Do prior online course outcomes provide more information than G.P.A. alone in predicting subsequent online course grades and retention? An observational study at an urban community college.

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Abstract

In this study, prior online course outcomes and pre-course enrollment G.P.A. were used as predictors of subsequent online course outcomes, and the interaction between these two factors was assessed in order to determine the extent to which students with similar G.P.A.'s but with different prior online course outcomes may differ in their likelihood of successfully completing a subsequent online course. This study used a sample of 962 students who took an online course at a large urban community college from 2004 to 2010. Results indicate that prior online course experience is a very significant predictor of successful completion of subsequent online courses, even more so than G.P.A. For students with no prior online course experience, G.P.A. was a good predictor of future online course outcomes; but for students with previous online course experience prior online course outcomes was a more significant predictor of future online course grades and retention than G.P.A..

Highlights

- We explore how prior online outcomes and GPA predict future online outcomes.
- Prior online course outcomes predict future online outcomes better than GPA.
- For a first-time online student, success online was strongly correlated with GPA.
- Students with prior online success, regardless of GPA, continued to succeed online.
- Unsuccessful online students continued to struggle online, regardless of GPA.

Keywords

Online learning, G.P.A., prior online experience, successful course completion, retention, community college

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1. Introduction

Over the last decade, online course offerings have become a standard at most colleges and universities (Downes, 2005; Larreadmendy-Joerns & Leinehardt, 2006; Sutton, 2008). The growth in online enrollments is over ten times higher than the growth in overall higher education enrollments and this trend is expected to continue (Allen & Seaman, 2010; 2013). With the rapid advancement of technology, shifting life styles, and expanding enrollments outpacing the current higher education infrastructure, more courses and degree options are expected to become available via online learning; some experts contend that soon, up to half of all traditional campus programs will be available [alternatively or exclusively] online (Howell, Williams & Lindsay, 2003).

Concomitant with the boom in online learning, there are escalating concerns about academic accountability, specifically student outcomes as measured by persistence [i.e. retention] and success [i.e. final course grade] (Boston & Ice, 2011; Howell, Williams & Lindsay, 2003). This arises from research that indicates that attrition rates in online courses are significantly higher in comparison to face-to-face courses (Patterson & McFadden, 2009; XXXX, In Press 2013). As higher education institutions, particularly community colleges, embrace online learning, higher attrition will have a detrimental impact on students and institutions alike (Moody, 2004). Despite this, there is little empirical research on community college online learning and student performance indicators such as online grade performance, re-enrollment and course completion (Nora & Plazas Snyder, 2008). This study aims to fill a gap in the literature, investigating the interaction of prior online experience and G.P.A. in order to help community colleges target support services by identifying students at greater risk of failure and dropout in online learning.

2. Literature Review

2.1 Community Colleges, Rising Enrollments and Online Learning

The rise, both in college enrollments and online learning, is particularly evident at community colleges. More than two-thirds of first-time freshman attend community colleges (U.S. Department of Education, 2008). Higher education enrollments in the fall of 2008 increased at rates not seen in the past 40 years, and this was led by growth in community colleges: overall enrollment in community colleges in 2008 grew 11% (Fry, 2010). In 2009, President Obama announced the American Graduation Initiative (AGI); AGI's goal is to graduate an additional five million community college graduates by 2020 (Obama, 2009). Thus, the growth in community college enrollments is expected to continue.

Responding to rising enrollment demands, over 97% of community colleges have turned to online learning to increase student access (Parsad, Lewis & Tice, 2008). Since 2010, community college online enrollments have increased 29% (CCRC, 2013). In fact, community colleges have the highest enrollment rates in online learning for all higher education institutions and they host about half of all online learning programs in the U.S. (Parsad, Lewis & Tice, 2008; Sammons & Poulin, 2007). In a recent nationally representative poll of 1,434 community colleges, over 60% of students reported taking at least one online course (Pearson Foundation, 2011); in comparison, only about 20% of all undergraduates in the National Postsecondary Student Aid Study took an online course in 2007-2008 (U.S. Department of Education, 2009). More and more, community college students are enrolling in online learning and this trend is expected to keep growing (Allen & Seaman, 2010; CCRC, 2013).

