Title
An Instructor and Two Teaching Assistants Share Their Experiences with Blended Instruction

Authors
Esfandiari, Mahtash
Liu, Ching-Ti
Choe, Mike

Publication Date
2005-04-26

Peer reviewed

"An Instructor and Two Teaching Assistants Share Their Experiences with Blended Instruction"

UCLA Department of Statistics

Mahtash Esfandiari,
Ching-Ti Liu,
Mike Choe and

Funded by

UCLA College of Letters and Science
Tamara Addison

UCLA Office of Instructional Development
Susan Phares

I Introduction:

As the rate of enrollment in lower division classes continue to grow at UCLA, it has become more challenging to maintain the quality of instruction, student-teacher interaction, and constructive methods of student evaluation. The College of Letters and Science at UCLA is looking into blended instruction, combining technology and customary teaching methods, as a solution to this dilemma. To that end, in 2004 the College awarded three departments including Statistics grants to conduct case studies to examine the potential of blended instruction as a possible solution to the problem described above. In Winter 2005 blended instruction was implemented in Statistics 10, which has the highest enrollment rate (around 1700-1800 per year) in the department.

II Overall Goals of the "Blended Instruction" Case study

1) Maximize the role of the students as active learners and minimize their roles as passive recipients of information through:

a) Introducing statistics as a science of data,
b) Implementation of the generative model of learning,
c) Using data resulting from case studies, and
d) Using technology.

2) Establish closer student-student, student-instructor, student-TA, and TA- instructor contact and communication through

a) Weekly discussion of the on-line quizzes among groups of students and with the TA, and
b) Weekly visits of the instructor with the groups of students.

3) Use assessment as a mean of improving learning and teaching and not simply grading and classifying the students through

a) Using technology to help the TA and the instructor develop a better sense of where the students are with respect to their knowledge of the material, and
b) Developing on-line quizzes that allow the students to engage in problem solving and testing for upper level thinking.

III Theoretical underpinnings of the case study

The study is bases on a synthesis of the "generative teaching model" designed by Merlin Wittrock, Professor of Education at UCLA, cased based approach, and cooperative group work.

III.1 Major components of the "generative model"

Preconception: Learning about students' prior knowledge of statistics, beliefs about statistics, and their learning strategies

Motivation: Success in generating relations among old knowledge and the new knowledge motivates the students and helps them believe in their ability to do well in statistics

Attention: Expecting the students to be active participants and generate relationships helps to focus their attention

Generation: Generation of relations between the old and the new content and the different parts of the new content by the students

III.2 How the "generative model" was implemented?

a) Communicating with the students why it is important that they be active participants and generate their own knowledge,
b) Presenting the concepts and methods within contexts that were motivating and interesting for the students,
c) Modeling the importance of linking the old and the new information in lectures, homework, on-line quizzes, and lab,
d) Requiring students to actively participate during lecture and engage in linking of the old and the new information as well as generation of new information,
e) Designing exams that required the students to engage in upper level thinking including application, analysis, synthesis, and evaluation,
f) Enhancing generation of knowledge through interesting case studies and group work, and
g) Collecting anonymous data three times in the quarter to monitor and evaluate the level of students' attention, motivation, learning, and involvement in the course.

IV The structure of the re-designed coursed

IV.1 Two hours of lecture on Monday and Friday:

- On Monday the instructor provides the students with an overview of the week's theme,
- On Friday the instructor solidifies the student's understanding of the material with emphasis on the concepts that the students had difficulty with as evidenced by the weekly quiz.

IV.2 One hour of section on Tuesday

Students meet with the TA on Tuesday in section to engage in problem solving and go over the data analysis exercises discussed in the lab and the homework problems.

IV.3 One hour of computer lab on Thursday

- Students take a short computer generated quiz. In the first lab, based on the instant feedback given to the TA by on the first quiz, the students are placed in groups four to discuss the questions that the majority (>50% to 60%) got wrong. Each group consists of one student from each of the four quartiles.
- The students will redo the quiz after the group work.
- The students are expected to work through the computer assignment prior to the lab and TA will help to clarify their questions .
- On Thursday, the instructor meets with the small groups while they discuss the quiz to interact with them, and answer their questions.

