Student Perceptions of On-Line Education

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ABSTRACT

The purpose of this research is to study general student perceptions of on-line education and characterize the differences that exist between various student demographic groups, with a focus on differences between those who have and have not previously taken courses on-line. We surveyed more than 300 students and analyzed their responses. Although almost every survey participant agreed that on-line courses are more convenient for students, there were significant disagreements and different perspectives about on-line education between the groups. Results from this research can be used to shape marketing and advising efforts for on-line courses and programs.

Keywords: On-line education, distance education, student perceptions

INTRODUCTION

In recent years there has been significant growth in on-line education for many reasons [1, 2]. With uncertain fuel costs, this is expected to grow even faster [3]. For example, a recent study by Eduventures found that 64 percent of students enrolled in on-line programs lived within the same geographic area as the institution offering the program [4]. However, many students are still not very familiar or comfortable with on-line course delivery methods. The purpose of this research is to study student perceptions and misconceptions related to on-line education and characterize the differences that exist between those who have taken on-line courses before and those who have not.

To accomplish this goal, we surveyed students from a public, primarily undergraduate institution and analyzed the results. Although almost every survey participant agreed that on-line courses are more convenient for students and are becoming very popular in general, there were also many differences in perception. These differences included effectiveness of several aspects of the learning experience, difficulty level of the courses, and interaction opportunities. There were also significant differences in their stated likelihood of taking various types of courses (quantitative, qualitative, lab-based, etc.) or types of delivery methods (synchronous, asynchronous, hybrid, etc.) in the future.

In this paper we expand upon these themes, and provide statistical analysis of the survey results. As universities continue to expand their on-line offerings, it is important to take into consideration the views of their various stakeholders. Results from this research can be used to shape marketing and advising efforts aimed at students.

BACKGROUND

Much research has been done in recent years to attempt to study the effectiveness of on-line education and characterize best practices associated with on-line delivery. However, much of this work ignores the student perceptions, which are a key input to the education process.

The Alliance for Higher Education Competitiveness extensively surveyed 21 institutions of higher learning that felt they were implementing successful e-learning programs and looked for best practices associated with that group [5]. They found many commonalities for success, including support from administration, a goal of moving full programs on-line rather than only individual courses, and the belief that on-line courses/programs are higher quality than traditional face-to-face offerings. They gathered some information on student perceptions, but from the point of view of the single person most responsible for on-line education at the institution, rather than from the students themselves. Similarly, a report by the Sloan Consortium, summarizing a survey of more than 1100 degree granting institutions of higher education in the United States, claimed that a large majority of all institutions agree that students are as satisfied with on-line courses as they are with face-to-face offerings. However, this was again the perception of the chief Academic Officer, not actual students [1]. Blakelock and Smith also studied attitudes surrounding distance learning, and found a growth in acceptance of distance learning in general, but their study focused on English composition faculty and administration [6]. Some older studies from 1999 [7, 8] discussed how student and teacher access to and familiarity with computers affected their comfort with online and computer enhanced learning.

One notable exception is a study of faculty and doctoral students in an on-line program in a school of computer and information sciences to obtain perceptions of what environmental factors are indicators of quality in on-line courses [9]. The study concluded that environment created by the community of learners, accessibility to the instructor, and clear and timely feedback were the most important factors, with the faculty and graduate participants very much in agreement on these factors. A study of engineering and engineering management students at the University of North Carolina, Charlotte attempted to assess student perceptions of online learning. This survey of 213 students made generalized statements that students who have taken online courses prefer asynchronous or blended delivery methods, while students who have not taken online courses prefer synchronous delivery methods. However, these conclusions are shown only in differences in the average rating for these groups and are not supported by statistical tests [10].

A study was conducted to test satisfaction levels, retention, and grade performance of on-line students for a fiber optics course. This study found that on-line students were significantly more satisfied with the course. However, all students (including those considered traditional) viewed pre-recorded class lectures without the instructor present [11], which removes some of the typically perceived benefits of traditional classes. Another study was of undergraduate students in traditional business courses at a Midwestern university who participated in an integrated online learning unit. The results showed that students in an elective course rated the online experience more positively than students in a required course [12]. Williamson et al. [13] also present faculty and student perspectives on an on-line course, but their results are limited because they focus on the point of view of one student in a single course. Roblyer [14] surveyed virtual high school and distance learning community college students in five courses. She found that control over pace and timing of learning was significant in why students chose distance learning courses over traditional face-to-face courses.

METHODS

Southern Polytechnic State University (SPSU) is a special-purpose institution in the University System of Georgia, with a mission to offer bachelors and masters degrees and continuing professional development in science, engineering, technology, and related fields. The university enrolls almost 5,000 students, many of whom are nontraditional. Three departments offer on-line degrees (2 masters degrees and 1 bachelors degree), three additional departments offer on-line certificates, and still others offer additional on-line or hybrid courses. The university is also affiliated with eCore, a program developed by the University System of Georgia to offer all required core undergraduate

classes on-line. The university offers a variety of on-line learning experiences, including asynchronous learning using just pre-recorded audio and text chat and synchronous learning, using Wimba Live classroom for live audio/video interaction.

An e-mail was sent to all 4,818 students enrolled at the university during fall semester 2008, inviting them to take a survey. Students were incented to take the survey by earning an entry into a gift card drawing, and the survey took approximately 5 minutes to complete. Many of the questions were written on a 5-value Likert scale, which we centered at 0 for analysis. There were also a few open-ended questions for qualitative analysis as well as demographic questions to assist in analyzing the results. (A copy of the survey questions, which were generated by the researchers, is included in Appendix A.) The survey was administered over the course of a week, using Survey Monkey's free hosting software (www.surveymonkey.com). Data was later imported into Microsoft Excel and Minitab for analysis.

A total of 332 surveys were fully completed (6.9% response rate) from a representative cross-section of SPSU's student population. The respondents experience with on-line courses breaks down as follows: 98 of the students had never taken an on-line course before, 125 had taken 1 or 2 on-lines classes and 103 had taken 3 or more. Approximately half of the students were pursuing engineering or engineering technology degrees; the rest were split among the various other majors of the university, such as the arts and sciences, business, architecture, and construction. Table 1 summarizes the demographics of students who completed the survey. Students were given the option to omit any demographic questions they wished, which in some cases caused the total to be less than 332.

In addition to reporting summary statistics in the results below, we often use the mean of the Likert scale responses to make comparisons between questions and between demographics. There is some disagreement about which tests of the equivalence of sample means on results from a Likert scale are appropriate. For this reason, we chose to use non-parametric tests, specifically the Mann-Whitney U-test [15], since they are the most conservative. Unless otherwise noted, if a difference between two means is claimed in the results, the p-value is no more than 0.01, and often much less. Mean results are included in Appendix B, and full results are available from the authors by request.

