

Student Achievement, Satisfaction and Instructional Delivery Modes

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Abstract

Despite the proliferation of online learning in higher education, little scientific, qualitative research has been conducted to examine online learning on student achievement and satisfaction levels. This is especially noted in the areas of health and physical education. The primary purpose of this study was to investigate the effects of three different modes of instructional delivery (online instruction, traditional face-to-face instruction, and combination of online and traditional instruction) on student achievement and satisfaction levels used in an undergraduate wellness course at a mid-sized rural university. Differences in student rating of the course and instructor, quality of learning, quality of communication, and support were also examined.

With an Advanced Technology grant from the Governor of South Dakota in 2001, an interactive online wellness course was developed through a collaborative effort of a faculty member, an instructional designer, and a technical specialist at Northern State University. A survey was developed to examine student demographics, student perceptions of online learning, and student satisfaction levels. One hundred fifty-three undergraduate students (71 men, 82 women; between the ages of 18 and 55 years, $M=22.5$ years, $SD=7.0$) completed a survey for this study. Comparing mean scores of a standard pre-and post course knowledge test among three groups was used to determine the effectiveness of the online course. A one-way analysis of variance (ANOVA) and Post hoc Scheffe multiple comparisons were conducted to compare the effects of the three different methods of instructional delivery on student achievement and satisfaction levels.

The results of this study indicated that students in the online learning group and the combined online and traditional learning group had a statistically significant higher achievement than students in the traditional learning group ($p<.05$). Students in the online learning group had statistically significant greater satisfaction levels with their overall learning experience than students in the traditional learning group ($p<.05$). These findings suggest that a well-designed online course can be very effective in teaching wellness. Also, online learning may motivate students to become more active learners, making them responsible for more of the learning process because it accommodates different learning styles and is convenient for students.

Introduction

Over the past decade, advances in the Internet and World Wide Web (WWW) technologies have significantly facilitated student learning and teaching in colleges and universities throughout the world. With a large percentage of university populations working part-time or full-time, and having computer and Internet experience prior to entering college, online education can provide increased opportunities to better meet their

needs, interests, learning styles and work schedules. Technology skills have become an important key to success in the modern workplace. Therefore, online education can provide students with an array of sources and increased opportunities to improve knowledge and skills in technology applications that are vital to the modern workplace. (Gubbins, Clay, & Perkins, 1999; Johnson, Roach, & Homes, 1999).

Numerous studies regarding the integration of online education have indicated the following benefits: a) an enhancement in communication and collaboration, b) an increase in accessibility, c) greater access to Internet resources, d) enhanced technical skills, and e) the promotion of a student-centered environment (Cooper, 1999; Gubbins, 1999; Johnson, 1999; Rosenkrans, 2001; Schrum & Lamb, 1996). Because of its benefits, online learning has been becoming increasingly popular for instruction in both distance education and the traditional class to enhance teaching and learning. Some studies found that integrating online components into traditional classes substantially improved communications, increased access to Internet resources and provided a high level of student satisfaction. (Kaynama & Kesling, 2000; Schrum & Lamb, 1996). In keeping with this trend, many instructors in higher education utilize Internet and WWW technologies in their classes to enhance teaching and student learning. At the same time, there has been a rapid growth of online courses.

Studies indicate student learning via online courses is equivalent to traditional classes (Aljadaani, 2000; Kalsow, 1999; Schulman and Sims, 1999; Wright, 1999). However, there has been more effort in developing and implementing online education than in investigating its effectiveness and student satisfaction with online education. Despite the proliferation of online learning in higher education, little scientific, qualitative research has been conducted to examine online learning on student achievement and satisfaction levels. This is especially noted in the areas of health and physical education. Gaining knowledge of student perceptions of online learning and its effectiveness is essential in order to improve online teaching and student learning. Therefore, the purpose of this research project was to investigate the effects of three different modes of instructional delivery (online instruction, traditional face-to-face instruction, and combination of online and traditional instruction) on student achievement and satisfaction levels used in the wellness course at a mid-sized rural university. Differences in student rating of the course and instructor, quality of learning, quality of communication, and support were also examined.

