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The Effect of Instructional Technologies on the Finance Classroom

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Abstract

Using a survey technique, we evaluate the effect of PowerPoint, online lecture notes, financial calculators, and machine readable forms (MRF) on students' assessment of the quality of instruction, perceived knowledge level, satisfaction, post-course interest in the subject, and average grade in introductory Finance courses. We also examine these opinions on a relative basis by comparing the responses of Finance majors versus non-Finance majors. The results suggest that certain technologies are received better than others and, further, that the perceived quality of instructional techniques is largely contingent on the student's choice of major.

Introduction

Although the application of technology in the classroom is not new, the extent of its use has never been higher, which begs the question of its relative effectiveness as compared to the standard "chalk and talk" method. As such, multiple studies have examined the impact of Computer Assisted Instructional (CAI) methods, particularly the use of PowerPoint, on student performance and perception. Unfortunately, however, these studies produce somewhat conflicting results, which implies a lack of consensus on the relative importance of CAI technologies.

The majority of these existing studies evaluate the use of CAI methods in introductory classes, typically focusing on a single type of technology such as PowerPoint or internet instruction. Further, these studies tend to concentrate on introductory classes that are of a qualitative nature (e.g., general psychology or management). Our primary contribution is to extend this existing set of literature in three areas.

First, we examine a subject deeply entrenched in quantitative methods, i.e., introductory Finance. The use of CAI methods in the classroom has historically lent itself much more to qualitative disciplines, which may be the reason for the lack of research in the field. Over the past several years, however, it has become more commonplace to find Finance classes, particularly introductory levels, taught using a variety of technological tools. It is possible that previous findings are inconsistent with those that exist when examining more quantitative disciplines.

Second, rather than addressing a single type of CAI, we consider the influence of multiple technologies on student perceptions. To aid in comparison, we follow previous studies by considering the impact of PowerPoint. In addition, we survey student feelings on the use of online lecture notes. While there is research (e.g., Liu 2005) that examines the effects of online instruction as a whole, we are unaware of any study that explicitly considers the impact of having notes available online versus being required to attend class to get the notes. Further, we also examine a technology that is unique to the Finance discipline, i.e., financial calculators. Many courses, including introductory levels, are now taught using financial calculators as opposed to traditional formula memorization. Therefore, we question students on the appropriateness of the calculator as a tool in the classroom. Lastly, we also examine the use of machine-readable forms (MRF), more commonly known as Scantron. As a quantitative discipline, Finance generally requires numerous calculations on tests and quizzes, often leading to partial credit, which is difficult to accommodate with MRF.

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Third, rather than treating all students in the class as homogenous, we examine the differences in student opinion based on choice of major (i.e., Finance versus non-Finance). Students have the option to choose a more qualitative discipline than Finance if that is where their interest lies; however, business majors at virtually all schools are required to take at least one introductory course in Finance. There are likely inherent differences in cognitive learning styles between students with different majors. This does not, however, indicate differences in learning abilities (Witkin, Moore, Goodenough, and Cox, 1997), but rather a preference for perceiving and processing information. For example, Hansen (1995) examines student cognitive styles and finds the learning needs of each student to be predictive of their chosen major. Further, students concentrating in qualitative disciplines may be more familiar (and comfortable) with CAI methods through previous classroom experiences. It is therefore possible that their opinions of the topic and the method with which it is taught will be systematically different from that of Finance majors.

To complete our study, we survey students at two universities, one private (Butler University) and one public (College of Charleston), asking them to rate the effectiveness of various types of technology in their introductory Finance classes. We concentrated our survey on students who completed the introductory course in a prior semester.

We find that Finance majors generally associate PowerPoint with lower teaching effectiveness, as evidenced by their feelings on the quality of the class, as well as their satisfaction level and knowledge obtained. However, these relationships are much weaker (and often not statistically significant) for non-Finance majors. This is consistent with the notion that students with different majors (quantitative versus qualitative) exhibit varying cognitive learning styles. For example, our findings suggest quantitative-based majors are more process focused learners, which is generally easier to illustrate with step-by-step examples on the traditional board than on PowerPoint. Our results also suggest, in contrast, that qualitative majors may be more visual learners, for which PowerPoint is well-suited. Alternatively, a non-exclusive possibility is that non-Finance majors are more accustomed to technology through exposure in prior coursework in their major.

