

A COMPARISON OF ONLINE INSTRUCTION VERSUS TRADITIONAL CLASSROOM
INSTRUCTION IN AN UNDERGRADUATE PHARMACOLOGY COURSE

A research project by

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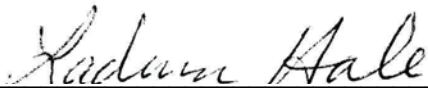
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We hereby recommend that the research project prepared under our supervision by Emily Mirakian entitled “A Comparison of Online Instruction Versus Traditional Classroom Instruction in an Undergraduate Pharmacy Course” be accepted as partial fulfillment for the degree of Master of Physician Assistant.

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ABSTRACT

Background: Online instruction has become a vital element in higher education. Most published research finds no significant difference between online (OL) and traditional (TD) instruction.

Purpose: Compare student satisfaction and learning outcomes of an undergraduate OL pharmacology course to a TD lecture course taught by the same instructor.

Methods: The OL and TD courses for Fall 05 and Spring 06 Clinical Pharmacology used the same notes, text, learning objectives, and exams. Three validated surveys measured aptitude for OL instruction, preferred learning styles, and student satisfaction with the course and self-perceived progress on relevant objectives. Learning outcomes were also objectively evaluated using exam scores and withdrawal rates.

Results: Mean satisfaction scores for both courses were high, generally $> 4.0/5$. Mean scores in the TD courses were significantly higher than OL courses regarding overall course satisfaction, instructor's displayed level of interest in students, students' perceived ability to share ideas, and self-perceived gains in factual knowledge, fundamental principles and application of material. Mean scores related to difficulty of subject matter were similar between courses. There were no significant differences in objective exam scores or withdrawal rates.

Conclusion: Overall, the OL and TD pharmacology courses had similar withdrawal rates and course grades, indicating similar learning gains. Although the OL students were highly satisfied with the course and their self-perceived knowledge gains, the OL satisfaction ratings were generally lower than those found in the TD courses.

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INTRODUCTION

Distance education has gone through many generations of evolution. The concept of education from a distance began with traditional printed materials as early as 1892 when Penn State offered a distance education program that utilized the US Postal Service¹. This form of distance education was superseded in the mid- to late-1900's by what is now considered the second generation of distance education. The second generation of distance education utilized audio recordings, radio and television broadcasts. The earlier modalities, including the first and second generations of distance education, were designed to produce and distribute learning materials as efficiently as technology of the day permitted while leaving no room for reflection on the lack of interactive communication between the student and the teacher. Distance education has since evolved into the third generation, which encompasses interactive video, email, and World Wide Web technologies. Because these modalities allow learning activities to be redefined to include student-teacher interactions, they are the most accepted and most utilized forms of distance education.²⁻⁶ Spooner et al defines distance education as any form of education that geographically separates the instructor and students, requiring communication through media.^{7,8} Today that media is most often the computer and the Internet including the World Wide Web and email and is referred to as online education. A comparison of distance education, in particular online education, and traditional education needs to be further investigated to determine if a difference in the outcomes with regard to student satisfaction, student grades, etc is significant or if there are other factors that need to be considered to enhance course outcomes.

Online education has become increasingly utilized as a means of instruction. As of 2004, it is projected that almost 3 million students nation wide will be enrolled in at least one online

course.⁹ Online education has been seen as an answer to population growth, institutional competition and changing learners' needs.¹⁰ Interest in online education is especially high in geographic regions where the student population is widely distributed and access to traditional campus courses is difficult.¹¹ According to the National Center for Education Statistics, the number of institutions that have degree or certificate programs, which can be completed entirely through distance instruction, has increased from 8% to 19% from 2000-2001. Some such programs include University of Phoenix, Walden University and DeVry University. Over half of the institutions reported offered online education courses during the years of 2000-2001. The fundamental premise of distance learning using online modalities was to create and widen access to education and to improve its quality, using current technologies to meet the particular requirements of individuals who are unable to participate in the traditional classroom environment due to job and family obligations.¹² Many people taking online courses are non-traditional students (e.g. single parents, older students) who are having to update their knowledge and skills constantly to remain competitive and useful in today's job market.^{8, 13-17} The flexibility and freedom from time and attendance requirements afforded by online education is one of the greatest appeals for many learners. It provides an alternative to traditional education that is accessible "anywhere" and "anytime" and allows the student to have more freedom to work at their own pace thus giving them more control over their learning achievements and their daily schedules.^{18, 19} For these reasons, online education has become a vital part of higher education and an accepted form of instruction at hundreds of universities worldwide.¹⁷

Even with the high utilization and demand for online education, some argue that it is not equivalent to traditional education. One consequence of the flexibility allowed by online education is students indiscriminately pursuing online education opportunities for the sake of

convenience without consideration of the appropriateness of online education for their individual learning behaviors and characteristics.^{18, 19} Those students who may not have developed appropriate strategies for self-regulation may find that online education courses do not meet their needs and those students may subsequently drop the course; as a consequence, online courses have been associated with much higher rates of attrition than traditional face-to-face courses.^{17, 20, 21} Brown and Liedholm noticed a significant decrease in students' exam scores that was most obvious in the students' ability to apply basic concepts in more sophisticated problems.²² However, Fox supports the idea that online education courses are equivalent to traditional courses and notes that students are not sacrificing an on-campus education in order to get an education through distance learning methods such as online education.²³

Over three decades ago, it was shown that there is a relationship between learning style variables and the satisfaction and completion of distance learning programs.²⁴ According to Sherry, student preference for a particular mode of learning is an important variable in learning effectiveness and effective learning requires knowledge of learner styles.²⁵ Learning styles is defined as personal qualities influence an individual's ability to interpret, process, understand and integrate information.^{18, 26, 27} Canfield goes on to define learning styles as a component of educational experience that motivates students to perform well.²⁸ Research supports that each individual differs in the way they interpret, process, understand and integrate information.²⁶ Because each individual has different learning styles, it is necessary to use a variety of instructional strategies during the designing phase of both online and traditional courses so that the learning styles of all students enrolled may be complimented proactively.¹⁹ Gender, age-group and discipline of study are variables that influence student learning preferences and have been shown to influence the results of research as well as a student's success in distance

education courses.²⁹ Studies have also shown that females have a greater preference for the qualitative and people-oriented disciplines and prefer a learning context that is well organized and provides clear instruction to students, while males have a greater preference for numeric and inanimate content in learning and prefer a competitive learning environment and instructors who are authoritative.^{30, 31} Inconsistent results with regard to the relationship between age and learning preferences have been found. Some studies have shown that younger students tend to be more resistant than older students to change towards taking more responsibility for their own learning and prefer a more structured environment where importance is assigned to relationships between peers and the instructor.^{29, 32-34} Students who tend to be most successful in online courses are those individuals who are self-directed and self-motivated in their learning and study habits, traits that may be learned over time. In contrast, Smith and Linder reported that among vocational students, it was older students who preferred structured, classroom learning.³⁵ Canfield showed significant learning preference differences between program groups at the college level.^{28, 29} It was found that the learning preferences of different vocational education program groups are distinctive and tend to reflect what an intuitive expectation of the group would predict.^{29, 35} For example, child care students had preferences for working with qualitative information and with people, while electrical mechanic students preferred working with inanimate objects and learning through direct experience.^{29, 35}

