

## **Distance Education in a Cost Accounting Course: Instruction, Interaction, and Multiple Measures of Learning Outcomes\***

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### **Abstract**

Students in online and traditional classroom sections of an intermediate-level cost accounting course responded to a survey about their experiences in the course. Specifically, several items related to the instruction and learning outcomes were addressed. Additionally, student examination performance in the two types of sections was compared. The results suggest that students in both learning environments generally rated the instruction, professor/student interaction, and learning outcomes at a high level. However, where differences in satisfaction levels exist, the ratings generally were higher among students in the traditional classroom. Examination performance was comparable on 14 of 18 topic areas with the traditional method producing better comprehension in three of the remaining four areas. While student learning, instruction, and interaction between students and with the instructor were good in the online sections, the results suggest that the traditional learning approach provided a level of richness to the student learning experience that was not matched in the online approach. Overall, the survey results have implications for course design going forward, regardless of course delivery method.

\*Author order is alphabetic; the authors contributed equally to this project.

**Keywords:** Cost accounting; online education; learning outcome measures

## Introduction

Distance education in its various forms has proven that it is here to stay. These delivery forms include courses that are completely online, those that include a few in-class meetings while otherwise relying on the internet, and a range of other methods that do not require students to attend class (Bryant, Kahle & Schafer, 2005). For many students, the relative costs in terms of time, energy, competing priorities – and sometimes gasoline – make online learning less burdensome than attending class in person (Perreault, Waldman, Alexander, & Zhao, 2008). Many students still sense the need to change or enhance their careers in today’s challenging world, and distance learning provides additional flexible options to help make this happen (Millson & Wilemon, 2008).

Many well-known, accredited institutions now have entire programs available online and use online education as a means to attract students, either out of necessity due to competition, or the desire to grow programs in new ways (Shanahan, 2003; Salimi, 2007). The U.S. Department of Education reported that there were over 12 million enrollments in college-level credit-granting distance education courses during 2006-07 (U.S. Department of Education, 2008).<sup>1</sup> This study further revealed that the majority of two-year and four-year degree-granting postsecondary institutions offered online or other forms of distance education courses, with nearly one-third offering complete degree programs through distance education (U.S. Department of Education, 2008). Additionally, the trend toward online training and testing is worldwide and extends not only to higher education (e.g. Aisbitt & Sangster, 2005; Love & Fry, 2006), but to professional firms and associations as well (Lynch, 2005; Krause, 2009). Technology continues to advance and make online education more effectively and professionally delivered than was previously the case (Rubenstein, 2003; Jennings, 2006).

The growth in online education raises the question of whether important course results are comparable to those of the time-tested “brick and mortar” approach to education, or if there are still areas of critical improvement needed in order for the results to be comparable. There has been a considerable amount of research in the area of online education, but the results tend to be

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<sup>1</sup> The term “enrollments” refers to the number of registrations, which includes duplicate counts.

mixed (Sooner, 1999; Dellana, Collins, & West, 2000; Terry, Owens, & Macy, 2001; Love & Fry, 2006). The differences may lie not only in learning outcomes, but in inputs (e.g. learning styles, technology, instruction methods and evaluation) and learning processes as well (Crow, Cheek, & Hartman, 2003; Arbaugh et al., 2009). The amount of research in technical fields such as accounting remains relatively sparse (Bryant et al., 2005), and the results of studies in non-technical and non-quantitative disciplines may not necessarily apply to accounting (Arbaugh, 2005). Further, given that the majority of prior distance education research has primarily used students' final grades when evaluating the effectiveness of the online method compared to traditional face-to-face delivery, other learning outcome measures can add insights into the evaluation of students' performance (Kan & Cheung 2007; Arbaugh et al., 2009).