IV.4 The demography of the students who took the course

a) A total of 33 students (14 females and 19 males) took the redesigned course.
b) 50% indicated that they took the course as a graduation requirement.
c) The average attendance for the lecture was 84.6%
d) The average attendance for the discussion was 82.33%
e) The average attendance for the group discussion of the online quizzes was 86.10%
f) The students spend an average of 2.8 hours on homework per week
g) The average GPA was 3.26.
h) The percentage of freshmen, sophomore, junior, and seniors were 18.2, 48.5, 15.2, and 18.2 respctively.

V The role of technology in accomplishing the goals of the redesign

1) The role of the Office of Instructional Development (OID) in choosing Moodle

2) The role of OID in teaching the instructor and the TAs how to use the software in developing the test bank

3) The significance of Moodle in making it possible

   a) For the students to take on-line quizzes and see their results right away

   b) For the TAs and the instructor to get the result of the on-line quizzes and the summary statistics right away

V EVALUATION OF THE BELNDED INSTRUCTION CASE STUDY

The following design is being followed for the evaluation of the "Blended Instruction" Cases Study:

1) The first section of the redesigned course (statistics 10A) was taught in Winter 2005.
2) The same instructor who taught the redesigned statistics course in Winter 2005 (Statistics 10A) is teaching the old version of this course (Statistics 10) in the Spring of 2005.
3) Another instructor is teaching the redesigned course for the second time in the Spring of 2005

The results obtained on the redesigned statistics course (statistics 10A) and the old course (statistics 10) will be obtained in terms of:

- Student achievement
- Student attitude toward statistics
- Student motivation toward statistics
- Attitude of the instructor toward the redesigned course and the old course
- Attitude of the teaching assistants toward the redesigned course and the old course

VI Results

Table 1. The percentage of students who thought that the lecture, lab, homework, weekly on-line quiz, and group discussion of the on-line quizzes helped to enhance the different components of the "generative model" to some extent, a large extent or a very large extent

Source	Components of the Generative Model					
Lecture	motivation	Attention	Maximizing active learning	Minimizing passivity	Creating ties	Generating knowledge
Lecture	81.8%	78.8%	65.6%	78.1%	84.4%*	78.8%
Lab**	66.7%	75.8%	68.7%	71.9%	75%	9.19%
Homework	90.9%	88.9%	65.6%	78.1%	81.2%	88.9%
Weekly on-line quizzes	97%	78.8%	81.2%	87.5%	84.4%	93.9%
Group discussion of quizzes	93.5%	93.7%	77.4%	93.5%	87.1%	93.7%

*** This is a major objective I had in mind when writing the lectures**

****We are working toward improving the labs in the second implementation of the BICS study conducted in Spring 2005**

Altogether, it seems that the on-line quiz and the group discussion of the on- line quiz played a more major role in enhancing the components of the "generative model" than learning than lecture, lab, and homework. This is to be expected because the latter involve more student involvement and what makes the on-line quiz and the group discussion of it different from lab and homework is that they are timed and require the students to know all of the material discussed.

Table 2: N, mean, and standard deviation for total score on "generative model" for lecture, lab, homework, on-line quiz, and the group discussion of the on-line quiz

Source	N	Mean (SD)
Lecture	32	56.25(22.32)
Lab	32	53.65(20.12)
Homework	32	56.90(15.21)
On-line quiz	31	69.89(15.91)
Discussion of the quiz	30	72.77(20.10)

Repeated measures ANOVA using the five sources of instruction (lecture, lab, homework, on-line quiz, and the group discussion of the on-line quiz) indicated that the effect of the different sources of instruction on enhancing generative learning were not similar (F = 9.330, P = 0.000).

Post-hoc analysis as well as the plot of the means indicate that the on-line quiz and the group discussion of the on-line quiz had a much more positive and significant effect on enhancing the different components that contribute to generative learning.