Several methods have been designed to classify students according to their learning styles. Canfield's Learning Styles Inventory demonstrates merit for use in distance learning studies since it attempts to measure the student's preference in environmental conditions such as the need for affiliation with other students and instruction and the need for independence or structure.^{18, 28} Not only do certain learning preferences help one succeed in an online course, but

there are also different skills required to be successful in an online course. Students that are characterized as the most successful in an online learning environment tend to be more self-motivated, organized and independent in their styles of learning compare to those enrolled in the same traditional course.^{12, 17, 18, 21} Despite all the research, it is still unknown how online education compares to traditional education as measured by final grades and student satisfaction in an online courses verses a traditional course.

LITERATURE REVIEW

A literature search of English-language articles was conducted using the ERIC, ArticleFirst, ECO, MEDLINE, and PerAbs databases. Search terms used included: online education, online learning, distance learning, distance education, teaching methods, cognitive styles, cognitive personalities, and web-based instruction. Manual reviews of article bibliographies were also conducted to search for related articles. With the ever-increasing student population, there has been tremendous growth in the number of college courses and programs offered through online modalities, particularly the Internet and a trend among schools of higher education to incorporate online courses into their curriculum. The impact of this growth on the quality and effectiveness of education is a concern for many education professionals.¹⁰ A variety of published articles present arguments both for and against online education. Some literature shows that students included in courses supplemented by online discussion scored significantly higher than other students in the same course taught by traditional methods.³⁶ However, the majority of reports argue that there is “no significant difference” between online learning and traditional learning in terms of student grades, test scores, student’s ratings of the instructors’ effectiveness, contribution learning or overall quality and other measures of student achievement.^{7, 8, 10, 13, 37-41} Ramage cautions that the multitude of variables, which influence learning and cognition may prohibit a definitive answer to the question as to which methodology is most effective; online or traditional.^{10, 42} One such variable is withdrawal rates. According to Forbes magazine, it is estimated that the online student withdrawal rate for the year 2004 was approximately 35% while the average attrition rate for college freshman at US universities was approximately 20%.⁴³ The increased dropout rate is generally thought to be due

to student perception that the online course will be easier because they are able to work at their own pace. In addition, students may believe the workload will be lighter, less time consuming and less difficult. It has been found that the online courses actually take more discipline on the part of the student to be successful and the workload is usually the same or heavier than in a traditional course.¹² It has also been found that learning styles, patterns of learning towards Web-based instruction and student characteristics do not have an effect on distance learning achievement.^{41, 44} Though there were no significant differences between the online and traditional courses in terms of student grades, test scores, and other measures of student achievement, some found that students were often less satisfied with the online course despite the fact that the instructor was the same for both courses.^{17, 37} One of the main problems cited regarding distance education is that instructors often adapt curriculums to fit the technology rather than choosing the technology to fit the curriculum.¹⁷ In contrast, Spooner et al. found no difference in the student's overall rating of the course content, rigor and other aspects of online education. It has also been suggested that student comfort with technology is a factor that should be taken into consideration when designing and executing an online course.¹⁷ As technology continues to advance, distance education will continue to evolve. Literature prior to 1998 found distance education to be non-statistically less effective than traditional education, whereas research post-1998 found the opposite. This discrepancy may be due to the advanced availability of the Internet post-1998. When the literature is combined, no significant difference still exists, but this slight shift in the results could be an indication that distance education programs, in particular online education programs, are improving and will one day be better than the traditional classroom.⁴⁵

Study Purpose

The purpose of this study is to compare the effectiveness of an undergraduate, online Pharmacology course to a traditional in-class lecture course taught by the same instructor as measured by: 1) percentage of student withdrawals from course, 2) mean exam scores and overall course grade, and 3) student satisfaction with the course, instructor, self-perceived gains in knowledge, and perceived difficulty of the course. Trends of student learning style preference and course success were also explored.

METHODOLOGY

Setting and Study Population

This study was conducted at Wichita State University (WSU). The WSU College of Health Professions houses several undergraduate and graduate degree-granting programs including communication sciences and disorders, dental hygiene, health services management and community development, medical technology, nursing, physical therapy, physician assistant and public health sciences. The student demographics are varied with a large number of part-time, non-traditional students. The current overall student population of WSU is over 15,000 students. The average age of an undergraduate student is 24 years with over 85% of WSU students being from Kansas.⁴⁶

The potential study population included all 224 students enrolled in Clinical Pharmacology HS 301, a three-credit course, from Fall 2005 to Spring 2006. This course is a multidisciplinary pharmacology course designed for students entering dental hygiene and nursing or as an elective for students seeking entry into other health care programs. It discusses most major classes of drugs as to pharmacokinetics, mechanisms of action, side effects, drug interactions, contraindications, therapeutic use, appropriate drug monitoring, and the clinical application of this knowledge. Clinical Pharmacology is offered as a traditional course and as an online course for students with schedule conflicts or who live outside the Wichita area. Each semester, the traditional section averages 90-120 students and the online section averages 25-30 students.

Similarities and Differences between Courses

Both courses had the same instructor, text, course notes, and learning objectives; used similar grading criteria; and use the same or similar paper-pencil exams. The instructor was available to both courses during the same allotted office hours, by appointment, or via email or telephone. The traditional course had weekly quizzes while the online course had weekly homework over the material presented the previous week. The traditional section received lectures with the instructor present using PowerPoint presentations while the online course viewed previously videotaped lectures through streamed media accessed either online or through CDs. This streaming video consists of audio and visual of the instructor and the rolling PowerPoint slides. The traditional section met once a week for approximately 2.7 hours whereas the online section had one week to watch approximately 2.5 hours of video lecture and complete any assignments. The streaming video lectures were also accessible by students in the traditional section as a means to have concepts repeated or make-up missed class lectures. The online section had three sets of student-run, synchronous online chat sessions with four to six students per group. Students complete two of four available cases studies individually and then met online to come to a group consensus regarding case answers. Answers from each group were posted and critiqued by classmates. The traditional section completed two sets of clinical cases independently or in groups. Cases were reviewed in-class with students answering questions in teams of five to seven students per team. The online students only met with the instructor for an initial two-hour orientation session at the beginning of the course and were not required to meet with the instructor at any other time during the semester. Table 1 shows the similarities and differences between instructional elements of the online and traditional pharmacology courses.

