Online Learning in Community Colleges of the State University of New York: Initial Results on Differences between Classroom-Only and Online Learners

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Abstract: This study extends prior work on questions related to the academic performance of community college students enrolled in online coursework. Using data from the entire community college system of the State University of New York the study employs structural equation modeling to compare course and program level outcomes. Specifically, we compared GPA and degree attainment for classroom-only students and students with online coursework. Results indicate that online students had lower GPAs but were significantly more likely to attain a credential than classroom-only students. This analysis confirms prior large-scale investigations suggesting an online paradox whereby community college students who take online courses under-perform at the course level and over perform at the program level, attaining college credentials at higher rates.

1. Introduction

Decades of research in higher education provides clear evidence of three converging trends in the US. First, participation in postsecondary study and completion of college credentials are correlated with a variety of desirable life outcomes. Among these outcomes are better lifetime income, lower rates of unemployment, better health, and more civic participation among college graduates (Baum, Ma, & Payea, 2010; McMahon, 2009). A second line of research documents significant shifts in US demographics including the aging of the US population. This shift has resulted in a larger pool of non-traditional students, many of whom have jobs and family, likely to benefit from access to post-secondary education (Radford, 2011). The third trend has been the vast expansion of online college opportunities (Allen & Seaman, 2015). In the last decade the number of students studying at a distance through internet-based technologies has more than doubled with estimates ranging from 5 to 7 million and a majority of institutions in the US now offer online instruction (Alen & Seaman. 2015; US Department of Education, 2014; Parsad & Lewis, 2008). Access to higher education among two-year colleges has been especially pronounced with 98% of such institutions offering online education (Parsad & Lewis, 2008)

The convenience and flexibility of online education makes it an attractive option for an ever growing population of non-traditional students to participate in and gain the benefits of higher education. Some researchers have expressed concerns about the match between the needs of many non-traditional students, especially students at risk of failure, and the demands of distance education. Community college students are a population frequently the subject of such concerns. For example, researchers at the Community College Research Center (CCRC) conducted state-wide studies in southern (Jaggars & Xu, 2010) and western (Xu & Jaggars 2011) US community college systems and found that failure and withdrawal rates were significantly higher for online courses than for face-to-face courses in the community college systems they studied. Additionally, these researchers concluded that students completed online course sections were 3 to 6 percentage points less likely to receive a C or better than students who completed face-to-face course sections (Jaggars & Xu, 2011). Further, program level outcomes were also problematic. Students in both community college systems who took one or more online courses

in their first semester were 4 to 5 percentage points less likely to return for the following semester (Jaggars & Xu 2010). Students who took a higher ratio of credits online were also less likely to earn a degree or transfer to a four-year institution than students who took a lower proportion of online credits (Xu & Jaggars, 2011). Finally, achievement gaps widen between males, lower-performing students, and majority and minority students in online coursework (Xu & Jaggars 2013).

Overall however the research is mixed with regard to outcomes of online learners in community colleges. In contrast to CCRC studies, other researchers, using a large, multi-state, federated data set of more than 600,000 students in the Predictive Analytics Reporting Framework (PAR) found that taking some online courses did not result in lower retention rates for students enrolled in primarily on-ground community colleges (James, Swan & Daston, 2016). The authors found no differences in retention between delivery mode for students enrolled in primarily on-ground four-year universities, while at primarily online institutions, students taking some online and some classroom courses had slightly better odds of being retained than students taking exclusively on ground or exclusively online courses. Age, however, did differentially affect delivery mode effects.

At the program level there is evidence students who take online courses attain degrees at higher rates than classroom-only students, despite lower course level performance. In studies at both the state level (Johnson & Cuellar Majia, 2014) and national level (Shea & Bidjerano, 2014) authors found that students who took at least some online courses were more likely to earn an associate's degree or transfer to a four-year institution than those who didn't net of other differences.

The current study investigates related questions with a third large data set representing students in the 30 community colleges in SUNY. Specifically, in this analysis we look at outcomes that have not yet been investigated including measures of overall performance of students taking some online courses reflected in grade point averages (GPA). If participation in online education is a cause for concern, as has been found among students in southern and western states, it is likely to be evident in the grade point averages of community college students who enroll in at least some online coursework. We also sought to understand variables that predict differences in GPA between online and classroom-based courses and whether online students are more likely to attain a degree than classroom-only students.

2. Purpose and Research Questions

RQ1. Do students who have experiences with both online and classroom courses in a given semester tend to earn lower GPAs in online courses relative to classroom courses?
RQ2. What are the predictors of the difference in student online and classroom GPA?
RQ3. Do students who take online courses attain degrees at higher rates than classroom-only students?