2.2 Online Learning and Attrition

With community college offerings composed of an increasing proportion of online courses, attrition in these courses will have an escalating negative impact on degree completion. This is particularly true for first-generation college students, low-income students, female students and students of color who are already at greater risk of dropping out of degree programs and who make up the majority of the community college student population (U.S. Department of Education, 2009; Zamani-Gallaher, 2007). The research shows that online course drop-out rates in the U.S. range from 30 to 40% (Tyler-Smith, 2006). Moreover, retention rates in online courses have been consistently reported as lower than those for face-to-face classes for more than a decade, with online retention rates often found to be anywhere from 7 to 20 percentage points lower than in-person retention rates (Carr, 2000; XXXX, 2013; Morris & Finnegan, 2008-9; Patterson & McFadden, 2009). This has raised serious concerns about student outcomes, since lower online retention has been connected to overall academic non-success in higher education (Boston & Ice, 2011; Diaz, 2002).

Online learning may engender different learner issues than found in the traditional classroom, because online students need more self-discipline and time management skills, and to be more proactive in their interaction with peers, instructors or other campus support services (Allen & Seaman, 2008; Boyles, 2000; Kember, 1989; LaPointe & Reisetter, 2008; Summers, 2003; Thomas, 2004). In particular, there is strong research suggesting an increased need in the online environment for guidance on time and stress management, note taking, reading and writing guidance, and help with testing-related anxieties and technical skills (Hart, 1999; Morris & Finnegan, 2008-9; Muilenburg & Berge, 2005). All of these issues can potentially be helped by targeted interventions and individualized learner support if high-risk online students can be identified at the beginning of the semester (Ludwig-Hardman & Dunlap, 2003; XXXX, 2012);

Yen & Lui (2009) contend that it is an absence of effective interventions targeted to at-risk students that has kept online learning dropout rates high at community colleges.

2.3 Potential Factors impacting Online Retention and Success

Many community colleges' primary strategy for reducing online course failure and dropout is the early identification of students most likely to be at-risk, so that interventions and support can be provided (Liu, Gomez, Khan & Yen, 2007). One easy way to do this is through the analysis of institutional research data, which routinely gathers a host of student demographics and other variables that may factor into online student outcomes. However, within the online learning research, it is clear that no single set of variables is clearly predictive of attrition in an online course, although several factors have emerged which need further empirical testing (Street, 2010). Among those oft cited as centrally important in the early identification of at-risk students (although not as yet rigorously researched), are student G.P.A. and prior online experience.

It has been proposed that college G.P.A. is an important predictor of persistence and retention in online learning (Boston, Ice & Burgess, 2012, Diaz 2002; Nora, Barlow & Crisp 2005; Rovai 2003). In particular, Muse (2003) cites G.P.A. as one of several significant factors affecting online retention at the community college level. In support of this, results from a study investigating community colleges in both Virginia and Washington State suggest that G.P.A. was positively correlated to course outcomes (Jaggers & Xu, 2010; Xu & Jaggers, 2013). In a university-level economics course, Figlio, Rush, & Yin (2010) found no significant difference between online and face-to face course formats among students with higher prior G.P.A.s, however, among those with lower G.P.A.s, those in the online course scored significantly lower on in-class exams than did those in the face-to-face section. Figlio et al's study mirrors the

research by Jaggers & Xu, suggesting that low-G.P.A. students may have more difficulty adapting to the online environment than high-G.P.A. students.

However, the research on G.P.A. and online learning is far from conclusive. In a recent study (XXXX, 2013), we found that while a lower G.P.A. may be a relatively good predictor of the likelihood of a student dropping out of *any* course, G.P.A. alone is not a good predictor of the likelihood that a student will be less successful in an online course. In particular, while the current research literature shows that G.P.A. can be a strong predictor of online course retention, there is no evidence that G.P.A. is any better at predicting student outcomes in online courses than in face-to-face courses: it follows logically that students with lower G.P.A.'s are likely at higher risk of dropping out of any course (either online or face-to-face), so while G.P.A. may help to identify students who may withdraw from courses in either medium, it may not be particularly helpful as a predictor for a student's risk in the online environment specifically.