In addition, we find that online lecture notes are associated with lower teaching effectiveness, as measured by quality and interest level, for non-Finance majors. This finding suggests that students with either a reduced interest in the subject or a natural difficulty with the quantitative nature of the subject suffer more from the potential disconnect between student and instructor when information is conveyed in standardized online form as opposed to more personalized face-to-face contact. Again, this finding may also indicate an intrinsic difference in cognitive style between Finance and non-Finance majors.

Further, we find that use of financial calculators, as opposed to strict memorization and application of formulas, is associated with higher quality instruction, as is evidenced by higher perceived quality, knowledge, and, to some extent, satisfaction. We also find that the relation to quality is primarily driven by the responses of non-Finance majors, which may, again, be attributable to different attitudes toward the material at hand, as these qualitative majors prefer a more applied rather than a technical, theoretical approach.

We also examine the relation of MRF to perceptions; however, we find no significant results. In addition, we examine the relation between each of the technologies and average performance, as measured by the grade earned by the student, finding no significant associations. This latter finding is consistent with the results of Bartlett and Strough (2003), Grupe (2003), Lui (2005), and Susskind (2005).

Of specific interest to finance instructors, our results have practical implications for the use of technology in the classroom. Specifically, we suggest broad application of the financial calculator, as it appears to benefit non-Finance majors, without a reduction in effectiveness as perceived by Finance majors. Further, our findings suggest that instructors should potentially avoid broad use of PowerPoint and online lecture notes, at least to the extent that these are the sole methods employed for disseminating and discussing information. Lastly, our results suggest that use of MRF, which is often avoided in quantitative classes, may be acceptable if properly employed.

Background

The use of technology in the classroom can take several forms. The most popular and widely studied method, however, appears to be PowerPoint. For example, Hutchens (2004a) examines the use of PowerPoint in General Psychology classes, finding that use of this particular technology produces, at best,

mixed results in student performance. Specifically, the study finds students' final grade averages actually fell in classes that use CAI methods.[2] However, in contrast, in a subsequent study Hutchens (2004b) suggests that student performance was higher in other classes using technology-assisted instruction, as was evidenced by final course grades and the extent of class attendance. Susskind (2005) and Szabo and Hastings (2000) also examine the use of PowerPoint and conclude that students' academic achievement was statistically unaffected by its use. One of the contributions of our study is to add additional evidence to these opposing findings.

Other studies examine the use of CAI technologies beyond PowerPoint. For example, Keefe, Rainbolt, and Wigley (2001) study the effect of different teaching methods on students taking a junior-level introductory management course (Management and Behavior in Organizations) at Indiana University Southeast. They find that when lectures and instruction were provided at different times over the internet and not face-to-face, students were less satisfied with the instructor, the course, and the perceived value of the course, and, in addition, their grades were lower. When the hybrid method (a mixture of both internet and traditional lecture methods) was compared with the exclusive use of the internet, student grades were lower in the internet course, but their satisfaction with the instructor was not significantly different. The authors conclude that the use of internet and hybrid courses offer convenience and flexibility; however, the internet should be used as a tool in instruction and not a replacement for the instructor.

Willet (2001) examines the effects of computer assisted instruction, with special emphasis placed on lecturing, at Cabrillo and Gavalin Community Colleges in California between the years 1996–1999. The study examines the effect of CAI technologies (including PowerPoint) on the achievement of students in Spanish and math (basic arithmetic, elementary algebra, and intermediate algebra) at the two colleges. The results were mixed when examined within the framework of student performance in the classes and on examinations. While the study finds major advantages from using CAI methods (i.e., improved access to information, saved time, immediate feedback provided to students, and enhanced presentations that used visual aids), it concludes the introduction of technology in the classroom had not, as yet, been shown to be unequivocally superior to face-to-face lectures.