AGGREGATE RESULTS

In this section of the paper, we report results from the entire sample of students taking the survey. In some of the figures, the results from students who have taken 3 or more on-line courses are also included for comparison, to illustrate differences between the general populations and those who have been exposed significantly to on-line education already. Differences between students who

Demographic	Students
Never taken an on-line course	98
Taken 1 or 2 on-line courses	125
Taken 3 or more on-line courses	103
Part-time student	100
Full-time student	232
Working more than 35 hours per week	128
Working 10-25 hours per week	105
Working 10 or fewer hours per week	91
Living on campus	81
Living less than 10 miles from campus	77
Living 10-25 miles from campus	81
Living more than 25 miles from campus	90
Freshman	49
Sophomore	57
Junior	79
Senior	75
Graduate student	75
Engineering/Engineering technology major	175
Male	234
Female	96
Students completing the survey	**332**

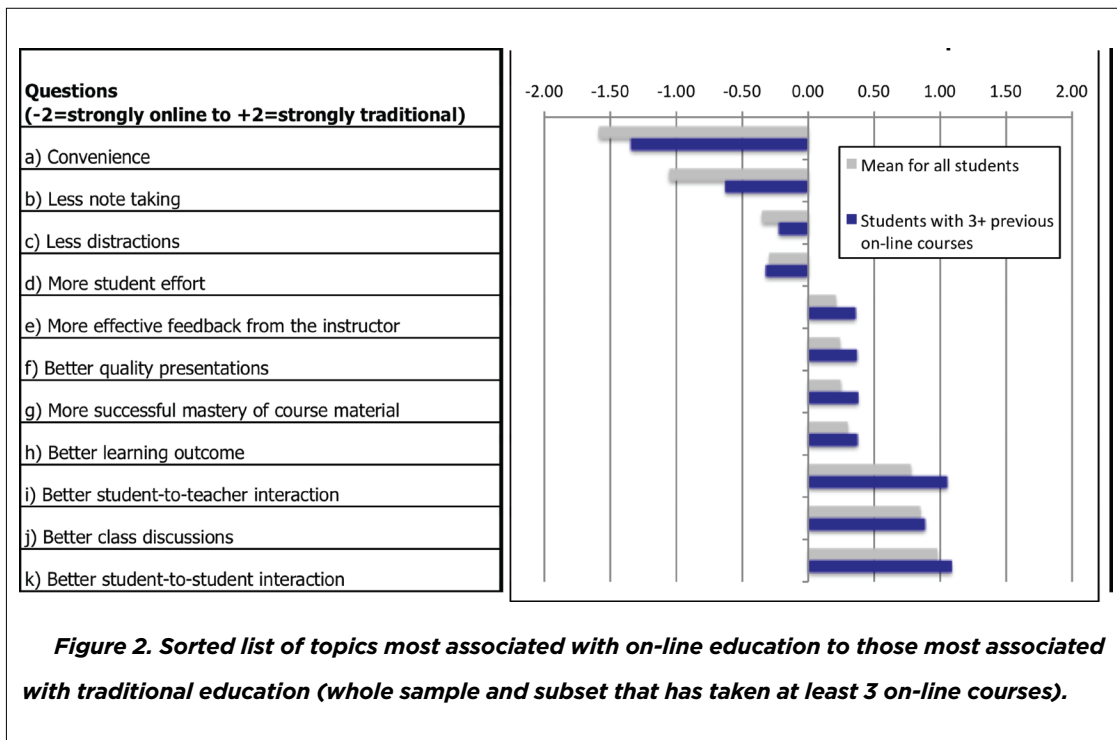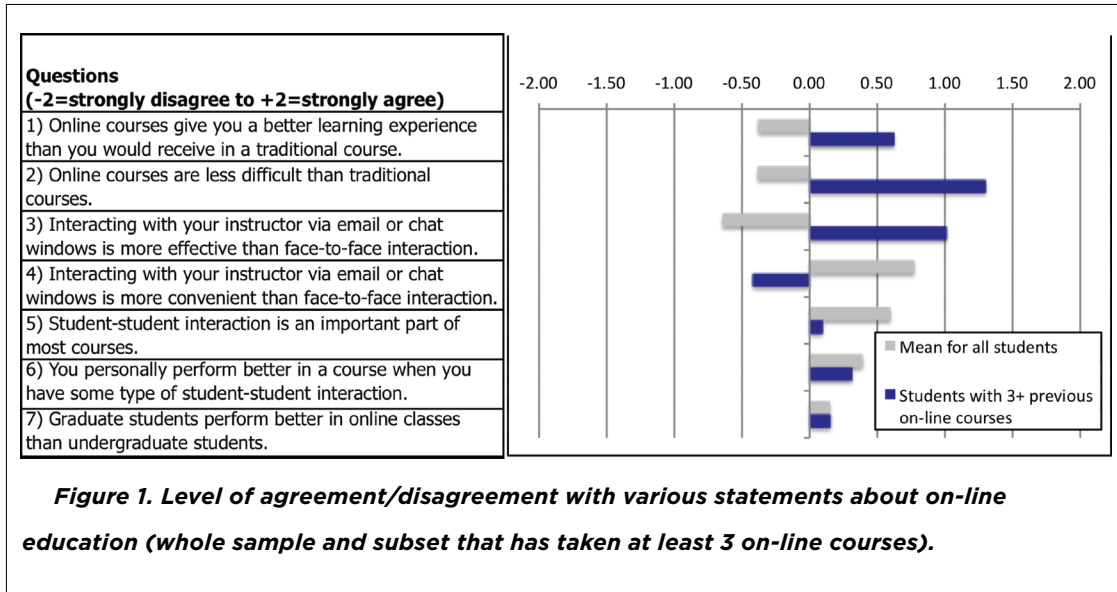*Table 1. Demographics of survey respondents.*

have and have not previously taken on-line courses will be discussed in the following section, along with other results by demographic.

The first set of questions asked the students to rate their opinions from strongly disagree to strongly agree. The full text of the questions can be found in Appendix A. In most categories, the results were relatively neutral for the aggregate group. (See Figure 1.)

