

# Evaluation of a Blended Design in a Large General Education Nutrition Course

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## Abstract

The purpose of this study was to evaluate the effectiveness of a blended delivery method in a large enrollment introductory nutrition course (n=400) offered to both on-campus and distance education students at a University in the western United States. In this blended class, half of the content (1.5 credits) was delivered in an instructor led synchronous format; the other half was delivered asynchronously in the online environment using Blackboard and enhanced with various instructional technologies. Student course evaluations and final grades were used to compare students' level of satisfaction with the course and performance across student groups (on-campus vs. distance education). The majority of students (80%) recommended that the course continue to be taught in the blended format. Both student satisfaction and performance were influenced by student group. On-campus students earned higher grades than did distance education students, although distance education students reported higher levels of satisfaction with the blended design. A blended delivery method may be a successful alternative approach to large enrollment traditionally lecture-based courses. Blended delivery of such classes may offer students greater flexibility and the option of smaller class sizes.

## Introduction

According to the National Center for Education Statistics, undergraduate enrollment at accredited institutions of higher education in the U.S increased by 37% between 2000 and 2010.

Many institutions are experiencing record increases in enrollment, yet faculty appointments and other resources often remain the same. One solution to this problem is to increase the number of students taught per course, however, empirical evidence suggests that students in large enrollment courses rate these courses less favorably and perceive themselves as learning less than they do when taught in smaller sections (Monks and Schmidt, 2010; Toth and Montagna, 2002). The blended learning model is gaining popularity due to evidence that it offers advantages over both traditional and purely web-based models of instruction (Stizmann et al., 2006;

Department of Education, 2010). In some cases, it may provide an alternative approach to the traditional lecture-based delivery of large enrollment courses.

Blended learning, also known as hybrid learning, is the integration of traditional face-to-face instruction with online learning and instruction in which students have some degree of control regarding the time, place, and or pace of the instruction (Holden, 2010; Duhaney, 2004). Blended learning can assume many formats. Well-planned blended course designs maximize the benefits and minimize the limitations of fully face-to-face or online formats. For example, where face-to-face learning is usually teacher-directed and provides little flexibility in terms of time, place, and pace of instruction, online learning expands the boundary of the physical classroom and puts students in charge of when, where, and how they learn. Kinzie and Sullivan (1989) propose that students' motivation to learn is enhanced when learners have greater control over these factors. In addition, while students of fully online courses often feel isolated from other students and instructors, traditional face-to-face instruction provides opportunity for frequent and direct interactions. These differences are noteworthy because motivation to learn and the degree of student-student and student-instructor interaction are independent predictors of both student satisfaction and performance (Colquitt et al., 2000; McFarlin, 2008; Riffel and Sibley, 2005).

Cohen et al. (2011) found that students enrolled in higher-education nutrition courses gained knowledge in both online and traditional face-to-face nutrition courses, however, student satisfaction for these courses was mixed and depended to a large degree on student and instructor characteristics. Little research is available on the effectiveness of blended delivery of courses within the discipline of nutrition or as applied to large enrollment courses (> 200 students). The objective of this study was to evaluate the effectiveness of a blended delivery method that included both traditional face-to-face classroom instruction with online learning activities in a large enrollment general nutrition course offered to both on-campus and distance education students.

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## **Materials and Methods**

The study procedures were reviewed and approved by the Institutional Review Board at Utah State University. All students enrolled in the general nutrition course (NDFS 1020) during spring semester 2011 were invited to participate. The on-campus and distance sections of the course were taught by different instructors. Only students who agreed to participate and who completed the course were included in the analyses presented here (n=285 on-campus students; 97 distance-education students).

### **The Blend**

Approximately half of the course (1.5 credits) was delivered in the traditional face-to-face lecture-based format. The other half of the course was delivered in an online learning environment using the platform of the Blackboard learning management system (Blackboard Vista, Blackboard Inc., Washington D.C., 2010-2011).

### **Asynchronous Elements**

Content for the course was organized into 12 modules. Modules were further organized into four pages, which were designed to direct students through a flow of activities and assessment that we thought would best support student learning. The "Read It" page listed module objectives and contained a link to the corresponding chapter of the online textbook. The "Study It" page included self-study quizzes, PowerPoint® slides from lecture, and other self-study material. The "Assess It" page contained all graded materials including weekly "no-pressure" quizzes that were open-book and could be taken multiple times without a penalty, weekly assignments with questions pertaining to a semester-long personal diet analysis project that utilized software (MyDietAnalysis version 4.0, Pearson Education Inc., Upper Saddle River, NJ, 2009) and links to online exams. The "Live It" page included supplementary and practical application resources, such as links to relevant websites, information concerning nutrition-related careers, instructional food preparation videos, and links to discussion boards regarding topics of special interest. Some of the "Live It" activities were offered as extra credit (up to 3% of total points).