Bartlett and Strough (2003) also examine the impact of different types of instructional forms on student performance. They find that both grades and student evaluations were higher when the traditional classroom approach was used. The multimedia (e.g., PowerPoint) employed did not provide additional benefits to the students in terms of course evaluations or grades. Grupe (2003) conducts a correlation analysis in order to determine whether or not there is a significant difference in the success of students who were taught with traditional classroom techniques as opposed to CAI methods. Using a unique sample of students enrolled in different sections of a course at the University of Wisconsin-Stout, he finds an insignificant relation between the grade point averages in the two groups.[3]

Data Methods and Collection

We collect our data using a survey method at each of our respective institutions. Students who had completed an introductory business finance class were asked to complete a brief survey that included cursory control questions such as gender, major, and year in which the course was taken. Students were also asked to describe the method of instruction in the introductory class and, consequently, their opinion on the quality and effectiveness of the course.

The first section of questioning examined the degree of use (from never to always) of four different types of technology in the classroom: (1) PowerPoint, (2) online lecture notes, (3) financial calculators, and (4) MRF. The next section required the students to give their opinion on the effectiveness of the course (on

[2] The lack of evidence suggesting PowerPoint to be an advantageous tool is not exclusive to academics. Nunnberg (1999) and Steward (2001) also suggest that PowerPoint may be intrinsically detrimental to the quality of presentations and critical thought.

[3] In addition, Durbin (2002) collects data on student attitudes and performance on examinations for large, entry-level Geosciences classes over a period of seven years. His study examined the use of computer assisted instruction as a presentation tool in the classroom as well as the use of the internet (WebCT) for increased student exposure to class notes (and content). He finds the use of CAI did indeed positively affect the performance of students in that average exam scores increased by more than twenty percent when the internet was used to get additional information in conjunction with computer-driven lectures. Comprehensive final exam averages increased by more than eleven percent over the time period studied. In addition, the pass rate of students taking the courses involving CAI was over eighty percent, while the pass rate for students who did not use computer technology in class was between fifty and sixty percent.

a 1 to 5 scale, Poor to Superior), as measured by (1) the quality of education in the class, (2) their level of knowledge of Finance after the class, (3) their level of satisfaction with the class, and (4) their interest in the subject after the class. Also, the student had the option of volunteering their grade in the class if they so chose, an option that all participants took. We collected a total of 205 student responses.

We present descriptive statistics in Table 1. For each technology, we examine the total sample along with segmented samples based on whether the student is a Finance major or non-Finance major.[4] Finance majors are generally subjected to a great deal of quantitative learning, while non-Finance majors, to varying degrees, are more likely to be subjected to a more qualitative method of education. Therefore, we feel that the latter group of students may be more accepting of technology in the Finance course as they may be more accustomed to it in their previous studies. For each technology method, we distinguish between those students who report their instructor used the tool in any regard (i.e. sometime, usually, or always) from those that never used it.[5] Also, we code the student's grade on a zero to four scale, where zero is failing, one is a D, two is a C, three is a B, and four is an A.[6]

We find that PowerPoint is actually associated with lower perceived quality and lower levels of satisfaction in the total sample. The use of PowerPoint is also associated with a lower level of students' perceived knowledge, although the significance is marginal (p-value = .12). These results are consistent with the findings of Bartlett and Strough (2003) and Hutchens (2004a), who find a negative relation between student performance and the use of PowerPoint. However, we find no significant difference in student interest or in the grade received.

When we evaluate the sample segmented by major, we find that the results outlined above for the total sample are driven largely by Finance majors. We find both Finance and non-Finance relate use of PowerPoint to a lower quality; however, the difference is more significant for Finance majors. Also, Finance majors experience less satisfaction with a class where PowerPoint is used, whereas there is no relation in the non-Finance major subsample. This is consistent with the belief that students choosing a more quantitative major tend to be process-focused learners, which is likely more difficult to present using PowerPoint. Again, we find no relation between the use of PowerPoint and grades for either sub-sample.