The second set of questions asked the students to rate each topic from 'relating strongly to on-line classes' to 'relating strongly to traditional classes'. In Figure 2, we have sorted the mean responses from the topics that the aggregate group of students felt most aligned with on-line classes to those they felt most aligned with traditional classes. 'Convenience' was very strongly correlated with on-line courses, followed by 'less note taking'. Better student-to-teacher and student-to-student interactions were associated with traditional classes, as were better class discussions.
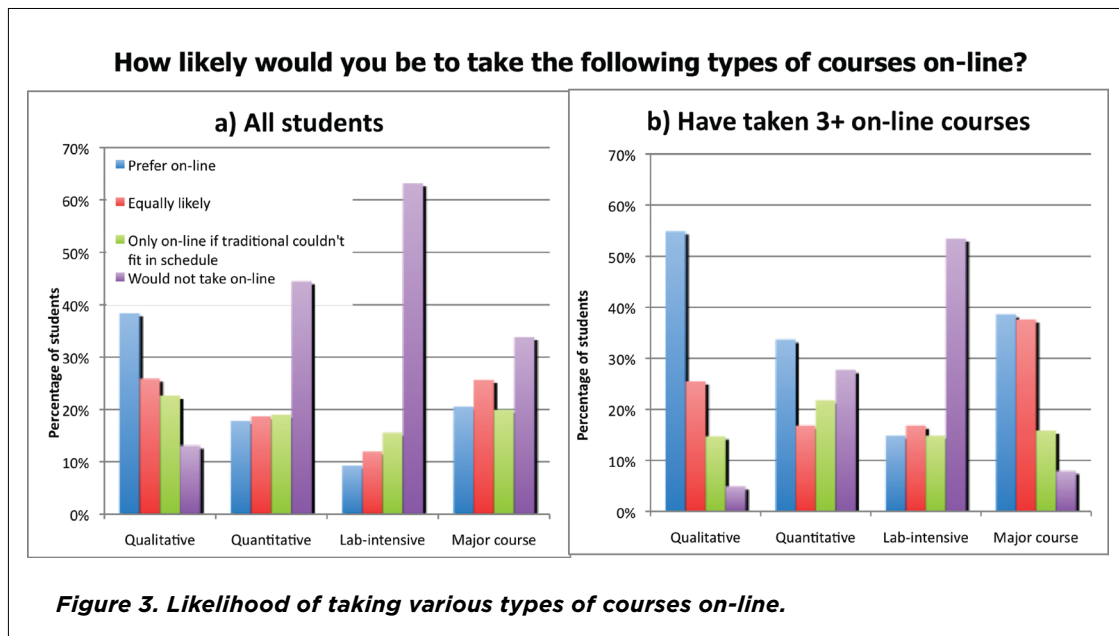
The third group of questions asked the students how likely they were to take different types of courses on-line in the future. Results are in Figure 3. For qualitative courses (defined in the

Questions (-2=strongly disagree to +2=strongly agree)	
1) Online courses give you a better learning experience than you would receive in a traditional course.	
2) Online courses are less difficult than traditional courses.	
3) Interacting with your instructor via email or chat windows is more effective than face-to-face interaction.	
4) Interacting with your instructor via email or chat windows is more convenient than face-to-face interaction.	
5) Student-student interaction is an important part of most courses.	
6) You personally perform better in a course when you have some type of student-student interaction.	
7) Graduate students perform better in online classes than undergraduate students.	

Figure 1. Level of agreement/disagreement with various statements about on-line education (whole sample and subset that has taken at least 3 on-line courses).

Questions (-2=strongly online to +2=strongly traditional)	
a) Convenience	
b) Less note taking	
c) Less distractions	
d) More student effort	
e) More effective feedback from the instructor	
f) Better quality presentations	
g) More successful mastery of course material	
h) Better learning outcome	
i) Better student-to-teacher interaction	
j) Better class discussions	
k) Better student-to-student interaction	

Figure 2. Sorted list of topics most associated with on-line education to those most associated with traditional education (whole sample and subset that has taken at least 3 on-line courses).

question text as "such as history or English") the highest number of students (nearly 40%) would prefer an on-line course over a traditional course, and an additional 26% would be equally likely to take one on-line. Forty-six percent of students say that they would either prefer or be equally likely to take an on-line course for their major courses, and 36% for quantitative courses ("such as

Figure 3. Likelihood of taking various types of courses on-line.

math or statistics"). However, 63% of students say that they would not take a lab-intensive course ("such as biology or physics") on-line.

The final group of questions asked about perceptions of various types of technology for course delivery. Of the choices given, students stated they were most likely to take an asynchronous course (defined in the question text as "students view the course materials at their own convenience") on average, followed by a hybrid course (defined as "some of the lectures are held on campus and some on-line"), and least likely to take a synchronous course (defined as "a portion of the course is viewed in real time"). However, this contradicts their response that they were least likely to take a course using only pre-recorded material and text-chat, as opposed to live audio or video. Perhaps this reflects a conflict between preferring not to be tied to a scheduled class time, yet also feeling live instruction would be more effective.

We also asked the open-ended question, "In general, would you prefer to take an on-line course or a traditional course? Why?" The comments from those preferring on-line courses mostly focused on convenience and travel costs. Several qualified their statements by saying there were still some classes they would prefer to not take on-line. The majority of those preferring traditional courses had concerns centering on a lack of interaction — mostly with faculty, but also with other students. Some went so far as to say college classes should <u>teach</u> students social skills. Other frequently mentioned reasons for avoiding on-line classes were motivation concerns and technology failures/inadequacy.

Figure 4. Likelihood of taking various types of courses on-line.
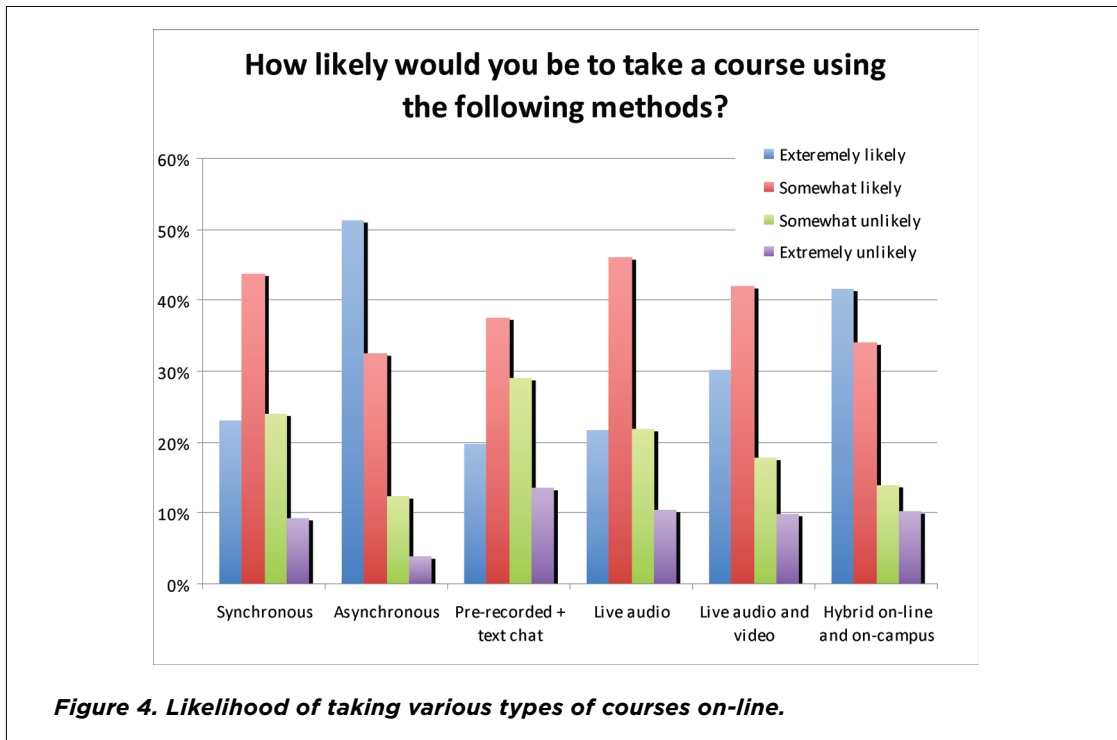
In the extra comments section, a significant number of students mentioned that the instructor plays a big role in the success of on-line education, offering both positive and negative examples. Common student complaints about on-line education were faculty not responding quickly enough to student questions and disorganized web pages that added to the time students needed to spend on the course.

