

EVALUATION REPORT

**Students in CS 313E and their decision about
future CS courses**

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Executive Summary

The purpose of this study was to examine the characteristics of students who take CS 313E, their evaluation about the course, and why or why not those students pursue further computer science courses.

CS 313E, Elements of Software Design, is the second course in the Elements of Software series that follows CS 303E. It is assumed that students know Java at the level taught in CS 303E. The emphasis of the course is on software development using object-oriented methodology. Students learn how to analyze and design software, how to create reusable software components and to compose programs from already available components. Students also learn about some basic data structures and algorithms and how to match the data structures and algorithms to problems, and test and evaluate programs for their functionality and their performance.

Students in CS 313E were asked to participate in 2 surveys, one at the beginning and the other at the end of the semester.

Key Findings

- ◆ The majority were natural sciences majors, male, Caucasian and Asian American, and senior.
- ◆ All students had an access to computers.
- ◆ Started to use computer functions, except Citrix, since middle school, and were comfortable using computers for everyday and advanced tasks.
- ◆ Exception of Java and C++, programming experiences are limited.
- ◆ No gender differences
- ◆ Regarded the course more difficult at the end of the semester than beginning.
- ◆ Later in semester, less expectation to master content and skills.
- ◆ More than 80% wanted to take other CS courses and were interested in them.

Key Recommendations

- ◆ It would be helpful for students to be informed about the level of difficulty of the course in the beginning.
- ◆ Targeting student population that can use the course as a part of degree or certificate requirements seems promising for more of future student enrollment.
- ◆ Introducing the other possible CS courses in the class might be a practical guide for students who want to pursue further in the field.

Introduction

Purpose of evaluation

The purpose of this study was to examine the characteristics of students who take CS 313E, their evaluation about the course, and why or why not those students pursue further computer science courses.

Description of the course

CS 313E, Elements of Software Design, is the second course in the Elements of Software series that follows CS 303E. It is assumed that students know Java at the level taught in CS 303E. The emphasis of the course is on software development using object-oriented methodology. Students learn how to analyze and design software, how to create reusable software components and to compose programs from already available components. Students also learn about some basic data structures and algorithms and how to match the data structures and algorithms to problems, and test and evaluate programs for their functionality and their performance. The completion of CS 303E with a grade of C or better is a prerequisite for CS 313E.

Students meet three times a week for lectures and once a week for a study group. The instructor follows the text quite closely. Supplemental notes are available on the Web. Unlike in the traditional lecture format, classes are a venue for solving problems, writing programs, and exchanging ideas. Student attendance is mandatory.

Programming assignments are given almost every week. Students may choose to use their own computer to work on these assignments. Students' performance in the class was evaluated including class participation, programming assignments, two tests, and final exam.

Methodology

The subjects were students enrolled in CS 313E during Spring 2006. They were asked to participate in 2 surveys, one at the beginning and the other at the end of the semester.

Pre- & Post-surveys

The commercial product SurveyMonkey was used to conduct surveys online. A pre-course survey (see Appendix A) administered after last drop/add date, included items concerning demographic information, history of computer use, reasons for taking the course, familiarity with and accessibility to a computer, computer skills, experience with programming languages, interest in the course, application of the course material, difficulty of the course, reasons for taking the course, and any comments about the course.

A post-course survey (see Appendix B) administered during the last week of class included several repeated items: reasons for taking the course, interest in the course,

application of the course material, difficulty of the course, plans for taking other CS course in the future, and any comments about the course.

Results

The number of participants for Pre-course survey, Post-course survey, and both surveys was shown in Table 1. Most of the findings reported are based on the students who responded to both the pre and post surveys. As noted in the text, however, a few findings are based on either pre- or post-survey responses only. For the results of the pre-survey only, with 29 participants, see Appendix C.

Table 1. Number of participants

	Number of participants
Pre-course survey	29
Post-course survey	22
Pre- & Post-surveys	12

Demographic information

Major

The majority of students were from natural sciences majors, especially Mathematics and Physical science, as shown in Table 2.