We next examine the use of online lecture notes. By putting lecture notes online, instructors leave the distinct possibility for a disconnect between teacher and student, as students have less incentive to attend class.[7] Both Finance and non-Finance majors each have potential to suffer from this disconnect. Non-Finance majors are less likely to be interested in the subject matter, as evidenced by their choice of a different area of study. Therefore, they may require more interaction to overcome the lack of attachment to the subject matter. On the other hand, Finance majors should have a deeper interest in the subject, particularly since it is their first taste of their chosen major. Therefore, they should wish to be as immersed in the learning process as possible in order to get a solid foundation on which to build the rest of their education.

We find a negative relation between the use of online lecture notes and students' perceived quality of instruction, satisfaction, and interest level. This suggests students prefer the direct interaction between teacher and student as opposed to an indirect connection via the web. This finding is consistent with Hutchens (2004a), who suggests the process of note taking leads to better memory and recall of the material being taught because of the increased mental processing needed to complete a meaningful set of lecture notes. As an extension, Hutchens (2004b) finds that student performance is higher in classes in which web-based notes were complimented by direct classroom note taking, a finding also consistent with

[4] At the College of Charleston, there is no Finance major. Rather, students obtaining a degree in Business Administration have the option of concentrating in Finance. We feel this is closely analogous to the decision to major in the discipline; therefore, we use the two interchangeably. However, for robustness, we examine observations from each University separately and find the results to be qualitatively unchanged.

[5] In unreported results, we examine each level of use, but chose to report our findings in the more intuitive, and straightforward approach of using two distinct levels. Also, since our sample size is limited, the breakout into the individual levels sometimes leaves sub-samples so small as to prevent meaningful comparison.

[6] Both institutions use, to some degree, a plus-minus system. However, due to the differences among the institutions, we chose to ignore the plusses and minus and code based only on the letter grade. For robustness, we repeat the analysis after recoding according to the plus-minus system of each institution. Our results are unchanged.

[7] Instructors can mitigate this concern somewhat by implementing a strict attendance policy, something that we do not consider on the survey.

Table 1: Summary Statistics

	PowerPoint			Online Lecture Notes			Financial Calculator			Machine-Readable Forms		
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
	Yes	No	*t-stat*	Yes	No	*t-stat*	Yes	No	*t-stat*	Yes	No	t-stat
Total Sample												
n	76	129		71	134		160	45		58	147	
Quality	3.39	3.87	-3.17	3.42	3.84	-2.68	3.77	3.42	1.84	3.67	3.70	-0.17
Knowledge	3.25	3.46	-1.55	3.25	3.45	-1.38	3.39	3.36	0.21	3.36	3.39	-0.17
Satisfaction	3.36	3.64	-1.92	3.35	3.63	-1.84	3.60	3.29	1.63	3.50	3.54	-0.27
Interest	3.47	3.69	-1.33	3.35	3.75	-2.33	3.56	3.80	-1.42	3.55	3.63	-0.45
Grade	3.08	2.98	0.87	3.04	3.01	0.33	3.05	2.91	1.08	3.17	2.96	1.94
Finance												
n	30	61		28	63		69	22		30	61	
Quality	3.47	4.02	-2.62	3.50	3.98	-2.18	3.96	3.45	1.82	4.00	3.75	1.09
Knowledge	3.47	3.70	-1.33	3.57	3.65	-0.42	3.67	3.50	0.82	3.73	3.57	0.77
Satisfaction	3.40	3.87	-2.28	3.46	3.83	-1.75	3.78	3.50	1.05	3.87	3.64	1.05
Interest	4.13	4.33	-1.23	4.14	4.32	-1.08	4.26	4.27	-0.07	4.30	4.25	0.32
Grade	3.17	3.20	-0.21	3.14	3.21	-0.49	3.23	3.05	1.18	3.33	3.11	1.67
Non-Finance												
n	46	68		43	71		91	23		28	86	
Quality	3.35	3.74	-1.86	3.37	3.70	-1.56	3.63	3.39	0.90	3.32	3.66	-1.46
Knowledge	3.11	3.24	-0.68	3.05	3.27	-1.16	3.18	3.22	-0.19	2.96	3.26	-1.43
Satisfaction	3.33	3.43	-0.49	3.28	3.45	-0.83	3.46	3.09	1.40	3.11	3.48	-1.65
Interest	3.04	3.12	-0.35	3.84	3.24	-1.84	3.02	3.35	-1.37	2.75	3.20	-1.98
Grade	3.02	2.79	1.47	2.98	2.83	0.96	2.91	2.78	0.66	3.00	2.85	0.88