Regarding the second factor, prior online experience, intuitively it makes sense that prior experience in any learning situation would be positively correlated with future learning outcomes. However, generally, there is a paucity of empirical research investigating student experience and online learning (Sharpe & Benfield, 2005; Haverila, 2011), particularly at the community college level. Gosmire, Morrison & Van Osdel (2009) report that prior online experience did not affect learner interaction in online graduate courses. Rodriguez, Ooms & Montanez (2008) found that prior online course experience did not impact comfort with using technology but they did find a negative relationship between the number of online courses taken and university student satisfaction, with satisfaction level linked to future online course success. Some other studies have indicated that previous online learning experience may be a significant factor in future online courses outcomes. Haverila (2011) found that prior learning experience

was a significant contributor to learner's perceived efficiency of online learning and learner productivity, although this study was limited in that it only looked at one online undergraduate course. More recently (XXXX, 2012), looking at 129 online courses in a large, urban community college, we found results that show that prior online course experience is strongly correlated with future online course success (in this case, defined as completion of an online course with a final grade of "C-" or better). In that study, community college students who had not successfully completed any previous online courses had very low success and retention rates, and students who had successfully completed all prior online courses had fairly high success and retention rates. So, there is some initial support that a lack of prior online experience seems to be a significant predictor of risk (XXXX, 2012; Muilenberg & Berge, 2005).

3. Purpose of the Study

In a previous study (XXXX, 2012), we found that previous online experience alone was not a good predictor of future online course outcomes, but that whether or not a student successfully completed[1] a previous online course with a C- grade or higher was a strong predictor of future online course outcomes. However, it is not clear whether students who successfully completed a prior online course go on to successfully complete future online courses at higher rates than other groups because these students possess particular attributes necessary to succeed in the online environment specifically, or whether they are simply stronger

[1] Throughout this paper, "successful course completion" is defined as completing a course with a grade of C- or higher. This criteria has been chosen because it is a typical standard for students to receive credit for a course in their discipline, or for them to receive transfer credit for a course. Successful course completion has also been chosen over retention because retention fails to distinguish between a student who remains in a course but does not turn in work (and receives a D or F grade) versus a student that simply stops attending; this measure of successful course completion treats both of these situations more similarly, since they both represent an "unsuccessful" course outcome.

students more generally, who would be more likely to successfully complete a course in any medium. For example, perhaps all students with higher G.P.A.'s are equally likely to successfully complete an online course, and are therefore equally likely to successfully complete both future online and face-to-face courses. On the other hand, it could be that students with comparable G.P.A.'s actually have very different course outcomes online, and that their subsequent performance in online courses is better predicted by the outcomes of their previous online courses than by their G.P.A.'s. In order to try to tease out the extent to which prior successful completion of an online course can be explained by general academic performance (as measured by G.P.A.), we seek to answer the following questions:

1. Is G.P.A. or a student's record of prior online course outcomes a better predictor of future online course outcomes?
2. How do G.P.A. and prior online course outcomes interact to predict future online course outcomes? (Do students with similar prior online course outcomes have similar future online course outcomes, regardless of differences in G.P.A.? Or do students with similar G.P.A. have similar future online course outcomes regardless of prior online course outcomes?)
3. Is the predictive power of G.P.A. stronger or weaker for groups with different kinds of prior online course experience?

4. Methodology

Data were obtained for this study through the Office of Institutional Research at a large, urban community college on the east coast. The College enrolls approximately 23,500 students yearly in degree-programs, with over 10,000 more enrolled in continuing education programs. With enrollees coming from over 150 countries around the world, the College hosts a diverse

student body. The majority of the College's student population belongs to historically underrepresented groups in higher education, with 37% of the student body African-American, 33% Hispanic, 14% Asian, and 16% Caucasian. In addition, about 65% of the student body is female. With an online learning program that is a decade old, the College currently has approximately 125 online courses in liberal arts (82%) and career majors (18%) and further, offers an online Associate's Degree in Liberal Arts.

In this study, we defined enrollment in an online course as any course in which at least 80% of the course content is delivered online[2]. Data were collected for 61 online course sections, with each online course section taught by instructors who teach the same course face-to-face (in practice, almost all instructors at this site also teach their online courses face-to-face) and who have been teaching online for at least three semesters (this was done in an effort to control for possible effects of instructor inexperience in the online environment). Included in the sample was a wide distribution of courses that covered both upper and lower level courses in career, liberal arts, STEM (science, technology, engineering and mathematics) and non-STEM disciplines. The resulting sample contained a total of 962 participants. For every student included, the following data were obtained: a list of previous online courses taken (with final grades), the final grade in the course (including withdrawal status) and the student's G.P.A. The G.P.A. listed was the G.P.A. at the beginning of the semester in which the student was registered for the course included in the sample. All student data were gathered without identifiers and with unique identification numbers.

[2] This study focuses on "fully online" courses and does not include hybrid courses in this analysis. The definition of a fully online course as a course in which 80% or more of the course content is delivered online is the definition used by the college, and is taken from the Sloan Consortium's definition of fully online courses (Allan & Seaman, 2011).