The four exams, including one comprehensive final, were timed (50 minutes), closed-book, and administered online on designated dates. Exams included multiple choice, true/false, and matching questions and were generated from question banks generated by course instructors such that each student received a unique exam. Students electronically signed an honor code statement at the end of each exam which declared that did not use any notes, text, internet, or other reference material and that they neither gave nor received aid from any person during the examination.

### **Synchronous Elements**

On-campus students met for one hour-long lecture period each week where information was presented

in a face-to-face format by an instructor. The objective of the face-to-face lectures was to deliver content in a manner that emphasized key concepts and encouraged discussion, application, and engagement from students. This was different from the traditional delivery of this course which was taught in one large section (n=300 students) and met for a 50 minute period three days per week. The distance education sections were offered a similar synchronous experience via the virtual classroom broadcasting technology known as Wimba (Wimba Classroom, Wimba Inc., NYC, NY, 2010-2011). This was different from the traditional delivery of the online courses which included pre-recorded lectures, but no opportunity for synchronous learning. Distance education students not wishing to participate in the synchronous element of the course could opt instead to view the recorded version of the weekly lectures. This option was not provided to the on-campus students.

### **Assessments**

Students were asked to complete a student profile during the first week of the semester. This assignment asked students to report on their personal characteristics (age, gender, year in school) and included questions on their usual dietary habits and physical activity. Students were also asked to complete a 31-question mid-semester course evaluation that included questions about the different elements of the course.

### **Data Analysis**

Data were analyzed using PASW SPSS statistics (SPSS version 18, SPSS Inc., Chicago, IL 2009). Analysis of variance and Pearson Chi-Square analyses was used to evaluate differences in performance and satisfaction of the course by student group (on-campus vs. distance education).

## **Results and Discussion**

Demographic characteristics of students enrolled in both the on-campus and distance education sections of this course are listed in Table 1. The majority of students was female, from Utah, had declared a major and was taking the class as one of several options to fulfill a breadth course in the life-sciences, which is an institution-level requirement. The average age of on-campus students was younger than that of distance education students. This is consistent with others who have found similar differences between students in distance education programs compared to traditional on-campus students (Qureshi et al., 2002; Russell et al., 2008). More distance education students also rated their dietary and physical activity habits as "average" or "poor" as compared to on-campus students. Students younger than age 25 rated themselves higher on the dietary and physical activity assessment questions compared to older students, independent of student group (P=0.05).

Course content and all assignments for the on-campus and distance education courses was standardized. On-campus students earned higher scores

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than did distance education students on both quizzes and exams (Table 2). On-campus students also had a greater number of attempts on “no-pressure” quizzes compared to distance-education students ( $P = 0.001$ ). Many factors may have influenced the difference in the number of attempts on no pressures quizzes including differences in motivation to learn and amount of available study time. Distance students for example, who were older on average than on-campus students, may have more demands on their time due to career, family, and other responsibilities than younger on-campus students. This is consistent with the observations of Qureshi et al., (2002) who found that distance education students are generally older and more likely to face barriers to learning due to competing demands on their time and other resources.

Some have found older distance learners to be more motivated to learn than younger traditional students (Dibiase, 2000); yet others have found that opportunities for distance education may encourage distance learners with busy work schedules to procrastinate or to otherwise perform poorly, especially when the course is fast-paced and communication with the instructor is limited (Bigelow, 1999; Salmon, 2000). Our observation

regarding differences in the distribution of final grades is consistent with these findings. In our sample, a higher percentage of distance education students received failing grades than did on-campus students ( $P = 0.022$ ).

Table 3 summarizes student responses to questions about the blended method of the course. The majority of students in both student groups reported being satisfied with the blended design. Distance education students reported greater satisfaction with the blended design than did on-campus students ( $P=0.026$ ). The majority, 96% of on-campus students and 71% of distance education students, also reported that this was their first experience with a blended class.