Table 1: Similarities and Differences between Instructional Elements of the Studied Online and Traditional Pharmacology Courses

	Online	Traditional	Similarities/Differences
Exams	3 Exams, 100 pts each (last exam being comprehensive)	Same	98% of exam questions are identical between the courses.
Quizzes	None	Weekly quizzes, 10 pts each	Weekly quizzes are used in the traditional course to reinforce weekly content.
Homework	Weekly homework assigned, 2 – 3 pts each	None	Due to online testing security concerns, weekly homework were used to reinforce course content. Since these are open-book, the point values are minimal.
Learning Objectives	Same	Same	All exam questions are derived from the learning objectives.
Online Practice Questions	Available 2 weeks before each exam.	Same	Online practice questions were available to both courses.
Course Text	Same text used for both courses.	Same	10% of exam questions come from the text rather than the notes.
Course Notes	110 page note packet required for the course.	Same	Same notes packet used for both courses.
Lecture Material	Approximately 2.5 hrs of video lecture viewing required each week.	Approximately 2.7 hrs spent each week in the class room.	Students in the TD course also had access to the same video lectures used in the online class.
Clinical Group Patient Case Assignments	Students complete 2 of 4 cases individually. Groups of 4 – 6 students meet online for a synchronous discussion of answers. Each group posts one set of answers. Students review and comment on each other's work.	Students complete 4 cases either individually or in groups as homework. Students form teams of 5 – 7. Teams use an audience response system to answer questions as each case is discussed.	Correctness of answers is not directly graded. Full participation is worth 5 pts.

Measurements

Two surveys were used to measure aptitude for online instruction, preferred learning styles, and student characteristics, the Distance Learning Aptitude survey and the Canfield's Learning Styles Inventory. Characteristics measured included: age, gender, prior computer experience, year in school, prior online courses, and prior pharmacology experience. A third survey was used to measure student satisfaction with elements of the course, instructor, and self-

perceived gains in learning. Learning outcomes were objectively evaluated using exam scores and withdrawal rates. All students were included in the analysis of course withdrawal rates. Exam scores were analyzed only for students who completed all three exams. All survey data was included, regardless of the student's course completion status; however, because the student satisfaction survey was completed following the last exam, it likely only represents those students who remained enrolled in the course.

Survey Instruments

The first survey, Distance Learning Attitudes survey is a 12-question survey followed by 11 questions pertaining to individual characteristics. This survey was adapted from “Are Distance-Learning Course For Me?” from the Center for Independent Learning and from “Are Telecourses for Me?” from PBS-Adult Learning Services.^{47, 48} Each question has 3 possible answers with each possible answer assigned a point value: a = 3 points, b = 2 points, c = 1 point. At the completion of all 12 questions, the assigned values are summed resulting in a score ranging between 12 and 36. Based on previous results done with this survey, students scoring ≥ 27 tend to be the most successful in an online course. Students scoring 18 – 26 may succeed in an online course, but would need to make a few adjustments in his/her schedule and study habits in order to succeed. Students scoring ≤ 17 will likely be unsuccessful in an online course because it may not be the best learning method for those students. No data specifically validating this survey could be located, but similar surveys have been used extensively at universities nationwide as a self-assessment instrument. See Appendix A for a copy of the complete Distance Learning Attitude survey instrument used in this study.

The Individual Development and Educational Assessment (IDEA) Diagnostic Form Report Survey, a standardized, statistically reliable, valid survey developed by IDEA Center, is utilized at a variety of universities nation wide.⁴⁹ This survey was used to evaluate student satisfaction with the courses and the course instructor. The IDEA survey is a 5-section assessment with 43 items using a rating scale designed to answer the following questions: 1) Overall, how effectively was this class taught? 2) How does this compare with the ratings of other teachers? 3) Were you more successful in facilitations progress on some class objectives than on others? 4) How can instruction be made more effective? and 5) Do some salient characteristics of this class and its students have implications for instruction? Each section of the survey utilizes a 5-point scale with different meanings, individualized to each section. See Appendix B for a copy of the IDEA survey instrument.⁵⁰

The third survey utilized was the Canfield's Learning Styles Inventory (CLSI). This survey was used to determine preferred learning styles of the students. The CLSI is a 30-item assessment with 21 subscale variables that are grouped into four major categories. It uses an ipsative form of measure in which a student's answers are interdependent.⁵¹ Each item is ranked on a scale of 1 to 4 with 1 being the most preferred choice and 4 being the least preferred choice. A ranking process was used to obtain raw scores with 6 being the lowest possible score, thus denoting the strongest preference, and 24 being the highest possible score, thus denoting the least preference. Reliability scores for the CLSI have ranged from 0.87 to 0.965.^{24, 28, 52} Split-half reliability scores obtained for each subscale score ranged from 0.96 to 0.99.^{24, 28} See Appendix C for a copy of the CLSI and evaluation instrument.

Two of the surveys, the CLSI and the Distance Learning Attitude survey were conducted either online through the use of Blackboard™ or on paper following either the 2nd or the 3rd

exam. Blackboard™ is a password protected course management system that can only be accessed by students enrolled in the course and the instructor teaching the course. Both sets of survey results were de-identified prior to analysis. The IDEA survey was administered on paper following the last exam. The instructor received summary data and individual written comments from the IDEA survey following the conclusion of the course. All course data including examination scores and drop rates were de-identified by the course instructor prior to data analysis. Usual procedures for the IDEA course evaluation were followed to ensure that the data remained anonymous to the course instructor as well as the co-investigator.

Confidentiality and IRB Approval

This research project was approved by the Wichita State University institutional review board (IRB). Since this was a voluntary, non-interventional project conducted with adults, completion of the surveys were considered to be consent, thus additional consent forms were not required by the IRB. All course data including examination scores and dropout rates were de-identified by the course instructor prior to data analysis.

Data Analysis

Statistical analysis was performed with SPSS version 13.0 (SPSS Inc., Chicago, IL). The alpha-level was set at 0.05. Mean data were compared by using the independent sample, two-tailed student's t-test and Lavene's test for equality of variance. Frequency data were compared by using the chi-square test or Fisher's exact test when appropriate.