During coding, retention in the online course was coded as a one if the student remained in the course after the beginning of the tenth week of classes and coded with a zero if the student stopped attending (withdrew officially or unofficially) prior to the tenth week of classes; this was done so that the mean represents the proportion of online students who completed the online courses. Likewise, success in the online course was coded with a one if the student completed the course with a C- or better. Additionally, each student was classified as either: "no prior online course experience" - the student had not taken an online course at the college prior to enrolling in the course which was included in this sample; "successful prior online course experience" - the student completed all prior online courses successfully with a C- or better; "unsuccessful prior online course experience" - the student failed to successfully complete any of the online courses taken previously with a C- or better; or "mixed prior online course experience" - the student completed some prior online courses successfully and some unsuccessfully.

5. Results and Discussion

In order to assess the effects of both prior experience and G.P.A., a binary logistic regression was run with success rates as the dependent variable and with G.P.A. and prior online course experience as independent variables. In the binary logistic regression models, G.P.A. was treated as a continuous variable. In order to graphically represent trends and interactions across G.P.A. levels, G.P.A.'s have been grouped into three bands selected based on our previous research (XXXX, 2013) which showed that there was a statistically significant difference in retention rates across these thresholds, but not between G.P.A.'s within each group. In the graphs herein, the G.P.A. bands are: students with G.P.A.'s below 2.5, students with G.P.A.'s from 2.5 to 3.49, and students with G.P.A.'s 3.5 to 4.0. Because there were so few students in

the "mixed" category, that is, students who had both successful and unsuccessful prior online course experiences (only 12 in the sample), and none in the "mixed" with G.P.A. <2.5 category, these 12 data points were excluded from the analysis.

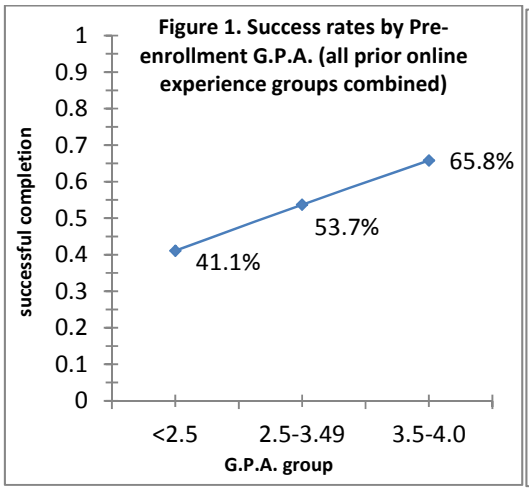
Success and Retention rates for each subcategory of G.P.A. by prior online experience are displayed in *Table 1*. Success rates are displayed graphically in *Figures 1* and *2*, and Retention rates are displayed graphically in *Figures 3* and *4*.

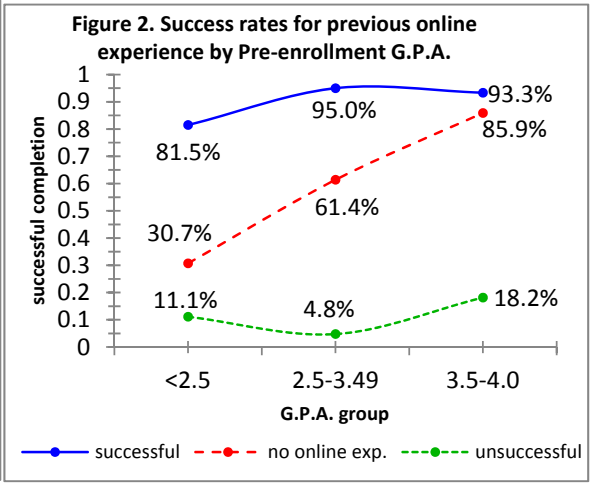
Table 1 Distribution of Success and Retention Rates by Prior Online Experience and Pre-Enrollment G.P.A.