3. Method

The sample was derived from the cohort of 41,616 community college students in the State University of New York (SUNY) who first enrolled in an associate or a certificate degree program in the fall semester of 2012. The fall 2012 cohort included was comprised of degree beginners who had no prior history of part or full-time enrollment status in any of the SUNY institutions as well as students who had not transferred from any other type of degree granting institution in the fall of 2012. Students were enrolled in one of the 30 community colleges in the SUNY system. Select demographic characteristics are given in Table 1. Sample members were tracked over seven semesters excluding the summer months. For each of the semesters under

study (Fall 12, Spring 13, Fall 13, Spring 14, Fall 14, Spring 15, and Fall 15) students' enrollment statuses including course-taking patterns were available and known as long as students had not transferred to a non-SUNY institution, had not earned a terminal degree or had not dropped out. To address the study research questions, we selected subsamples of students who had both online and classroom coursework in any given semester. The analytic samples varied from semester to semester due to the fact that there was no continuity in course taking patterns for the cohort. In other words, students who had a mixture of both online and classroom courses in one semester were not necessarily the same students who had both online and classroom courses in another semester.

In addition to GPA obtained in online and classroom courses, we considered the following variables at various stages of the analysis: (a) *student demographics*: race, gender, age, academic ability (whether the student was enrolled in a remedial/ developmental course in his/her first semester in college); (b) *semester enrollment information*: type of academic program (Certificate, Associates, or Baccalaureate), full-time status, financial need (Pell grant recipient vs. not), online load (proportion of online credits attempted), and proportion of credits attempted in the disciplines Humanities, Social Sciences, Professional, and STEM; and (c) *institutional characteristics*: size (small or large), location (suburban vs. other), graduations rates for the cohort of students immediately preceding the 2012 community college cohort.

4. Results

We examined differences between students with a combination of online and classroom coursework and counterparts with no online coursework on key demographic and other status characteristics. Gender, race, status, and financial aid status, and academic ability at entry – Fall 2012 – unvaryingly predicted the likelihood of combined (online and classroom) coursework across all seven semesters. That is, all other being equal, female students, Caucasian students, full-time students, and older students, as well as Pell grant recipients were much more likely to be in both online and classroom-based courses than to be "classroom-only" students in any given semester. Higher academic ability students were also more likely to take a mix of online and classroom courses than to be "classroom-only" students in the earlier semesters.

To address the study central research question (*RQ1*), we explored mean differences in online and classroom GPA in the context of structural equation modeling (SEM). Preliminary multilevel analyses exploring differences across institutions in outcome measures showed that the amount of variation across institutions is negligible with small design effects (≈ 2) as well small interclass correlations in the range from .01 to .06 in semesters. Therefore, standard errors were adjusted to account for the nesting of students within institutions with the options for complex samples in Mplus (Muhen & Muhen, 2007). The structural equation model tested in the analyses was conceptually identical to a paired samples t-test (one group of students measured under two different conditions) with two important exceptions. First, unlike the conventional paired samples-t statistic, which assumes no error in measured variables, in our SEM model, the amount of measurement error was controlled statistically. More importantly, the SEM approach allowed inclusion of predictors of the difference between conditions (i.e., online and classroom GPA) which would have been statistically impossible within the framework of the conventional t-test (McArdle, 2009).

The model with predictors of the difference between online and classroom GPA is depicted in Figure 1. In this model, the coefficient α_0 represents the mean GPA of the sample members obtained in classroom traditional courses, whereas α_1 is the mean of the latent growth factor equal to the mean difference between online and classroom GPA. The model is just

identified (*df* = 0) (Volkle, 2007) and estimates the mean difference between the classroom and online GPA obtained by the same students in classroom and online coursework.

Table 2 presents the classroom GPAs of the sample of students in a particular semester and the latent growth factor (α_1) - conceptualized as the difference between the students' classroom and online GPAs. As seen, the differences are with negative signs across semesters, results suggesting that students' online GPAs tend to be lower relative to the GPA these same students obtain in classroom coursework. The difference was statistically significant for four of the seven semesters considered (i.e., Fall 13, $p = .002$; Spring 14, $p < .001$; Fall 14, $p = .01$; Spring 15, $p < .001$).

In analyses in response to *RQ2*, we examined *predictors* of the difference between online and classroom GPA. The model depicted in Figure 3 represents an extension of the previous model (in Figure 1) as it incorporates covariates with arrows to both F_0 and F_1. The model evaluates the effect of a factor on both the initial level (classroom GPA) and the difference *between* classroom GPA and online GPA. Table 3 shows the results for the four semesters in which the difference between classroom and online GPA from the first model (*RQ1*) was statistically significant. Predictors were evaluated simultaneously.