This study contributes to the literature by examining certain aspects of inputs and processes, and by offering multiple measures of learning outcomes to better examine the relative efficacy of two course delivery methods in key cost accounting areas. We examine online and traditional classroom students' perceptions of instruction and course administration, student-faculty interaction, and student-student interaction based on survey responses. Course learning outcomes are measured in terms of expected grade (as of the last week of the course), overall perceptions relating to other important outcomes, and objective, topic-specific examination results. The latter measure adds to the literature by providing a more detailed analysis of performance in order to examine whether there are specific topic areas that warrant further fine-tuning by online instructors. Although not a controlled experiment, the study also contributes methodologically by providing internal validity to the extent possible. Specifically, the same instructor taught both the online sections and traditional classroom sections and administered the courses in the same manner except for the course delivery method.

Overall, we found that online students perceive high quality instruction and learning, as well as quality interaction with the instructor and other students. Students' comprehension of specific topical areas was comparable between students in the online and traditional course sections. With the exceptions of standard costing variance calculations and certain areas of cost allocation, where traditional students demonstrated somewhat higher comprehension, no significant differences were noted. However, where differences in students' perception of their overall

learning existed, the students in the traditional classroom generally rated these dimensions higher. For instance, traditional classroom students were more confident about their grasp of key concepts and their ability to communicate these concepts and issues. In total, the results suggest that the traditional learning approach provided a level of richness to the student experience that was not matched in the online approach.

### **Prior Literature**

Distance learning studies in other disciplines have yielded mixed conclusions. Some researchers have concluded that distance learning is at least as effective as traditional classroom learning (Dellana et al., 2000; Iverson, Colky, & Cyboran, 2005; Sooner, 1999; Jones, Moeeni, & Ruby, 2005). Other research studies have found that students in traditional classes tend to outperform their counterparts in online learning environments. Ponzurick, France, & Logar (2000) found that effectiveness and overall satisfaction were lower for graduate marketing students in distance education courses than for students in a face-to-face course. Priluck (2004) found students enrolled in traditional sections of a marketing principles course to be more satisfied with the development of their skills and course knowledge than their counterparts in the online sections. Similarly, Terry et al. (2001) concluded that students in traditional face-to-face MBA classes performed better than did students in online classes.

Relatively few studies have focused on distance learning in accounting (Gagne & Shepherd, 2001; Vamosi, Pierce, & Slotkin, 2004; Chen & Jones, 2007; Jones & Chen, 2008). These studies yielded mixed results. Gagne and Shepherd (2001) surveyed MBA students in online sections and traditional face-to-face classes of financial accounting. They reported insignificant differences for overall evaluations of the course and instructor and for final grades. Similarly, in a study that examined blended learning in an MBA accounting course, Chen and Jones (2007) reported that both blended learning students and those in a traditional classroom environment indicated favorable responses in terms of learning outcomes.

However, other accounting studies found distance learning to be less effective compared to the traditional classroom method. Vamosi et al. (2004) examined students' satisfaction and

perceptions in an undergraduate accounting principles course. Their results suggested that students were less satisfied with distance learning, which was considered less effective in the delivery of course materials compared to learning in a traditional classroom. In contrast, Jones and Chen (2008) reported that MBA accounting students in blended learning sections had more positive group work experiences and more positive perceptions of instructor feedback compared to students in traditional classroom sections.

Prior studies in distance education often report the effectiveness of delivery method based on students' final course grades as the primary source of learning outcomes. Also, these studies often report findings that do not control for differences in styles of teaching and grading formats. Therefore, this study extends prior literature in accounting distance education by (1) examining multiple measures of learning outcomes, (2) examining student-faculty and student-student interactions, and (3) controlling for instruction and style of teaching by having the same instructor teach both online and traditional sections of the intermediate-level cost accounting course. In this study, we consider the following research questions with regard to an intermediate-level cost accounting class:

1. What are the students' perceptions of the quality of instruction?
2. What are students' perceptions of interactions with faculty and classmates?
3. What are students' perceptions of their learning outcomes?
4. Is the online method as effective with respect to quality of instruction, interaction, and learning outcomes as traditional classroom instruction?
5. Is there a difference in the level of knowledge obtained by online students, as measured by exam performance in specific topical areas, compared with traditional classroom students?