Success* rates	**No online Exp.**	**Successful**	**Unsuccessful**	**Total**
<2.5	30.7%	81.5%	11.1%	41.1%
2.5-3.49	61.4%	95.0%	4.8%	53.7%
3.5-4.0	85.9%	93.3%	18.2%	65.8%
Retention rates	**No online Exp.**	**Successful**	**Unsuccessful**	**Total**
<2.5	53.0%	85.2%	48.1%	56.4%
2.5-3.49	70.0%	95.0%	40.5%	71.6%
3.5-4.0	88.9%	93.3%	27.3%	86.4%

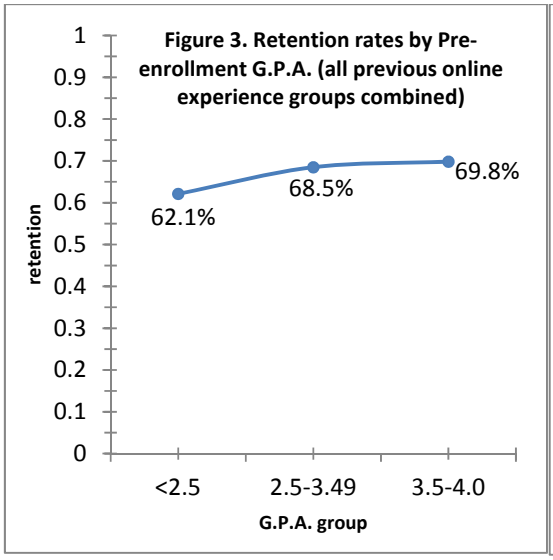
*Success is defined as completion of the course with a C- or higher.

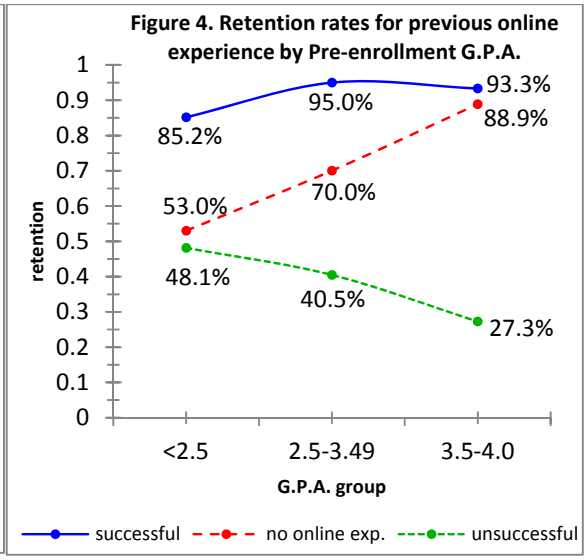
The interaction between prior online experience and G.P.A., illustrated graphically in *Figure 2,* is striking: for students with no prior online experience, their likelihood of success in an online course increases strongly and relatively linearly with G.P.A. However, for students with prior online course experience, the success rates are relatively flat across all G.P.A. categories and appear to depend much more on the success of their prior online course experience than their pre-enrollment G.P.A.: students with prior online success have relatively high future online success rates in all G.P.A. categories, and students with prior online non-success have relatively low online success rates across all G.P.A. categories.





Similar patterns were found with retention rates (see *Figures 3* and *4*).





To determine the possible significance of these patterns, a binary logistic regression analysis was run, which is displayed in *Table 2*. The dependent variable was successful course completion in the first model and course retention in the second model, with pre-enrollment G.P.A., prior online course experience, and the interaction between these two factors as the independent variables.

Table 2 Binary Logistic Regression Type III Analysis, for course success and retention

		base model, no interaction			base model with interaction			full model		
	Source	**Chi-square (LR)**	***p***	**sig**	**Chi-square (LR)**	***p***	**sig**	**Chi-square (LR)**	***p***	**sig**
success[a]	ethnicity							5.87	0.1181	
	gender							6.14	0.0132	*
	age							7.55	0.0060	**
	financial aid							7.70	0.0527	
	class standing							6.10	0.0135	*
	G.P.A.	87.39	0.0000	***	98.01	0.0000	***	72.71	0.0000	***
	online exp.	170.73	0.0000	***	19.98	0.0002	***	21.88	0.0001	***
	G.P.A.*online exp.				15.48	0.0014	**	16.26	0.0010	**
		-2 Log Likelihood -472.0 **R²(Nagelkerke)** 0.351			**-2 Log Likelihood** -464.3 **R²(Nagelkerke)** 0.368			**-2 Log Likelihood** -448.8 **R²(Nagelkerke)** 0.401		
retention	ethnicity							3.02	0.3887	
	gender							9.38	0.0022	**
	age							2.75	0.0975	
	financial aid							3.85	0.2787	
	class standing							2.99	0.0837	
	G.P.A.	26.38	0.0000	***	34.70	0.0000		30.78	0.0000	***
	online exp.	77.39	0.0000	***	10.78	0.0130		11.70	0.0085	**
	G.P.A.*online exp.				12.67	0.0054	**	13.39	0.0039	**
		-2 Log Likelihood -482.8 **R²(Nagelkerke)** 0.185			**-2 Log Likelihood** -482.8 **R²(Nagelkerke)** 0.185			**-2 Log Likelihood** -472.4 **R²(Nagelkerke)** 0.213		