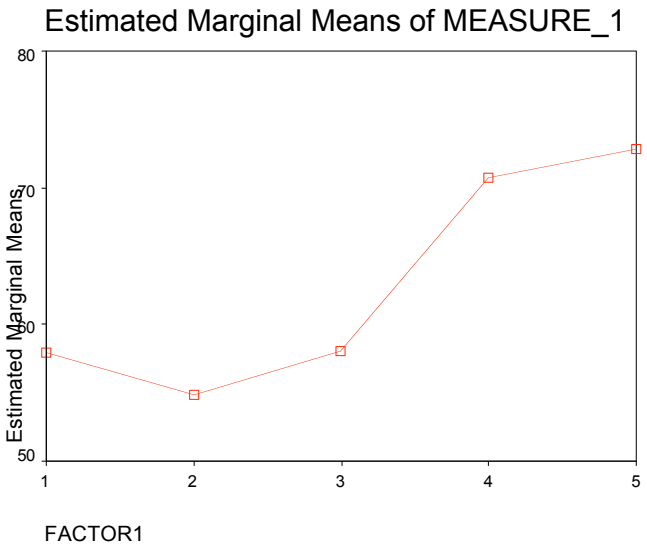

Figure 1: Mean score of lecture(1), lab (2), homework (3), on-line quiz (4) and group discussion of the on-line quiz (5) on the generative model

Table 3. The comparison of the "blended instruction" case study in statistics with course of a similar nature in terms of the major components of "generative model"

	Components of the Generative Model					
Compared to other course	Interactive nature of the course	Student motivation level	Student attention level	Students participation level	Student ability to link the material	Active role students plays in their own learning
less	0	0	3%	0%	3%	0%
similar	3%	54.5%	51.5%	30.3%	42.4%	34.4%
more	48.5%	30.3%	24.2%	45.5%	36.4%	50%
Much more	48.5%	15.2%	21.2%	24.2%	18.2%	18.2%

- **97% of the students found Statistics 10A more interactive or much more interactive than similar courses.**
- **45.5% found of the students rated their motivation level in Statistics 10A more or much more than similar courses.**
- **45.4% of the students rated their attention level in Statistics 10A more or much more than similar courses.**
- **69.7% of the students rated their participation level in Statistics 10A more or much more than similar courses.**
- **54.6% of the students rated their ability to link the material in Statistics 10A more or much more than similar courses.**
- **68.2% of the students found the active role that they played in their own learning in Statistics 10A to be higher or much higher than similar courses.**

Thus, it can be concluded that based on students' perceptions, compared to courses of similar nature, the students found the blended instruction case study to be much more conducive to helping them generate their own knowledge.

Table 4. The comparison of the "blended instruction" case study in statistics with course of a similar nature in terms of the major components of "generative model"

	Components upper level thinking						
Compared to other course	memorization	Critical thinking	Problem solving	Application of knowledge to new situations	Analysis of the material learned	Synthesis of the content learned	Evaluation of different scenarios
less	78.8%	6.3%	3%	3%	3%	3%	0%
similar	18.2%	21.9%	21.2%	33.3%	18.2%	33.3%	36.4%
more	3%	53.1%	48.5%	51.5%	66.6%	51.5%	48.5%
Much more	0%	18.8%	27.3%	12.2%	18.2%	12.1%	15.2%

- **78.2% of the students indicated that Statistics 10A required less memorization than courses of similar nature.**
- **71.8% of the students indicated that Statistics 10A they were required to do more or much more critical thinking than in similar courses.**
- **75.8% of the students indicated that in Statistics 10 they engaged in problem solving more or much more than in similar classes.**
- **63.7% of the students indicated that in Statistics 10A they applied their knowledge to new situations more or much more than similar courses.**
- **78.8% of the students indicated that in Statistics 10A they engaged in the analysis of the material more or much more than in similar classes.**
- **63.7% of the students indicated that in Statistics 10A they engaged in the synthesis of the material more or much more than in similar courses.**
- **63.6% of the students indicated that in Statistics 10A they engaged in the evaluation of the different scenarios more or much more than in similar courses.**

Based on the above data it can be concluded that compared to courses of similar natures, in Statistics 10A the students engaged more or much more in upper level thinking including less memorization and more critical thinking, problem solving, application, analysis, synthesis, and evaluation.