## **Data Collection and Methods**

### **Participants**

Students in six sections of the same intermediate-level cost accounting course participated in a survey aimed at assessing the relative effectiveness of online learning vs. traditional classroom delivery across different dimensions. Three sections involved a traditional classroom setting

(n=64), while the other three sections involved an online learning approach (n=75). Since more than one semester was involved, we tested for differences in responses due to the semester in which the student was enrolled. We found no significant differences related to the semester. Table 1 reports demographic data for the participants in the study, specifically gender, age, and self-reported undergraduate grade point average. There were no significant differences between the two delivery methods with respect to these demographic variables.

**TABLE 1: Participant Demographic Information<sup>2</sup>**

	Traditional	Online
<b>Gender</b>		
Male	32	31
Female	32	44
Total	64	75
<b>Mean Age</b>	26.39	28.20
<b>Mean Self-Reported Undergraduate GPA</b>	3.34	3.78

### Course Administration

All online and traditional sections included in the study were taught by the same instructor. The traditional and online sections differed only in the method of delivery. The sections were alike in terms of the factors that determined students' grades and the relative weight of each factor. The instructor conducted classes in the traditional sections using a combination of lecture and class discussions. The lectures primarily involved a summary of key issues related to particular topics. Discussions focused on illustrative examples from actual financial reports and cases that were assigned for a particular day. In the online sections, the instructor posted lecture notes online and conducted the online class meetings in a manner similar to those for traditional classroom sessions. Online class meetings primarily focused on chapter questions posted by the instructor and specific student questions e-mailed to the instructor prior to online meetings. Students in the online section were required to participate in the Discussion Board meetings.

<sup>2</sup> The data reported in this table were also reported in a separate paper (Chen, Jones, and Moreland 2010), which used the same group of participants, but focused specifically on various aspects related to group work. The demographic data are presented for information and control purposes only and are not a primary emphasis of either paper.

The course grade for all sections was based on three examinations (37.5%), a group project (18.75%), and three individual writing assignments involving cases (18.75%), homework (15%), and participation (10%). The instructor assigned students into groups of four for the group project. In the first meeting and in the course syllabus, the instructor informed the students that they would fill out peer evaluations during the last class meeting to assess the relative contribution of each group member. The instructor then adjusted individuals' grades based on these peer assessments.

## Survey

We developed the survey by incorporating items identified as important factors related to teaching effectiveness in prior studies. With respect to instruction and course administration, we adapted items from Jones and Chen (2008). The student-faculty and student-student interaction items were measured using items from Marks, Sibley, & Arbaugh (2005). We measured learning outcomes by adapting items from Chen and Jones (2007). Students responded to each of these items on a five-point scale from 1 (strongly disagree) to 5 (strongly agree). We examined all differences for significance using Multivariate Analysis of Variance (MANOVA). The following sections discuss the results of comparisons between the two delivery methods in terms of instruction, interaction, learning outcomes, and knowledge of subject matter. As a measure of effect size, we have included "eta squared" statistics to Tables 1-3. Where we have significant comparative differences, most of the effect sizes fall within a medium range, consistent with the majority of social research (Grimm and Yarnold 1995). Power statistics are shown as well.

## Comparative Survey Results

### Instruction and Course Administration

Because the method of delivery might be expected to affect students' perceptions about the instructor and/or the course, we compare responses relative to instruction, the instructor, and the way the instructor administered the course. Table 2 shows the results for these items.<sup>3</sup>

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<sup>3</sup> A principal components analysis suggests that the items in the table form three separate factors. Specifically, Items 1, 4, 5, 10, 11, 12, and 13 load onto a factor seemingly related to instructional components. Items 2, 7, 8, and 9 related to communication effectiveness. Finally, Items 3 and 6 related to feedback by the instructor. However, the Cronbach Alpha for the separate factors ranges from .738 for the instructor feedback factor to .772 for