Methodology

Subjects

Students enrolled in the wellness course at Northern State University were asked to participate in the research during the spring of 2002. The course is required for all undergraduate students as part of their general education requirement and was taught by online instruction, traditional face-to-face instruction, and combination of online and traditional instruction. As the students registered into one of the three modes of instruction based on their preference, they were divided into three treatment groups: online learning group, traditional learning group, and combined online and traditional learning group. The online learning group received only online education, with no face-to-face interaction between the instructor and students and among students. Students in

the traditional learning group was taught on campus through a traditional face-to-face method. Students in the combined online and traditional learning group were taught on campus with combination of online instruction and traditional face-to-face instruction. However, all students in the three groups had the same instructor, requirements, learning objectives, and course materials such as exams, assignments and textbook.

Instrumentation

The University's Student Evaluation on Teaching Survey was modified and used to evaluate course contents, availability of the instructor, quality of learning experience, and grading process. In addition, as a part of the South Dakota's Star School Project organized by the South Dakota Alliance for Distance Education (SDADE), the researchers developed an Online Education Survey (OES). The OES instrument consisted of three parts, each of which provided specific information regarding the participants. The three parts were designed to identify (a) student demographics, (b) student perceptions of online learning, and (c) student satisfaction levels. Reliability was determined with a test-retest pilot study. To determine the test-retest reliability coefficient between two pilot surveys, a Pearson Product Moment Correlation was calculated. The test-retest reliability was $r = 0.93$. A Cronbach alpha coefficient value was also computed to determine the internal consistency of the two surveys. The Cronbach alpha coefficient value was 0.91. The reliability coefficients for this survey instrument were high.

Procedures

With an Advanced Technology grant from the Governor of South Dakota in 2001, an interactive online wellness course developed through a collaborative effort of a faculty member, an instructional designer, and a technical specialist at Northern State University during summer, 2001. Because of its excellence, the online course was nominated for the **Best Online Course Award** by the Electronic University Consortium of South Dakota in 2002. For each lesson, there were an interactive streaming online lecture, virtual lab, online quiz, online discussion and an extensive set of web links. It was designed to better meet needs, interests and learning styles for online students. For example, the immediate feedback from an online quiz enabled students to spend more time in areas where they needed to improve their understanding. An extensive set of Web links was also provided to help students explore research and locate information related to course content.

An online interactive, virtual tutorial program for the WebCT was provided for students in the online learning group when they enrolled. However, students in the combined online and traditional learning group were trained to use the WebCT and its features by the primary researcher and an instructional specialist during the first week of class. After training, the students in both groups were able to use the discussion board, e-mail, lessons, web links and other course materials. The first requirement of the semester was to post a personal introduction on the course discussion board; an exercise to acquaint them with class members and to become familiar with the WebCT features. All communication was stored and tracked for analysis after the research was concluded.

All three student groups completed a pre- and post-course knowledge test to measure skills and knowledge they were expected to master during the course. The same standard test was given to all students in each group. Comparing mean scores of pre- and

post-tests among three student groups was used to determine the effectiveness of instructional modes. In order to provide exam integrity, students were proctored. In addition, the survey questionnaire was administered to each student at the end of the semester to provide the student with enough time to become familiar with the course. The researchers explained the nature of the survey to students and answered questions they had prior to administering the survey.

Data Collection and Analysis

Descriptive statistics (percentages, frequency distributions, means, ranges, and standard deviations) were utilized to analyze student demographic characteristics. A one-way analysis of variance (ANOVA) was conducted to compare the effects of the three different methods of instructional delivery on student achievement and satisfaction levels. When the results of the ANOVA test were statistically significant, Post hoc Scheffe multiple comparisons were conducted to determine where differences between means existed. Statistical significance was accepted at an alpha level of $p < .05$.

Results

Demographic Characteristics of Participants

In Table 1, a breakdown of respondents by gender is presented. One hundred fifty-three undergraduate students (71 men, 82 women; between the ages of 18 and 55 years, $M=22.5$ years, $SD=7.0$) completed the survey. Of the respondents, 31 (14 men, 17 women; $M=30.3$ years, $SD=10.6$) were from the online learning group, 82 (42 men, 40 women; $M=20.4$ years, $SD=3.0$) from the traditional learning group, and 40 (15 men, 25 women; $M=20.8$ years, $SD=5.0$) from the combined online and traditional learning group. The online learning group and combined online and traditional learning group consisted of more female students than the traditional learning group.