Notes: The following table presents summary statistics for the entire sample, divided by those students in classes where the respective technology, at least to some degree, and those that were not. Students responded on a five-point scale to their perception of quality of education, knowledge of the subject matter, satisfaction with the class, and interest in the subject. A response of one signified a very poor perception, while four signified a very high perception. The student also provided their grade in the course, which we input as on a traditional 4.0 basis. T-statistics are calculated assuming unequal variances.

those of Keefe, Rainbolt, and Wigley (2001). Upon closer examination, we find these results are driven by both Finance and non-Finance majors. Finance majors find the presence of online lecture notes to be associated with a lower quality of instruction and a lower level of satisfaction, while non-Finance majors have less interest when online lecture notes are available. Again, we find no relation to grades.

Financial calculators are becoming an increasingly useful and necessary tool in Finance, particularly in upper-level classes where the problems become more difficult, and almost impossible, to solve using traditional calculation methods. Further, students may prefer to be taught using the calculator as opposed to conventional equations and calculations, primarily due to the ease of use and the lack of formula memorization. Finance majors, in particular, may prefer the use of the calculator, as it provides a jump start on other upper-level classes, although we suspect non-Finance majors will have the greater interest in the financial calculator since it represents a more applied, rather than technical, approach. We find that students associate the use of financial calculators with a higher quality education and more (albeit marginally) satisfaction. These results seem to be a combination of both Finance and non-Finance majors, although the relationship with quality is more significant for Finance majors.[8]

Lastly, we examine the use of electronic MRF (i.e., Scantron), a tool that is being increasing utilized given the growing number of students in a classroom at many institutions. One positive aspect of MRF, from the student perspective, is the quick turnaround on grading. Also, many students prefer multiple choice questions over open-form type questions that require the students to start from scratch to find an answer as opposed to having options available. On the other hand, MRF does not generally allow for partial credit, which is something that may be very valuable, particularly for non-Finance majors who may not be as comfortable with the subject matter. However, across the full sample, we find no relation between the use of MRF and student perception of teaching effectiveness. Interestingly, we find a positive relation between the use of electronic MRF and student grades.[9]

Examining the two subsamples provides a possible reason for the lack of significance in the total sample. Specifically, we find offsetting results in the two samples. Non-Finance majors associate MRF with a lower level of satisfaction with the class (significant at 10 percent level), as well as a lower interest in the subject matter. This is consistent with the belief that less quantitative learners tend to need more interactive-type exams and the partial credit that goes along, something that MRF does not provide. We also find that the positive relation between the use of MRF and grades is driven by Finance majors, who, on average, should better understand the material due to increased interest. Therefore, they should be better able to judge the accuracy of the solutions provided and are not as in need of partial credit as non-Finance majors.

Overall, the univariate analysis suggests that students do view technology as important, and it matters in classroom instruction. Further, it appears that the impact of these technologies may be contingent upon the student's chosen major, which likely captures differences in underlying cognitive styles. This finding significantly adds to the existing set of literature, which generally treats all students as homogenous. We now turn our attention to examining these issues in a more robust fashion, allowing us to control for potential underlying relations that could be influencing the results.

Results

To address the possible underlying relations mentioned above, we extend our analysis by examining the following regression model:

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[8] To take an opposing view, we also ask the students to report the use of formulas in the class, particularly those that had to be memorized. We find results consistent with the ideas put forth in relation to the financial calculators. Specifically, memorization of formulas is associated with lower quality, knowledge, satisfaction, and interest, at least in a univariate setting. Interestingly, we also find the use of formulas leads to a significantly lower grade. We do not report these results for a two reasons. First, we attempt to keep the focus of this paper on students' feelings of the effectiveness of technology in the classroom, rather than opposing methods. Second, due to our chosen method of distinguishing the use of formulas versus the lack of use, we find a very small number of respondents that report no use of formula memorization. In fact, the small number may indicate that we are only picking up the results for one instructor, which is something we would like to avoid if possible.