RESULTS

The student characteristics for the online and traditional courses were similar in gender, student rank, student self-reported GPA, and previous pharmacology course experience.

Students in the traditional course tended to be younger than those in the online course, having a higher percentage of students in the 18 – 25 year age range, 75% vs. 34.6%, $p = 0.001$. Both groups reported a similar number of computer experience in years, with approximately 80% having taken at least 1 prior online course. However, students in the online course were more likely to have taken a higher number of previous online courses than those enrolled in the traditional course, $p = 0.009$. See Appendix D for results of student characteristics.

Mean scores for the Distance Learning Attitude survey were similar for the online and traditional courses, 26.58 ± 2.89 vs. 25.62 ± 2.67 , $p = 0.135$, respectively. However a lower percentage of online students scored ≥ 27 , indicating a lower percentage of students in the online course were highly likely to succeed in an online course as compared to the traditional course. No students scored ≤ 17 . See Table 2 for a summary of these results.

Table 2: Distance Learning Attitude Survey Results

	Online	Traditional	p-Value
Mean score \pm standard deviation	26.6 ± 2.9	25.6 ± 2.7	0.135 ^a
Range of scores	20 – 31	19 – 33	
Percentage of students with a score ≥ 27	50.0%	61.7%	0.017 ^b
Percentage of students with a score 18 – 26	50.0%	38.3%	
Percentage of students with a score ≤ 17	0.0%	0.0%	

^a Means were compared using the student's *t*-test.

^b Frequency data were compared using the Chi-square test.

The results for the IDEA survey are presented in Appendix E. Mean satisfaction scores for both courses were high, generally $> 4.0/5.0$ and found to be above the national average and

University average for similarly sized courses. Mean scores in the traditional courses were significantly higher than the online courses regarding overall course satisfaction, instructor's displayed level of interest in students, students' perceived ability to share ideas, and students self-perceived gains in factual knowledge, fundamental principles and application of material.

Table 3 shows the results of the CLSI. The most preferred subscale is that with the lowest mean. There were no statistical differences between the online and traditional students with regard to preferred learning styles or expected course grade.

Table 3: CLSI Subscale Means and Standard Deviations

CLSI Subscale	Online		Traditional		p-Value ^c
	Percentage ^a	Mean ^b	Percentage ^a	Mean ^b	
<i>Conditions of Learning</i>					
Competition	54.5%	16.14 ± 3.89	47.1%	16.73 ± 3.11	0.414
Peer	22.7%	15.73 ± 15.73	22.4%	15.44 ± 3.21	0.728
Organization	13.6%	11.14 ± 1.14	17.6%	11.86 ± 3.24	0.341
Goal Setting	9.1%	16.55 ± 16.55	12.9%	15.85 ± 3.18	0.360
Authority	31.8%	15.50 ± 4.21	10.6%	17.44 ± 2.97	0.052
Detail	45.5%	12.64 ± 4.05	48.2%	11.80 ± 4.22	0.405
Independence	18.2%	18.09 ± 3.26	23.5%	17.34 ± 4.09	0.605
Instructor	4.5%	13.77 ± 3.07	17.6%	13.34 ± 3.56	0.428
<i>Interests</i>					
Inanimate	27.3%	15.27 ± 3.72	28.2%	15.93 ± 3.87	0.476
Numeric	31.8%	16.59 ± 4.86	40.0%	15.55 ± 4.40	0.336
People	18.2%	12.22 ± 4.83	18.8%	12.95 ± 4.83	0.483
Qualitative	22.7%	16.05 ± 16.05	12.9%	15.60 ± 3.86	0.641
<i>Mode of Learning</i>					
Direct Experience	40.9%	12.86 ± 4.64	21.2%	14.28 ± 4.30	0.178
Iconic	13.6%	14.91 ± 3.74	22.4%	14.41 ± 3.45	0.555
Listening	22.7%	14.68 ± 4.41	18.8%	13.86 ± 3.68	0.372
Reading	22.7%	17.55 ± 4.58	37.6%	17.45 ± 4.37	0.926
<i>Expected Course Grade</i>					
Expected A	9.1%	11.91 ± 3.65	9.4%	11.98 ± 4.07	0.944
Expected B	9.1%	9.86 ± 3.63	11.8%	10.16 ± 2.54	0.653
Expected C	36.4%	16.32 ± 2.88	17.6%	15.34 ± 2.64	0.132
Expected D	45.5%	21.73 ± 4.20	61.2%	22.53 ± 2.71	0.277

^a Reported as percentage of students selecting that category is most preferred.

^b Reported as mean ± standard deviation. A lower mean indicates a higher preference for that subscale.

^c The p-value was a comparison of the means using the student's t-test.

No significant differences were observed in objected measurements of learning outcomes. The percentage of students withdrawing from the courses was 28% in the online course vs. 22% in the traditional course, $p = 0.148$. Mean exam scores were also similar, $83.5\% \pm 10.6$ in the online course vs. $83\% \pm 10.7$ in the traditional course, $p = 0.768$. Table 4 shows the percentage of students expected to receive each letter grade as reported in the CLSI results as compared to the percentage of students actually earning each letter grade.

Table 4: Expected Letter Grade vs. Actual Letter Grade Earned

	Online	Traditional
Percentage of students receiving an “A”	38.3%	28.7%
Percentage of students <i>expecting</i> an “A”	9.1%	9.4%
Percentage of students receiving an “B”	23.4%	39.3%
Percentage of students <i>expecting</i> an “B”	9.1%	11.8%
Percentage of students receiving an “C”	21.3%	20.8%
Percentage of students <i>expecting</i> an “C”	36.4%	17.6%
Percentage of students receiving an “D”	17.0%	7.9%
Percentage of students <i>expecting</i> an “D”	45.5%	61.2%
Percentage of students receiving an “F”	0.0%	3.4%
Percentage of students <i>expecting</i> an “F”	NA	NA

DISCUSSION

Several factors were examined throughout the course of this study to determine the effectiveness of an undergraduate, online pharmacology course to a traditional lecture course taught by the same instructor. One such factor was the percent of student withdrawals from the course. This study found no statistically significant difference in withdrawal rates. Because this pharmacology course is a required pre-requisite for entrance into and/or completion of nursing and dental hygiene degrees, it is conceivable that this applied pressure to all students regardless of the course format to remain engaged and complete the course.