Table 2. Distribution of Participants by Major

Major	N	Percent (%)
Biological science	1	8
Business	0	0
Computer science	0	0
Engineering	1	8
Health professions	1	8
Humanities	0	0
Languages	1	8
Mathematics	4	33
Physical science	3	25
Social science	0	0
Other	1	8
Total	12	100

Gender

The majority of students responded to both surveys was male, as shown in Table 3.

Table 3. Distribution of Participants by Gender

Gender	N	Percent (%)
Male	9	75
Female	3	25
Total	12	100

Ethnicity

The majority of respondents were Caucasian and Asian American, with no African Americans, Native Americans, or International, as shown in Table 4.

Table 4. Distribution of Participants by Ethnicity

Ethnicity	N	Percent (%)
African American	0	0
Asian American	4	33
Caucasian	7	58
Hispanic	1	8
International	0	0
Native American	0	0
Total	12	100

Class Standing

The majority of respondents was senior, and same proportions of freshman and junior students responded to both surveys, as shown in Table 5.

Table 5. Distribution of Participants by Class Standing

Class Standing	N	Percent (%)
Freshman	3	25
Sophomore	1	8
Junior	3	25
Senior	5	42
Total	12	100

SAT Math score

Most of respondents to both surveys had scored at least 700 on SAT Math, except one with 570.

Characteristics of students

History of Computer Use

Most students first learned to use many computer functions in middle school or high school, though many never learned to use Citrix, as shown in Table 6.

Table 6. Distribution of Participants by History of Computer Use

N Percent (%)	Middle School	High School	At UT	Another College	Never Learned	Total
PC	12 (100)	0 (0)	0 (0)	0 (0)	0 (0)	12 (100)
MAC	5 (42)	5 (42)	1 (8)	0 (0)	1 (8)	
Save a file	12 (100)	0 (0)	0 (0)	0 (0)	0 (0)	
Microsoft Word	11 (92)	1 (8)	0 (0)	0 (0)	0 (0)	
WinZIP	5 (42)	5 (42)	2 (17)	0 (0)	0 (0)	
Citrix	0 (0)	2 (17)	0 (0)	0 (0)	10 (83)	
Search engine	10 (83)	1 (8)	1 (8)	0 (0)	0 (0)	
E-mail	10 (83)	2 (17)	0 (0)	0 (0)	0 (0)	

Familiarity with Computers

Most students were comfortable using computers for everyday tasks and a little less comfortable for advanced tasks. Nobody was uncomfortable with computer using for everyday and advanced tasks (see Table 7).

Table 7. Distribution of Participants by Familiarity with Computers

N Percent (%)	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
	0	0	0	0	12	

	(0)	(0)	(0)	(0)	(100)	(100)
Advanced tasks	0 (0)	0 (0)	2 (17)	5 (42)	5 (42)	

Computer Skills

Most students considered themselves skillful at using computers for everyday and advanced tasks, and programming tasks, as shown in Table 8.

Table 8. Distribution of Participants by Computer Skills

N Percent (%)	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Everyday tasks	0 (0)	0 (0)	1 (8)	0 (0)	11 (92)	12 (100)
Advanced tasks	0 (0)	1 (8)	1 (8)	7 (58)	3 (25)	
Programming tasks	0 (0)	1 (8)	0 (0)	6 (50)	5 (42)	

Experience with Programming Languages

The majority of students did not have any or only a little experience with programming languages. However, 58 % and 92% of students had more than some experience in C++ and Java respectively, as shown in Table 9.

Table 9. Distribution of Participants by Experience with Programming Languages

N Percent (%)	None	A little	Some	Very much	Extensive	Total
Basic	8 (80)	1 (10)	0 (0)	1 (10)	0 (0)	10 (100)
C	7 (58)	3 (25)	2 (17)	0 (0)	0 (0)	12 (100)
C++	5 (42)	0 (0)	4 (33)	3 (25)	0 (0)	12 (100)
C#	11 (100)	0 (0)	0 (0)	0 (0)	0 (0)	11 (100)
Cobol	11 (100)	0 (0)	0 (0)	0 (0)	0 (0)	11 (100)
Fortran	11 (100)	0 (0)	0 (0)	0 (0)	0 (0)	11 (100)

Java	0 (0)	1 (8)	4 (33)	6 (50)	4 (8)	12 (100)
Pascal	11 (100)	0 (0)	0 (0)	0 (0)	0 (0)	11 (100)

Accessibility to computers

Virtually all students reported accessibility to computers at home and school. At UT Austin, all respondents had an access to computers on campus and at home, with 58% owning own laptops.