**TABLE 2: Instruction and Course Administration**

Item*	Traditional	Online	F-value	P-value	Eta Sq	Power
1. The clarity of instruction was good.	4.25	4.20	0.08	0.78	.00	.06
2. The instructor's answers to the questions by other students enhanced my understanding of materials	4.14	3.77	7.02	0.01	.05	.75
3. The professor usually answered my questions promptly.	4.46	4.33	0.60	0.44	.00	.12
4. In general, the instructor was effective in motivating the students to put in their best work.	4.26	4.05	1.86	0.18	.01	.27
5. I was motivated to do well in this course	4.54	4.16	6.52	0.01	.05	.72
6. The instructor kept students informed of their progress.	4.40	4.56	.57	0.45	.00	.12
7. The comments from the instructor in class discussions are constructive	3.54	3.87	5.24	0.02	.04	.62
8. The comments from the instructor through e-mails are constructive	3.60	4.22	24.68	0.00	.16	.99
9. I feel comfortable providing my input in class discussions	3.51	4.24	28.08	0.00	.17	1.00
10. The homework assignments were helpful in learning course content	4.30	4.04	2.28	0.13	.02	.32
11. The individual case assignments were helpful in learning course content	4.17	4.20	0.25	0.62	.00	.08
12. The group case assignments were helpful in learning course content	4.17	3.04	37.13	0.00	.22	1.00
13. I find the lecture notes to be helpful in learning course content	4.42	3.65	24.11	0.00	.15	1.00

\* Students responded on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree).

In terms of instruction, the results shown in Table 2 are mixed, but suggest that students viewed traditional instruction as more effective than online instruction. In some ways, students taking the class online were no less satisfied with the outcomes than their counterparts in the traditional class. Both groups were motivated to do well, although that difference was significant in favor of

communication effectiveness, compared with an Alpha of .83 when all of the items are combined. We have retained the details to increase the informativeness of the research for the reader at this early stage of research in online accounting education.

the traditional classroom group (Item 5). Statistical tests revealed no significant difference in terms of instruction clarity (Item 1), the instructor's tendency to answer questions promptly (Item 3) and to keep students informed of their progress (item 6), and his/her ability to motivate students (Item 4), but generally favored the traditional classroom approach in other areas.

Online students had significantly better perceptions in terms of two aspects related to class discussions. First, they indicated stronger agreement that comments from the instructor were constructive (Items 7 and 8). Second, they were considerably more comfortable providing input in class discussions (Item 9). Traditional classroom students believed that the instructor's answers to questions enhanced their understanding to a significantly greater degree than was the case with online students (Item 2). Traditional classroom students also expressed a significantly stronger belief than did online students that homework assignments, group case assignments, and lecture notes were beneficial in learning course content (Items 10, 12, and 13). However, both groups of students thought individual case assignments were helpful in learning course content and the difference between the two groups was not statistically significant (Item 11).

### Student-Faculty and Student-Student Interaction

The ability of students to interact with the professor and with fellow students may affect their learning experience and their overall satisfaction with the instructor and the course (Muirhead, 2002; Wong, 2005). Table 3 presents the results for several items related to the level and type of interaction.<sup>4</sup>

The results indicate that interactions in the course were at a high level for both traditional classroom students and online students. However, on balance, traditional classroom students rated their interactions as more effective than did online students. While both groups provided mean responses to interaction questions that were near or above "4," traditional classroom students agreed significantly more strongly that the course was conducted in an interactive manner (Item 14) and that the amounts of professor/student (Item 15) and student/student (Item 16) interaction were sufficient. Also, we observed a slightly larger gap favoring the traditional

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<sup>4</sup> A principal components analysis revealed that items 14-19 load onto one factor we would call "interaction components". The Cronbach Alpha statistic is .85 for the resulting construct. However, we have retained the separate items to increase the informative content for the reader.

approach when asked whether interaction became more natural as the course progressed (Item 17). There was no significant difference in the students' perceptions of the instructor's facilitation of class discussions (Item 18). Both groups appeared satisfied with that aspect. Both groups seemed to indicate that students often asked the instructor questions (Item 19), although the difference again is statistically significant in favor of the traditional classroom students.