Significant differences were found between the online and traditional courses in 11 of the 40 IDEA survey questions. Student in the online courses were less satisfied with the instructor as compared to students in the traditional courses as shown in these three questions: Q1) displayed personal interest in students and their knowledge, Q2) found ways to help students answer their own questions, and Q16) asked students to share ideas and experiences with others whose backgrounds and viewpoints differed. These results may reflect the lack of personal interaction with the instructor and the lack of face-to-face impromptu open discussion that often occurs in traditional course settings between the instructor and the students. These results were somewhat expected because without face-to-face peer interaction there is less opportunity for the students to share ideas and personal experiences. High quality and quantity of instructor and peer interaction can occur in online courses and should be encouraged

The online students were also less satisfied with their gains in knowledge and application of material as reflected in these three questions: Q21) gaining factual knowledge, Q22) learning fundamental principles, generalizations, or theories, and Q23) learning to apply course material

to improve thinking, problem solving and decisions. Both courses had similar opportunities to practice applying their knowledge through the case studies and on the exams. The lower satisfaction in the online courses may reflect delayed feedback time and less frequent feedback provided, as compared to the traditional courses where feedback was immediate within the classroom setting. Although the online sections were less satisfied with their knowledge and application gains, there were no significant differences in objective evaluations such as examinations which did require application of knowledge and expression of factual knowledge and fundamental principles. Generally 25% - 30% of exam questions required higher level of synthesis application of knowledge or reading from the text. Questions 33 - 35 pertain to the student's perceived difficulty of the course. Significant differences were shown in Q34) amount of work in other non-reading assignments. Students in the online courses perceived having more work than the traditional courses. This may reflect the additional homework assignments given in lieu of the weekly quizzes in the traditional courses.

The final subcategory of questions pertains to the student's overall satisfaction with the course. Significant differences were shown in Q37) I worked harder on this course than on most courses I have taken, Q38) I really wanted to take this course regardless of who taught it, Q40) as a result of taking this course, I have more positive feelings toward this field of study, and Q42) overall, I rate this course as excellent. Students in the traditional course felt they put forth more work. This may reflect the study work required to for weekly quizzes rather than the minimal amount of work required to complete weekly homework assignments. The online students likely made up for this time by having to put forth more time in studying for the exams, but the perception is different. The results from Q38 are of little value because there is only one instructor for this course at WSU. Q40 found that the online students were less likely to have

increased positive feelings toward this field of study. It is uncertain why this difference occurred. It could be a result of decreased personal interaction with peers and/or the professor. When asked about the excellence of the course in Q42, the online section was not as satisfied with the course as the traditional section. This, again may be a reflection of overall less satisfaction with certain elements of the course such as professor involvement, peer interaction, self-perceived gains in factual knowledge, and delayed and less frequent feedback.

Study Limitations

In this study, students self-selected either the online or the traditional course. It is likely that students self-selected appropriately based on their own understanding of their learning style preferences. A small percentage of students were repeating the course, thus cross contamination from students having taken the course in the other format is possible. The instructor noted that approximately 3% - 5% of students enrolled in the traditional course would leave class early each week after the quiz. These students did not attend the face-to-face lectures but would view the video lectures on-line instead.

Conclusion

Overall, the online and traditional pharmacology courses had similar withdrawal rates and course grades, indicating similar learning gains. Although the online students were highly satisfied with the course and their self-perceived knowledge gains, the online satisfaction ratings were generally lower than those found in the traditional courses.

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APPENDIX A

Distance Learning Attitude Survey Instrument

1. My need to take this course now is:
 - a. High – I need to take it immediately for a degree or a specific goal.
 - b. Moderate – I could take it on campus later, or substitute another course.
 - c. Low – It could be postponed.
2. Feeling that I am part of the class is:
 - a. Not particularly necessary to me.
 - b. Somewhat important to me.
 - c. Very important to me.
3. I would classify myself as someone who:
 - a. Often gets things done ahead of time.
 - b. Needs reminding to get things done.
 - c. Puts things off until the last minute.
4. Classroom discussions are:
 - a. Rarely helpful to me.
 - b. Sometimes helpful to me.
 - c. Almost always helpful to me.
5. When an instructor hands out instructions for an assignment, I prefer:
 - a. Figuring out the instructions on my own.
 - b. Trying to follow directions on my own, then asking for help as needed.
 - c. Having the instructions explained to me.
6. I need faculty comments on my assignments:
 - a. Within a few weeks, so I can review what I did.
 - b. Within a few days, or I forget what I did.
 - c. Right away, or I get very frustrated.
7. Considering my professional and personal schedule, the amount of time that I have to work on a distance-learning course is:
 - a. More than enough for an on-campus course.
 - b. The same as for a class held on campus.
 - c. Less than for a class held on campus.
8. Whenever I am asked to use technology that is new to me:
 - a. I look forward to learning new skills.
 - b. I feel apprehensive, but will try anyway.
 - c. I put it off or try to avoid it entirely.
9. As a reader, I would classify myself as:
 - a. Good. I usually understand the text without help.
 - b. Average. I sometimes need help to understand the text.
 - c. Slower than average.
10. Coming to campus on a regular schedule is:
 - a. Extremely difficult for me. I have commitments (work, family, or personal) during times when classes are offered.
 - b. A little difficult, but I can rearrange my priorities to allow for regular attendance on campus.
 - c. Easy for me.
11. When I need help understanding the subject:
 - a. I am comfortable approaching an instructor to ask for clarification.
 - b. I am uncomfortable approaching an instructor, but do it anyway.
 - c. I never approach an instructor to admit I don't understand something.
12. I would rate my computer skills as:
 - a. Above average. I understand all commonly used programs and love to troubleshoot new programs until I understand its full capabilities.
 - b. Average. I have basic knowledge of commonly used programs such as Microsoft Office, Blackboard, and the Internet.
 - c. Below average. I can email and type if someone else logs me on.

APPENDIX B

IDEA Survey Instrument

- Q1: Displayed personal interest in students and their knowledge
Q2: Found ways to help students answer their own questions
Q3: Scheduled course work in ways that encouraged students to stay up-to-date in their work
Q4: Demonstrated the importance and significance of the subject matter
Q5: Formed “teams” or “discussion groups” to facilitated learning
Q6: Made it clear how each topic fit into the course
Q7: Explained the reasons for criticism of students’ academic performance
Q8: Stimulated students to intellectual effort beyond that required by most courses
Q9: Encouraged students to use multiple recourses to improve understanding
Q10: Explained course material clearly and concisely
Q11. Related course material to real life situations
Q12: Gave tests, projects, etc. that covered the most important points of the course
Q13: Introduced stimulating ideas about the subject
Q14: Involved students in “hands on” projects such as research, case studies, or “real life” activities
Q15: Inspired students to set and achieve goals which really challenged them
Q16: Asked students to share ideas and experiences with others whose backgrounds and viewpoints differed
Q17: Provided timely and frequent feedback on tests, reports, projects, etc to help students improve
Q18: Asked students to help each other understand ideas or concepts
Q19. Gave projects, tests, or assignments that required original or creative thinking
Q20. Encouraged student-faculty interaction outside of class (office visits, phone calls, e-mail, etc)