Overall course evaluation

Overall, most of the respondents were satisfied with the course. Nobody was unsatisfied, as shown in Table 10.

Table 10. Overall Course Evaluation

N Percent (%)	Very unsatisfactory	Un- satisfactory	Neutral	Satisfactory	Very satisfactory	Total
Overall course evaluation	0 (0)	0 (0)	2 (17)	4 (33)	6 (50)	12 (100)

Gender differences

There was no statistically significant difference between males and females on course difficulty, history of computer use, reason for taking the course, familiarity with and accessibility to computers, computer skills, experience with programming language, interest in the course, application of the course material, and plans for taking the next sequent course.

Change between Pre- and Post-Surveys

Several topics were addressed in both surveys: learning interest, expectation for the course, usefulness of the course content, application of the course material, and the course difficulty. For 3 items there were statistically significant differences between the responses to the pre- and post-surveys. Respondents’ expectations to master the content and programming skills on post-survey decreased from pre-survey, and respondents considered the course more difficult on post-survey than pre-survey. For those items with significant differences, descriptive statistics are shown in Table 11 and t-test results in Table 12.

Table 11. Descriptive Statistics for Items with Differences between Pre- & Post-Surveys

	Mean	N	Std. Deviation	Std. Error of the Mean
Expectation to master the content (pre)	4.42	12	0.67	0.19
Expectation to master the content (post)	3.83	12	0.72	0.21
Expectation to master programming skills (pre)	4.33	12	0.89	0.26
Expectation to master programming skills (post)	4.00	12	0.74	0.21
Course difficulty (pre)	2.67	12	0.65	0.19
Course difficulty (post)	2.08	12	0.67	0.19

Table 12. Paired Samples t-Test Results for Differences between Pre- & Post-surveys

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pre – Post items								
Expectation to master the content	0.58	0.67	0.19	0.16	1.01	3.02	11	0.01
Expectation to master programming skills	0.33	0.49	0.14	0.02	0.65	2.35	11	0.04
Course difficulty	0.58	0.51	0.15	0.26	0.91	3.92	11	0.00

Due to the small sample size, displaying the frequencies of each item is helpful in understanding the actual distribution. Table 13, 14, and 15 show the frequency distributions for those items. Many respondents who strongly believed that they would master the content and programming skills became less convinced at the end of the course. Among respondents, 42% regarded the course as difficult at the beginning of the course, but 75% at the end of the course. Also, a half of the respondents considered the course difficulty appropriate in the beginning, but only a quarter of students considered the same way at the end of the course.

Table 13. Distribution of Participants by Expectation to Master Content

N Percent (%)	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total

Expectation to master content (pre)	0 (0)	0 (0)	1 (8)	5 (42)	6 (50)	12 (100)
Expectation to master content (post)	0 (0)	1 (8)	1 (8)	9 (75)	1 (8)	

Table 14. Distribution of Participants by Expectation to Master Programming Skills

N Percent (%)	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Expectation to master programming skills (pre)	0 (0)	0 (0)	1 (8)	5 (42)	6 (50)	12 (100)
Expectation to master programming skills (post)	0 (0)	1 (8)	0 (0)	9 (75)	2 (17)	

Table 15. Distribution of Participants by Course Difficulty

N Percent (%)	Very difficult	Somewhat difficult	Appropriate	Somewhat easy	Very easy	Total
Course difficulty (pre)	0 (0)	5 (42)	6 (50)	1 (8)	0 (0)	12 (100)
Course difficulty (post)	2 (17)	7 (58)	3 (25)	0 (0)	0 (0)	

Reason for taking C S 313E

On the pre-survey, 75% of respondents are taking CS 313E because it is required for a degree or certificate. Table 16 shows the distribution.

