AN INITIAL EXPLORATION INTO THE COMPARATIVE EFFECTIVENESS OF HYBRID AND TRADITIONAL STYLE TEACHING OF MICROECONOMICS

by

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Table of Contents:

Abstract

This research project aimed to explore the differences in how students learn the same material for a microeconomics course just with a different course layout. By using data previously collected from students who took Dr. Rupp's Microeconomics course at East Carolina University (Econ 2113) hybrid and traditional style courses, we were able to use linear regression modeling to find indicators of what may impact student performance within the hybrid course. With this initial exploration of what impacts student performance within hybrid style courses, further research is necessary to completely determine what, if anything, across both styles of courses impact student performance and therefore overall learning in Dr. Rupp's classes. It is with this in mind that this further research will be conducted in the next year and that question be answered.

Introduction

East Carolina University, like many other institutions of higher education, offers traditional, distance education, and hybrid style courses. All have their tradeoffs and benefits however hybrid style learning is a compromise of the latter two since it substitutes class time with online work. This research initially focused on the microcosms of Principles of Microeconomics courses (Econ 2113) and whether or not they should be taught as a hybrid or traditional course. This problem Dr. Nicholas Rupp and I investigated with the research and will continue to do so contains multiple components that seeks to advise the Economics Department of ECU in either pursing or dissuading the department from their continuation of their hybrid course offerings. If significant, we hope to provide our examination methodology not only to the Economics Department but also to the Faculty Senate at East Carolina University. It is our combined hope that our assessment can be used across the curriculum as a basis of

a complete and full, explicit and implicit, cost benefit analysis of hybrid versus traditional style classes at ECU.

Our root research question is if hybrid courses have any significant impact on how students learn across all ages, genders, races, and GPA categories. The Economics Department, like many others, are exploring hybrid course offerings as an explicit cost saver to ECU. However, if there are adverse impacts on student learning then these may outweigh the potential cost savings. These costs could be quantified by implicit costs to students, such as learning pace or ease, associated with these course hybrid offerings. Hence the Department needs to assess their true effectiveness on students' comprehension and understanding of the material. Saving cents may cost hundreds of students' economics sense.

Background

Unless you are a student or a member of the higher education community, hybrid style learning is not a familiar term. As defined by East Carolina University, a "hybrid or blended course is one that combines face-to-face instruction with web-based content and activities ("Teaching")." While traditional courses require face to face meetings every week, hence the name traditional. Cutting down even just meeting one class time per week across an entire semester saves the professor time and therefore the department and university money via room space to electricity usage and everything in between. Yet assessing whether one course is more compatible with hybrid or traditional teaching isn't exactly easy.

There are several articles and scientific studies on the relative performance of students between hybrid, online, and traditional style courses across the curriculum. It is still unknown how students do in these classes in comparison to each other, if one type of student will do better than another in an online health course versus an online biology and vice versa ("Teaching"). Several studies indicated that there was not much of a difference of performance between hybrid style classes and traditional (American,

2014). However, in a study done across six different universities that gathered data from students in the same statistical course, half registered for hybrid and the other traditional, that the hybrid students perform just as well as their counterparts did (Bowen, 2013). However different students have strengths in various classes, just because students performed the same in an introductory statistical course does not indicate the same for microeconomics courses.

Yet for the purpose of this project, narrowing in on research pertaining to solely economics students were imperative. Out of 725 students randomized to take either a hybrid or traditional style course offering of and introductory economics courser at Kansas University in 2013 and 2014, researchers found that not even section preference created a bias that yielded to unbalanced academic performance when comparing the two types of course offerings (Joyce, 2015). Out of an even larger sample size of 35,000 students at the University of Virginia (UVA) who took a Principles of Economics course taught by the same professor over the last twenty years, it was found that students' academic performance did not suffer across the traditional and hybrid style offerings (Elzinga, 2009). The only aspect that seems to be negative of a hybrid or online course when compared to a traditional one is the students' satisfaction with the course due to mainly lack of support from their instructor and physical isolation (Ghaffari, 2011). With this information regarding the literature in mind, we were able to have a solid understanding of what has been done prior in order to incorporate these previous successes into our current research.

