A comparison of student performance in face to face classes versus online classes versus hybrid classes using open educational resources

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ABSTRACT

This research focuses on the performance (as measured by exam grades) of students in a section of Accounting Principles taught face to face (traditional delivery) versus one section of the same class taught in an online format versus two sections of the same course taught in a hybrid format. The distinction of this research is that the students in the hybrid sections did all their work (including online exams) in My Accounting Lab the same as students in the online class. The only difference is that the hybrid students were able to meet with the instructor twice a week during the semester to ask questions about their My Accounting Lab assignments and benefit from having some of the assignments explained in detail. The students in the online section could only submit questions electronically through a My Accounting Lab link or through university email. The face-to-face (traditional delivery) class did homework and chapter multiple-choice quizzes on My Accounting Lab but took all their exams in class and had the opportunity to see and hear instructor lectures on each of the covered topics.

INTRODUCTION

More and more instructors of introductory accounting courses are now using Online Homework Managers such as My Accounting Lab, Connect, and Wiley Plus as a supplement to their face-to-face classes or as the primary learning resource for online or hybrid classes. According to a report by Brown (2015), there has been a decline in the purchase of textbooks in higher education due primarily to the fact that the price of textbooks rose 812 percent between 1978 and 2012 (U.S. Census Bureau). Further, Brown (2015) reports that 71 percent of students used what he referred to as Open Educational Resources (OER) in 2013 (up from 25 percent in 2010). Tuomi (2013) defines OER as "those resources that include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge." Heretofore in this paper the traditional name of Homework Managers will be replaced by OER to reflect the fact that these online packages are now much more than just a vehicle to do homework.

This research focuses on the performance (as measured by exam grades) of students in a section of Accounting Principles taught face to face (traditional delivery) versus one section of the same class taught in an online format versus two sections of the same course taught in a hybrid format. The distinction of this research is that the students in the hybrid did all their work (including online exams) in My Accounting Lab the same as students in the online class while the face-to-face students did only homework and multiple-choice chapter quizzes in My Accounting Lab but did all of their exams in class.

The following sections of this paper consist of a review of relevant literature, the research design, a discussion of results, and a conclusion.

A REVIEW OF RELEVANT LITERATURE

Much of the research published about the use of OER has dealt with either theoretical discussions about the effectiveness on online classes versus hybrid classes versus traditional face-to-face classes or how students perceive the effectiveness of OER based on student surveys. Articles by Abbassi (2019) and Lento (2018) provide excellent reviews of the theoretical and survey-based research. However, these studies did not deal with how students performed in the three different delivery methods.

Two recent studies by Hahn, Fairchild, and Dowis (2013) and McCarthy, Kusaila, and Grasso (2019) examine the performance of students using OER. Both articles looked at student performance on exam scores in classes using OER. Hahn, Fairchild, and Dowis (2013) used OER in traditional face-to face sections of introductory accounting to examine whether students in sections using OER performed better on exams than students in similar sections that did not use OER. They found that the students using OER performed no better on exams than ones who did not use OER and that there was no difference in performance between males and females. The primary problem with this study was that all the students were in traditional face-to-face sections that used OER only as a supplement. The study by McCarthy, Kusaila, and Grasso (2019) is much more relevant to this paper in that they looked at the performance on exams of students in traditional face-to-face sections versus hybrid sections versus online sections of upper level accounting courses. However, they used OER only as a supplement and all the exams were in class paper and pencil exams. Their results indicate that students do benefit from OER when

high quality instructional delivery and OER components are present. As with Hahn et.al., there was no difference in performance between males and females

This paper is distinguished from the above-mentioned research in that the students in the hybrid sections and the online sections used OER (My Accounting Lab) for all their work (including online exams). The only difference is that the hybrid students were able to meet with the instructor twice a week during the semester to ask questions about their My Accounting Lab assignments and benefit from having some of the assignments explained in detail. The students in the online section could only submit questions electronically through a My Accounting Lab link or through university email. The face-to-face (traditional delivery) class did homework and chapter multiple-choice quizzes on My Accounting Lab but took all their exams in class and had the opportunity to see and hear instructor lectures on each of the covered topics. Accordingly, the authors of this study were able to examine the performance of students in three distinct course delivery formats.