Table 16. Distribution of Participants by Reasons for Taking C S 313E

Reason for taking CS 313E	N	Percent (%)
Required for degree	6	50
Interested in the content	2	17
Related to major	1	8
Sequence to CS 303E	0	0
Requirement for the certificate	3	25
Other	0	0
Total	12	100

Reason for taking Other C S Courses

On the post-survey, the most frequently mentioned reasons (50%) for taking other C S courses were because they are interested in the content, followed by “required for degree” and “other.” Other reasons were “for certificate” and “for both degree and my interest.” Table 17 shows the distribution.

Table 17. Distribution of Participants by Reasons for Taking Other CS Courses

Reason for taking other CS courses	N	Percent (%)
Required for degree	2	20
Interested in the content	5	50
Related to major	1	10
Sequence to CS 313E	0	0
Other	2	20
Total	10	100

CS courses that respondents want to take in the future include; CS 323E, CS 324E, CS 326E, CS 327E, CS 329E, elements courses, networking and web design.

CS 303E

Total of 25 respondents out of 29 on pre-survey said that they took CS 303E and listed the instructor’s name that they took the course with. Majority of the respondents took the course with Dr. Mitra and in 2005 Fall, Summer, or Spring.

Table 18. Instructors that Participants Took CS 303E with

Instructor	N	Percent (%)
Shaymal Mitra	19	76
Mary Eberlein	5	20
Jack Sarvela	1	4
Total	25	100

Table 19. Semesters in which Participants Took CS 303E

Semester	N	Percent (%)
2005 Fall	15	58
2005 Summer	4	15
2005 Spring	4	15
2004 Fall	2	8
2004 Spring	1	4
Total	26	100

Comments

Fifteen students commented about the course on the pre-survey. Comments are listed in descending order from most to least frequently mentioned, with the number of comments in parentheses. Their comments were dismantled according to the theme. For the details of the comments, see Appendix D.

- Assignments/Homework (5)
- Grading/Tests (5)
- Instructor (5)
- Course content (3)
- Overall course (3)
- Course difficulty (2)
- Other (1)

Six students commented about the course on the post-survey. Comments are listed in descending order from most to least frequently mentioned, with the number of comments in parentheses.

- Instructor (4)
- Overall course (3)
- Content (2)
- Grading/Tests (2)

Conclusions

The majority of respondents were natural sciences majors, male, Caucasian and Asian American, and senior. Virtually all students had an access to computers. Most of them started to use several computer functions, except Citrix, since middle school, and were comfortable using computers for everyday and advanced tasks. Exception of Java and C++, most of students' experiences in programming languages were quite limited.

Gender differences were not present on any demographic information or characteristics of students.

Students regard the course more difficult at the end of the semester than at the beginning. Accordingly, their level of self-expectation to master the course content and programming skills decreased at the end of semester.

Most of students are taking CS 313E because it is required for a degree or certificate. When they were asked about the possibility of taking other CS courses in the future, 10 out of 12 answered they would. The most common reason for taking other CS courses in the future was because they were interested in the content.

Recommendations

It seems that students expected the course less difficult to begin with and later in the course they realized it is more difficult than expected. It would be helpful for students to be informed about the level of difficulty of the course in the beginning, by providing detailed description of the course including examples of expected activities or assignments.

Targeting student population that can use the course as a part of degree or certificate requirements seems promising for more of future student enrollment. In addition, students who took this course expressed interests in taking the other CS courses in the future. Therefore, introducing the other possible CS courses in the class might be a practical guide for students who want to pursue further in the field.

Appendix A

CS 313E Survey I Spring 2006

Welcome!

The instructor of this course is interested in making this course a good experience for you and for future classes. To that end he is working with the Division of Instructional Innovation and Assessment (DIIA) to determine what works well for you, the students in the class. We are going to ask you for a little information about yourself and your expectations for this course. We'll come back to you later in the semester for more information.