In brief, the results indicate that conventional predictors of GPA account for the variability in classroom GPA to a significant degree. Female students, older students, and non-minority students tended to have a higher classroom GPA. Higher classroom GPA was also associated with higher academic ability (not needing remedial coursework) and higher socio-economic status. In addition, professional coursework credits and the number of credits in the Humanities had a positive effect on student classroom GPA, possibly reflecting grade inflation in these disciplines. However, these same conventional factors did not appear to fully explain the difference between classroom and online GPA. Our data suggest that net of other factors, academic ability, the number of STEM credits attempted, and online course load represent the most reliable predictors of the difference between GPAs. The gap grows bigger for students who qualified for remedial coursework in their first semester in college and for those with more credits in the STEM disciplines. Interestingly, online course load is not only positively correlated with classroom GPA but it also diminishes the discrepancy between classroom and online GPA. The same was not true for the effect of minority status; the mean classroom GPA of Caucasian students tended to be higher than the mean classroom GPA of minority students, but minority status had *no* effect on the gap between online and classroom GPA. Nevertheless, in all semester-based models, the size and the magnitude of the residual variance of the difference in GPAs reveal that there is a great deal of intra-individual variability in the change from classroom to online GPA. This suggests that other within-person characteristics (not captured by the models evaluated in this study) might be contributing to trends.

Additional analysis on research question 3 indicated that with the exception of the first and the last semester, students with combined coursework were significantly more likely to attain a degree at a later point in time ($p < .001$). Of the 4,914 students who had both online and classroom courses in Spring 13, 31% were able to graduate in a subsequent semester. The proportion of degree completers are presented in Table 1. The odds of degree attainment were about 1.5 times higher for students with a combination of online and traditional courses compared to students with classroom courses only. Interestingly, the odds of degree attainment were about 2 to 3 times lower for the fully online students relative to students with a mix of online and classroom courses.

5. Significance of the study

Using a large sample from a unified community college system, in four of the seven semesters analyzed we found lower GPAs for students in online courses than for these same students taking classroom courses. These outcomes are interesting for several reasons. First, it is clear that participation in online coursework is a cause for some concern for many students in these community colleges. Students GPAs were lower in their online coursework than in their classroom coursework in the majority of semesters analyzed. Students who needed remedial coursework were particularly ill-suited to online study and taking STEM courses online appears to increase the gap in GPA between online and classroom conditions.

Second, that for three of the seven semesters there were no significant differences in GPA between online and classroom courses represents an alternate and potentially more positive perspective than previous findings (Jaggars & Xu, 2011) and suggest that a great deal of unexplained variance exists with regard to online and classroom academic performance.

Third, unlike previous studies (Xu & Smith Jaggars, 2013) we did not find that minority status or gender amplifies achievement gaps between males and females or minority and non-minority students taking online courses as measured by differences in GPA. Neither gender nor minority status were significant predictors of differences in GPA between classroom and online courses in almost all semesters where difference existed.

Finally, we again confirmed that taking some online coursework appears to be a more efficient means for attaining college credentials. Students who mixed online and classroom coursework were significantly more likely to attain a degree than students who took only classroom coursework. However, taking *only* online coursework appears to be associated with lower odds of earning a credential. These results extend recent work by James, Swan and Daston (2016), who came to the same conclusion with students in primarily online institutions. Our findings extend to this result to students in primarily on-ground (campus-based) institutions as well. These issues clearly deserve further study.

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Table 1

Student Demographic Characteristics: Variable Means and Proportions by Semester

		Fa 12	S 13	Fa 13	S 14	Fa 14	S 15	Fa 15
Female		.52	.57	.59	.58	.60	.59	.60
Age		21.47	2.99	2.67	2.4	2.64	2.45	2.22
Race	White	.74	.75	.76	.76	.72	.69	.69
	Asian	.03	.02	.02	.02	.03	.03	.03
	Black	.10	.10	.08	.08	.10	.12	.10
	Hispanic	.10	.09	.10	.09	.12	.13	.14
	Other	.03	.04	.04	.04	.04	.03	.04
Goal	Transfer	.27	.31	.34	.37	.33	.35	.36
	Degree	.15	.15	.14	.13	.13	.14	.12
	Job	.14	.13	.14	.13	.14	.13	.12
Remedial		.43	.43	.42	.42	.51	.54	.51
Program	Cert	.04	.03	.03	.96	.02	.02	.02
	AA	.93	.96	.96	.02	.89	.83	.71
	BA	—	—	.01	.01	.08	.13	.25
Full-time		.91	.91	.91	.91	.83	.80	.76
Pell		.53	.54	.49	.47	.49	.50	.43
Institution	Suburban	.64	.59	.58	.58	.66	.68	.74
	Large	.60	.53	.51	.49	.55	.56	.54
	Gr. Rate	22.34	22.91	23.06	23.34	25.1	26.35	31.32
	4-Yr	—	—	.01	.01	.08	.13	.25
Degree		.24	.31	.42	.50	.44	.38	.23
N		3,867	4,914	4,713	5,385	3,566	2,976	1,899