RESEARCH DESIGN

The sample included one section from Spring of 2014 taught in a traditional face-to-face format; two sections from Fall of 2015 taught in a hybrid format; and one section from Fall of 2015 taught in an online format all taught by the same instructor. Table 1 displays how the classes were delivered and the methods of assessment.

Table 1 - Principles of Accounting I Course Delivery Method and Assessment

Principles of Accounting I	***Face-to-Face***	***Hybrid***	***Online***
Lectures	Class met twice a week for 75 minutes and consisted of lectures, PowerPoint slides and working exercises on a whiteboard.	Two sections met twice per week for 50 minutes for the purpose of answering questions about learning resources and assignments in My Accounting Lab.	No face-to-face class meetings.
Exams	Four exams, primarily computational made up of problems and multiple choice, taken in class in paper and pencil format.	All exams taken online in My Accounting Lab. Exams were primarily computational made up of problems and multiple choice. The exams were algorithmic and in random order for each student.	Same as hybrid.
Other	Multiple-choice quizzes and homework assignments for every chapter in my Accounting Lab.	Same as face-to-face.	Same as face-to-face.

Data were collected for each class that included the exam average for each student, multiple-choice chapter quiz grades, homework grades, and the gender of each student. There was no grade curving in any of the sections. The exams in the face-to-face sections were administered in class in a paper and pencil format and were multiple choice and problems, mostly computational in nature. The exams in the hybrid and online sections were formatted similarly and drawn from the same test bank. They were taken online in My Accounting Lab with questions sorted randomly for each student and amounts algorithmically generated. Students in all the sections were encouraged (but not required) to use the myriad of learning resources provided in My Accounting Lab such as the interactive PowerPoints, DemoDocs (explanation of how to work chapter exercises), and video tutorials.

All the sections were principles of accounting I and were taught by the same instructor using My Accounting Lab and the same textbook edition. Some of the students in the face-to-face class purchased hardcopies of the textbook but were not required to do so; if they preferred, they could use the electronic textbook in My Accounting Lab. All the students in the hybrid and online sections used the electronic textbook embedded in My Accounting Lab. The classes were

taught at a medium size regional comprehensive university and all the students were majoring in a business discipline that required them to take the class.

RESULTS AND DISCUSSION

Results on the following variables were compared: Exams (Table 2), Multiple Choice Quizzes (Table 3) and Homework (Table 4).

Table 2 presents data on student grades based on the average of all the exams for students in the face-to-face, hybrid and online sections. The data is organized by delivery method, gender and overall grades. The grades were categorized by those students whose performance was good (A or B average grade on the exams), average (C average exam grade) or poor (D or F average exam grade). The research question addressed is whether there is a considerable difference in the performance of students (based on exam grades) between the three delivery methods and whether gender makes a noticeable difference on the student performance.

Table - Average Exam Grades – All Sections

FACE-TO-FACE	MALE	FEMALE	MALE	FEMALE	OVERALL
Good (A/B)	3	7	17%	46%	30%
Average (C)	4	4	22%	27%	24%
Poor (D/F)	11	4	61%	27%	46%
Total	18	15	100%	100%	100%
	55%	45%			
HYBRID	MALE	FEMALE	MALE	FEMALE	OVERALL
Good (A/B)	25	13	60%	45%	53%
Average (C)	6	6	14%	21%	17%
Poor (D/F)	11	10	26%	34%	30%
Total	42	29	100%	100%	100%
	59%	41%			
ONLINE	MALE	FEMALE	MALE	FEMALE	OVERALL
Good (A/B)	9	5	50%	38%	45%
Average (C)	3	5	17%	38%	26%
Poor (D/F)	6	3	33%	24%	29%
Total	18	13	100%	100%	100%
	58%	42%			

As can be seen in Table 2, the overall percentage of A/B average exam grades were considerably lower in the face-to-face section (30%) versus the hybrid (53%) and online (45%) sections. One might expect this result given that the students in the face-to-face section took their exams in a monitored classroom. However, students in the hybrid and online sections did take timed (the same amount of time as the face-to-face class) multiple-choice exams that included questions that were algorithmic computational type questions. Also, all the questions were sorted

in random order so that no two student quizzes were remotely the same. Based solely on the data in this research, students perform better in a hybrid or online format than in a face-to-face class. The authors of this study are fully aware that there may be several factors that contribute to these results other than the delivery method. However, the authors of this study do believe that in a hybrid or online class, the students are more likely to utilize the learning resources provided in their OER and are in some sense required to take a greater level of responsibility for learning material than students who are exposed to lectures in a face-to-face class.