The survey should take you about 15 minutes.

Participation in this survey is voluntary. If you do not wish to participate, just exit the survey with our thanks. Only staff at DIIA will have access to individual responses. The instructor will not know if you decide to participate and only will receive aggregated responses for the whole class.

If you are willing to participate, just click the "next" button below. Please submit your survey by Friday, February 17.

A little information about you

1. Please provide your UT EID (e.g., abc123) in the space below. It will be used only to match your responses to a survey administered at the end of the semester.

2. What is your major?

1. Biological science (eg. microbiology, integrated biology, etc.)
2. Business
3. Computer science
4. Engineering
5. Health professions (eg. nursing, pharmacy, premed)
6. Humanities (eg. English, fine arts, etc.)
7. Languages (eg. Spanish, Germanic Languages, linguistics, etc)
8. Mathematics
9. Physical science (eg. chemistry, physics, astronomy, etc.)
10. Social science (eg. anthropology, sociology, psychology, history, etc.)

3. Gender

1. Male
2. Female

4. Ethnicity (optional)

1. African American
2. Asian American
3. Caucasian
4. Hispanic
5. International
6. Native American
7. Other (please specify) _____

5. Class standing
 1. Freshman
 2. Sophomore
 3. Junior
 4. Senior
 5. Other (please specify) _____

Previous skills/achievements

We're interested in how you already know about computers. Please respond to the following questions about your previous accomplishments.

6. SAT math score (as best you can remember)

7. When did you first learn to:

	Middle school	High school	At UT	Another college	Never learned
Use a PC (Windows)					
Use a MAC					
Save a computer file					
Use Microsoft Word					
Use compressing software (WinZIP)					
Use remote access software (Citrix)					
Use a search engine					
Use email					

8. Please indicate the degree of your agreement for the following.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I am comfortable using computers for everyday tasks, such as email, instant messaging, websearching, etc.					

I am comfortable using computers for more advanced tasks, such as programming or data analysis.					
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9. Please indicate the degree of your agreement for the following.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I am skillful at using computers for everyday tasks.					
I am skillful at using computers for more advanced tasks, like data analysis.					
I am skillful at programming computers for basic tasks.					

10. How much experience do you have programming in each of the following languages?

	None	A little	Some	Very Much	Extensive
Basic					
C					
C++					
C#					
Cobol					
Fortran					
Java					
Pascal					

11. With what other programs not listed above do you have some experience?

Access to computers

12. Which of the following is the best description of accessibility to computers when you were in high school?

1. I had an access to computers ONLY at home.
2. I had an access to computers ONLY at school.
3. I had an access to computers BOTH at home and school.

4. I did NOT have an access to computers at all.

13. Following descriptions are about the accessibility to computers at UT. Please select all that apply to you.

1. I have my own laptop computer.
2. I have an access to computers at home.
3. I have an access to computers at UT computer lab.
4. I do NOT have an access to computers at all.

Expectations for CS 313E

Now we are interested in finding out about your incoming expectations for this course and your performance in it.

14. Is this course required for your major?

1. Yes
2. No

15. Please indicate the degree of your agreement for the following.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I need the content of this course to succeed in my work here at UT.					
I need the content of this course to succeed in my chosen profession.					
I need the content of this course to understand the uses of technology in the future.					

16. Please indicate the degree of your agreement for the following.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I am interested in learning more about computers in general.					
I am interested in learning to program simple tasks for which computers are used in my field					

of study.					
I am interested in learning more about computer science as a career choice.					

17. Please indicate the degree of your agreement for the following.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I will be able to make a good grade in this course.					
I will be able to master the content taught in this course.					
I will be able to master the programming skills in this course.					

18. Please indicate the degree of your agreement for the following.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I understand how the content for this course can be applied to human services/social problems.					
I understand how the content for this course can be applied to the natural sciences and engineering research.					
I understand how the content for this course can be applied to everyday problems we all face.					