[9] Naturally, one of the determinants of the use of technology in the classroom is determined by class size. For example, large classes taught in large, auditorium-style rooms likely require the use of PowerPoint and/or MRFs. However, both the College of Charleston and Butler University keep classes small, on average not exceeding 35 students.

$$Measure = \alpha + \beta_1 Finance + \beta_2 Math + \beta_3 Sophomore + \beta_4 Junior + \beta_5 PowerPoint + \beta_6 Online + \beta_7 MRF + \beta_8 Calculator + \varepsilon_i$$

where *Measure* is either *Quality*, *Knowledge*, *Satisfaction*, *Interest*, or *Grade*. With the exception of *Grade*, each is measured on a one to five scale, where one is very poor, two is somewhat poor, three is average, four is above average, and five is very high. *Grade* is measured on the conventional 4.0 scale.

Finance is a dummy variable equal to one if the student reports they are a Finance major, zero otherwise. This variable is designed to test our hypothesis that Finance majors embrace various technologies differently than other majors. *Male* is a dummy variable equal to one if the respondent is a male, zero otherwise. Previous research (e.g., Hutchens, 2004a and Grupe, 2003) finds an asymmetric response based on the gender of the participant. Specifically, females seem to perform better with the traditional lecture method, while the performance of males showed no difference between CAI and traditional lecture methods. *Sophomore* and *Junior* are dummy variables equal to one if the respondent was a sophomore or junior in the year they took the class, respectively, and zero otherwise. *Senior*, being the most prevalent response, is the excluded category.

The variable for each form of technology equals zero if the student responded that the instructor never used the tool, one if it was used sometimes, two if it was usually used, and three if the instructor always used the method.[10] We present results in Table 2 for all four measures of effectiveness, as well as for the student's reported grade in the course. Panel A presents the results for *Quality*, while Panel B presents the results for *Knowledge*. Panels C and D report the results for *Satisfaction* and *Interest*, respectively, while Panel E reports the results for *Grade*.

Table 2: Regression Analyses

Panel A: Quality

	Total		*Finance*		*Non-Finance*		*t-stats*
	Coef.	*t*-stat	Coef.	*t*-stat	Coef.	*t*-stat	Fin vs. Non-Fin
Intercept	3.75	16.19	3.87	9.35	3.86	12.73	
Finance	0.30	2.01					
Male	0.03	0.21	0.23	0.96	-0.11	-0.56	
Sophomore	-0.44	-1.50	-0.43	-0.99	-0.20	-0.45	
Junior	-0.42	-2.29	-0.15	-0.45	-0.54	-2.32	
PowerPoint	-0.09	-1.02	-0.29	-2.18	0.01	0.09	-1.69
Online	-0.19	-2.17	-0.08	-0.54	-0.23	-2.03	0.65
MRF	0.01	0.09	0.18	1.48	-0.09	-0.84	1.95
Calculator	0.16	2.57	0.05	0.58	0.18	2.05	-1.05
N	205		91		114		
Adj R. Sq.	.1076		.1199		.1030		

Panel B: Knowledge

	Total		*Finance*		*Non-Finance*		*t-stats*
	Coef.	*t*-stat	Coef.	*t*-stat	Coef.	*t*-stat	Fin vs. Non-Fin
Intercept	3.23	15.26	3.42	8.97	3.40	12.32	
Finance	0.47	3.40					
Male	0.01	0.05	0.22	0.96	-0.13	-0.74	
Sophomore	-0.15	-0.57	-0.13	-0.32	-0.04	-0.11	
Junior	-0.21	-1.26	0.03	0.11	-0.33	-1.57	
PowerPoint	-0.02	-0.21	-0.22	-1.78	0.08	0.77	-1.84
Online	-0.07	-0.90	0.10	0.77	-0.15	-1.44	1.32
MRF	-0.02	-0.33	0.09	0.82	-0.09	-1.02	1.57
Calculator	0.09	1.66	0.04	0.48	0.09	1.15	-0.49
N	205		91		114		
Adj R. Sq.	.0517		-.0007		.0156		

[10] This approach assumes that the difference between each level of use is uniform, which may not be the case. Thus, we examine several alternatives to this approach, including the simple binary variable utilized in the univariate analysis. We find that our results are qualitatively unchanged.