Key: 1 = Hardly ever 2 = Occasionally 3 = Sometimes 4 = Frequently 5 = Almost always

- Q21: Gaining factual knowledge (terminology, classifications, methods, trends)
Q22: Learning fundamental principles, generalizations, or theories
Q23: Learning to apply course material to improve thinking, problem solving, and decisions
Q29: Learning how to find and use resources for answering questions or solving problems

Key: 1 = None apparent 2 = Slight 3 = Moderate 4 = Substantial 5 = Exceptional

- Q33: Amount of reading
Q34: Amount of work in other (non-reading) assignments
Q35: Difficulty of subject matter

Key: 1 = Much less than most 2 = Less than most 3 = Average 4 = More than most 5 = Much more than most

- Q36: I had a strong desire to take this course
Q37: I worked harder on this course than on most courses I have taken
Q38: I really wanted to take this course from this instructor
Q39: I really wanted to take this course regardless of who taught it
Q40: As a result of taking this course, I have more positive feelings toward this field of study
Q41: Overall, I rate this instructor an excellent teacher
Q42: Overall, I rate this course as excellent
Q43: As a rule, I put forth more effort than other students on academic work

Key: 1 = Definitely false 2 = More false than true 3 = In between 4 = More true than false 5 = Definitely true

APPENDIX C

Canfield's Learning Styles Inventory and Evaluation Instrument

This inventory gives you an opportunity to describe how you learn best. There are no right or wrong answers. Read the questions and rank (1, 2, 3, or 4) the responses according to how well they describe your reactions or feelings. 1 is the most preferred rank, 4 is the least preferred rank.

1. Rank the following in terms of how well they describe the classes you've liked most.
 - a. I enjoyed the other students; we shared our ideas and feelings with each other.
 - b. The course was well organized and the topics followed one another in a meaningful sequence.
 - c. I more or less set my own goals and studied the things of most interest to me.
 - d. I knew how my work compared with others and the best work was fairly recognized.
2. Number the descriptions of teachers from 1 to 4 in the order in which you normally prefer them.
 - a. Teachers who are pleasant, friendly, and who take a personal interest in me.
 - b. Teachers who provide specific and clear information about assignments and requirements.
 - c. Teachers who give me opportunity to decide what I want to study and how I want to do things.
 - d. Teachers who impose high standards and make me do work necessary to accomplish them.
3. Rank the following courses in terms of their general appeal to you.
 - a. Mathematics and physical science.
 - b. Language and literature.
 - c. Household and craft repair skills.
 - d. Interviewing and counseling.
4. Rank the following in terms of their general value to you as ways to learn.
 - a. Listening to others talk about a subject.
 - b. Reading what others have written about it.
 - c. Seeing pictures, graphs, movies, etc.
 - d. Handling or working with something tangible.
5. Rank the following grades to indicate how likely you are to receive them on a paper or report.
 - a. Excellent or outstanding.
 - b. Good or above average.
 - c. Satisfactory or about average.
 - d. Unsatisfactory.
6. Rank the following in the order in which they would be most helpful for improving your school experience.
 - a. More group activities and opportunities to get to know other students.
 - b. More class outlines and clearer statements about what the classes were all about.
 - c. More opportunities to think through my capabilities and set goals for my performance.
 - d. More objective and frequent information on how my performance compares with others.
7. Rank the following in terms of how accurately they describe the worst teachers you've ever known.
 - a. They were more interested in the subject matter than in the students.
 - b. They were vague about assignments and I was never sure what was expected of me.
 - c. They were too restrictive in letting me do things on my own, coming to my own conclusions, etc.
 - d. They were too easy and the students lost respect for them.
8. Rank the following in the order in which you enjoy doing them.
 - a. Figuring out how things differ in cost.
 - b. Writing a report or a letter.
 - c. Building or repairing something.
 - d. Carrying on a conversation with a stranger.

9. Classes typically involve the following kinds of teaching activities. Rank them in the order in which you generally prefer them as ways to learn.
 - a. Lectures, audio tapes, and question-answer sessions.
 - b. Textbook assignments and other readings.
 - c. Movies, slides, graphics, charts, etc.
 - d. Experiments or projects in the laboratory.
10. Imagine that you have just received your grade on the final exam in a course that you felt was pretty easy and that you got the lowest grade in the class. Rank the following as to how you'd most likely feel.
 - a. Somebody made a mistake in grading the papers.
 - b. I'd be quite surprised, because that doesn't happen very often.
 - c. It would surprise me a little, but that sometimes happens.
 - d. It wouldn't surprise me very much at all.
11. In most courses, student performance is evaluated on some basis. Rank the following in terms of how you feel about such evaluations.
 - a. They sometimes create jealousies and hard feelings among the students.
 - b. Sometimes they are unrelated to the content and purposes of the course.
 - c. They sometimes aren't very helpful in evaluating my progress or in helping me focus my study activities.
 - d. Sometimes they don't really distinguish between those who are doing well and those not doing so well.
12. Rank the following in terms of their value to you in learning.
 - a. Having a chance to visit informally and develop an effective relationship with the teacher.
 - b. Having specifics on what courses include and what they require.
 - c. Having the chance to adopt my own approach and to make some contribution of my own.
 - d. Having scholarly teachers explain the material and direct my study in the most meaningful and useful direction
13. If you were in a course that required everyone to visit a home for the elderly and you could do any of the following, rank them in the order of their interest to you.
 - a. Help them compute their income taxes or balance their checkbooks.
 - b. Write a letter or read to them.
 - c. Help repair or replace something for them.
 - d. Sit and visit with them about their feelings.
14. How do the following appeal to you as ways to find out about new occupations or types of work?
 - a. Have someone in the field tell me about it.
 - b. Read a recent study explaining it.
 - c. Watch a demonstration of the work.
 - d. Trying to do the work itself.
15. Imagine that you have just turned in a paper to an instructor. Rank how you think it would be evaluated.
 - a. Excellent
 - b. Above Average
 - c. Average
 - d. Below Average
16. As a student, I feel it is my responsibility to:
 - a. Cooperate with the other students and help them when I can.
 - b. Ask the teachers questions when the course is confusing.
 - c. Make my own decisions as to what I can accomplish
 - d. Assess the ability of the other students and work accordingly.
17. Consider the following topics for teacher training and rank them in the order in which you think they would generally be most helpful to teachers.
 - a. How to get along with students and maintain good relationships with them.
 - b. How to inform students of requirements, rules, the basis for grades, etc.
 - c. How to utilize independent study techniques so students can work more or less on their own.
 - d. How to maintain classroom discipline and get students to do the assigned work.