RESULTS BY DEMOGRAPHIC

In this section we compare differences in perceptions between various student groups. Our focus is on differences between those who have taken on-line courses before and those who have not, but we include other interesting differences as well.

Differences between those who have and have not taken on-line classes before

Analysis showed that 89.2% of the students who have taken 3 or more on-line courses are working at least 10 hours per week, and 65.7% are working at least 35 hours per week. The students are relatively evenly split between part-time and full-time students, and most are upperclassmen or graduate students. There does not appear to be any age or gender bias in that group, compared with the population of SPSU.

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Students who have not taken on-line courses before have a more negative view of the learning experience as well as the effectiveness and convenience of interacting with their professor in an on-line course. They are also more likely to feel that it is important to have student-student interaction in a course. Students who have taken on-line courses before are less likely to believe that on-line courses are easier than traditional courses. Differences between the means of the students who have taken no on-line courses and those who have taken 3 or more on-line courses are statistically significant at 99% for all questions in Table 2, except for question 7. Excluding question 7, the mean from the group of students who had taken 1 or 2 on-line courses falls between the other two groups' means, but is not always statistically different from both groups.

While all groups characterized on-line courses as more convenient, those who have taken them before feel more strongly so. Those who have taken on-line courses before feel that there are fewer distractions in an on-line course, while those that have not are neutral. Students who have not taken an on-line course before feel that presentations would be higher quality in an on-line course, while those who have are neutral. Those who have taken on-line courses before feel that on-line classes relate to more successful mastery of the material while those who have not feel that traditional classes do. P-values for the differences between the no on-line courses and 3 or more on-line courses groups for ALL categories in Table 3 are less than 0.01. As before, the group who has taken 1 or 2 on-line courses falls between the other two groups, but with varying levels of statistical significance.

Questions (-2=strongly disagree to +2=strongly agree)	no on-line courses	1 or 2 on-line courses	3 or more on-line courses
1) Online courses give you a better learning experience than you would receive in a traditional course.	-0.68	-0.44	-0.13
2) Online courses are less difficult than traditional courses.	-0.12	-0.32	-0.80
3) Interacting with your instructor via email or chat windows is more effective than face-to-face interaction.	-0.83	-0.65	-0.51
4) Interacting with your instructor via email or chat windows is more convenient than face-to-face interaction.	0.54	0.82	0.92
5) Student-student interaction is an important part of most courses.	0.81	0.60	0.40
6) You personally perform better in a course when you have some type of student-student interaction.	0.60	0.40	0.18
7) Graduate students perform better in online classes than undergraduate students.	0.13	-0.06	0.34

Table 2. Mean responses for questions for students who have taken no on-line courses previously, those who have taken 1 or 2, and those who have taken 3 or more.

Questions (-2=strongly online to +2=strongly traditional)	no on-line courses	1 or 2 on-line courses	3 or more on-line courses
Convenience	-1.24	-1.65	-1.84
Better student-to-student interaction	1.47	0.94	0.59
Better student-to-teacher interaction	1.08	0.74	0.55
Better class discussions	1.39	0.81	0.39
Less distractions	0.13	-0.41	-0.72
Better quality presentations	0.45	0.38	-0.13
More effective feedback from the instructor	0.61	0.18	-0.14
More student effort	0.41	-0.40	-0.82
More successful mastery of course material	0.65	0.27	-0.12
Better learning outcome	0.69	0.33	-0.13

Table 3. Mean responses for questions for students who have taken no on-line courses previously, those who have taken 1 or 2, and those who have taken 3 or more.
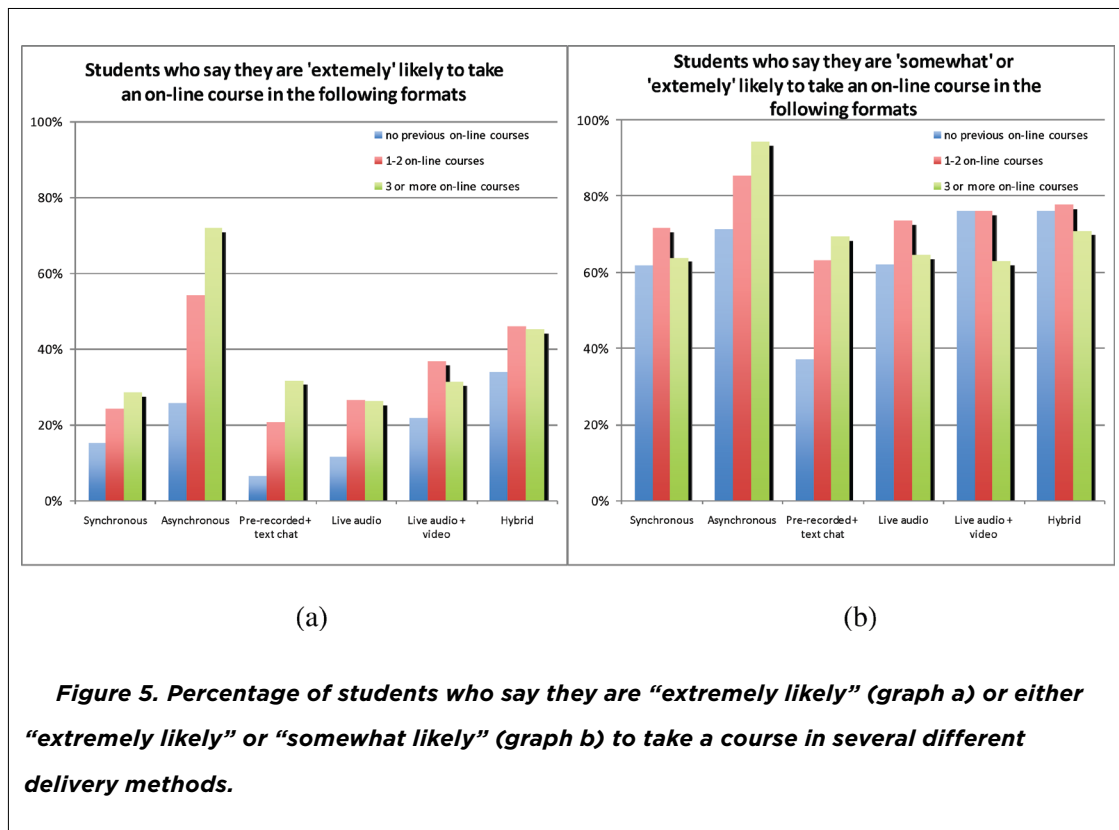
All groups of students would be more likely to take a qualitative course on-line than a quantitative course, and even less likely to take a lab-intensive course. However, the students who have taken on-line courses before said they were more likely to take more on-line courses in the future, in all category types (See Figure 3 in the previous section). A majority of students who have taken 3 or more courses on-line would prefer to take a qualitative course on-line instead of through traditional course delivery methods. A majority of those students would also either prefer or be equally likely to take a quantitative or major course on-line.