Table 2 compares demographic characteristics of participants according to the three instructional delivery methods. The average age of the online learning group was 30.3 ($SD=10.6$) while the average age was 20.4 ($SD=3.0$) for the traditional learning group and 20.8 ($SD=5.0$) for the combined online and traditional learning group. A one-way ANOVA revealed that there were statistically significant differences in the means of age among the three learning groups, $F(2, 150) = 34.7$, $p < .001$. Because the test was significant, Post hoc Scheffe multiple comparisons were conducted to evaluate pairwise differences among the groups. The analysis revealed that the mean age of students in the online learning group was statistically significantly higher than other groups. Most students in all three learning groups were either freshmen or sophomores. The results of the pre-course knowledge test indicated that there were no statistically significant differences in the mean for test scores among the three learning groups, $F(2, 150) = .2$, $p > .05$. A one-way ANOVA revealed that there were statistically significant differences in Internet usage for educational tools among the three learning groups, $F(2, 150) = 27.4$, $p < .001$. Post hoc Scheffe multiple comparisons indicated that students in the online learning group and the combined online and traditional learning group used the Internet more often for educational tools prior to taking this course than students in the traditional learning group. Students in the online learning group had more experience in taking an online course prior to taking this course, which was statistically significantly higher than other groups, $F(2, 150) = 3.1$, $p < .05$. Also, students in the online learning group had

better technology skills prior to taking this course, which was statistically significant in being higher than other groups, $F(2, 150) = 7, p < .05$).

Student Achievement

All students in the three learning groups completed a pre- and post-course knowledge test to measure skills and knowledge they were expected to master during the course. The mean for the pretest score was 61.9%, while the mean for the posttest was 75.4%. A paired T-test revealed that all learning groups showed a statistically significant higher achievement after taking this class $t(179) = 15.3, p < .001$. Comparing the difference in the mean scores of pre- and post-tests among the three learning groups was used to determine the effectiveness of instructional modes. As shown in Figure 1 and Table 3, the mean difference between the pre- and posttest scores was 17.3 ($SD = 8.3$) for the online learning group, 11.4 ($SD = 13.1$) for the traditional learning group, and 17.8 ($SD = 14.1$) for the combined online and traditional group. A one-way ANOVA was conducted to compare the student achievement among the three learning groups. The analysis revealed that there were statistically significant differences in the student achievement among the three learning groups, $F(2, 177) = 5.6, p < .01$. The results of the Post hoc Scheffe test show that students in the combined online and traditional group and online learning group had a statistically significant higher achievement than the traditional learning group, and no significant differences were found between the combined online and traditional learning group and online learning group (see Table 3).

Student Satisfaction Levels

A five point Likert scale (5 = very satisfied, 4 = satisfied, 3 = neutral, 2 = dissatisfied, and 1 = very dissatisfied) was used to measure satisfaction levels of the participants with their overall learning experience including the overall quality of the instruction and the course. Students in the three learning groups provided positive ratings: the mean rating was 4.2 ($SD = .7$) for the online learning group, 3.7 ($SD = .7$) for the traditional learning group, and 3.9 ($SD = .8$) for the combined online and traditional learning group (see Figure 2 and Table 4). A one-way ANOVA revealed that there were statistically significant differences in the means among the three learning groups $F(2, 150) = 4.8, p < .05$. As shown in Table 4, Post hoc Scheffe multiple comparisons indicated that students in the online learning group showed statistically significant greater satisfaction levels than the traditional learning group, and no statistically significant differences were found between the online learning group and combined online and traditional learning group.

Student Perceptions

A one-way ANOVA was conducted to analyze mean differences in student perceptions of various aspects of the course and instructor among groups. When results of the ANOVA test were statistically significant, Post hoc Scheffe multiple comparisons were conducted to determine where differences between means existed.

Course and instructor: A five point Likert scale (5 = excellent, 4 = above average, 3 = average, 2 = below average, and 1 = poor) was used to measure students' ratings of the overall quality of the course and instructor. All three learning groups rated the overall quality of the course positively: the mean rating was 4.2 ($SD = .9$) for the

online learning group, 3.4 ($SD = .8$) for the traditional learning group, and 3.9 ($SD = 1.0$) for the combined online and traditional learning group (see Table 5). Analysis revealed that the online learning group and combined online and traditional learning group showed a statistically significant higher rating than the traditional learning group, $F(2, 150) = 10.7, p < .05$. However, no significant differences were found between the online learning group and combined online and traditional learning group. All three learning groups rated the instructor very positively: the mean rating was 4.4 ($SD = .8$) for the online learning group, 4.2 ($SD = .6$) for the traditional learning group, and 4.3 ($SD = .7$) for the combined online and traditional learning group. There were no statistically significant differences among the three learning groups, $F(2, 150) = 2.7, p > .05$.