**TABLE 3: Student-Faculty and Student-Student Interaction**

Item*	Traditional	Online	F-value	P-value	Eta Sq	Power
14. The course was conducted in an interactive manner.	4.53	4.01	19.88	0.00	.13	.99
15. The amount of interaction between the professor and students was sufficient.	4.51	4.12	10.05	0.00	.07	.88
16. The amount of interaction among the students was sufficient.	4.28	3.79	12.18	0.00	.08	.93
17. Interacting with other students and the instructor became more natural as the course progressed.	4.21	3.65	20.81	0.00	.13	.99
18. The instructor does a good job facilitating class discussions.	4.17	4.01	1.62	0.21	.01	.24
19. Students often asked the instructor questions	4.21	3.77	13.41	0.00	.09	.95

\* Students responded on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree).

### Perceptions of Learning Outcomes

Table 4 shows mean responses relative to a number of items regarding students' self-reported perceptions of learning outcomes.<sup>5</sup> The results again generally favored traditional classroom delivery when there were between-group differences. Traditional classroom students indicated more strongly that they gained a good understanding of concepts/principles in the field (Item 21) and were able to identify central issues of the course (Item 22). However, there were no significant between-group differences in students' views that they "learned a great deal from the course" (Item 20), were able to interrelate the important facts and issues (Item 23) and improved their ability to integrate facts and develop generalizations (Item 24). Conversely, traditional classroom students indicated more strongly that they deepened their interest in the subject matter

<sup>5</sup> A principal components analysis reveals that all items in the table load onto one factor related to "learning outcomes". The Cronbach Alpha statistic is .90 for the resulting construct. However, we have retained the separate items to show the results related to different dimensions of this construct.

(Item 25), and they were more confident that they could communicate clearly about the subject (Item 26).

**TABLE 4: Learning Outcomes**

Item*	Traditional	Online	F-value	P-value	Eta Sq	Power
20. I learned a great deal from this course.	4.30	4.16	0.99	0.32	.01	.17
21. I gained a good understanding of concepts/principles in this field.	4.23	3.77	14.65	0.00	.10	.97
22. I was able to identify the central issues of the course.	4.45	3.92	21.22	0.00	.13	1.00
23. I learned to inter-relate the important issues in the course material.	4.36	4.20	1.65	0.20	.01	.25
24. I improved my ability to integrate facts and develop generalizations from the course material.	4.11	4.08	0.05	0.82	.00	.06
25. I deepened my interest in the subject matter of this course.	4.15	3.36	25.06	0.00	.16	1.00
26. I developed the ability to communicate clearly about the subject.	4.22	3.58	24.51	0.00	.15	1.00
27. The quality of the course compared favorably to my other business courses	4.43	3.90	12.33	0.00	.08	.94
28. I was very satisfied with this course	4.48	3.73	32.29	0.00	.19	1.00
29. Overall, the instructor was an excellent teacher.	4.39	4.33	0.22	0.64	.00	.08
30 Overall, this was an excellent course.	4.42	3.96	10.68	0.00	.07	.90
31. Expected Grade in the course**	3.47	3.42	0.33	0.57	.00	.09

\* Students responded on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree), except for the last item.

\*\*Coded as follows: A=4; B=3; C=2; D=1; E=0

Both groups rated the overall course quality compared to other courses (Item 27) and their satisfaction with the course (item 28) at a fairly high level. However, students in the traditional classroom rated these dimensions at a significantly higher level. Also, both groups of students indicated strong agreement with the statements that “the instructor was an excellent teacher”

(item 29) and that “this course was an excellent course” (item 30). The significance tests for these items suggested that mode of delivery was associated with differential perceptions of the course, but not of the instructor.

As another measure of learning outcomes, a separate item asked students about their expected final grade in this course using a letter grade from A (coded 4) to E (coded 0). The traditional classroom students responded with a higher mean expectation (3.47 vs. 3.42 for online students), but the difference was not significant ( $p=0.56$ ).

### Objective Learning Outcomes

Table 5 shows results relative to knowledge of specific topic areas. The mean responses represent percentages of objective questions answered correctly by traditional classroom and online students for each topic area. Using one-way ANOVA, we found that traditional and online students differed significantly in four of 18 topic areas with a marginally significant difference in a fifth area (relevant costs and decision making). Of these five areas, online students outperformed traditional classroom students in one area (inventory management and just-in-time purchasing). That area of the course includes such topics as economic order quantity, a discussion of how just-in-time systems have affected accounting, and an introduction to “backflush” costing. The reason for online students’ better performance in this area is unknown.