*p<0.05, **p<0.01, ***p<0.001

[a]Success denotes successful course completion with a "C-" grade or better

The Nagelkerke R^2 for the success models with a G.P.A. by prior experience interaction term are 0.368 and 0.401 (without and with additional student level co-variates respectively) both of which are large-sized effects (Cohen, 1988). In the success and retention models, both pre-enrollment G.P.A. and prior online course experiences are highly significant predictors of subsequent online course outcomes; for correct interpretation of these first-level effects, we consider the base model which does not include the G.P.A. by prior online experience interaction term – this model clearly shows that both of these factors are highly significant, and that prior online experience has a larger effect on the outcome variable than G.P.A., as evidenced by larger chi-squared values (we note that the first-level effects of G.P.A. and prior online experience

cannot be interpreted in such a straightforward way in the models including a G.P.A. by prior experience interaction term). The interaction between these two factors is also highly significant as we can see in the models including the G.P.A. by prior online experience interaction term, supporting the hypothesis that the differences in course outcomes for each G.P.A. group vary significantly by prior online course experience. This means that the differences in the slopes of the lines we see in *Figures 2* and *4* are highly statistically significant, and therefore, that the outcomes that we would predict for a student with a particular G.P.A. vary greatly based on whether they have previously taken an online course or not, and if they have taken one, by what their grade was in that course.

Table 3 Planned Comparisons of Success Rates for Interaction between G.P.A. and Online Experience Group (one-tailed), with Effect Sizes

Category	**Comparison**	***z***	***p***	***d***
No Online Exp.	<2.5 vs. 2.5-3.49	-6.50	<0.0001**	-0.61[M]
No Online Exp.	2.5-3.49 vs. 3.5-4.0	-5.20	<0.0001**	-0.53[M]
No Online Exp.	3.5-4.0 vs. <2.5	9.58	<0.0001**	1.11[L]
Successful	<2.5 vs. 2.5-3.49	-2.19	*ns*	-0.49[M]
Successful	2.5-3.49 vs. 3.5-4.0	0.39	*ns*	0.07[t]
Successful	3.5-4.0 vs. <2.5	1.55	*ns*	0.38[M]
Unsuccessful	<2.5 vs. 2.5-3.49	0.99	*ns*	0.24[M]
Unsuccessful	2.5-3.49 vs. 3.5-4.0	-1.50	*ns*	-0.51[M]
Unsuccessful	3.5-4.0 vs. <2.5	0.58	*ns*	0.21[S]
<2.5	No Online Exp. vs. Successful	-5.04	0.0008*	-1.05[L]
<2.5	Successful vs. Unsuccessful	5.19	0.0019*	1.41[L]
<2.5	Unsuccessful vs. No Online Exp.	-2.11	*ns*	-0.44[M]
2.5-3.49	No Online Exp. vs. Successful	-5.80	<0.0001**	-0.72[L]
2.5-3.49	Successful vs. Unsuccessful	9.86	<0.0001**	1.88[L]
2.5-3.49	Unsuccessful vs. No Online Exp.	-6.97	<0.0001**	-1.14[L]
3.5-4.0	No Online Exp. vs. Successful	-1.31	*ns*	-0.23[S]
3.5-4.0	Successful vs. Unsuccessful	5.45	<0.0001**	1.83[L]
3.5-4.0	Unsuccessful vs. No Online Exp.	-5.49	<0.0001**	-1.72[L]

*p < .05,**p < .01 (These p-values represent the total pooled α for all pairwise comparisons in this table; the corresponding p-values for each planned comparison, adjusted using the Bonferroni procedure, are 0.0028 and 0.0006, respectively.)