Panel C: Satisfaction

	Total		*Finance*		*Non-Finance*		*t-stats*
	Coef.	*t*-stat	Coef.	*t*-stat	Coef.	*t*-stat	Fin vs. Non-Fin
Intercept	3.55	14.90	3.59	8.32	3.70	12.03	
Finance	0.36	2.30					
Male	0.09	0.58	0.25	0.99	-0.01	-0.07	
Sophomore	-0.17	-0.55	-0.15	-0.34	0.15	0.32	
Junior	-0.38	-1.98	0.06	0.18	-0.61	-2.56	
PowerPoint	-0.05	-0.58	-0.27	-1.91	0.07	0.62	-1.77
Online	-0.11	-1.23	0.03	0.18	-0.15	-1.28	0.57
MRF	-0.04	-0.55	0.08	0.63	-0.10	-1.00	1.41
Calculator	0.09	1.46	0.02	0.18	0.09	1.05	-0.69
N	205		91		114		
Adj R. Sq.	.0473		.0213		.0609		

Panel D: Interest

	Total		*Finance*		*Non-Finance*		*t-stats*
	Coef.	*t*-stat	Coef.	*t*-stat	Coef.	*t*-stat	Fin vs. Non-Fin
Intercept	3.33	14.94	4.38	12.62	3.49	10.97	
Finance	1.16	8.02					
Male	0.22	1.48	0.19	0.92	0.20	0.94	
Sophomore	0.13	0.44	0.13	0.37	0.06	0.13	
Junior	-0.32	-1.82	-0.22	-0.81	-0.40	-1.65	
PowerPoint	0.07	0.86	-0.09	-0.76	0.15	1.25	-1.34
Online	-0.19	-2.24	-0.05	-0.41	-0.25	-2.14	1.06
MRF	-0.10	-1.33	0.06	0.53	-0.19	-1.79	1.64
Calculator	-0.02	-0.31	-0.02	-0.27	-0.05	-0.58	0.24
N	205		91		114		
Adj R. Sq.	.2784		-.0312		.0389		

Panel E: Grade

	Total		*Finance*		*Non-Finance*		*t-stats*
	Coef.	*t*-stat	Coef.	*t*-stat	Coef.	*t*-stat	Fin vs. Non-Fin
Intercept	2.72	16.11	2.79	10.16	2.81	11.76	
Finance	0.28	2.57					
Male	-0.12	-1.08	-0.04	-0.26	-0.15	-0.92	
Sophomore	0.37	1.70	0.54	1.90	0.33	0.92	
Junior	0.16	1.16	0.36	1.64	0.06	0.30	
PowerPoint	0.02	0.32	0.00	0.04	0.05	0.54	-0.30
Online	0.01	0.08	-0.01	-0.08	0.01	0.16	-0.36
MRF	0.08	1.51	0.09	1.14	0.08	0.95	0.31
Calculator	0.03	0.60	0.03	0.43	0.01	0.11	0.19
N	205		91		114		
Adj R. Sq.	.0376		-.0016		-.0312		

In Panel A, we find a positive relation between the quality of instruction and Finance majors, a result unsurprising as one would expect those students to have a more favorable view of the course. We find negative relations between perceived quality and *Sophomore* (p = .1355) and *Junior*. This indicates that seasoned students are more satisfied with the quality of instruction than their less experienced counterparts. However, we find no relation between the gender of the respondent and their opinion of the quality of instruction. This finding is in contrast with Grupe (2003), Hutchens (2004a) and Hutchens (2004b), all of which find that female students perform better with traditional lecture based approaches. Our result may be driven by the fact that the majority of Finance majors (at least at the institutions studied) are male.

Turning to the primary variables of interest, we find a negative relation between the use of online lecture notes and the reported quality of instruction. Conversely, we find a positive relation between the use of a financial calculator and quality. We find no significance in the coefficients on *PowerPoint* or *MRF*. In

columns 2 and 3, we again segment the sample based on the respondent being a Finance major. We see that Finance majors associate PowerPoint with lower quality instruction, while non-Finance majors do not. Non-Finance majors, on the other hand, appear to be driving the positive association between the use of a financial calculator and the quality of instruction, likely because these qualitative majors prefer the applied approach typically employed with the financial calculator.