Methodology

In order to properly assess the impact of the hybrid style of Dr. Rupp's Principles of Microeconomics, we must collect information on a variety of variables. We used the information provided from Dr. Rupp of data he already had on one hundred and twenty-five of his students from 2015 and 2016. Across both sections of courses, Dr. Rupp taught both which meant that the entirety of the class, from instructor to instruction remained the same. This allowed us to combine the two sections

into one data set very easily because all the independent variables were measured the same across our entire sample size. In order to measure students' academic performance, we used student's final exam scores as our dependent variable because the final is cumulative and therefore tests for what they learned throughout the entire class. The various independent variables we had data on was performance on the first exam, homework averages, gender, section, how many semester hours they were taking, how many hours total they had accrued at ECU, their ECU GPA, their composite ACT scores, and an attendance measure. If there was a student who took this class but we did not have a certain piece of data on them or if they removed themselves from the class, then they were dropped out of our sample size as well. If students only provided an SAT score then we converted those scores into ACT equivalence scores using College Boards concordance table provided on their website (College, 2015). Since attendance was not taken in the course, our measure of attendance is a proxy of whether or not the student picked up their exams in class prior to the next test.

Once the different pieces of data were compiled in Excel, we began importing them into STATA. STATA is a regression analysis software, akin to SAS or EViews, that uses Ordinary Least Squares (OLS) to find the best fitting model of data provided regarding linear regression. Piecing together the various parts of the data that represent the difference explanatory variables via STATA gave us a complete set of our sample size of 125 students which we used to test different regression equations aiming to find a statistically significant equation and coefficients.

Regression Models

Attempting to find the best fitting model for a sample of data comes down to logic and a little bit of luck. There are several variables we did not include, simple because we didn't have data on them, that we suspect would have made for better fitting models than the ones we were able to test. There are several underlying factors, potentially left out, that make a certain independent variables more descriptive of a data set than others. For example, attendance could be influenced by what time of day

different sections occur throughout the semester. Our section variable only capture for a difference of sections and not what time of day it occurred. Same goes with homework averages and exam scores, a plethora of other independent variables not captured could influence them as well as our dependent variable of final exam scores. Appendix I of this paper showcases the thirty-two regression equations tested and ran through STATA based off of our data collected. After looking through all the results of Appendix I, Appendix II depicts the four equations that best fit our data out of the ones provided in Appendix I. These four equations were chosen based off of their r squared values and statistically more significant coefficients in comparison to the other equations. In the following equations the dependent variable of final exam scores of students is denoted as $EXFLi$ and the independent variables are Sex ($MALEi$), section ($SECTi$), first exam scores ($EX1i$), homework averages (HWi), semester hours ($SEMHRSi$), total hours ($TLHRSi$), ECU GPA ($GPAi$), Composite ACT scores ($ACTi$), and attendance ($NOT1i$), ($NOT2i$), ($NOT3i$), and ($NOT4i$).

There were certain correlations we expected to see in the data. In other pieces of literature, males seemed to have done better in economics courses than their female counterparts and those with an intended business or economics major additionally did better than others as well (Bowen, 2013). We expected to have a positive correlation between how students did on Exam 1 and how they did on the cumulative final, part of the final is testing students on what they were previously tested on via Exam 1. Performance on the ACT could also have an indication as to how they may perform in Dr. Rupp's Principles of Microeconomics (Econ 2113) as well and lead to yet another positive correlation between this independent variable and the dependent variable, due to the type of student who tends to do well on the ACT. The ACT requires studying and reviewing of material on the pupil's own time, all of these skills would help a student excel in a hybrid introductory course of economics as well. If a student is taking too many credit hours and is spread too thin, that may reveal a negative correlation between a student's performance on the final exam and their semester hours at ECU. Conversely, a freshman may

not do as well as an older student who is used to college courses or vice versa so the impact of total hours accrued at ECU would be another interesting variable to look at. Attendance and homework averages would most likely have positive correlations with our dependent variable because it's logically to believe that if a student attends class and does well on the homework, then they will do well on the exams and therefore the final exam. However, there could be important omitted independent variables that we did not capture that could also be telling of students' performance in this type of hybrid course at ECU.