Figure 5 illustrates the percentage of students who say they are "extremely likely" (graph a) or either "extremely likely" or "somewhat likely" (graph b) to take a course in several different delivery methods. All groups were more likely to take an asynchronous course than a synchronous one. Students who have not taken an on-line course before would be more likely to take a hybrid course than other methods (either synchronous or asynchronous), while those who have taken on-line courses are relatively equally likely to prefer any delivery method. Students who have not taken on-line courses before are especially wary of courses using only pre-recorded material and text-chat (though this is in conflict with their preference for asynchronous courses!).

Courseload and workload

There was a significant amount of correlation between part-time students and full-time workers, so we combined those demographics into four groups: those who were part-time students working 10 or fewer hours per week, those who were part-time students working more than 10 hours per

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(a)   (b)

Figure 5. Percentage of students who say they are "extremely likely" (graph a) or either
"extremely likely" or "somewhat likely" (graph b) to take a course in several different
delivery methods.

week, those who were full-time students working 10 or fewer hours per week, and those who were
full-time students working more than 10 hours per week. The first category had only 3 students, so
we removed it from further analysis. The remaining three had 96, 86, and 135 students, respectively.
We analyzed differences between the three groups, and, where possible, also compared the subsets
of each of the three groups who have not taken on-line courses with those who have taken at least
three on-line courses.

Part-time students (working more than 10 hours per week) were more likely to say that they would
take each type of class on-line than the full-time students. Of the full-time students, those working more
than 10 hours per week were only slightly more likely to say they would take each type of course (p-
values between 0.05 and 0.10) than those working less than 10 hours. Looking only at students who had
never taken an on-line class, part-time students were more likely to take a course in their major on line
(p-value 0.01) but sample sizes were too small for statistical significance in the other types of classes.
For students who had taken 3 or more courses on-line, part-time students were more likely to take
quantitative, major, and lab-based courses on-line than full-time students (p-values less than 0.10).

Part-time students were also much more likely (p-value < 0.01) to prefer an asynchronous course
than the other groups, and this was statistically significant (p-value < 0.10) for the subsets where

students had never taken an on-line course and where students had taken at least 3 on-line courses. Part-time students were also more likely to agree with the statement that 'online courses are less difficult than traditional courses' (significant at p-value of 0.10 for each group).

Distance residing from campus

We surveyed students living various distances from campus (on campus, less than 10 miles from campus, 10-25 miles from campus, and more than 25 miles from campus). The percentage of students in each of those groups who have taken on-line courses before is in Table 4. Those living further from campus were more likely to have taken on-line courses before, in general.

In aggregate, students living further from campus were more likely to find interacting with the instructor on-line more convenient than face-to-face and more likely to disagree with the statement that on-line courses are less difficult than traditional courses. Those who lived on-campus did not find as much convenience in on-line courses, but notably, there was not a statistically significant difference in convenience perception among the other groups. Students living further from campus were more likely to attribute most of the positive categories to either on-line or equally to both, such as better interaction, class discussions, presentations, and learning outcomes. They also attributed more student effort more significantly to the on-line courses. The differences in means for students living further from campus in the individual subgroups of students who have not taken on-line classes and who have taken at least 3 on-line classes seem to support these same conclusions, but the difference is too small to claim statistical significance for our sample size.

In aggregate, and in the subset of students who had previously taken three or more on-line courses, students living furthest from campus were more likely to state that they would take all course types on-line, except for a lab-based course. (P-value < 0.01 for aggregate and < 0.10 for the subset.) Among the subset of students who had never taken an on-line course, those living at

		Number of on-line courses taken		
	total	0	1-2	3+
Living on campus	82	57%	30%	12%
Living less than 10 miles from campus	73	26%	49%	25%
Living 10-25 miles from campus	76	25%	45%	30%
Living more than 25 miles from campus	64	19%	36%	45%

Table 4. Percentage of students who have taken on-line courses previously in each distance demographic.

least 10 miles from campus were more likely to take a qualitative or lab-based online course than students living less than 10 miles from campus (p-value < 0.10).

Other Demographics

It is also interesting to note the areas where we found no significant differences. Looking at Engineering and Engineering Technology students versus students from other majors, there were no significant differences. Likewise, we found no significant differences between male and female survey takers, or differences based on age. There were also no differences based on class standing, once we controlled for the number of on-line courses the students had taken. (However, it was much less common for freshman and sophomore students to have taken three or more on-line courses, which made their overall responses very similar to the group that had not taken on-line courses before.)

CONCLUSIONS

This study confirms, among students at our university, many of the popular beliefs about students who are likely to take on-line courses. As expected, students who live further away from campus or who work full-time while going to school reported more interest in on-line courses. Overall, students are more interested in taking qualitative courses on-line than quantitative or lab-intensive courses. More than two thirds of students surveyed expressed an interest in taking on-line courses in the future. Age, gender, class standing, and major did not seem to affect student perceptions, implying that on-line programs are equally attractive across broad demographics.

While it is impossible to prove causality from this survey, students who have taken on-line courses are likely to think more highly of them than those who have not. This leads us to believe that potentially if students can be encouraged to take one on-line course in a non-threatening environment, or experience an on-line learning module in a traditional course, they can determine whether it is a delivery method that works well for them. In addition, it is important to be aware that students are more comfortable with the idea of taking qualitative courses on-line. There appears to be significant apprehension toward taking lab-based courses on-line, among students at our university. (Note that currently the only labs that students have the option to take on-line are science labs offered through eCore. We did not collect that data, but it is likely that very few of the students surveyed had taken a lab course on-line.) This leads us to believe that if a similar university wishes to offer lab-based courses on-line they will need to do considerable marketing to convince students that the learning outcomes and course tools are acceptable.

The study also highlights a need for careful advisement of students who wish to take on-line courses to align expectations. There appears to be a belief among students who have not yet taken an on-line course that such courses are easier or require less student effort, while those who have taken on-line courses no longer feel that way. Resolving these differences in perception before students attempt an on-line course could lead to better learning outcomes and course satisfaction for the students, as well as increased completion rates.

There is a need for further study into the effectiveness of asynchronous technologies versus synchronous, in light of students' preference for asynchronous courses. Do students (and faculty) believe that learning outcomes are as strong or stronger with asynchronous courses, or does this finding just imply that the convenience of viewing course materials on the students' schedule may outweigh the benefit to them of having an instructor readily available to answer questions? Conflicting responses to the question about preferred course delivery method added to this uncertainty. In future research, we would also like to study the impact of exposure to different on-line learning methods and technologies on the user's perception of on-line education.

A limitation of our study is that it only surveys students from one institution. We believe that the results of this study do apply to many other institutions, especially those that serve a large number of nontraditional students as we do. However, we are also interested in expanding this study to other institutions as future research.

ACKNOWLEDGEMENTS

REFERENCES

[1] Allen, I. E., & Seaman, J. (November, 2004). Entering the mainstream: The quality and extent of online education in the United States, 2003 and 2004. The Sloan Consortium. http://www.sloan-c.org.