Note. Proportions do not sum up to 1.0 due to rounding; Age = Age as of September 2012; Goal = Student goal as of fall 2012; Remedial = Qualified for remedial coursework in Fall 12; Cert = Enrolled in a Certificate degree program; AA = Enrolled in an Associate degree program; BA= Baccalaureate Degree Program; Pell = Pell grant recipient; Gr. Rate = Institution graduation rates for the cohort of 2011; 4-Yr= 4-year institution; Degree= attained a degree by Fall 2015.

Table 2

Results from LGC Models of the Comparison between the Classroom and Online Student GPA: Classroom GPA and Difference between Online and classroom GPA

Semester		MLE	Standard error (SE)	*p*
Fall 12				
	Classroom GPA (α_1)	2.14	.07	<.001
	Latent Change (α_2)	-.09	.15	.536
Spring 13				
	Classroom GPA (α_1)	2.22	.05	<.001
	Latent Change (α_2)	-.17	.09	.077
Fall 13				
	Classroom GPA (α_1)	2.49	.03	<.001
	Latent Change (α_2)	-.13	.04	.002
Spring 14				
	Classroom GPA (α_1)	2.60	.03	<.001
	Latent Change (α_2)	-.15	.04	<.001
Fall 14				
	Classroom GPA (α_1)	2.50	.02	<.001
	Latent Change (α_2)	-.11	.04	.010
Spring 15	Classroom GPA (α_1)	2.47	.03	<.001
	Latent Change (α_2)	-.11	.03	.001
Fall 15	Classroom GPA (α_1)	2.42	.05	.000
	Latent Change (α_2)	-.08	.06	.196

Note. MLE = maximum likelihood estimate; Latent change = difference between online and classroom GPA

Table 3

Results from LGCM: The Effect of Covariates on the Difference between Classroom and Online GPA

Predictors of Classroom GPA	Fall 13		Spring 14		Fall 14		Spring 15	
	γ_0	s.e.	γ_0	s.e.	γ_0	s.e.	γ_0	s.e.
White	.27***	.03	.25***	.03	.26***	.03	.26***	.03
Female	.21***	.01	.21***	.01	.18***	.02	.15***	.02
Age	.02***	.00	.02***	.00	.02***	.00	.01***	.00
Rem	– .48***	.02	– .47***	.02	– .30***	.03	– .23***	.02
AA	.12	.07	.17	.11	.13	.11	.04	.09
BA			.22*	.12	.30*	.12	.32***	.09
Full-time	.35***	.04	.27***	.04	.05	.04	– .02	.03
Pell	– .10***	.03	– .10***	.03	.01	.02	– .02	.03
Online	.19*	.08	.24***	.05	.18***	.06	.11	.06
Stem	.21	.12	.01	.07	– .13*	.07	– .17**	.06
Hum	.35**	.12	.11	.07	.13*	.06	.06	.06
SS	.26*	.11	.02	.12	– .09	.08	– .17*	.07
Prof	.41***	.11	.22**	.08	.33***	.06	.25***	.06
Predictors of the Difference between Classroom and Online GPA								
	γ_1	s.e.	γ_1	s.e.	γ_1	s.e.	γ_1	s.e.
White	– .12	.06	– .07	.06	– .07	.07	.06	.06
Female	– .03	.03	– .01	.05	.04	.07	.10*	.05
Age	.01	.01	.01	.00	.00	.00	.00	.01
Rem	.13*	.06	.06**	.02	.14***	.05	.15***	.05
AA	– .13	.18	– .12	.12	– .02	.22	– .11	.14
BA			.08	.31	.40	.21	.19	.16
Full-time	– .08	.10	– .04	.08	– .22***	.06	– .06	.07
Pell	– .14***	.03	– .11**	.04	– .07	.04	– .09*	.04
Online	– 1.08***	.13	– .95***	.14	– .92***	.15	– .74***	.17
Stem	.40***	.14	.81***	.15	.57***	.11	.35*	.16
Hum	– .09	.19	.03	.13	– .06	.16	– .18	.10
SS	– .21	.22	.34*	.15	.20	.12	.12	.17
Prof	.20	.18	.30*	.13	.28*	.13	.26*	.12
Intercepts								
F_0	1.16***	.10	1.54***	.12	1.74***	.13	1.95***	.09
F_1	.27	.29	– .05	.21	.14	.17	.11	.25

