

Achievement and Satisfaction in a Computer-assisted Versus a Traditional Lecturing of an Introductory Statistics Course

¹Gholamreza Jandaghi, Ph.D. and ²Hasan Zarei Matin, Ph.D.

¹Faculty of Management, University of Tehran, Qom Campus, Iran

²Faculty of Management, University of Tehran, Qom Campus, Iran

Abstract: Computer assisted education has become a rapidly developing educational alternative. Many universities deliver such courses across a variety of disciplines. However, few studies have evaluated the efficiency of such presentations for quantitative courses like Mathematics and Statistics courses. The purpose of this study was to examine achievement and satisfaction of management students who participated in an introductory Statistics course which was presented in power-point slide format and a traditional lecture-based (white board and marker) class. Thirty four subjects in a PowerPoint slide class and twenty five subjects in a traditional lecture-based class participated in this study. Outcomes included performance on a 100-point written exam (pre- and posttest). All participants completed a satisfaction survey. No significant differences were found between PowerPoint slide and traditional courses in the pretest and posttest written exams. No significant differences were found in age and gender in two classes. In terms of satisfaction, the traditional lecture-based class evaluated the course significantly higher in learning and understanding the subject materials, encouragement to express their ideas in class and clearness of material explanations. On the other side, the power-point class evaluated the course highly significant in being invited to share their ideas and knowledge. There was a significant relationship between achievement and satisfaction in both classes and there was a significant difference between correlation coefficients of achievement and satisfaction in two groups.

Key Words: Computer-assisted education, management students, lecture-based, quantitative course, introductory Statistics, satisfaction, age, pretest-posttest.

INTRODUCTION

There is a continuing interest in the effective use of various instructional strategies, such as computers and cooperative learning experiences, for improving student achievement. Using computer in teaching quantitative courses is of great importance, since presentation of quantitative courses via computer may not have enough efficiency. Alternatives to traditional lecture-style delivery of education have been offered for many years (Huang, 1996-1997). Computer-assisted learners continues to grow at double digit rates (Allen & Seaman, 2006). Edulakanti Mohan Reddy (2008) found that there were no significant differences in the final learning outcomes between those students instructed via computer and those students instructed through traditional classes. Edsal and Wentz(2007) compared a traditional physical model versus a compute visualization presentation in an introductory undergraduate Georgraphy course . Their results confirm that computer-based approaches are appealing to students but are not, by themselves, significantly beneficial in enabling understanding of complex concepts. House(2007) examined how cooperative learning groups were used in a Mathematics lesson in Japan, and how computers were integrated into the lesson. It was found that the application of both strategies was consistent with recommendations from previous research on the effective use of cooperative learning groups and computer-based instruction. In this study we aim to compare the achievement and satisfaction of two group of undergraduate Management students enrolled in an introductory Statistics course one of which were taught by Interactive Traditional Lecturing (called Traditional class) and the other group by PowerPoint Slide Lecturing(called PowerPoint class).

MATERIALS AND METHODS

Participants:

Participants included 25 students enrolled in a traditional lecture-based introductory Statistics course and 34 students enrolled in the PowerPoint class of introductory Statistics. All participants completed the course

and study materials and took the final written exams. All participants were first year full time students without any employment and lived on Campus.

Procedures:

The traditional course format included two lectures per week via white board and board marker and a exercise lab portion once per week. The PowerPoint course format included a two PowerPoint presentations each week plus an additional document of narrative information for each presentation. Biweekly quizzes were given to all participants using the same questions from the daily reviews.

Demographic information was collected to obtain descriptive characteristics for the students in the two groups. A pretest examination was given to assess the participants' knowledge of course content prior to presentation of any course materials. The pretest examination contained 100-point exam about the introductory statistical concepts from high school Mathematics and Statistics. A posttest examination, composed of the same 100-point questions as the pretest, was given at the completion of the course.