The Regression Models formed from Appendix II are:

Equation 1)

$$EXFL_i = 23.90 + 0.495EX1_i - 3.404NOT1 + 1.258NOT2_i - 3.744NOT3_i - 4.999NOT4_i + 0.680ACT_i + 0.339GPA_i - 0.00215TLHRS_i - 0.263SEMHRS_i + 3.882MALE_i - 0.468SECT_i + \epsilon_t$$

Equation 2)

$$EXFL_i = 20.52 + 0.481EX1_i - 2.432NOT1 + 1.175NOT2_i - 3.698NOT3_i - 4.915NOT4_i + 0.735ACT_i + 0.138GPA_i - 0.00136TLHRS_i - 0.287SEMHRS_i + 3.855MALE_i - 0.404SECT_i + 0.497HW_i + \epsilon_t$$

Equation 3)

$$EXFL_i = 22.92 + 0.462EX1_i - 4.987NOT4_i + 0.695ACT_i + 0.214GPA_i - 0.0104SEMHRS_i - 1.465SECT_i + \epsilon_t$$

Equation 4)

$$EXFL_i = 2717 - 4.359NOT1 + 0.625NOT2_i - 2.288NOT3_i - 5.039NOT4_i + 1.783ACT_i + 1.841GPA_i + 0.0186TLHRS_i + 0.165SEMHRS_i + 1.185MALE_i - 3.310SECT_i + \epsilon_t$$

Data Analysis & Results

The results found in this research were not incredibly conclusive but they were useful. Equations 1 and 2 have the highest R squared values of 0.390 and 0.393 respectively. Since no other equations were found with an R squared value higher than the two previously mentioned, we sought to understand why. Without more data or further research, it cannot be said for sure but such low R squared values are indicative of omitted independent variables that are significant. What this could

mean is that there are other explanatory variables that, if included, would yield a better fitting model for the data and for the dependent variable. Equation 4 only has an R squared value of 0.217 but is included to display that dropping the independent variable of Exam 1 grades from Equation 1 significantly impacts the fitting of the model with the data.

Besides R squared values, P values test for relational changes between an independent variable and the dependent variable. Low P values (below 0.05) suggest that the coefficient does not equal zero and is therefore meaningful to the overall equation. What these low p values suggest is that the slope between the independent variable and the dependent variable is not zero and therefore have a relationship between themselves. In order for the variable to be considered statistically significant its P value must be 0.05 or less. The Exam 1 grade independent variable is statistically significant with P values less than 0.01 across the three of the four equations in Appendix II. Furthermore, across every equation tested and seen in Appendix I, each coefficient for the Exam 1 grades independent variable is statistically significant with P values less than 0.01. This would make logical sense because Exam 1 scores would be somewhat indicative of students' future performance on their cumulative final exam. There are a few other independent variables that had statistically significant P values, like the attendance after Exam 4 and the constant within the equations itself. The independent variable for students' ACT Composite scores weren't significant but still had low P values that were less than 0.10 and in Equation 4 proved to be less than 0.01. However, no equation has more than one statistically significant independent variable or a R squared value higher than 0.393. This leads me to believe that in order to get more substantial results I should attempt this research again but augmented from what was learned from this initial exploration.

Conclusion & Further Research

Based off of the regression modeling employed, this research project did not yield any conclusive data regarding what impacts students' learning in Dr. Rupp's Principles of Microeconomics courses. However, it was an excellent preliminary examination that yielded insights as to how to properly investigate further. Ideally I would like to set up further research based off of the information found in this study. Instead of using data from classes that already happened, I think it would be useful to set up Dr. Rupp's future hybrid and traditional style microeconomics courses in accordance with the future research project. This way we can not only ensure than information collected across the courses are uniform in nature but also thoughtfully gathered and planned for. Using an IRB approved survey to capture more demographic, family, and habitual information on students may capture more of those omitted independent variables that could be statistically significant. Even if race, whether their parents graduated from college, or if they are involved in Greek life or not prove to not be significant independent variables that alone would be important to know in order to disprove stereotypes. Once comparisons across the hybrid and traditional style courses are made using these modified techniques from this pilot study then the Department of Economics can use them to compare effectiveness of these types of courses across all types and tiers of students' performances. Depending on the results of this future research, the Department of Economics can have empirical evidence on both types of course offerings and therefore use it to either add or subtract hybrid style Principles of Microeconomics classes.