Table 5: The extent to which the blended instruction case study enhanced the relationship between student-TA, student- instructor, and student – student

	RATINGS				
	Very small extent	Small extent	Some extent	Large extent	Very large extent
The extent to which the weekly meetings with the instructor helped to create a closer teacher-student contact.	6.1%	0%	45.5%	27.3%	21.2%
The extent to which group discussions of the quiz helped to create a closer student-student contact.	6.1%	0%	18.2%	45.5%	30.3%
The extent to which group discussions of the quiz helped to create a closer student-TA contact.	3%	0%	27.3%	39.4%	30.3%

- **48.4% of the students indicated that weekly meetings with the instructor helped to create a closer contact between them and the instructor to a large or a very large extent.**

- **75.7% of the students indicated that the group discussions of the quiz helped to create a closer student-student contact to a large or a very large extent..**

- **69.7% of the students indicated that the group discussions of the quiz helped to create a closer student-TA contact to a large or a very large extent.**

- **32 out of 33 or 97% of the students indicated that they would recommend this course to a friend.**

Table 6: Answers to other questions related to the objectives of the study

Question asked	Possible Responses				
	Very small Extent	Small extent	Some extent	Large Extent	A Very Large Extent
The extent to which we succeeded to introduce statistics as "**science of data".**	0%	3%	27.3%	39.4%	30.3%
The extent to which we succeeded to show you how statistics **enhances your understanding of mass media**	0%	3%	24.2%	36.4%	33.3%
The extent to which we succeeded to show you that **mathematical operations are a mean to a better understanding of statistics and not the major objective of the course.**	0%	0%	36.4%	36.4%	27.3%
The extent to which we showed you that the major objective of statistics is to **answer real world questions and not to carry out computations.**	0%	0%	30.3%	39.4%	30.3%
The extent to which the **instructor modeled what was expected of you in terms of linking the material.**	0%	0%	30.3%	48.5%	21.2%

Open-ended question:
What was the best feature of this class and what made it different from other classes?

1) Interaction with teacher and class notes
2) The quiz and the lecture notes
3) A lot of teacher and student interaction
4) Quizzes, student-student interaction, focusing on application of concepts and not just equations.
5) Comfortable environment, felt part of the class. I learned much better this way and am now able to able statistics to logical and real life situation.
6) High frequency and personal interaction with the professor and the TA
7) Very interesting with practical applications of statistics
8) Student-TA and student professor interaction because of the small class size
9) Lecture notes, informative lecture, good section, section tied to lecture.
10) Professor-student and student-TA interaction much better than other classes helped me learn the material more effectively.
11) Group discussion of the quizzes helped me see how to think about the questions with the help of the others
12) The on-line quizzes and their discussion
13) Close student-teacher interaction
14) On-line quizzes and group discussion of them
15) Online quizzes really helped to see the different possibilities. Thanks so much for putting so much effort into differences in student learning. I would never have made it through looking at calculations alone. Group discussions with the TA really helped to narrow down unclear concepts.
16) The student teacher and the group interactions
17) Interaction with TA, professor, and students
18) Online quizzes and lab discussions
19) Discussing quizzes and re-taking them
20) Timed quizzes at home help you know how you are doing and keep you on track
21) The groups made a great learning tool
22) The class was harder than I thought it should be
23) Linking everything together, very interactive
24) The discussions were a good way to learn the material
25) Lab, online quizzes, and small lecture
26) Lab and discussions were helpful and made it easier to link the material
27) Quizzes and homework was great practice and TA was available online
28) TA was more active, different styles of learning and application to real world problems
29) Online lectures
30) Group discussions and quizzes, enthusiastic teacher
31) Group discussions

19 out of 31 (61%) of the comments related to group discussion and interactions as being the best feature of the course

How can this course be improved?

1) Final and quiz were hard
2) No lab
3) Easier quiz and final
4) More applicable labs – like CLT lab that we can visualize the concepts
5) Better instruction on lab assignments
6) The quizzes were hard to interpret
7) Longer availability of on-line quizzes
8) Not enough time to discuss the quiz and the lab. Quiz and homework more useful than lab.
9) Lecture time should be one and a half hour to see more connections
10) no lab
11) labs should be optional
12) less wasting time in lab
13) less work during the week, incorporate the lab and the homework
14) more quizzes and practice quizzes
15) a little more structure to lecture, discussion, and lab

7 out of 15 comments related to making some kind of improvement on the lab and this is what we are working on in the second round of teaching statistics 10.

VII Teaching Experiences of Teaching Assistant in "Blended Instruction"

a) Enhanced student participation

b) Enhanced initiation of discussion by students
c) Helped me make evaluations of the student's baseline knowledge or their misconceptions
d) Helped me enhance my interaction with the students
e) Helped me see that different students learn differently (equation, example, figure, etc.)
f) Participation in the development of the on-line quizzes was a more challenging and yet rewarding experience than other classes.