All participants completed a Satisfaction survey, which consisted of a modified Students' Evaluation of Educational Quality (SEEQ) survey (Centra, 1993). The SEEQ uses a 5-point Likert scale and the following variables: strongly agree (SA) 5, agree (A) 4, neutral (N) 3, disagree (D) 2, and strongly disagree (SD) 1. The participants completed this portion of the study upon termination of the course, after completing the posttest examination.

Statistical Analyses:

All data were analyzed using the statistical software package SPSS (version 15.0). Because of the non-normality of age, a Mann-Whitney test was performed to determine if a difference in age existed between traditional and PowerPoint students. Distributions for sex across treatment groups were compared using a chi-square test for independence. The mean overall satisfaction of the PowerPoint students was compared to that of the traditional students using a pooled *t*-test for independent samples at a level of significance of 0.05. Average scores of the twenty-five individual measures of the Satisfaction survey were compared for PowerPoint vs. traditional courses using *t*-tests. For testing the relationship between achievement and satisfaction we used correlation coefficient and at last we use the test for difference of two correlation coefficients to compare the correlations between achievement and satisfaction in Traditional and PowerPoint classes.

Results:

No significant differences were noted between the ages of the students in the two courses, where the PowerPoint course mean age (\pm SD) was 23.74 ± 3.08 , and the traditional course mean age was 23.96 ± 3.41 . No significant difference existed between the groups in sex proportion using a Chi-Square test. Table 1 presents the demographic information.

Table 1: Demographic Information of PowerPoint and Traditional Students

Demographic Characteristics	PowerPoint Class	Traditional Class
Age (years)	23.74 \pm 3.08	23.967 \pm 3.41
Sex	Male = 21, Female = 13	Male = 16, Female = 9

No significant differences were noted in pretest score ($P = 0.348$), posttest score ($P = 0.461$), or the pretest-posttest score difference ($P = 0.975$), see Table 2.

Table 2: Course Performance of PowerPoint and Traditional Students

Test Score	PowerPoint Class Mean(SD)	Traditional Class Mean(SD)
Pretest	27.53(8.04)	28.44(5.94)
Posttest	71.15(9.16)	73.44(10.01)
Pretest Posttest Difference	43.62(13.56)	45.00(7.35)

Mean course satisfaction scores between the PowerPoint (3.46 ± 0.39) and traditional (3.59 ± 0.34) courses ($P = 0.176$) were not significantly different. However, within the individual satisfaction questions, a significant difference ($P < 0.001$) was found between the PowerPoint and traditional courses when the participants were asked whether "Students learned and understood the subject materials in the class", whether "Students are invited to share their ideas and knowledge." and whether "Material explanation was clear", The traditional students indicated that they learned and understood the subject materials in the class, they felt more encouraged to express their ideas in class, and they found the explanations much clear than the PowerPoint students. Though all other variables did not reach the corrected level of significance, many showed a trend

toward significance. On the contrary the PowerPoint students were significantly more satisfied than Traditional class when they were asked whether “Students were invited to share their ideas and knowledge”. Table 3 shows the mean and the standard deviations of the significant satisfaction items.

Table 3: Test results for Significant Satisfaction Items between PowerPoint and Traditional Students

Satisfaction Item	PowerPoint Mean(SD)	Traditional Mean(SD)	P-Value
I have learned and understood the subject materials in the class	3.29(0.58)	3.92(0.76)	0.001
Students were invited to share their ideas and knowledge	3.71(0.72)	3.00(0.86)	0.001
Students were encouraged to express their ideas and question the instructor	3.32(0.59)	3.72(0.84)	0.038
Material explanation was clear	2.71(0.68)	4.20(0.71)	0.000

Table 4. Show the mean and standard deviations of all satisfaction items for both groups. As can be seen, there is no significant differences between the two classes except for four items. The overall satisfaction does not show any significant difference between two groups.