[t]indicates a trivial effect size, [S] a small effect size, [M] a medium effect size, and [L] a large effect size, based on Cohen's guidelines

In order to further analyze the visual differences that were observed in the success rates for different G.P.A. and prior experience groups in *Figure 2*, a set of planned pairwise comparisons of success rates was conducted, comparing success rates across each G.P.A. category and across each prior online experience group. The results of this analysis are displayed in *Table 3*. Here, the differences visible in the chart are mostly highly statistically significant. The differences among G.P.A. categories are highly statistically significant only for the "no online experience" group; for the students with prior online experience (either "successful" or "unsuccessful"), there was no significant difference in success rates across G.P.A. classes. For students in the lowest G.P.A. category, the differences between the students with prior online success and both other prior online experience groups were statistically significant, so those students did have significantly higher success rates online than students in the other online experience groups. For the middle G.P.A. group, all three prior online experience groups had highly statistically significantly different success rates, with students with prior online non-success having relatively low success rates, students with no prior online experience having success rates in the middle, and students with prior online success having relatively high success rates. And finally, students in the highest G.P.A. category who had prior online non-success had relatively low success rates that were highly statistically significantly different from the two other prior online experience groups, each of which had relatively high success rates. Most of the effect sizes in *Table* 3 are extremely large (Cohen, 1988): the effect sizes for all significant results have an absolute value of at least 0.5, and the effect sizes for the differences in success based on prior online course experience in each category are also very large, as all but one of them have an absolute value of at least one, with several having an

absolute value close to two. A similar pattern among planned pairwise comparisons for retention rates can be seen in *Table 4*.

Table 4 Planned Comparisons of Retention Rates for Interaction between G.P.A. and Online Experience Group (one-tailed), with Effect Sizes

Category	Comparison	*z*	*p*	*d*
No Online Exp.	<2.5 vs. 2.5-3.49	-3.77	<0.0001**	-0.36[M]
No Online Exp.	2.5-3.49 vs. 3.5-4.0	-4.31	<0.0001**	-0.44[M]
No Online Exp.	3.5-4.0 vs. <2.5	6.70	<0.0001**	0.78[L]
Successful	<2.5 vs. 2.5-3.49	-1.68	*ns*	-0.37[M]
Successful	2.5-3.49 vs. 3.5-4.0	0.39	*ns*	0.07[t]
Successful	3.5-4.0 vs. <2.5	1.13	*ns*	0.28[M]
Unsuccessful	<2.5 vs. 2.5-3.49	0.63	*ns*	0.15[S]
Unsuccessful	2.5-3.49 vs. 3.5-4.0	0.80	*ns*	0.27[M]
Unsuccessful	3.5-4.0 vs. <2.5	-1.18	*ns*	-0.42[M]
<2.5	No Online Exp. vs. Successful	-3.14	0.0008*	-0.65[M]
<2.5	Successful vs. Unsuccessful	2.89	0.0019*	0.79[L]
<2.5	Unsuccessful vs. No Online Exp.	-0.47	*ns*	-0.10[S]
2.5-3.49	No Online Exp. vs. Successful	-4.63	<0.0001**	-0.57[M]
2.5-3.49	Successful vs. Unsuccessful	6.72	<0.0001**	1.28[L]
2.5-3.49	Unsuccessful vs. No Online Exp.	-3.84	<0.0001**	-0.63[M]
3.5-4.0	No Online Exp. vs. Successful	-0.86	*ns*	-0.15[S]
3.5-4.0	Successful vs. Unsuccessful	4.94	<0.0001**	1.66[L]
3.5-4.0	Unsuccessful vs. No Online Exp.	-5.39	<0.0001**	-1.69[L]

*p < .05,**p < .01 (These p-values represent the total pooled α for all pairwise comparisons in this table; the corresponding p-values for each planned comparison, adjusted using the Bonferroni procedure], are 0.0028 and 0.0006, respectively.)

[t]indicates a trivial effect size, [S] a small effect size, [M] a medium effect size, and [L] a large effect size, based on Cohen's guidelines

These results strongly suggest that students who have no previous online experience have success and retention rates that increase linearly with G.P.A., but students with prior online course experience have success and retention rates which are determined primarily by the success of their prior online courses (regardless of student G.P.A.). Prior online course experience is strongly correlated with future online course success and retention, and seems to be a much stronger predictor of online course success than G.P.A. alone, for students who have previously taken an online course.