19. How difficult do you think this course would be?

1. Very difficult
2. Somewhat difficult
3. An appropriate level of difficulty
4. Somewhat easy
5. Very easy

Other CS courses

20. Did you take CS 303E?
1. Yes (Go to #21)
 2. No (Go to #23)

CS 303E --- “yes” follow up

21. Who was the instructor for CS 303 E?
22. What semester did you take CS 303E (e.g., fall 2005, summer 2005, etc.)?

Why taking CS 313E

23. Why are you taking CS 313E?
1. It is required for my degree
 2. I am interested in the content
 3. It is related to my major
 4. It is a sequence course to CS 303E
 5. It is a requirement for the Elements of Computing Certificate
 6. Other (please specify) _____

Positive experience

24. Write any suggestions that might help you have positive and enjoyable experience in this course.

Thank you!

That concludes this survey. Thank you for your cooperation.

Appendix B

CS 313E Survey II Spring 2006

Welcome Back!

This is a follow-up survey of “CS 313E Survey I Spring 2006.” As mentioned before, the instructor of this course is interested in making this course a good experience for you and for future classes. To that end he is working with the Division of Instructional Innovation and Assessment (DIIA) to understand what worked well and what did not for you, the students in the class. We are going to ask you questions about your experience with course.

The survey should take you about 5 minutes.

Participation in this survey is voluntary. If you do not wish to participate, just exit the survey with our thanks. Only staff at DIIA will have access to individual responses. The instructor will not know if you decide to participate and only will receive aggregated responses for the whole class.

If you are willing to participate, just click the "next" button below. Please submit your survey by Friday, May 5.

UT EID

1. Please provide your UT EID (e.g., abc123) in the space below. It will be used only to match your responses to a survey administered at the beginning of the semester.

Evaluation for CS 313E

Now we are interested in finding out about your evaluation for this course and your performance in it.

2. After taking the course, what is the degree of your agreement for the following?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I needed the content of this course to succeed in my work here at UT.					
I needed the content of this course to succeed in my chosen profession.					

I needed the content of this course to understand the uses of technology in the future.					
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3. After taking the course, what is the degree of your agreement for the following?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I am interested in learning more about computers in general.					
I am interested in learning to program simple tasks for which computers are used in my field of study.					
I am interested in learning more about computer science as a career choice.					

4. After taking the course, what is the degree of your agreement for the following?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I received a good grade in this course.					
I mastered the content taught in this course.					
I mastered the programming skills in this course.					

5. After taking the course, what is the degree of your agreement for the following?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I understand how the content for this course can be applied to human services/social problems.					

I understand how the content for this course can be applied to the natural sciences and engineering research.					
I understand how the content for this course can be applied to everyday problems we all face.					

6. How difficult do you think this course was?

- 6. Very difficult
- 7. Somewhat difficult
- 8. An appropriate level of difficulty
- 9. Somewhat easy
- 10. Very easy

7. Overall, how would you evaluate this course?

- 1. Very unsatisfactory
- 2. Unsatisfactory
- 3. Neutral
- 4. Satisfactory
- 5. Very satisfactory

Future CS courses

8. Do you plan to enroll in other Computer Science course in the future?

- 3. Yes (Go to #9)
- 4. No (Go to #10)
- 5. Not sure (Go to #10)

Future CS courses --- “yes” follow up

9. Which CS course(s) do you plan to enroll in the future?

10. Why do you plan to enroll in other CS courses in the future?

- 1. To fulfill my degree requirement
- 2. I am interested in the content
- 3. It is related to my major
- 4. It is a sequence course to CS 313E
- 5. Other (please specify) _____

Future CS courses --- “no” “not sure” follow up

11. Why do you not plan to enroll in other CS courses in the future?

7. It is not required for my degree
8. I am not interested in
9. It is not related to my major
10. I may have to retake this course
11. Other (please specify) _____

Comments

12. If you have any other comments about CS 313E, please write in the space provided below.

Thank you!

That concludes this survey. Thank you for your cooperation.