Increasing interaction and sense of community has been found to be associated with higher levels of student satisfaction in both traditional and distance education courses (Wu, et al., 2010; McBrien and Jones, 2009; Vermunt, 2005). Opportunities for interaction are less common in distance education courses than they are in traditional on-campus courses, and in our observations, this is a common frustration voiced by distance education students. In our study, 60% of distance education students felt that the hybrid design provided a better opportunity to communicate with the instructor and their peers than what was offered in a traditional distance education course. This was not the case for on-campus students. This difference in perceptions of opportunity for student interaction may explain the observed differences in course satisfaction by student group.

Table 4 summarizes students’ perceptions of the effectiveness of different components of the course. Distance education students expressed greater appreciation for the flexibility that the hybrid delivery method provided ( $P=0.009$ ) and also gave positive feedback regarding instructor-student communication, indicating that the blended format may have provided better communication opportunities than traditional distance education courses. In contrast, most on-campus students felt there was more communication between instructor and student in traditional classes than what was provided in the blended course ( $P<0.0001$ ). Increasing opportunities for student-student and student-instructor communication in blended courses by utilizing discussion boards, virtual classrooms (such as Wimba) and study and office hours, may help to improve levels of student satisfaction and learning.

On-campus and distance education students provided similar rankings regarding the helpfulness of the different learning resources provided in the courses. They rated no-pressure quizzes, the textbook, and the face-to-face lectures as the most helpful resources. This indicates that both distance learners and traditional on-campus students valued both student centered learning activities (such as the no-pressure quizzes) as well as the traditional face-to-face lecture component of the course.

**Table 1: Student characteristics by student group (on-campus vs. distance education); blended general education nutrition course spring 2011.**

Characteristic	On-Campus (n=285)	Distance Education (n=97)
Less than 20-years-old <sup>1</sup>	57%	12%
Female	74%	82%
Major declared	68%	74%
Dietary habits ranked low <sup>1,2</sup>	17%	38%
Physical activity ranked low <sup>1,3</sup>	21%	30%

<sup>1</sup> Difference significant at a  $P<0.01$  level based on a 2-tailed Pearson Chi-Square analysis with 4 degrees of freedom.  
<sup>2</sup> Quality of dietary habits ranked as “lower or less healthy than most people my age”  
<sup>3</sup> Level of physical activity ranked as “less than most people my age”

**Table 2. Student performance by student group (on-campus vs. distance education); blended general education nutrition courses spring 2011.**

	On-Campus n=285	Distance education n=97	P-value <sup>1</sup>
Average final score out of 1000	845.3 ( $\pm 141.4$ )	754.9 ( $\pm 246.6$ )	0.010
Average exam score out of 125	99.4 ( $\pm 12.4$ )	95.4 ( $\pm 14.6$ )	0.010
Average quiz score out of 20	18.5 ( $\pm 1.8$ )	17.8 ( $\pm 3.1$ )	0.008
Average assignment score out of 25	22.9 ( $\pm 1.6$ )	22.1 ( $\pm 3.1$ )	0.001
Number of quiz attempts	2.89 ( $\pm 1.31$ )	2.34 ( $\pm 1.48$ )	0.001

<sup>1</sup>ANOVA

**Table 3. Percent of student who agreed with the following statements asked on the mid-term course evaluation by student group (on-campus vs. distance education); blended general education nutrition course.**

Question Summary	% Of Students	
	On-campus (n=264)	Distance education (n=52)
I would recommend this course to a friend	89	92
I would recommend this course continue to be taught in a hybrid format*	77	90 <sup>1</sup>
This class provided a high quality educational experience **	80	94 <sup>2</sup>
The quality of course would be lower if it was delivered in a traditional format.**	41	54
If I were to give this course a grade, I would give it an A.	43	58

<sup>1</sup> $P<0.05$ . <sup>2</sup>  $P<0.01$  using a 2-sided Pearson Chi-Square analysis; 4 degrees of freedom.

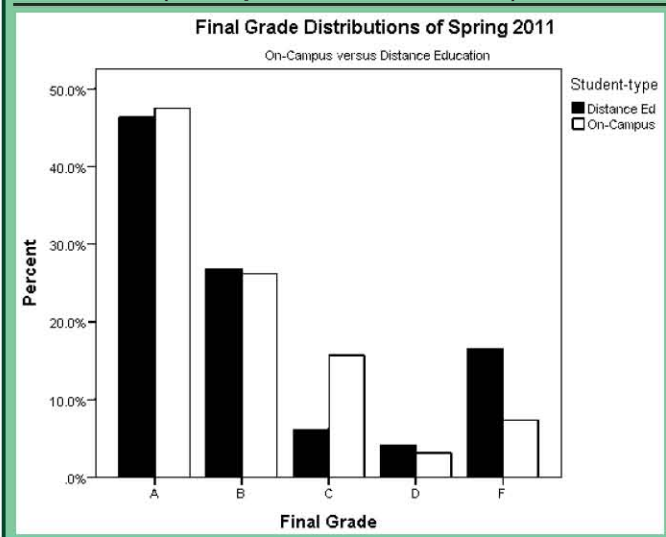


**Table 4: Student satisfaction by student group (on-campus vs. distance education) of a blended design of a general education course in nutrition.**