[2] Primary Research Group. The Survey of Distance and Cyberlearning Programs in Higher Education. 2002. New York. http://www.distance-educator.com/dnews/modules.php?op=modload&name=News&file=article&sid=7377

[3] Young, Jeffrey R. "$4-a-Gallon Gas Drives More Students to Online Courses." The Chronicle of Higher Education Pg. 20 Vol. 54 No. 45, July 18, 2008 Friday. http://www.chronicle.com/article/4-a-Gallon-Gas-Drives-More/16188/

[4] Carnevale, Dan. "Nonprofit Institutions Could Make Gains in Online Education, Report Says." The Chronicle of Higher Education, Vol. 53 No. 31, Pg. 30, April 6, 2007. http://www.chronicle.com/article/Nonprofit-Institutions-Could/35706

[5] Abel, Rob. Achieving Success in Internet-Supported Learning in Higher Education: Case Studies Illuminate Success Factors, Challenges, and Future Directions. ALLIANCE FOR HIGHER EDUCATION COMPETITIVENESS. February 2005. http://www.a-hec.org/

[6] Blakelock, Jane; Smith, Tracy E. "Distance Learning: From Multiple Snapshots, a Composite Portrait." Computers and Composition. Vol. 23, Pg. 139, 2006.

[7] McMahon, J.; et al. "Barriers to Student Computer Usage: Staff and Student Perceptions." Journal of Computer Assisted Learning, Vol 15(4), Pg 302, 1999.

[8] Ropp, M.M. "Exploring Individual Characteristics Associated with Learning to Use Computers in Preservice Teacher Preparation." Journal of Research on Computing in Education, 31(4), Pg 402, 1999.

[9] Cohen, Maxine S.; Ellis, Timothy J. "Developing Criteria for an Online Learning Environment: From the Student and Faculty Perspectives." Journal of Engineering Education. April 2004. http://www.asee.org/publications/jee/PAPERS/display.cfm?pdf=809.pdf&special_issue=809

[10] Ozelkan, Ertunga; Galambosi, Agnes. "Assessing Engineering Management Students' Preceptions of On-Line Learning." 2009 American Society of Engineering Education Annual Conference and Exposition, Austin, TX. June 2009.

[11] Haag Susan; Palais, Joseph C. "Engineering Online: Assessing Innovative Education." Journal of Engineering Education. July 2002. http://www.asee.org/publications/jee/PAPERS/display.cfm?pdf=447.pdf&special_issue=447

[12] Smart, Karl L; Cappel, James J. "Students' Perceptions of Online Learning: A Comparative Study." Journal of Information Technology Education. Vol 5, Pg 201, 2006.

[13] Williamson, Christopher; Jennifer T. Bernhard, and Kent Chamberlain. "Perspectives on an Internet-Based Synchronous Distance Learning Experience." Journal of Engineering Education. January 2000. http://www.asee.org/publications/jee/PAPERS/display.cfm?pdf=652.pdf&special_issue=652

[14] Roblyer, M.D. "IS Choice Important in Distance Learning? A Study of Student Motives for Taking Interned-Based Courses at the High School and Community College Levels." Journal of Research on Computing in Education. Vol 32(1), Pg 157, 1999.

[15] *NIST/SEMATECH e-Handbook of Statistical Methods* http://www.itl.nist.gov/div898/handbook/prc/section3/prc35.htm; last accessed October 2008.

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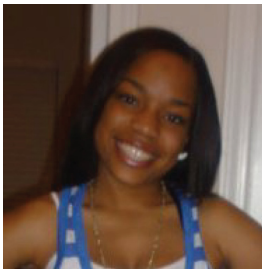
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APPENDIX A – SURVEY QUESTIONS

1. For each of the following statements choose the statement that most applies (strongly agree, agree, neutral, disagree, strongly disagree or don't know).

- On-line courses give you a better learning experience than you would receive in a traditional course.
- On-line courses are less difficult than traditional courses.
- Interacting with your instructor via email or chat windows is more effective than face-to-face interaction.
- Interacting with your instructor via email or chat windows is more convenient than face-to-face interaction.
- Student-student interaction is an important part of most courses.
- You personally perform better in a course when you have some type of student-student interaction.
- Graduate students perform better in on-line classes than undergraduate students.

2. For the following categories choose whether you feel each topic relates strongly to on-line courses, slightly to on-line courses, equally to both types of courses, slightly to traditional courses, strongly to traditional courses, or don't know.

- Convenience
- Better student-to-student interaction
- Better student-to-teacher interaction
- Better class discussions
- Less distractions
- Better quality presentations
- Less note taking
- More effective feedback from the instructor
- More student effort
- More successful mastery of course material
- Better learning outcome

3. How likely would you be to take the following types of courses on-line if offered to you? Check the one that applies best (would be your preference, equally likely to take on-line or on-campus, would only take on-line if the traditional couldn't fit in your schedule the semester you wanted to take it, would not take on-line, or don't know)

- a qualitative course (such as history or English)

- a quantitative course (such as math or statistics)

- a lab-intensive course (such as biology or physics)

- a course in your major

4. Several types of technology are available for use in on-line courses. For each, please choose how likely YOU would be to take a course using the method. (Extremely likely, somewhat likely, somewhat unlikely, extremely unlikely, do not know)

- Synchronous learning (a portion of the course is viewed in "real-time")

- Asynchronous learning (students view the course materials at their own convenience)

- Courses using only pre-recorded material and text chat

- Courses using live audio

- Courses using live audio and video

- A "hybrid" course that is partially held on-campus and partially on-line

5. For the following methods of on-line courses, rate the overall effectiveness of each method (I'm thinking we should stick with previous format and use 'highly effective, somewhat effective, neutral, somewhat ineffective, highly ineffective, don't know)

- Synchronous learning (a portion of the course is viewed in "real-time")

- Asynchronous learning (students view the course materials at their own convenience)

- Courses using only pre-recorded material and text chat

- Courses using live audio

- Courses using live audio and video

- A "hybrid" course that is partially held on-campus and partially on-line

6. For the following, we are interested in any insights you would like to share with us:

- Would you prefer an on-line course or a traditional course, in general? Why?

- Use this space to share any additional comments you have about on-line education.