Appendix C

Pre-survey Analyses

Demographic information

Major

	N	Percent (%)
Biological science	7	24
Engineering	3	10
Health professions	1	3
Languages	1	3
Mathematics	8	28
Physical science	7	24
Social science	1	3
Other	1	3
Total	29	100

Gender

	N	Percent (%)
Male	21	73
Female	8	28
Total	29	100

Ethnicity

	N	Percent (%)
African American	1	3
Asian American	6	21
Caucasian	18	62
Hispanic	1	3
International	2	7
Other	1	3
Total	29	100

Class standing

	N	Percent (%)
Freshman	6	21
Sophomore	5	17
Junior	8	28
Senior	10	35
Total	29	100

Characteristics of students

History of computer using

N Percent (%)	Middle school	High school	At UT	Another college	Never learned	Total
PC	29 (100)	0 (0)	0 (0)	0 (0)	0 (0)	29 (100)
MAC	14 (48)	7 (24)	6 (21)	0 (0)	2 (7)	29 (100)
Save a file	29 (100)	0 (0)	0 (0)	0 (0)	0 (0)	29 (100)
Microsoft Word	26 (90)	2 (7)	1 (3)	0 (0)	0 (0)	29 (100)
WinZIP	14 (48)	8 (28)	3 (10)	0 (0)	4 (14)	29 (100)
Citrix	1 (4)	6 (21)	3 (11)	0 (0)	18 (64)	28 (100)
Search engine	24 (83)	1 (3)	3 (10)	1 (3)	0 (0)	29 (100)
Email	24 (83)	2 (7)	2 (7)	1 (3)	0 (0)	29 (100)

Familiarity to computers

N Percent (%)	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Everyday tasks	0 (0)	0 (0)	0 (0)	1 (3)	28 (97)	29 (100)
Advanced	0	2	4	13	10	

tasks	(0)	(7)	(14)	(45)	(35)	
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Computer using skills

N Percent (%)	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Everyday tasks	0 (0)	0 (0)	2 (7)	3 (10)	24 (83)	29 (100)
Advanced tasks	1 (3)	3 (10)	4 (14)	12 (41)	9 (31)	
Programming tasks	0 (0)	2 (7)	4 (14)	13 (45)	10 (35)	

Experience of programming languages

N Percent (%)	None	A little	Some	Very much	Extensive	Total
Basic	17 (63)	3 (11)	3 (11)	3 (11)	1 (4)	27 (100)
C	15 (56)	6 (22)	4 (15)	1 (4)	1 (4)	27 (100)
C++	12 (41)	5 (17)	5 (17)	5 (17)	2 (7)	29 (100)
C#	25 (93)	1 (4)	1 (4)	0 (0)	0 (0)	27 (100)
Cobol	27 (100)	0 (0)	0 (0)	0 (0)	0 (0)	27 (100)
Fortran	25 (93)	1 (4)	0 (0)	1 (4)	0 (0)	27 (100)
Java	0 (0)	2 (7)	14 (48)	10 (35)	3 (10)	29 (100)
Pascal	23 (85)	1 (4)	2 (7)	1 (4)	0 (0)	27 (100)

Accessibility to computers

There was not much variability for the accessibility to computers. When students were in high school, there was nobody who did not have an access to computer. At UT, all the respondents had an access to computers. In addition, 86% had an access at home and 69% owned own laptops.

Appendix D Comments

Pre-survey

Assignments/Homework (5)

- I think the pair programming was a great idea for the class and I appreciate the instructor making it optional. I think some mandatory pair programming classes and mandatory individual assignments might help balance so that folks are learning the content and not latching on to others to do their work for them.
- The in-class programming exercises are also very good, and they let the students develop problem solving skills in class without feeling pressure of grades.
- I think it would help to have a model coding (answers) for the homework assignments. We could've achieved the same effect, but if there was a more effective way, it would be helpful to see what other approach could have been used.
- The programming assignments are tough and grading outlines are tough as well.
- I would like the interesting computer programming assignments and focus on programming techniques to continue, as these are excellent examples of how one can relate computer programming to real life work.

Grading/Tests (5)

- Plus the grading has changed which has taken a little stress away.
- No tests and final?
- I would like to see more exam support materials online.
- I am very interested in learning as much as I can regardless of the fact that I may not be able to make the grade.
- Please be flexible on grading late assignments.