Survey Statement Summary		% of Students who Strongly Agreed or Agreed	
		On-Campus (n=264)	Distance (n=52)
Comfort level within hybrid learning environment	My first hybrid course <sup>3</sup>	96	71
	Accessing coursework on Blackboard is simple	80	87
	The syllabus is clear and detailed	86	90
	MyDietAnalysis is user-friendly	72	75
	I appreciate the flexibility of the course design <sup>2</sup>	81	98
Student Engagement	Read or reference the text book >3 times per week <sup>3</sup>	39	67
	Study for this class with another person at least weekly <sup>2</sup>	23	6
	I have used the discussion boards <sup>2</sup>	10	27
	Attending and or listening to face-to-face lectures is useful <sup>1</sup>	60	40
	Attended or listened to >85% of face-to-face lectures <sup>2</sup>	31	23
	The instructor encourages student participation during face-to-face lectures	78	75
	Opportunity to communicate with the instructor and my classmates is BETTER THAN in a traditional class <sup>3</sup>	26	60
	My instructor is responsive and available to students <sup>2</sup>	82	98
	The assignments encouraged application <sup>2</sup>	66	43

<sup>1</sup> P<0.05; <sup>2</sup> P<0.01 <sup>3</sup> P<0.001 using a 2-sided Pearson Chi-Square analysis; 4 degrees of freedom.

**Figure 1. Distribution of final grades earned in a blended general education nutrition course by student group (on-campus vs distance education)**



Another interesting observation is that 67% of distance education students indicated they referenced their textbook three times or more per week but only 31% of on-campus students reported accessing their textbook at least this often (P<0.0001; Table 4). Some research supports the hypothesis that younger students, who were also more likely to be traditional on-campus students, may struggle with the level of self-regulation needed to succeed in classes that require independent reading and learning (Richardson, 2012). Student responses on the mid-semester evaluation demonstrated that on-campus students were more likely to mention troubles procrastinating and missing due dates than were distance education students, despite our previously mentioned hypothesis that distance students may struggle with these factors because of additional demands on their time. In fact, at least 10 students mentioned specifically that the hybrid design encouraged procrastination and that had a negative effect on their performance in the course.

Strengths of the study include its high participation rates and standardized assessments across student groups (distance education vs. on-campus). It is

noteworthy that 100% of students who completed the courses during the designated times consented to participate and were included in this study. We also include individual, instead of group level assessments of course outcomes, including indicators of the level of satisfaction for different elements of the course design. A few limitations of this study should also be noted. There were likely differences in instructor characteristics and teaching styles, as well as other factors not recorded or accounted for that may have confounded the differences in student satisfaction and performance that were evaluated and observed. Data collection tools were developed for this project and reviewed by a panel of experts but have not been validated using other methods and may not be appropriate for the assessment of the efficacy of other blended course designs in different classes, institutes, and populations.

**Summary**

A blended learning model for a large enrollment general education nutrition course seems to adequately facilitate student learning and may be a successful model of course delivery for large enrollment courses offered both on-campus and through distance education. This blended format allowed the course to be taught in smaller sections (three sections of 100 students which each meet with the instructor for one 50 minute period per week) with the same instructor teaching load as required for larger enrollment lecture-dominant courses (one section of 300 students which meet with the instructor for three 50 minute sessions per week).

Though most students had no previous experience taking blended courses, the majority of students in this study expressed a favorable opinion towards the blended design and indicated that they would recommend it to a friend. The blended format may be more acceptable to older students who have a higher level of self-regulatory skills. However, blended courses may also help younger students to develop better self-regulatory skills which have been previously associated with greater levels of academic success. In summary, a blended learning course design that consists of asynchronous and

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synchronous elements appears to be a viable model for other large-enrollment introductory nutrition courses, and perhaps other courses in the life sciences, offered in a standardized format to on-campus and distance education students.

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