Note. Rem = Qualified for remedial coursework in Fall 2012; AA= Associate degree program; BA = Bachelor degree program; Online = Online load: online credits attempted relative to total load; Hum= Semester credits in the Humanities; SS= Semester credits in the Social Sciences; Prof = Semester credits professional courses; Stem = Semester credits in the Stem field; ***p<.001, ** p<.01, *p<.01.

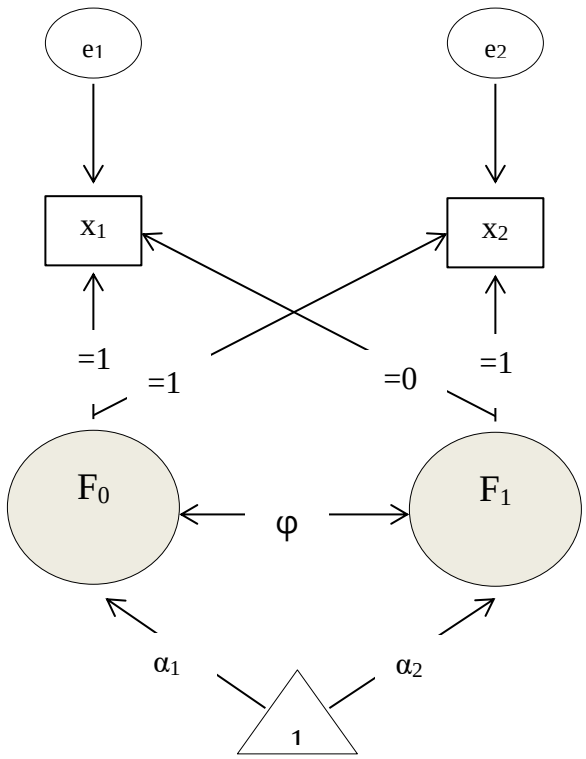

Figure 1. Latent Growth Curve Model of difference between online and classroom GPA equivalent to paired samples ttest. 1= constant; F_0= latent factor classroom GPA; F_1 = latent growth factor – difference between classroom and online GPA; $e_{1/2}$ = error terms; $x_{1/2}$ = measured indicators of classroom and online GPA;φ = covariance between F_0 and F_1. α_1 = mean of latent factor classroom GPA; α_2 = mean of latent growth factor.

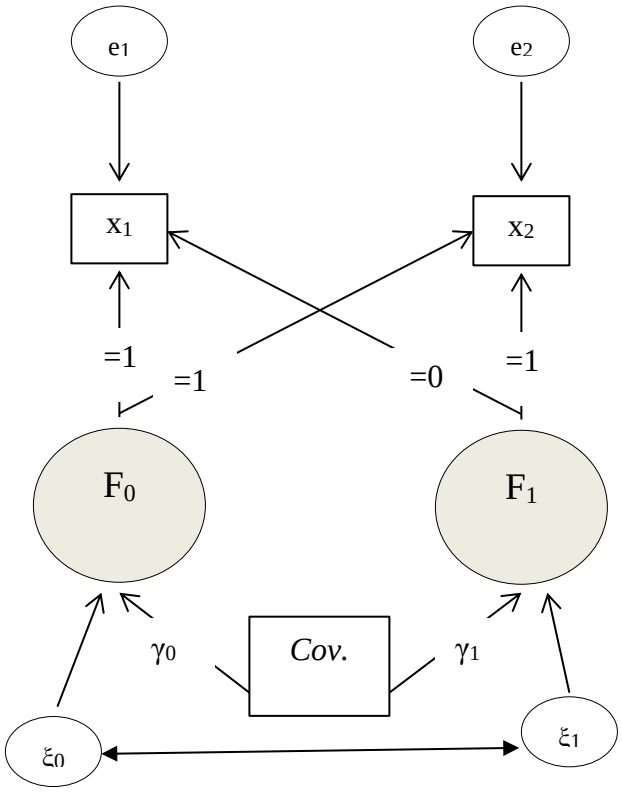

Figure 2. Latent Growth Curve Model of difference between classroom GPA and online GPA