Instructor (5)

- I've very much enjoyed the presentation style and the professor's involvement with the course so far.
- I enjoy Dr. Mitra's teaching style very much. He goes in a very coherent, step-by-step manner and has a genuine interest in the success of his students.
- He will frequently ask for audience participation while not placing any stress on the student. I think this is a key aspect to the enjoyable experience in this course and should be continued (as is).
- High personal interaction with the students (ie, high student involvement) is a very beneficial teaching tool that Dr. Mitra has mastered and placed much emphasis in. The use of this teaching style, as opposed to solely lecturing, is extremely positive.
- I also believe Dr. Mitra to be an exceptional Professor who will make time to meet and discuss with students issues about themselves and the content of the course.

Course content (3)

- CS 313E has been much more enjoyable so far than CS303E because now we can actually apply real programs.
- We should play around with other langs than java... I think comparing java to C++ and pascal and even fortran would give good perspective... something to think about...
- I would like to focus on the Java language and learning the intricacies and focus less on developing problem solving skills.

Overall course (3)

- This is one of my most enjoyed classes for this semester.
- No suggestions of note.
- so far so good

Course difficulty (2)

- The class is very hard!!
- This is not a CS major class, it is a class for non majors and that should be considered in the level of difficulty.

Other (1)

- As to my own failings; I am under extreme stress with my last years upper division courses, with my time to study them, along with 313E, and Arabic 507. I have made my own bed and now I will lay in it.

Post-survey

Instructor (4)

- As a teacher, Mitra shows considerable interest in the success of his students. The teaching style was terrific.
- I think Dr. Mitra is a great professor.
- I very much enjoyed Dr. Mitra's lecture. He has a lot of valuable information to impart, and he is quite good at teaching.
- Dr. Mitra is a wonder professor, he seems to be very interested in the students' learning and he takes the time to listen and help his students anyway he can. I had kind of a set back during this course and I am hoping to pull through, but if not I will be willing to enroll in Dr. Mitra's 313E again, and if I do make it through I am already planning to take another of Dr. Mitra's courses on Web design. Thank you, Dr. Mitra.

Overall course (3)

- The course was taught extremely well.
- I really enjoyed this course.
- The course was run superbly.

Content (2)

- The field of computer science itself, however, simply does not interest me, therefore this will be the last computer science course I take, as I have already fulfilled my computer science requirements for my degree by taking CS303E and CS313E.
- I feel many topics were a bit condensed and could be elaborated more.

Grading/Tests (2)

- Some of the material tested on should be more over the stuff used in the programming assignments and less dependent on whether certain facts were remember. (i.e. the particular implementation of q-sort when there exists many variations)
- I think the problem is, a lot of non-majors who take this course are afraid that there is no cut and dry method to solving the problems. One's success depends on one's ability to think logically through the problem and come up with an algorithm. In a sense, it makes computer science more difficult than mathematics, where one adheres to strict doctrines and formulas/methods to solve certain classes of problems. The same cannot truly be said for computer science, and people are afraid of that when it comes to grading. They become nervous that they won't be able to immediately think of a logical solution to a given problem under time constraints for, say, a test. One remedy to this is to maybe place even more grading emphasis on the programming assignments - have them count 50% (or more) as opposed to 40%. I don't think people feel pressured to do the weekly homework assignments. The weekly assignments demand more logic than problems on the test, in any case, and they are more representative of what a computer scientist would have to do in real life. They are given week(s) to solve a larger problem, as opposed to 2 hours to solve a smaller, easier problem (the format of the tests). I personally have had no problem with any portion of the course - I am simply speaking out of what I feel my peers are thinking, based on what I've heard from them in the lab. Ultimately what it comes down to is people don't want to feel too pressured for making a good grade in the course, given that this is a nonmajor course. And, the reason people feel pressured is because in computer science there is no strict methods to follow to solve problems. To remedy this, placing more emphasis (grade-wise) on the programming assignments, which have no time-pressure, may help attract more people to this course.