In column 4, we test the difference on the coefficients for Finance majors (column 2) versus non-Finance majors (column 3). These results are obtained by examining the *t*-statistics on interaction terms between *Finance* and each primary variable of interest using the full sample. The Finance major distinction is statistically significant for *PowerPoint* and *MRF*. These results indicate that Finance majors prefer MRF more than non-Finance majors, while the opposite is the case for PowerPoint. Thus, our results, to this point, are consistent with those found in our univariate analysis.

In Panel B, we examine student perception of their knowledge of the subject matter following the course. We find, as expected, Finance majors feel they have more knowledge than non-majors. The only technology variable that is significant is the financial calculator, which has a positive relation with student knowledge. More closely examining the Finance major sample reveals those students again feel that PowerPoint is associated with a lower knowledge level following the course. It also appears that the knowledge related to the use of PowerPoint is significantly different between Finance and non-Finance majors, as it was with the *Quality* measure.

We examine the students' level of satisfaction with the course in Panel C. We find that, controlling for age and gender of the respondent, each of the technology tools is insignificantly related to the students' level of satisfaction in the entire sample. We again find, however, that Finance majors associate PowerPoint with a statistically significant lower level of satisfaction. In addition, we find that Finance majors are less tolerant than non-Finance majors of this method of instruction, as the latter group is likely more accustomed to it, as well as more prone to accept it due to cognitive style as visual learners.

In Panel D, we examine each respondent's post-class interest in the subject matter. We find that students are less interested if their class involved online lecture notes, a result that is found for non-Finance majors, but not for their counterparts. For the non-Finance sample, MRF is also negatively related to student interest. Panel E examines the effect of the technology devices on student grades. We find no significant relation in any of the variables for any of the samples.

Our results from the multivariate analysis are generally consistent with those found in our prior section, which examines the data on a univariate basis. Thus, our findings appear to be robust to various controls for underlying student characteristics such as gender and year of schooling. As such, we continue to suggest that technology can serve a valuable role in the classroom, improving perceived quality, knowledge, satisfaction, and interest level. However, our primary conclusion, and that which represents the greatest contribution to the literature, is that students (dependent on their chosen majors) react differently to various forms of classroom technology, which is most likely a function of differences in underlying cognitive learning styles.

Summary and Conclusions

We survey students that have completed an introductory Business Finance course with the intention of gauging their feelings on the effectiveness of various technologies in the classroom. We examine the use of PowerPoint, online lecture notes, financial calculators, and MRF. Students were asked to answer questions pertaining to the quality of the instruction, their perceived knowledge obtained in the course, their level of satisfaction with the course, and their interest in the subject matter

We find that Finance majors generally feel that PowerPoint is associated with lower teaching effectiveness, as gauged by their feelings on the quality of the class, as well as their satisfaction level and knowledge obtained. This may likely be a function of the differences in learning styles between Finance majors (process-focused) and other business majors (visual learners). Finance is a discipline heavily focused on quantitative methods and tools, which may be more difficult to relate via multimedia, such as PowerPoint. We also find that online lecture notes are associated with lower teaching effectiveness, particularly for non-Finance majors, who may suffer more so from the potential disconnect between student and instructor. In contrast, we find that non-Finance majors favorably view the use of financial calculators. We also find that the technology tools utilized are unrelated to grades, which is the subject of most papers in the area.

By taking a student's approach to examining the effectiveness of the various technological tools gaining popularity among instructors, we are able to provide results that have implications for preferred classroom techniques, particularly for finance instructors. Specifically, we suggest broad application of the financial calculator, as it benefits non-quantitative majors, without a reduction in effectiveness as perceived by Finance majors. Further, our findings suggest that instructors avoid broad use of PowerPoint and online lecture notes, at least to the extent that these are the sole methods employed for disseminating and discussing information. Lastly, our results suggest that use of MRF, which is often avoided in quantitative classes, may be acceptable if properly employed.

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