Table 4: Satisfaction Items Comparisons for PowerPoint and Traditional Classes

Satisfaction Item	PowerPoint Mean(SD)	Traditional Mean(SD)	P-Value
I find the course intellectually challenging and stimulating.	3.38(0.75)	3.14(0.69)	0.212
I have learned something which you consider valuable.	4.12(0.91)	3.86(0.88)	0.276
My interest in the subject has increased as a consequence of this course.	3.45(0.59)	3.66(0.73)	0.229
I intend to use the information learned in this class in my daily life	3.72(0.73)	3.68(0.96)	0.856
I have learned and understood the subject materials in this course	3.92(0.76)	3.29(0.58)	0.001
Instructor is enthusiastic about teaching the course.	4.12(0.60)	3.86(0.61)	0.110
Instructor is dynamic and energetic in conducting the course.	3.00(1.27)	3.01(1.07)	0.975
Instructor enhances presentations with the use of humor.	4.05(1.01)	4.14(1.07)	0.742
Instructor's style of presentation holds your interest during class	3.77(0.99)	3.67(0.79)	0.681
Material explanation was clear.	4.20(0.71)	2.71(0.68)	0.000
Course materials are well prepared and carefully explained	3.78(0.81)	3.95(0.78)	0.425
Course content prepared me for the exams	3.48(0.65)	3.38(0.85)	0.610
Proposed objectives agree with those actually taught so you know where the course is going.	3.48(0.59)	3.56(0.81)	0.662
Instructor gives lectures that facilitate taking notes	4.08(0.89)	3.88(0.94)	0.406
Students are encouraged to participate in class discussions	3.58(0.71)	3.46(0.69)	0.519
Students are invited to share their ideas and knowledge	3.00(0.86)	3.71(0.72)	0.001
Students are encouraged to ask questions and are given meaningful answers.	3.48(1.01)	3.39(1.03)	0.740
Students are encouraged to express their own ideas and/or question the instructor	3.72(0.84)	3.32(0.59)	0.038
Instructor is friendly towards individual students	3.92(0.77)	3.95(0.82)	0.886
Instructor makes students feel welcome in seeking help/advice in or outside of class.	3.52(1.08)	3.44(0.82)	0.758
Instructor has a genuine interest in individual students	4.15(1.01)	4.17(0.98)	0.939
Instructor is adequately accessible to students during office hours or after class.	3.64(1.04)	3.44(0.75)	0.415
Instructor contrasts the implications of various theories	3.28(1.18)	3.21(0.94)	0.809
Instructor presents the background or origin of ideas/concepts developed in class.	3.59(1.06)	3.53(0.72)	0.807
Instructor presents points of view other than his/her own when appropriate.	4.11(1.10)	3.88(1.07)	0.426
Instructor adequately discusses current developments in field.	3.56(0.88)	3.71(0.97)	0.540
Feedback on examinations/graded materials is valuable.	3.71(0.66)	3.49(0.70)	0.221
Methods of evaluating student work are fair and appropriate.	3.40(0.82)	3.65(0.65)	0.216
Examinations/graded materials test course content as emphasized by instructor	3.40(0.76)	3.71(0.59)	0.096
Overall satisfaction	3.59(0.34)	3.46(0.39)	0.176

To see whether or not there is any relationship between students’ achievement and their satisfaction, we used the correlation coefficient test. The correlation coefficient between achievement and satisfaction was $r=0.696$ with significant level of $p\text{-value}<0.0001$ when we combined both groups. In Traditional group the correlation coefficient was $r=0.567$ with $p\text{-value}=0.003$ while in PowerPoint group it was $r=0.867$ with $p\text{-value}<0.0001$. There was a significant difference between the two correlation coefficients with $p\text{-value}=0.017$ indicating that There was a higher significant relationship between achievement and satisfaction in PowerPoint class compared to Traditional Class.

Discussion and Conclusions:

The present findings indicated that both PowerPoint and traditional course formats effectively presented materials and enhanced knowledge levels of students enrolled in an introductory Statistics course. No significant differences were found in either achievement or satisfaction between the PowerPoint and traditional groups. Moreover, no significant differences were found with sex or any other achievement measures.