Quality of Learning: As shown in Table 5, all three learning groups rated the quality of learning positively: the mean rating was 3.9 ($SD = .8$) for the online learning group, 3.3 ($SD = .8$) for the traditional learning group, and 3.7 ($SD = .9$) for the combined online and traditional learning group. The online learning group rated it statistically significantly higher than the traditional learning group, $F(2, 150) = 7.6, p < .05$. However, no significant differences were found between the traditional learning group and combined online and traditional learning group.

Quality of Communication: A five point Likert scale (5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, and 1 = very disagree) was used to evaluate the quality of communication. As shown in Table 6, all three learning groups rated the quality of communication experience with their peers positively: the mean rating was 3.7 ($SD = .9$) for the online learning group, 3.6 ($SD = .8$) for the traditional learning group, and 3.8 ($SD = .8$) for the combined online and traditional learning group. There were no statistically significant differences among the three learning groups, $F(2, 150) = .5, p > .05$. They rated the quality of communication experience with the instructor very positively: the mean rating was 4.4 ($SD = .8$) for the online learning group, 4.2 ($SD = .7$) for the traditional learning group, and 4.5 ($SD = .6$) for the combined online and traditional learning group. The online learning group rated it statistically significantly higher than the traditional learning group, $F(2, 150) = 3.2, p < .05$.

Support: Most students in the three learning groups indicated that the instructor encouraged and helped them to learn. The mean rating for the instructor's encouragement was 4.4 ($SD = .7$) for the online learning group, 4.1 ($SD = .6$) for the traditional learning group, and 4.2 ($SD = .4$) for the combined online and traditional learning group. The mean rating for the instructor's help was 4.5 ($SD = .5$) for the online learning group, 4.7 ($SD = .5$) for the traditional learning group, and 4.7 ($SD = .5$) for the combined online and traditional learning group. In these two variables, there were no statistically significant differences among the three learning groups, $F(2, 150) = 2.9, p > .05$; $F(2, 150) = 1.6, p > .05$.

Computer Technology Skills: As shown in Table 7, students in the online learning group and combined online and traditional learning group indicated that this course helped them improve their computer technology skills. The mean rating was 4.2 ($SD = .6$) for the online learning group, 2.4 ($SD = .8$) for the traditional learning group, and 3.6 ($SD = .9$) for the combined online and traditional learning group. A one-way ANOVA revealed that there were statistically significant differences among the groups, $F(2, 150) = 62.1, p < .05$. The online learning group rated it statistically significantly

higher than the other groups. The combined online and traditional learning group rated higher than the traditional learning group.

Online Learning Experience: Most students in the online learning group perceived that it was easy or very easy to navigate this online course and access its materials. Compared to the traditional class, 45% of students in online learning group reported that they put in more work or much more work, 36.4 % said they put in equal work, and 19.4 % indicated they put in less work. Also, most students in the online learning group indicated they were likely or very likely to take additional online courses. More than 90% of students in the online learning group indicated they were likely or very likely to recommend the online course to other students, based on their experience in this online course. All students in the online group were satisfied or very satisfied with accessibility of a computer and online library materials needed for this course. The majority of online students indicated the main reason to take this course was convenience and flexibility.

Student comments: Overall, students in the online learning group are appeared to enjoy their online learning experience. Online students repeatedly made the following comments:

I liked the feedback from fellow classmates and the instructor on-line.

I liked the discussions and the instructor suggesting websites.

I liked the freedom to do it any time during the week.

I really enjoyed online interactive multimedia lectures.

Students in the combined online and traditional learning group repeatedly made the following comments:

I liked the whole on-line sessions.

I liked online components, it made me read the chapters carefully and not depend on the instructor to tell me the material.

I liked the discussion questions we had to reply to on-line.

I liked the online class because I think that the material was easy enough for us to learn on our own.