18. Rank the following classes in the order in which they appeal to you.
 - a. Formal logic and mathematics.
 - b. Developing the plot and writing short stories.
 - c. Operating a machine to make something.
 - d. Human behavior / "helping" occupations.

19. Rank the following in the order in which you would typically like to learn about the properties of a new plastic.
 - a. Hearing a lecture.
 - b. Reading a book or text.
 - c. Viewing a movie or slides.
 - d. Experimenting with a small sample.

20. Assume you are going to be in school next year; rank the following evaluations in the order in which you think you'd receive them.
 - a. In the top 10% or so.
 - b. In the top 25 or 33 percent.
 - c. In the middle 50 percent.
 - d. In the bottom 25 or 33 percent.

21. Rank the following in terms of how accurately they described the classes you have DISLIKED.
 - a. There was a lot of arguing, bickering, or fighting among the students.
 - b. The class was disorganized and I couldn't tell what topic was coming next.
 - c. There was no opportunity for me to pursue my own special interests or branch off on anything.
 - d. No matter how well or how much anyone did, the teacher just accepted it.

22. Rank the following in the order in which you feel they describe your most effective teachers.
 - a. They like students and have a sincere desire to understand and help them.
 - b. They leave no confusion about what is to be done and how it is to be done.
 - c. They consider each person as an individual and let each student work to their abilities and interests.
 - d. They control their classrooms and require everyone to meet some minimum requirements.

23. Club members are generally required to help; rank the following in order of your preference for doing the club duties.
 - a. Keeping the books on income, expenses, and finances.
 - b. Keeping the minutes of the meetings and doing the correspondence.
 - c. Setting up the room and keeping club equipment in order.
 - d. Greeting newcomers and helping everyone feel welcome.

24. Imagine you're taking an Ecology course. Rank the way you'd like to study the topic.
 - a. Hear speeches by qualified people.
 - b. Read reports and studies.
 - c. Watch movies, TV, films, etc.
 - d. Take field trips.

25. Rank the following in terms of how well they describe your feelings about your school performance.
 - a. I've been at or near the top of my class.
 - b. I've been better than average.
 - c. I've been near the middle.
 - d. I've been in the lower half.

26. Rank the following in their importance to you in the way classes are handled.
 - a. There is an opportunity to develop friends and the students support one another.
 - b. Class sessions are logically related to each other; topics follow in an understandable and meaningful sequence.
 - c. Based upon the topic and my abilities, I can determine what areas I'll pursue.
 - d. Students' grades and the evaluation of their performance give fair recognition and credit to those doing best.

27. Rank the following in terms of how likely they would be as a reason for you to dislike a class.
 - a. The teacher was hostile, easily angered, or inconsiderate.
 - b. There were vague standards and vague or frequently changing requirements.
 - c. There was too little opportunity to determine my own activities.
 - d. The teacher lacked the ability to direct and control the class.

28. Rank the following in terms of their interest to you as a general field of work.
- Mathematics, engineering, accounting.
 - Language, writing, speaking.
 - Building, installing, operating equipment.
 - Interviewing, selling, teaching.
29. Rank the following class activities in the order in which they normally appeal to you.
- The teacher lectures and answers questions.
 - I can read about the topic in a text or some outside reading.
 - Pictures, movies, graphs, displays, etc., are used.
 - I can experiment with or actually use the material.
30. Imagine that you've just received the results of a final exam in a very difficult course and your grade was the highest in the class. Rank the following in terms of how you would most likely feel.
- I'd have expected to do well so it wouldn't surprise me.
 - I'd be surprised, but it could happen.
 - I'd feel like I had lucked out and guessed a lot of the correct answers.
 - I'd probably think that someone had made a mistake in grading the test.

Learning Styles Definitions

- **Peer (P):** Working in student teams; good relations with other students; having student friends; etc.
- **Organization (O):** Course work logically and clearly organized; meaningful assignments and sequence of activities.
- **Goal Setting (G):** Setting one's own objectives; using feedback to modify goals and procedures; making one's own decisions about objectives.
- **Competition (C):** Desiring comparison with others; needing to know how one is doing in relation to others.
- **Instructor (N):** Knowing the instructor personally; having mutual understanding; liking one another.
- **Detail (D):** Specific information on assignments, requirements, rules, etc.
- Learning Styles Definitions cont.
- **Independence (I):** Working alone and independently; determining one's own study plan; doing things for oneself.
- **Authority (A):** Desiring classroom discipline and maintenance of order; having informed and knowledgeable instructors.
- **Numeric (N):** Working with numbers and logic; computing; solving mathematical problems; etc.
- **Qualitative (Q):** Working with words or language; writing, editing, talking.
- **Inanimate (I):** Working with things; building, repairing, designing, operating.
- **People (P):** Working with people; interviewing, counseling, selling, helping.
- **Listening (L):** Hearing information; lectures, tapes, speeches, etc.
- **Reading (R):** Examining the written word; reading texts, pamphlets, etc.
- **Iconic (I):** Viewing illustrations, movies, slides, pictures, graphs, etc.
- **Direct Experience (D):** Handling or performing; shop, laboratory, field trips, practice exercises, etc.
- **Expectancy Score:** The student's predicted level of performance.
 - An outstanding or superior level.
 - An average or good level.
 - An average or satisfactory level.
 - A below average or unsatisfactory level.

APPENDIX D

Student Characteristics		Online	Traditional	p-Value^a
Gender				
-	% Female	84.6%	86.1%	0.764
Age				
-	18 – 25	34.6%	75.0%	0.001
-	26 – 30	26.9%	12.0%	
-	31 – 40	26.9%	8.3%	
-	≥ 40	11.5%	4.6%	
Student Rank				
-	Freshman	3.8%	0.9%	0.238
-	Sophomore	15.4%	27.8%	
-	Junior	38.5%	45.4%	
-	Senior	30.8%	13.0%	
-	Graduate Student	2.8%	4.6%	
-	Other	7.7%	8.3%	
Student Reported GPA				
-	≤ 2.0	0.0%	0.0%	0.592
-	2.1 – 2.5	3.8%	1.9%	
-	2.6 – 3.0	3.8%	4.6%	
-	3.1 – 3.5	46.2%	43.5%	
-	3.6 – 4.0	46.2%	24.1%	
-	I do not wish to answer this question	0.0%	25.9%	
Computer Experience				
-	≤ 1 year	3.8%	0.9%	0.375
-	2 – 4 years	11.5%	20.4%	
-	5 – 10 years	42.3%	48.1%	
-	≥ 11 years	42.3%	30.6%	
Previous Online Courses				
-	Yes	80.8%	79.6%	0.885
-	No	19.2%	19.4%	
-	Have taken distance courses, but not online	0.0%	0.9%	
Number of Previous Online Courses				
-	0 courses	19.2%	18.5%	0.009
-	1 course	34.6%	41.7%	
-	2 – 3 courses	15.4%	32.4%	
-	4 – 5 courses	23.1%	3.7%	
-	≥ 6 courses	7.7%	3.7%	
Previous Pharmacology Courses				
-	Yes	7.7%	14.8%	0.111
-	No	80.8%	82.4%	
-	No, but have clinical pharmacology experience	11.5%	2.8%	

^aFrequency data were compared using the Chi square test or Fisher's exact as appropriate.