No significant differences were noted between achievement scores in the pretest, posttest, pretest-posttest difference between the PowerPoint and traditional courses. Thus, it can be suggested that both the PowerPoint and the traditional courses provided the same degree of knowledge acquisition. This finding has been somewhat controversial in the literature, as some studies have found that there is no difference while others have found that either online or traditional courses perform better than the other. It may be that certain courses cannot effectively present materials in an online format (Allen *et al.*, 2004). For instance, a course in social work history (Faux & Black Hughes, 2000) found that there was a significant difference between the traditional and online groups, where the traditional group scored significantly higher than the online group on posttest.

In a meta-analysis, Allen *et al.* (2004) examined the effectiveness of distance education versus traditional classes. The results indicated a small overall improvement in performance for the distance education courses. Jandaghi(2008) found that there was a significant difference in achievement between distance education and traditional one in an inferential Statistics course.

A consideration when providing educational alternatives is whether students enjoy the alternative forms. The current study found that mean satisfaction scores were not significantly different between two groups. The only significant differences that resulted were “learning and understanding the subject materials”, “Clearness of material explanation”, “encouragement to express their own ideas and/or question the instructor”, and “being invited to share their ideas and knowledge”. The score of first three items were significantly higher in Traditional class while the fourth item was significantly higher in PowerPoint group.

This was in contrast to a finding in a meta-analysis (Allen, Bourhis, Burrell, & Mabry, 2002) that reported an overall slightly higher, non-significant level of satisfaction with traditional courses. Student satisfaction has also been evaluated through rating instructors. Wang and Newlin (2000) found that, in an instructor evaluation, the online and traditional courses were nearly identical, indicating that students were equally satisfied with how the courses were taught.

The results of the present study indicate that academic achievement and student satisfaction were similar in both PowerPoint and traditional lecture-based introductory Statistics courses. But there was a significantly higher correlation between achievement and satisfaction noted in PowerPoint class.

REFERENCES

- Allen, I.E. and J. Seaman, 2005. Growing by Degrees: Online Education in the United States, 2005. The Sloan Consortium. Retrieved from <http://www.sloan-c.org/>
- Allen, M., J. Bourhis, N. Burrell, and E. Mabry, 2002. Comparing student satisfaction with distance education to traditional classrooms in higher education: A meta-analysis. *The American Journal of Distance Education*, 16: 83-97.
- Allen, M., E. Mabry, M. Mattery, J. Bourhis, S. Titsworth, and N. Burrell, 2004. Evaluating the effectiveness of distance learning: A comparison using meta-analysis. *Journal of Communication*, 54: 402-420.
- Centra, J.A., 1993. Reflective faculty evaluation: Enhancing teaching and determining faculty effectiveness. San Francisco: Jossey-Bass Inc.
- Edsall, R., E. Wentz, 2007. Comparing Strategies for Presenting Concepts in Introductory Undergraduate Geography: Physical Models vs. Computer Visualization: *Journal of Geography in Higher Education*, 31: 427-435.
- Edulakanti, M., S. Reddy, 2008. Developing, implementing and evaluating computer-based instruction: AAT 3305435.
- Faux, T.L. and C. Black Hughes, 2000. A comparison of using the internet versus lectures to teach social work history. *Research on Social Work Practice*, 10: 454-466.
- House, D., 2007. Cooperative Learning and Computer Use During a Geometry Lesson in Japan: A Case Analysis from the TIMSS Videotape Classroom Study: *International Journal of Industrial Media*, 34: 323-330.
- Huang, A.H., 1996-1997. Challenges and opportunities of online education. *Journal of Educational Technology Systems*, 25: 229-247.
- Jandaghi, Gh., 2008. The Relationship Between Undergraduate Educational System and Postgraduate Achievement in Statistics, *International Journal of Human Sciences*, 5(1) Education Section.
- Wang, A.Y. and M.H. Newlin, 2000. Characteristics of students who enroll and succeed in psychology web-based classes. *Journal of Educational Psychology*, 92: 137-143.