When gender is taken into consideration, males performed much better in the hybrid and online sections than in the face-to-face section. While females did perform a bit worse than males in the online section versus the hybrid and face-to-face sections, there was no considerable difference in the three delivery methods for female performance. It is, however, quite disconcerting that the males performed so poorly in the face-to-face section relative to females. Males did outperform females in the hybrid and online sections but there was not nearly the difference as between males and females in the face-to-face section. A possible implication of this result is that females may take a greater level of responsibility for learning material than males in face-to-face classes.

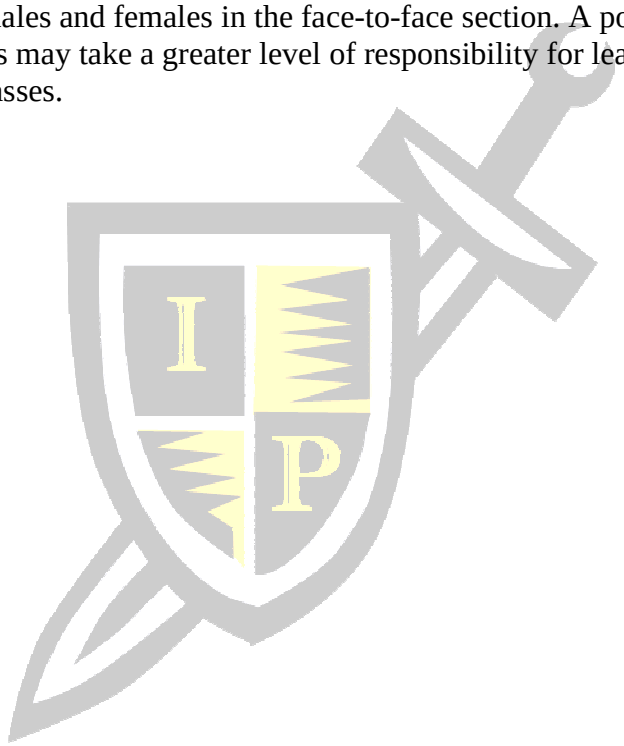

Table 3 - Multiple-Choice Chapter Quiz Grades – All Sections

FACE-TO-FACE	MALE	FEMALE	MALE	FEMALE	OVERALL
Good (A/B)	15	11	83%	73%	79%
Average (C)	1	1	6%	7%	6%
Poor (D/F)	2	3	11%	20%	15%
	18	15	100%	100%	100%
	55%	45%			
HYBRID	MALE	FEMALE	MALE	FEMALE	OVERALL
Good (A/B)	18	15	43%	52%	46%
Average (C)	9	7	21%	24%	23%
Poor (D/F)	15	7	36%	24%	31%
	42	29	100%	100%	100%
	59%	41%			
ONLINE	MALE	FEMALE	MALE	FEMALE	OVERALL
Good (A/B)	5	7	28%	54%	39%
Average (C)	3	4	17%	31%	22%
Poor (D/F)	10	2	55%	15%	39%
	18	13	100%	100%	100%
	58%	42%			

Table 3 above presents data on student grades based on the average multiple-choice chapter quiz grades for students in the face-to-face. hybrid, and online sections. The data is organized by delivery method, gender, and grades. Again, the grades were categorized by those students with good performance (A or B average multiple-choice grade), average performance (C average), or poor performance (D or F average). The research question addressed is whether there is a considerable difference in the performance of students (based on multiple-choice chapter quiz grades) between the three delivery methods and whether gender makes a considerable difference in the student performance.