APPENDIX E

Results for IDEA Student Perceptions and Satisfaction Survey

	Question	Course	N	Mean	SD	p-Value ^a
Stimulating Student Interest	Q8: Stimulated students to intellectual effort beyond that required by most courses	Online	43	4.44	0.854	0.267
		Traditional	138	4.59	0.761	
	Q15: Inspired students to set and achieve goals which really challenged them	Online	43	4.21	1.036	0.393
		Traditional	140	4.35	0.913	
Q4: Demonstrated importance and significance of the subject matter	Online	43	4.74	0.581	0.749	
	Traditional	143	4.78	0.574		
Q13: Introduced stimulating ideas about the subject	Online	43	4.51	0.768	0.219	
	Traditional	142	4.67	0.580		
Fostering Student Collaboration	Q18: Asked students to help each other understand ideas or concepts	Online	42	3.95	1.081	0.054
		Traditional	140	4.29	0.971	
	Q5: Formed “teams” or “discussion groups” to facilitated learning	Online	43	4.51	0.768	0.520
Traditional	143	4.41	0.914			
Q16: Asked students to share ideas with others whose backgrounds / viewpoints differed	Online	42	3.31	1.473	0.005	
	Traditional	140	4.03	1.156		
Establishing Rapport	Q20: Encouraged student-faculty interaction outside of class	Online	42	4.02	1.179	0.092
		Traditional	139	4.33	0.981	
	Q2: Found ways to help students answer their own questions	Online	43	4.12	1.028	0.017
		Traditional	145	4.48	0.809	
Q7: Explained reasons for criticism of academic performance	Online	42	3.90	1.165	0.590	
	Traditional	139	4.01	1.148		
Q1: Displayed personal interest in students and their knowledge	Online	43	4.14	1.014	0.018	
	Traditional	146	4.50	0.824		
Encouraging Student Involvement	Q19: Gave projects, tests, or assignments that required original or creative thinking	Online	42	3.93	1.237	0.180
		Traditional	140	4.19	1.036	
	Q9: Encouraged students to use multiple recourses to improve understanding	Online	42	4.57	0.831	0.210
		Traditional	142	4.37	0.956	
Q14: Involved students in “hands on” projects eg research, case studies, or “real life” activities	Online	43	4.37	0.926	0.906	
	Traditional	141	4.39	0.860		
Q11: Related course material to real life situations	Online	43	4.84	0.531	0.945	
	Traditional	142	4.83	0.519		
Structuring Classroom Experiences	Q10: Explained course material clearly and concisely	Online	43	4.70	0.741	0.870
		Traditional	142	4.72	0.718	
	Q12: Gave tests, projects, etc. that covered the most important points of the course	Online	43	4.63	0.874	0.795
		Traditional	142	4.66	0.713	
	Q6: Made it clear how each topic fit into the course	Online	43	4.72	0.549	0.743
Traditional		143	4.69	0.644		
Q3: Scheduled course work in ways encouraging students to stay up-to-date with work	Online	43	4.63	0.691	0.973	
	Traditional	144	4.63	0.677		
Q17: Provided timely and frequent feedback on tests, projects, etc to help students improve	Online	42	4.36	0.906	0.347	
	Traditional	140	4.49	0.791		

^a Means were compared using the two-tailed Student's t-test and Lavene's test for equality of variance.

Appendix E is continued on the next page.

Appendix E continued from previous page.

	Question	Course	N	Mean	SD	p-Value^a
Learning on Relevant Objectives	Q21: Gaining factual knowledge (terminology, classifications, methods, trends)	Online Traditional	42 137	4.21 4.57	0.871 0.755	0.011
	Q22: Learning fundamental principles, generalizations, or theories	Online Traditional	42 136	4.10 4.40	1.031 0.772	0.043
	Q23: Learning to apply course material to improve thinking, problem solving, and decisions	Online Traditional	42 136	4.05 4.51	1.125 0.740	0.015
	Q29: Learning how to find and use resources for answering questions or solving problems	Online Traditional	42 134	3.90 4.19	1.246 0.997	0.135
Course Difficulty	Q33: Amount of reading	Online Traditional	43 135	3.49 3.55	0.768 0.817	0.672
	Q34: Amount of work in other (non-reading) assignments	Online Traditional	43 135	4.09 3.43	0.868 0.989	<0.001
	Q35: Difficulty of subject matter	Online Traditional	43 135	4.05 4.19	0.754 0.725	0.281
Student Description	Q37: I worked harder on this course than most courses I have taken	Online Traditional	43 134	3.79 4.25	1.013 0.836	0.004
	Q39: I really wanted to take this course regardless of who taught it	Online Traditional	42 134	3.31 3.68	1.405 1.135	0.084
	Q43: As a rule, I put forth more effort than other students on academic work	Online Traditional	43 133	3.91 3.75	0.781 0.933	0.326
Overall Ratings	Q41: Overall, I rate this instructor an excellent teacher	Online Traditional	43 134	4.42 4.74	1.006 0.648	0.055
	Q42: Overall, I rate this course as excellent	Online Traditional	43 133	4.33 4.65	0.993 0.686	0.048
Misc Questions	Q36: I had a strong desire to take this course	Online Traditional	43 135	3.77 4.16	1.377 0.908	0.083
	Q38: I really wanted to take this course from this instructor	Online Traditional	42 133	3.29 3.80	1.154 0.996	0.005
	Q40: As a result of taking this course, I have more positive feelings toward this field of study	Online Traditional	43 134	4.07 4.50	1.142 0.763	0.025

^a Means were compared using the two-tailed Student's *t*-test and Lavene's test for equality of variance.

Vita

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- | | |
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- | | |
|-------------|--|
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