Overall, the results in Table 5 suggest that online students’ comprehension of cost accounting topics as measured by examination performance was comparable to that of their traditional classroom counterparts. Many of these areas require significant calculations and understanding of interrelationships between numbers. The most noticeable difference in favor of the traditional classroom students was observed in the area of materials and labor variance calculations (mean of 79% for traditional vs. 70% for online students). To a lesser extent, the differences also were significant in relation to overhead variance calculations and support department cost allocations. As shown in Table 5, the percentages of questions answered correctly in both learning modes for these three learning areas were relatively low.

**TABLE 5: Knowledge of Subject (Means of Percentage of Questions Answered Correctly on Exams)**

Item	Traditional	Online	F-value	P-value
32. The Accountants' Role in the Organization	0.90	0.88	0.56	0.45
33. Cost Terms	0.88	0.87	0.06	0.79
34. The Schedule of Cost of Goods Manufactured	0.82	0.83	0.17	0.67
35. Cost-Volume-Profit Analysis	0.85	0.83	0.43	0.50
36. Activity-Based Costing and Activity-Based Management	0.84	0.84	0.00	0.93
37. Cost Allocations and Costing Systems	0.82	0.79	1.48	0.22
38. Allocation of Support-Department Costs	0.77	0.72	2.52	0.05
39. Process costing	0.77	0.75	1.05	0.30
40. Budgeting and Responsibility Accounting	0.81	0.80	0.57	0.44
41 Static Budgets, Flexible Budgets and Variances	0.81	0.79	0.88	0.34
42. Price and Efficiency Variances for Direct Costs Inputs	0.79	0.70	12.00	0.01
43. Variable Overhead and Fixed Overhead Costs Variances	0.77	0.72	3.83	0.05
44. Strategy and Balanced Scorecard	0.85	0.88	0.87	0.35
45. Relevant Costs and Decision Making	0.86	0.83	2.20	0.07
46. Pricing Decisions and Cost Management	0.87	0.87	0.00	0.92
47. Inventory Management and Just-in-Time Purchasing	0.83	0.87	4.39	0.03
48. Transfer Pricing	0.86	0.85	0.61	0.43
49. Evaluating Management Control Systems	0.85	0.86	0.02	0.88

Considering that students would have already been exposed to these calculations in a principles-level prerequisite course, it is unknown why online students were markedly lower in this area. Perhaps variance analysis and cost allocation using the reciprocal and other methods reach levels of complexity and intricacy where the additional verbal instructor explanations and clarifications provided in a traditional classroom setting produce significant student comprehension benefits. While the results did not suggest significant deficiencies in online students' mastery of topics in most areas, these results did perhaps suggest a few areas in which cost accounting instructors should be aware of student learning challenges in developing their instructional approach.

### **Conclusions and Implications**

The results of this study suggest that learning outcomes, student knowledge gained, interaction among students and with the instructor, and student overall course satisfaction in online sections

of this cost accounting course were at a high level. However, where differences existed in specific aspects of these course delivery areas between online sections and traditional sections, the traditional approach more frequently is associated with a better result.

Students in online sections rated their own comfort level in providing input in classroom discussions (discussion board) higher than did students in traditional sections. The online students also viewed instructor comments in classroom discussions (discussion board) and in emails as more constructive than did students in traditional sections. This is consistent with the general perception that online course delivery is more comfortable for some students, in part because of its asynchronous and more flexible nature, and the opportunity to provide discussion input without being “in front of” the class. However, these results may suggest that online courses foster less student engagement if steps are not taken to promote more active learning.