Appendix I

	(1)	(13)	(14)	(15)	(29)	(30)
VARIABLES	finalexam	finalexam	finalexam	finalexam	finalexam	finalexam
exam1	0.495***	0.481***	0.495***	0.495***	0.481***	0.495***
	(0.0873)	(0.0903)	(0.0873)	(0.0873)	(0.0903)	(0.0873)
notest1	-3.404	-2.432	-3.404	-3.404	-2.432	-3.404
	(2.958)	(3.351)	(2.958)	(2.958)	(3.351)	(2.958)
notest2	1.258	1.175	1.258	1.258	1.175	1.258
	(2.779)	(2.790)	(2.779)	(2.779)	(2.790)	(2.779)
notest3	-3.744	-3.698	-3.744	-3.744	-3.698	-3.744
	(2.839)	(2.848)	(2.839)	(2.839)	(2.848)	(2.839)
notest4	-4.999**	-4.915**	-4.999**	-4.999**	-4.915**	-4.999**
	(2.429)	(2.440)	(2.429)	(2.429)	(2.440)	(2.429)
newactcomp	0.680	0.735*	0.680	0.680	0.735*	0.680
	(0.421)	(0.431)	(0.421)	(0.421)	(0.431)	(0.421)
gpa	0.339	0.138	0.339	0.339	0.138	0.339
	(1.612)	(1.648)	(1.612)	(1.612)	(1.648)	(1.612)
tothours	-0.00215	-0.00136	-0.00215	-0.00215	-0.00136	-0.00215
	(0.0481)	(0.0482)	(0.0481)	(0.0481)	(0.0482)	(0.0481)
semhours	-0.263	-0.287	-0.263	-0.263	-0.287	-0.263
	(0.534)	(0.537)	(0.534)	(0.534)	(0.537)	(0.534)
male	3.882	3.855	3.882	3.882	3.855	3.882
	(2.407)	(2.414)	(2.407)	(2.407)	(2.414)	(2.407)
section	-0.468	-0.404	-0.468	-0.468	-0.404	-0.468
	(2.462)	(2.471)	(2.462)	(2.462)	(2.471)	(2.462)
hwavg		0.0497			0.0497	
		(0.0798)			(0.0798)	
Constant	23.90**	20.52*	23.90**	23.90**	20.52*	23.90**
	(10.24)	(11.62)	(10.24)	(10.24)	(11.62)	(10.24)
Observations	125	125	125	125	125	125
R-squared	0.390	0.393	0.390	0.390	0.393	0.390

	(31)	(32)	(33)	(34)	(48)	(49)	(50)
VARIABLES	finalexam	finalexam	finalexam	finalexam	finalexam	finalexam	finalexam
exam1	0.495***	0.481***	0.495***		0.481***	0.495***	
	(0.0873)	(0.0903)	(0.0873)		(0.0903)	(0.0873)	
notest1	-3.404	-2.432	-3.404	-4.359	-2.432	-3.404	-4.359
	(2.958)	(3.351)	(2.958)	(3.333)	(3.351)	(2.958)	(3.333)
notest2	1.258	1.175	1.258	0.625	1.175	1.258	0.625
	(2.779)	(2.790)	(2.779)	(3.134)	(2.790)	(2.779)	(3.134)
notest3	-3.744	-3.698	-3.744	-2.288	-3.698	-3.744	-2.288
	(2.839)	(2.848)	(2.839)	(3.191)	(2.848)	(2.839)	(3.191)
notest4	-4.999**	-4.915**	-4.999**	-5.039*	-4.915**	-4.999**	-5.039*
	(2.429)	(2.440)	(2.429)	(2.742)	(2.440)	(2.429)	(2.742)
newactcomp	0.680	0.735*	0.680	1.783***	0.735*	0.680	1.783***
	(0.421)	(0.431)	(0.421)	(0.421)	(0.431)	(0.421)	(0.421)
gpa	0.339	0.138	0.339	1.841	0.138	0.339	1.841
	(1.612)	(1.648)	(1.612)	(1.795)	(1.648)	(1.612)	(1.795)
tothours	-0.00215	-0.00136	-0.00215	0.0186	-0.00136	-0.00215	0.0186
	(0.0481)	(0.0482)	(0.0481)	(0.0541)	(0.0482)	(0.0481)	(0.0541)
semhours	-0.263	-0.287	-0.263	0.165	-0.287	-0.263	0.165
	(0.534)	(0.537)	(0.534)	(0.597)	(0.537)	(0.534)	(0.597)
male	3.882	3.855	3.882	1.185	3.855	3.882	1.185
	(2.407)	(2.414)	(2.407)	(2.663)	(2.414)	(2.407)	(2.663)
section	-0.468	-0.404	-0.468	-3.310	-0.404	-0.468	-3.310
	(2.462)	(2.471)	(2.462)	(2.721)	(2.471)	(2.462)	(2.721)
hwavg		0.0497			0.0497		
		(0.0798)			(0.0798)		
Constant	23.90**	20.52*	23.90**	27.17**	20.52*	23.90**	27.17**
	(10.24)	(11.62)	(10.24)	(11.54)	(11.62)	(10.24)	(11.54)
Observations	125	125	125	125	125	125	125
R-squared	0.390	0.393	0.390	0.217	0.393	0.390	0.217