Conclusions

The purpose of this study was to investigate the effects of three different modes of instructional delivery (online instruction, traditional instruction, and combination of online and traditional instruction) on student achievement and satisfaction levels used in the wellness course at a mid-sized rural university. All three leaning groups made statistically significant improvement in the mean scores between the pre- and post-course knowledge tests. A one-way ANOVA revealed that there were statistically significant differences in student achievement among the three learning groups. The results of this study indicated that students in the online learning group and the combined online and traditional learning group had a statistically significant higher achievement than students in the traditional learning group ($p < .05$). Students in the online learning group had statistically significant greater satisfaction levels with their overall learning experience than students in the traditional learning group ($p < .05$). However, there were no statistically significant differences found between the online learning group and the combined online and traditional learning group.

The findings of this study indicate that there were no significant differences in the

instructor, his support and grading process. However, students in the online group rated statistically significantly higher on the overall quality of course, the quality of learning, and the quality of communication with the instructor than students the traditional learning group.

These findings suggest that a well-designed online course can be effective in teaching wellness. Also, the online learning may motivate students to become more active learners, making them responsible for more of the learning process because it accommodates different learning styles and is convenient for students. Additional research is needed to investigate the effectiveness of online instruction in all areas of education.

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Tables

Table 1. Survey respondents by gender

Groups	Men	Wome	Total
	n		
Online	14	17	31
Traditional	42	40	82
Combined	15	25	40
Total	71	82	153

Table 2. Characteristics of participants prior to taking the course

Variable	Online <i>M ± SD</i>	Traditional <i>M ± SD</i>	Combined <i>M ± SD</i>	F value (<i>df = 2</i>)	p value
Age	30.3 ± 10.6*	20.4 ± 3.0	20.8 ± 5.0	34.7	0.001
Student Classification	1.9 ± .9	1.67 ± 1.0	1.8 ± 1.0	0.6	0.584
Content Knowledge	61.3 ± 11.2	62.1 ± 12.4	62.1 ± 12.3	0.2	0.859
Internet Usage	3.2 ± .1*	1.7 ± 1.5	3.1 ± .7*	27.4	0.001
Online Learn. Exp.	.9 ± 1.2*	.4 ± .7	.6 ± 1.1	3.1	0.050
Tech. Skills	2.3 ± .8*	1.8 ± .7	1.7 ± .6	7.0	0.001

Note: *M* = mean; *SD* = Standard Deviation; an asterisk (*) = significance using the Scheffe procedure.

Table 3. Differences among groups on student achievement

Groups	<i>M</i>	<i>SD</i>	Online	Traditional
Online	17.3	8.3		
Traditional	11.4	13.1	*	
Combined	17.8	14.1	NS	*

Note: NS = nonsignificant differences between pairs of means, while an asterisk (*) = significance using the Scheffe procedure.

Table 4. Differences among groups on satisfaction levels

Groups	<i>M</i>	<i>SD</i>	Online	Traditiona l
Online	4.2	.7		
Traditional	3.7	.7	*	
Combined	3.9	.8	NS	NS

Note: NS = nonsignificant differences between pairs of means, while an asterisk (*) = significance using the Scheffe procedure.

Table 5. Student perceptions of the course and instructor

Variable	Online $M^a \pm SD$	Traditional $M^a \pm SD$	Combined $M^a \pm SD$	F value ($df = 2$)	p value
Quality of Course	4.2 ± 1.0*	3.4 ± .8	3.9 ± .9*	10.7	0.001
Instructor	4.4 ± .8	4.2 ± .6	4.3 ± .7	2.7	0.073
Quality of Learning	3.9 ± .8*	3.3 ± .8	3.7 ± .9	7.6	0.001

Note: M = mean; SD = Standard Deviation; an asterisk (*) = significance using the Scheffe procedure.
 a : 5 = excellent, 4 = above average, 3 = average, 2 = below average, and 1 = poor

Table 6. Student perceptions of the quality of communication and support

Variable	Online $M^a \pm SD$	Traditional $M^a \pm SD$	Combined $M^a \pm SD$	F value ($df = 2$)	p value
Commu. With instructor	4.4 ± .8*	4.2 ± .7	4.5 ± .6	3.2	0.043
Commu. With peers	3.7 ± .9	3.6 ± .8	3.8 ± .8	0.5	0.626
Encouragement	4.4 ± .7	4.1 ± .6	4.2 ± .4	2.9	0.057
Help	4.5 ± .5	4.7 ± .5	4.7 ± .5	1.6	0.214
Grading process	4.3 ± .6	4.1 ± .8	4.2 ± .4	0.9	0.423