The traditional approach was favored compared to the online learning experience in two general ways. First, when differences existed between traditional and online sections for specific course aspects, the results usually favored the traditional approach. These areas included:

- More effective instructor motivation of students
- Higher quality and more useful lectures and lecture notes
- Learning benefits of completing homework and group assignments
- Better interaction among students and between students and the instructor
- Better comprehension of key concepts and principles
- Better identification of central course issues
- Development of deeper student interest in the subject
- Better ability to communicate clearly on the subject matter
- Higher course quality and course satisfaction
- Better comprehension of more specific course topics

Second, the differences show that the traditional course provided a level of richness to the student learning experience that exceeded that of the online approach. This likely is related to factors such as better interaction among class participants, greater instructor adaptability in the

teaching approach in response to verbal and non-verbal cues received from students, and more verbal communication between the instructor and students.

A potentially important difference is in the perceived higher level of quality and usefulness of lectures and lecture notes that traditional classroom students found in comparison to their online counterparts. This may be due to the enhanced value of lecture notes that results from an instructor's verbal comments in the traditional classroom. Additionally, homework assignments and group case assignments were viewed as more beneficial by traditional classroom students than by online students. This too may be due in part to greater support offered in the traditional classroom environment, where instructors possibly are better able to provide guidance and answer questions useful in completing such assignments. Instructors in online courses should be cognizant of factors that may affect the extent to which homework, group case assignments, and lecture notes contribute to the achievement of course learning objectives.

The results suggest that interaction among participants in online courses is less effective than in traditional courses. Students generally are quite comfortable with technology, and interaction via a computer is generally quite routine. Indeed, with the proliferation of technology-based communication devices among the college-age population, it may be that some are more comfortable communicating through machines than face-to-face. Neither group indicated strongly that it was more difficult to participate in class discussions than in other undergraduate courses taken. Online instructors likely can improve course quality in this area by staying current with and adopting new communication technologies in their classes.

This study offered two measures of learning outcomes that arguably offer somewhat different conclusions. In terms of perceptions about important learning outcomes, the traditional classroom students responding to this survey were considerably more likely to indicate confidence in their understanding of key concepts and the ability to identify and communicate about important issues. This difference was noted even though the two groups of students reported nearly identical average expected overall grades.

On balance, the comparative results on exam performance, an objective measure, suggested a slight advantage to the traditional approach. The most notable difference was in the area of variance analysis, particularly with respect to direct costs. Perhaps instructors should be aware of the potential for some aspects of cost variances to be more difficult to grasp in an online learning environment. In general, the results suggested that student comprehension as measured by exam results did not suffer significantly in the online approach, with the traditional approach showing slightly better comprehension in a few areas. However, as the level of detail or complexity of the topic increases, instructors should be cognizant of the need to consider additional teaching techniques in online courses. These additional techniques might include audio and/or video recordings of lectures, additional examples, and/or additional practice assignments.

Taken together, the results of this study indicate that effective learning occurred in the online environment. However, online instructors face challenges with regard to optimizing student comprehension of more difficult subject matter, student engagement in the course, and interaction among students and with the instructor. In this regard, instructors should consider techniques and activities such as enhanced lecture approaches, student discussion activities, and other active learning approaches to address these issues in online courses.

### **Limitations**

The results of survey research where participants are asked for their perceptions should be interpreted with caution. For example, when participants report agreement or strong agreement with statements such as “I was able to identify central issues” or “I was able to inter-relate important issues” of the course, their perceptions might not be accurate. This limitation is mitigated – but not eliminated - in this study by objective results (Table 5) that generally are consistent with the perception-related survey results.

Another limitation of this study is that it was conducted among students taught at the same university by the same instructor. Consequently, the results and conclusions should be generalized with caution. At the same time, this study benefited from the internal validity that resulted from having one instructor teach all online and traditional sections. As a result,

differences in factors such as institutional environments, grading standards, and instructor teaching style are minimized. While this level of internal validity may not be possible in other settings, additional studies can provide information on the robustness of this study's findings. Consequently, future research is needed at other institutions using different instructors in order to see if the results are similar to those in the current study.

Our survey excluded certain control variables that could affect students' perceptions. For example, we did not ask for the amount and quality of their previous online education experience. In addition, full/part-time status might affect their experience and the resulting perceptions. Future researchers should consider these and perhaps other control variables that could potentially be important.

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