	(51)	(52)	(53)	(54)	(55)	(56)	(57)	(58)
VARIABLES	finalexam	finalexam	finalexam	finalexam	finalexam	finalexam	finalexam	finalexam
exam1	0.473***	0.465***	0.466***	0.473***	0.481***	0.462***	0.479***	0.494***
	(0.0870)	(0.0856)	(0.0858)	(0.0866)	(0.0858)	(0.0858)	(0.0898)	(0.0869)
notest1		-5.783**	-5.160*				-2.195	-3.184
		(2.528)	(2.807)				(3.291)	(2.907)
notest2			-1.229	-3.103				
			(2.376)	(2.168)				
notest3					-4.603**		-3.073	-3.074
					(2.162)		(2.422)	(2.415)
notest4						-4.987**	-4.777**	-4.854**
						(2.291)	(2.409)	(2.400)
newactcomp	0.449	0.656	0.655	0.503	0.574	0.695*	0.731*	0.673
	(0.395)	(0.398)	(0.400)	(0.395)	(0.394)	(0.405)	(0.429)	(0.419)
gpa	0.395	-0.0519	-0.0937	0.168	-0.119	0.214	0.106	0.311
	(1.529)	(1.515)	(1.522)	(1.530)	(1.526)	(1.507)	(1.641)	(1.605)
tothours							0.000970	0.000315
							(0.0478)	(0.0476)
semhours	0.108	-0.129	-0.119	0.0689	0.0298	-0.0104	-0.278	-0.252
	(0.533)	(0.534)	(0.536)	(0.531)	(0.526)	(0.528)	(0.534)	(0.531)
male							3.795	3.818
							(2.401)	(2.395)
section	-2.652	-2.099	-1.906	-2.015	-2.032	-1.465	-0.319	-0.379
	(2.402)	(2.373)	(2.409)	(2.433)	(2.385)	(2.428)	(2.454)	(2.446)
hwavg							0.0513	
							(0.0794)	
Constant	22.71**	24.81**	24.99**	23.75**	24.13**	22.92**	20.50*	24.01**
	(10.43)	(10.29)	(10.33)	(10.41)	(10.30)	(10.27)	(11.58)	(10.21)
Observations	125	125	125	125	125	125	125	125
R-squared	0.323	0.352	0.353	0.335	0.348	0.349	0.392	0.389