Note: M = mean; SD = Standard Deviation; an asterisk (*) = significance using the Scheffe procedure.
 a : 5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, 1 = strongly disagree

Table 7. Student perceptions of improvement in their computer technology skills

Groups	M^a	SD	Online	Traditional
Online	4.2	.6		
Traditional	2.4	.8	*	
Combined	3.6	.9	*	*

Note: NS = nonsignificant differences between pairs of means, while an asterisk (*) = significance using the Scheffe procedure; a : 5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, 1 = strongly disagree

Figures

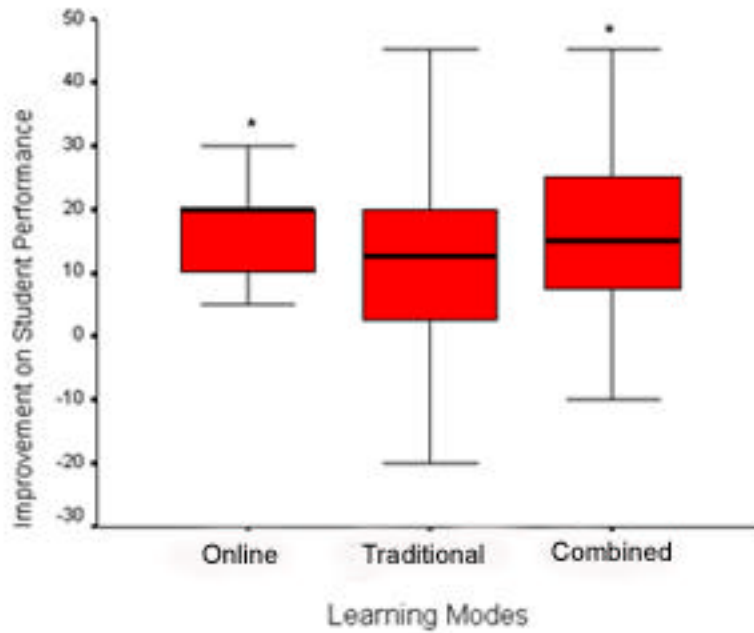


Figure 1. The mean score gained from the pre-course knowledge test

Note: an asterisk (*) = significance ($p < .05$)

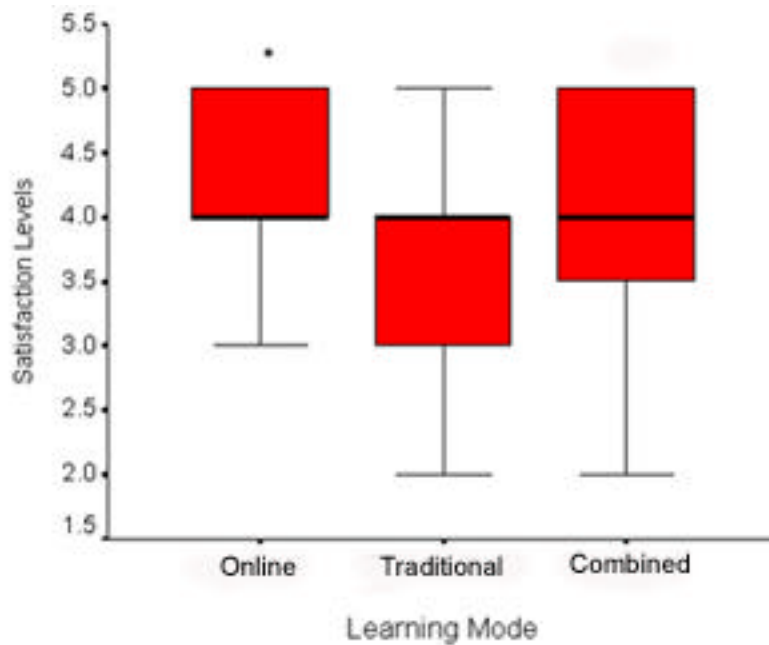


Figure 2. Student satisfaction levels with their overall learning experience

Note: an asterisk (*) = significance ($p < .05$)