As can be seen in Table 3, the overall percentage of A/B grades on the multiple-choice chapter quizzes is much higher in the face-to-face section (79%) than in the hybrid (46%) and online sections (39%). This result may be due to the fact students in the face-to-face class took the multiple-choice chapter quizzes in My Accounting Lab (in the same way as the hybrid and online sections) after each chapter was covered by the instructor. This suggests that the students benefitted more by the classroom lectures than by merely utilizing the My Accounting Lab resources.

When gender is taken into consideration, there is still a large difference in the overall percentage of A/B grades on the multiple-choice chapter quizzes for males and females in the face-to-face section versus the hybrid and online sections. This finding is much the same as the overall class. However, it is interesting that females in the hybrid and online sections the females had a considerably larger percentage of A/B grades than did the males especially in the online section whereas in the face-to-face section males performed better than females.

Table 4 - Homework Grades – All Sections

FACE-TO-FACE	MALE	FEMALE	MALE	FEMALE	OVERALL
Good (A/B)	3	6	17%	40%	27%
Average (C)	6	4	33%	27%	30%
Poor (D/F)	9	5	50%	33%	43%
	18	15	100%	100%	100%
	55%	45%			
HYBRID	MALE	FEMALE	MALE	FEMALE	OVERALL
Good (A/B)	36	25	86%	86%	86%
Average (C)	3	3	7%	10%	8%
Poor (D/F)	3	1	7%	4%	6%
	42	29	100%	100%	100%
	59%	41%			
ONLINE	MALE	FEMALE	MALE	FEMALE	OVERALL
Good (A/B)	16	13	89%	100%	94%
Average (C)	1	0	5.5%	0%	3%
Poor (D/F)	1	0	5.5%	0%	3%
	18	13	100%	100%	100%
	58%	42%			

Table 4 above presents data on student grades based on the average homework grades for students in the face-to-face. hybrid, and online sections. The data is organized by delivery method, gender, and grades. Again, grades were organized as “Good, Average and Poor”. The research question addressed is whether there is a considerable difference in the performance of students (based on homework grades) between the three delivery methods and whether gender makes a considerable difference in the student performance.

As can be seen in Table 4, the overall percentage of Good grades on the homework is much higher in the hybrid (86%) and online sections (94%) than in the face-to-face section (27%). This result could be due to the fact that the students in the hybrid and online sections are typically more attuned to using My Accounting Lab and do not have the advantage of seeing the instructor go over problems in class. Thus, they are required to learn the material more independently than the face-to-face students.

When gender is taken into consideration, there is still a large difference in the overall percentage of Good grades on the homework assignments for males and females in the hybrid and online sections versus the face-to-face section. This finding is much the same as the overall class. However, females and males in the hybrid and online sections were close in the percentage of Good grades whereas in the face-to-face section females performed better than males.

CONCLUSIONS

This research focuses on the performance, as measured by the average exam grades, multiple-choice chapter quiz grades, and homework grades, of students in a section of Accounting Principles taught face to face (traditional delivery) versus one section of the same class taught in an online format versus two sections of the same course taught in a hybrid format.

When exam scores are analyzed, the results of this research indicate that, overall, students performed better in the hybrid and online classes than in the face-to-face class. This is due to the difference in performance by males in the three delivery methods. Males performed much better in the online and the hybrid format than face-to-face. Female performance was fairly consistent across the three different delivery methods, meaning they outperformed males in the face-to-face format but did not do as well in hybrid or online.

With respect to student performance on the multiple-choice chapter quizzes, the overall results are just the opposite. Students overall performed much better in the face-to-face section than the hybrid and online sections. This was true for both males and females. The only noticeable difference between genders was in the online section, where females performed better than males.

When homework is examined, the results are the opposite of the multiple-choice chapter quizzes in that students performed much better in the hybrid and online sections than the face-to-face section. Unlike the performance on multiple-choice chapter quizzes, males and females performed equally in the hybrid and online sections but females performed considerably better than males in the face-to-face section.

The authors of this study suggest that additional research is necessary to provide more definitive answers to the implications discussed here. Additional data are needed such as surveys of student preferences and learning styles regarding face-to-face versus hybrid or online classes. Also, an increase in the sample size that would allow for robust statistical tests would be helpful. Given the fact that more and more classes will be taught using OER, it is critical that instructions learn more in order to effectively design the courses.

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