	(59)	(60)	(61)	(62)	(63)	(64)	(65)	(66)	(67)	(68)
VARIABLES	finalexam	finalexam	finalexam	finalexam	finalexam	finalexam	finalexam	finalexam	finalexam	finalexam
exam1	0.558***	0.564***	0.558***	0.563***	0.507***	0.534***	0.570***	0.502***	0.498***	0.495***
	(0.0795)	(0.0763)	(0.0795)	(0.0757)	(0.0793)	(0.0758)	(0.0731)	(0.0826)	(0.0845)	(0.0866)
notest1	-2.686	-2.826	-2.686	-2.860	-2.550	-2.440	-2.848	-3.441	-3.411	-3.416
	(3.367)	(2.937)	(3.367)	(2.917)	(3.073)	(2.961)	(2.907)	(2.904)	(2.919)	(2.932)
notest2	1.816	1.815	1.816	1.769	3.664	1.409	1.705	1.190	1.196	1.244
	(2.732)	(2.710)	(2.732)	(2.684)	(2.812)	(2.725)	(2.669)	(2.715)	(2.727)	(2.749)
notest3	-4.089	-4.177	-4.089	-4.131	-4.792*	-3.544	-4.184	-3.793	-3.748	-3.733
	(2.826)	(2.794)	(2.826)	(2.768)	(2.885)	(2.803)	(2.754)	(2.783)	(2.803)	(2.816)
notest4	-4.618*	-4.630*	-4.618*	-4.667*	-4.986**	-3.168	-4.876**	-5.094**	-5.112**	-5.009**
	(2.412)	(2.388)	(2.412)	(2.367)	(2.499)	(2.309)	(2.291)	(2.328)	(2.340)	(2.408)
newactcomp								0.681	0.683	0.681
								(0.414)	(0.416)	(0.418)
gpa	0.601		0.601						0.323	0.321
	(1.632)		(1.632)						(1.549)	(1.555)
tothours	-0.0121	-0.00767	-0.0121							
	(0.0484)	(0.0466)	(0.0484)							
semhours	-0.174	-0.137	-0.174	-0.136		-0.0222	-0.159	-0.259	-0.276	-0.262
	(0.538)	(0.525)	(0.538)	(0.523)		(0.529)	(0.517)	(0.516)	(0.524)	(0.531)
male	5.130**	4.936**	5.130**	5.006**	4.361*		5.160**	3.839*	3.964*	3.892
	(2.353)	(2.277)	(2.353)	(2.228)	(2.343)		(2.181)	(2.260)	(2.348)	(2.386)
section	-0.829	-0.872	-0.829	-0.906	-2.813	-1.921				-0.477
	(2.475)	(2.453)	(2.475)	(2.434)	(2.580)	(2.432)				(2.443)
hwavg	0.00291		0.00291							
	(0.0769)		(0.0769)							
Constant	30.55***	31.44***	30.55***	31.29***	34.42***	34.02***	30.63***	23.98**	23.52**	23.87**
	(10.13)	(8.825)	(10.13)	(8.743)	(6.273)	(8.806)	(8.527)	(9.688)	(9.976)	(10.18)
Observations	126	126	126	126	136	126	126	125	125	125
R-squared	0.384	0.383	0.384	0.383	0.310	0.357	0.383	0.390	0.390	0.390

Appendix II

	Equation 1	Equation 2	Equation 3	Equation 4
	(1)	(13)	(56)	(34)
VARIABLES	finalexam	finalexam	finalexam	finalexam
exam1	0.495***	0.481***	0.462***	
	(0.0873)	(0.0903)	(0.0858)	
notest1	-3.404	-2.432		-4.359
	(2.958)	(3.351)		(3.333)
notest2	1.258	1.175		0.625
	(2.779)	(2.790)		(3.134)
notest3	-3.744	-3.698		-2.288
	(2.839)	(2.848)		(3.191)
notest4	-4.999**	-4.915**	-4.987**	-5.039*
	(2.429)	(2.440)	(2.291)	(2.742)
newactcomp	0.680	0.735*	0.695*	1.783***
	(0.421)	(0.431)	(0.405)	(0.421)
gpa	0.339	0.138	0.214	1.841
	(1.612)	(1.648)	(1.507)	(1.795)
tothours	-0.00215	-0.00136		0.0186
	(0.0481)	(0.0482)		(0.0541)
semhours	-0.263	-0.287	-0.0104	0.165
	(0.534)	(0.537)	(0.528)	(0.597)
male	3.882	3.855		1.185
	(2.407)	(2.414)		(2.663)
section	-0.468	-0.404	-1.465	-3.310
	(2.462)	(2.471)	(2.428)	(2.721)
hwavg		0.0497		
		(0.0798)		
Constant	23.90**	20.52*	22.92**	27.17**
	(10.24)	(11.62)	(10.27)	(11.54)
Observations	125	125	125	125
R-squared	0.390	0.393	0.349	0.217
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

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