APPENDIX B – SUMMARY RESULTS

	Online courses give you a better learning experience than you would receive in a traditional course.	Online courses are less difficult than traditional courses.	Interacting with your instructor via email or chat windows is more effective than face-to-face interaction.	Interacting with your instructor via email or chat windows is more convenient than face-to-face interaction.	Student-student interaction is an important part of most courses.	You personally perform better in a course when you have some type of student-student interaction.	Graduate students perform better in online classes than undergraduate students.
ALL STUDENTS	0.4	0.4	0.6	-0.8	-0.6	-0.4	-0.2
Never taken an on-line course	0.7	0.1	0.8	-0.5	-0.8	-0.6	-0.1
Taken 1 or 2 courses	0.4	0.3	0.6	-0.8	-0.6	-0.4	0.1
Taken 3 or more courses	0.1	0.8	0.5	-0.9	-0.4	-0.2	-0.3
Part-time students	0.3	0.9	0.6	-0.9	-0.5	-0.2	-0.5
Full-time students	0.4	0.2	0.7	-0.7	-0.6	-0.5	0.0
Do not work	0.6	0.0	0.8	-0.6	-0.6	-0.4	0.0
Work < 10 hours per week	0.5	0.0	0.9	-0.4	-0.9	-0.9	0.1
Work 10-35 hours per week	0.6	0.2	0.7	-0.9	-0.6	-0.4	-0.1
Work > 35 hours per week	0.2	0.8	0.5	-0.9	-0.5	-0.2	-0.3
Part-time student, working > 10 hours	0.2	0.9	0.6	-0.9	-0.5	-0.2	-0.5
Full-time student, working >10 hours	0.4	0.3	0.6	-0.8	-0.6	-0.4	0.0
Full-time student, working < 10 hours	0.5	0.1	0.8	-0.6	-0.7	-0.6	0.1
Living on campus	0.6	0.1	0.8	-0.7	-0.7	-0.5	0.1
Living < 10 miles from campus	0.4	0.2	0.7	-0.7	-0.4	-0.4	-0.2
Living 10-25 miles from campus	0.5	0.3	0.7	-0.7	-0.8	-0.5	-0.1
Living > 25 miles from campus	0.1	0.9	0.5	-1.0	-0.5	-0.2	-0.4
Engineering/Engineering Technology ma	0.3	0.2	0.6	-0.7	-0.7	-0.4	-0.2
Male	0.4	0.3	0.7	-0.7	-0.6	-0.4	-0.2
Female	0.4	0.6	0.5	-1.0	-0.6	-0.3	-0.1
Freshmen	0.7	0.1	0.8	-0.6	-0.7	-0.7	-0.1
Sophomores	0.3	0.1	0.8	-0.8	-0.6	-0.4	-0.2
Juniors	0.2	0.4	0.5	-1.0	-0.4	-0.2	0.2
Seniors	0.5	0.5	0.7	-0.5	-0.5	-0.3	-0.1
Undergraduate average	0.4	0.3	0.7	-0.8	-0.5	-0.4	0.0
Graduate students	0.5	0.5	0.7	-0.5	-0.5	-0.3	-0.1

Table B1. For each of the following statements, choose the statement that most applies: strongly agree (2), agree (1), neutral (0), disagree (−1), strongly disagree (−2) or don't know.

	Convenience	Better student-to-student interaction	Better student-to-teacher interaction	Better class discussions	Less distractions	Better quality presentations	Less note taking	More effective feedback from the instructor	More student effort	More successful mastery of course material	Better learning outcome
ALL STUDENTS	-1.6	1.0	0.8	0.8	-0.4	0.2	-1.1	0.2	-0.3	0.2	0.3
Never taken an on-line course	-1.2	1.5	1.1	1.4	0.1	0.5	-0.9	0.6	0.4	0.6	0.7
Taken 1 or 2 courses	-1.7	0.9	0.7	0.8	-0.4	0.4	-1.1	0.2	-0.4	0.3	0.3
Taken 3 or more courses	-1.8	0.6	0.6	0.4	-0.7	-0.1	-1.1	-0.1	-0.8	-0.1	-0.1
Part-time students	-1.7	0.8	0.7	0.7	-0.6	-0.1	-1.0	0.1	-0.7	0.1	0.1
Full-time students	-1.5	1.1	0.8	0.9	-0.3	0.4	-1.1	0.3	-0.1	0.3	0.4
Do not work	-1.4	1.3	1.1	1.3	-0.2	0.4	-1.2	0.3	0.1	0.6	0.7
Work < 10 hours per week	-1.2	1.0	1.1	1.2	0.0	0.6	-1.0	0.4	0.0	0.3	0.4
Work 10-35 hours per week	-1.5	1.2	0.9	0.9	-0.1	0.4	-1.0	0.3	-0.1	0.4	0.5
Work > 35 hours per week	-1.8	0.7	0.5	0.5	-0.7	-0.1	-1.0	0.1	-0.7	-0.1	-0.1
Part-time student, working > 10 hours	-1.7	0.8	0.6	0.6	-0.6	-0.1	-1.0	0.1	-0.8	0.1	0.0
Full-time student, working >10 hours	-1.6	1.0	0.7	0.7	-0.3	0.3	-1.0	0.2	-0.2	0.3	0.3
Full-time student, working < 10 hours	-1.4	1.2	1.0	1.2	-0.2	0.4	-1.1	0.3	0.0	0.5	0.6
Living on campus	-1.3	1.3	1.0	1.1	-0.1	0.7	-1.0	0.4	0.3	0.5	0.6
Living < 10 miles from campus	-1.6	1.0	0.6	0.9	-0.4	0.2	-1.3	0.1	-0.5	0.3	0.3
Living 10-25 miles from campus	-1.7	1.1	1.0	1.0	-0.4	0.3	-0.9	0.4	-0.3	0.3	0.4
Living > 25 miles from campus	-1.7	0.6	0.5	0.4	-0.6	-0.2	-1.1	0.0	-0.7	0.0	-0.1
Engineering/Engineering Technology ma	-1.5	1.1	0.8	0.9	-0.3	0.1	-1.1	0.2	-0.2	0.3	0.4
Male	-1.5	1.0	0.8	0.9	-0.3	0.3	-1.0	0.3	-0.3	0.3	0.3
Female	-1.7	0.9	0.6	0.6	-0.5	0.1	-1.2	0.0	-0.4	0.1	0.1
Freshmen	-1.4	1.6	1.1	1.4	-0.4	0.4	-1.1	0.3	0.2	0.5	0.6
Sophomores	-1.4	1.3	0.9	1.2	0.0	0.5	-1.1	0.4	-0.1	0.4	0.6
Juniors	-1.7	0.8	0.5	0.6	-0.4	0.1	-1.1	-0.1	-0.5	0.0	0.0
Seniors	-1.5	0.8	1.0	0.8	-0.4	0.2	-1.0	0.4	-0.3	0.4	0.3
Undergraduate average	-1.5	1.1	0.8	0.9	-0.3	0.3	-1.1	0.2	-0.2	0.3	0.3
Graduate students	-1.5	0.8	1.0	0.8	-0.4	0.2	-1.0	0.4	-0.3	0.4	0.3

Table B2. For the following categories choose whether you feel each topic relates strongly to on-line courses (−2), slightly to on-line courses (−1), equally to both types of courses (0), slightly to traditional courses (1), strongly to traditional courses (2), or don't know.

	a qualitative course (such as history or English)	a quantitative course (such as math or statistics)	a lab-intensive course (such as biology or physics)	a course in your major
ALL STUDENTS	2.1	2.9	3.4	2.7
Never taken an on-line course	2.4	3.4	3.6	3.4
Taken 1 or 2 courses	2.2	2.9	3.3	2.8
Taken 3 or more courses	1.7	2.4	3.1	2.0
Part-time students	1.9	2.5	3.2	2.3
Full-time students	2.2	3.1	3.4	2.9
Do not work	2.5	3.3	3.6	3.4
Work < 10 hours per week	2.1	3.2	3.5	3.0
Work 10-35 hours per week	2.2	3.2	3.5	2.9
Work > 35 hours per week	1.9	2.4	3.1	2.1
Part-time student, working > 10 hours	1.9	2.5	3.2	2.2
Full-time student, working >10 hours	2.1	3.0	3.4	2.6
Full-time student, working < 10 hours	2.3	3.2	3.5	3.2
Living on campus	2.6	3.3	3.6	3.3
Living < 10 miles from campus	2.3	3.1	3.2	2.8
Living 10-25 miles from campus	2.0	2.8	3.3	2.6
Living > 25 miles from campus	1.7	2.5	3.3	2.1
Engineering/Engineering Technology ma	2.1	3.0	3.3	2.9
Male	2.1	2.9	3.4	2.7
Female	2.1	2.8	3.3	2.7
Freshmen	2.6	3.2	3.6	3.3
Sophomores	2.2	3.1	3.4	3.1
Juniors	1.9	2.8	3.1	2.6
Seniors	2.0	2.9	3.3	2.5
Undergraduate average	2.1	3.0	3.3	2.8
Graduate students	2.0	2.9	3.3	2.5

