list-server was
concerned. I think that the organizers need
to consider the number of students involved
as being a class with no restraints on who
speaks or when. Either limiting the number
of students or colleges involved, or using a
different forum for the discussion would
alleviate this problem.
17. Required more work than many of my other
classes. This was by no means unmanageable,
but you had to devote the time needed to
keep pace with the others.
27. I believe this course should be expanded to
a two credit course if possible. Ideally,
the amount of work required for this course
would be worth more than one hour credit.
29. The amount of work required for this course
was excessive at times, but well worth it.
34. About right for a three credit course.
Excessive for the one credit course I took
it for, but it was interesting. I believe
the course to be very worthwhile and hope it
is offered again.

Programming Methods for the World-Wide Web

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Introduction

This article provides a basic overview of several common programming methods that are used to create interactive material for the World Wide Web (WWW).[1] Interactive Web pages can be textual, calculational, or graphical; and can serve as on-line versions of tutorials, homework problems, take-home exams, and other educational tools. The largest distinction between the different interactive methods is that some are client-side, in which all processing in done on the client computer, and others are server-side, in which all processing is done on the WWW server. Client-side methods include client-side image maps, JavaScript,[2] and Java. The question-and-answer information for client-side image maps and JavaScripts is contained in the HTML file, and users have access to the information by looking at the HTML source code. Server-side methods include server-side image maps, and scripts or programs called through the Common Gateway Interface (CGI). Server-side methods are most appropriate for delivering interactive exercises that access existing databases of information, or require tracking or grading capabilities. Client-side methods are most appropriate for practice exercises. Client-side methods have a major advantage in delivery speed over server-side methods in that they do not make a new connection and transfer data over the internet for the data processing step. This consideration can be very important for interactive material that requires many repetitive actions. Combinations of client-side and server-side methods are possible. For example, a client-side JavaScript can check the format of data entry before it is submitted to a server-side program for evaluation.

Hyperlinks

Multiple-choice exercises can be produced without any programming by simply using hyperlinks for each answer choice. When a choice is selected, the link retrieves a new HTML page that can indicate if the choice was correct or incorrect, and can also provide an explanation or a return link to try the exercise again. An