5.1 Limitations

This study consisted of a sample from one community college among many community colleges across the country. Therefore, characteristics of this particular institution may limit the generalizability of the study findings. However, this limitation is mitigated in several important ways, in particular with the methodology employed (Collett, 2003; Fears, Benichou & Gail , 1996; Fox, 1997; Harrell Jr., 2001; Paeitan, 2001). In addition, large institutions like the community college in this study (those with greater than 15,000 total enrollments) constitute 14% of all institutions with online offerings, but educate nearly two-thirds (64%) of all online students (Allen & Seaman, 2010). Further, the sample was drawn from a community college serving students with a wide range of demographic characteristics, and is therefore a good choice for representing the national urban community college population. Because 82% of all U.S. community college students attend institutions in or on the fringe of mid- and large-sized cities (IPEDS, 2003), this suggests that research based on datasets from the College should be relevant to the vast majority of community college students in the nation. Finally, studying students at a single institution (as opposed to across institutions) controls for several threats to internal validity, in that students are more likely to have been exposed to similar conditions regarding faculty, course requirements and institutional elements (Nora & Cabrera, 1996).

A second limitation is the sample size. While the total size of this sample was relatively large, the number of students in each subcategory varied. While the sample sizes in the study were large enough to yield several significant findings, some of our non-significant results may have been significant with a larger sample size. Therefore, additional research with larger sample sizes in particular subcategories could prove fruitful.

6. Implications

6.1 For Practice

These results suggests that institutions wishing to target at-risk students in online courses may want to particularly target students with no prior online experience who have G.P.A.'s at the lower end of the spectrum and students, regardless of G.P.A., who have had a prior unsuccessful online course experience, defined as either course withdrawal or a low course grade. The results also suggest that the success of a student's first online course experience may be critical in determining future online course success, and therefore, that institutions should provide focused support to students taking their first course online, especially when they have lower G.P.A.'s. It may be, for example, that online orientation is particularly important for these students (and less important for students with high G.P.A.'s who have no prior online experience). Or, such support could take the form of a diagnostic intervention in which e-advisors identify students potentially at-risk, then assess the students through interviews and other assessment tools to identify specific areas for support and provide the individualized counseling and guidance needed (Ludwig-Hardman & Dunlap, 2003). Another intervention could occur at the instructor level, with instructors notified of novice online students, and encouraged to provide additional support. Another interesting implication is that these results may explain why the research on the effectiveness of G.P.A. as a predictor for online course success has yielded mixed results: as rapidly growing proportions of students come to online courses with prior online learning experience, their G.P.A. seems to become a relatively poor predictor of online course success in comparison to prior online course experience. Thus, perhaps when institutions aim to assess student risk, they should first look at a student's prior online course experiences, and then only if the student has no online course experience, may it be useful to consider student G.P.A. as a predictor variable.

6.2 For Research

It is important for these results to be replicated across different samples of students, including multiple institutions, to see if these trends are institution-specific or if they are prevalent in the wider student population nationally. Furthermore, it is not clear why prior online course experience is so strongly correlated with future online course success, to the extent that G.P.A. no longer seems to play much of a role in predicting successful online course completion once a student has taken even one online course. Is it possible that a student's first online course experience impacts them so strongly that their success in all future online courses will likely be affected by these prior experiences? If that is the case, then putting more effort into ensuring that a student's first online experience is successful (e.g. through online orientations, advisement, tutoring, or technical support) should provide strong leverage to increase online success and retention rates across the board, since students with successful prior online experiences are extremely likely to complete a future online course successfully. Or, is the correlation present simply because some students are much more strongly suited to the online environment than others, and that a student's "suitability" for the online environment is a stronger predictor of online success than their ability to succeed in face-to-face courses more generally (as represented by G.P.A.)? If that is the case, then this would suggest that the more important tactic in improving online success and retention rates would be to come up with more effective mechanisms for determining which students are best suited to succeed in online courses, and to use these mechanisms to deter students who are likely to withdraw from or fail online courses before they enroll. Additionally, more work needs to be done to determine why students are successful online, and to find ways of imparting these techniques to other students, both online novices as well as prior non-succeeders. Further, studies are necessary in order to

tease out to what extent each of these possible effects may be playing a role in determining subsequent online course outcomes for students with prior online course experience.

Also, this study did not look at students with mixed prior online course experience who completed some prior online courses successfully and some prior online courses unsuccessfully, because the number of students in this group was so low in this particular sample. Preliminary analysis suggests that these students may have success rates that are also uncorrelated with G.P.A. but which are between those rates for previously successful and previously unsuccessful students. Further analysis is needed to determine whether these preliminary results hold, and to determine whether prior online success or non-success might have a more significant impact on future online success. For example, how much impact does a single successfully completed online course have vs. a single unsuccessfully completed online course on predicting future online course success? Further studies with larger sample sizes could clarify some of these questions.

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