*Table B3. How likely would you be to take the following types of courses on-line if offered to you? (Would be your preference (1), equally likely to take on-line or on-campus (2), would only take on-line if the traditional couldn't fit in your schedule (3), would not take on-line (4)) **Note that these do not conform to an interval scale.*

	Synchronous learning (a portion of the course is viewed in "real-time")	Asynchronous learning (students view the course materials at their own convenience)	Courses using only pre-recorded material and text chat	Courses using live audio	Courses using live audio and video	A "hybrid" course where some of the lectures are held on-campus and some on-line
ALL STUDENTS	-0.2	-0.7	0.0	-0.2	-0.3	-0.5
Never taken an on-line course	0.1	-0.3	0.4	-0.1	-0.3	-0.3
Taken 1 or 2 courses	-0.3	-0.8	-0.1	-0.3	-0.4	-0.6
Taken 3 or more courses	-0.3	-1.2	-0.4	-0.2	-0.3	-0.5
Part-time students	-0.4	-1.1	-0.2	-0.3	-0.4	-0.2
Full-time students	-0.1	-0.6	0.1	-0.2	-0.3	-0.6
Do not work	0.1	-0.4	0.2	-0.1	-0.3	-0.6
Work < 10 hours per week	-0.2	-0.7	0.0	-0.4	-0.6	-0.7
Work 10-35 hours per week	-0.1	-0.6	0.2	-0.1	-0.3	-0.5
Work > 35 hours per week	-0.3	-1.1	-0.3	-0.4	-0.4	-0.3
Part-time student, working > 10 hours	-0.4	-1.1	-0.2	-0.3	-0.4	-0.2
Full-time student, working >10 hours	-0.2	-0.7	0.0	-0.2	-0.3	-0.5
Full-time student, working < 10 hours	0.0	-0.4	0.2	-0.2	-0.4	-0.6
Living on campus	0.1	-0.2	0.4	-0.1	-0.2	-0.5
Living < 10 miles from campus	-0.1	-0.8	0.0	-0.1	-0.2	-0.5
Living 10-25 miles from campus	-0.3	-0.9	-0.3	-0.4	-0.5	-0.6
Living > 25 miles from campus	-0.4	-1.0	-0.2	-0.4	-0.5	-0.2
Engineering/Engineering Technology ma	-0.2	-0.6	0.0	-0.2	-0.4	-0.4
Male	-0.2	-0.7	0.0	-0.1	-0.3	-0.5
Female	-0.3	-0.8	-0.2	-0.4	-0.4	-0.6
Freshmen	0.1	-0.3	0.4	-0.2	-0.4	-0.5
Sophomores	-0.2	-0.7	0.0	-0.1	-0.3	-0.7
Juniors	0.1	-0.8	-0.1	-0.1	-0.2	-0.2
Seniors	-0.3	-0.8	0.0	-0.2	-0.3	-0.6
Undergraduate average	-0.1	-0.7	0.0	-0.2	-0.3	-0.5
Graduate students	-0.3	-0.8	0.0	-0.2	-0.3	-0.6

Table B4. Several types of technology are available for use in on-line courses. For each, please choose how likely YOU would be to take a course using the method. (Extremely likely (−1.5), somewhat likely (−0.5), somewhat unlikely(0.5), extremely unlikely(1.5), do not know)

	Synchronous learning (a portion of the course is viewed in "real-time")	Asynchronous learning (students view the course materials at their own convenience)	Courses using only pre-recorded material and text chat	Courses using live audio	Courses using live audio and video	A "hybrid" course where some of the lectures are held on-campus and some on-
ALL STUDENTS	-0.8	-0.9	-0.3	-0.6	-1.0	-1.0
Never taken an on-line course	-0.7	-0.4	0.2	-0.4	-0.9	-1.0
Taken 1 or 2 courses	-0.9	-1.0	-0.4	-0.7	-1.0	-1.0
Taken 3 or more courses	-0.9	-1.2	-0.7	-0.6	-0.9	-1.0
Part-time students	-1.0	-1.1	-0.7	-0.7	-1.1	-0.8
Full-time students	-0.8	-0.8	-0.2	-0.6	-0.9	-1.1
Do not work	-0.8	-0.7	0.0	-0.6	-0.9	-1.1
Work < 10 hours per week	-0.8	-0.5	-0.5	-0.8	-1.1	-1.0
Work 10-35 hours per week	-0.8	-0.8	0.0	-0.5	-0.9	-1.0
Work > 35 hours per week	-0.9	-1.1	-0.7	-0.7	-1.0	-0.9
Part-time student, working > 10 hours	-0.9	-1.1	-0.7	-0.7	-1.1	-0.9
Full-time student, working >10 hours	-0.8	-0.9	-0.2	-0.6	-0.8	-1.0
Full-time student, working < 10 hours	-0.8	-0.6	-0.1	-0.6	-1.0	-1.1
Living on campus	-0.7	-0.6	0.1	-0.5	-0.8	-1.1
Living < 10 miles from campus	-0.8	-0.8	-0.3	-0.4	-0.9	-0.9
Living 10-25 miles from campus	-0.7	-0.8	-0.4	-0.5	-0.9	-1.0
Living > 25 miles from campus	-1.2	-1.2	-0.6	-0.9	-1.2	-1.0
Engineering/Engineering Technology ma	-0.8	-0.8	-0.2	-0.6	-1.0	-0.9
Male	-0.8	-0.8	-0.3	-0.5	-0.9	-1.0
Female	-0.9	-1.0	-0.5	-0.8	-1.0	-1.1
Freshmen	-0.8	-0.8	0.0	-0.8	-1.1	-1.1
Sophomores	-1.0	-0.9	-0.2	-0.6	-0.9	-1.2
Juniors	-0.6	-0.9	-0.5	-0.6	-0.9	-0.9
Seniors	-0.8	-0.7	-0.3	-0.4	-0.8	-0.8
Undergraduate average	-0.8	-0.8	-0.3	-0.6	-0.9	-1.0
Graduate students	-0.8	-0.7	-0.3	-0.4	-0.8	-0.8

Table B5. For the following methods of on-line courses, rate the overall effectiveness of each method. (highly effective (−2), somewhat effective (−1), neutral (0), somewhat ineffective (1), highly ineffective (2), do not know)