

THE ROLE OF ENROLLMENT CHOICE IN ONLINE EDUCATION: COURSE SELECTION RATIONALE AND COURSE DIFFICULTY AS FACTORS AFFECTING RETENTION

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ABSTRACT

There is well-documented evidence that online retention rates are lower than face-to-face retention rates; however, most past research on online retention focuses on student characteristics, with little knowledge existing on the impact of course type. This study uses a matched sample of 2,330 students at a large urban community college to analyze two key course-level factors which may be impacting online retention: the student's reason for taking the course (as an elective or a requirement) and course difficulty level. The results of this study indicate that the online modality increases dropout risk in courses that are taken as an elective or distributional requirement, particularly for lower-level courses. The findings suggest that in the online environment, the student's reason for course enrollment may be considered a risk indicator and that focused learner support targeted at particular course types may be needed to increase online persistence and retention.

KEY WORDS

Online learning; retention; motivation; course difficulty; elective; community college

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INTRODUCTION

There has been a dramatic shift in higher education in the last decade toward online education; as result, online courses are now a core feature of most community colleges and universities (Larreadmندی-Joerns & Leinhardt, 2006; Layne, Boston & Ice, 2013; Sutton & Nora, 2008). Today, more than 30% of all college students, and more than 60% of community colleges students, enroll in online courses. Online enrollments grew by one million students from 2009 to 2010, the largest ever year-to-year increase, far surpassing the growth of higher education in general, and have increased more than 29% since 2010 (Allen & Seaman, 2010; Community College Research Center, 2013; Pearson Foundation, 2011). With higher education enrollments exploding today, and more technologically savvy students who seek alternate pathways to higher education entering college, online education is expected to keep growing (Allen & Seaman, 2013).

Concurrent with this accelerated growth in online education are escalating concerns about student outcomes (Boston & Ice, 2011; Hachey, Wladis & Conway, 2013; Howell, Williams & Lindsay, 2003). Course completion serves as an important measure of both student outcomes and the success of an online program (Abel, 2005; Moody, 2004; Willging & Johnson, 2004). Student retention is a costly issue for both institutions and their students. From the institutional perspective, student dropout incurs staff costs to handle transitions, and involves extra administrative and advising time and lost revenue (Moody, 2004). Moreover, reporting high completion rates is often critical for institutions to secure funding (Patterson & McFadden, 2009). From the student perspective, course drop out can impede progress towards a degree, cause financial loss and incur potential psychological distress related to withdrawal decisions (Reed, 1981).

Because of the high costs of student attrition and its association with program quality, there is a critical need for higher learning institutions to be able to predict the potential persistence of online students in order to direct targeted support towards ameliorating the problem (Hachey, Wladis & Conway, 2013; Parker, 2003). So far, most of the research on student retention in the online environment focuses on student characteristics ((Layne, Boston & Ice, 2013); for reviews, see (Levy, 2007; Yukselturk & Bulut, 2007)); little knowledge exists on the impact of course type, even though it has been suggested as a potential online retention risk factor (Diaz, 2002). If course type is an online retention risk factor, then targeting particular courses for intervention, instead of seeking out individual students with particular characteristics, may be a more efficient and reliable way of allocating institutional resources to improve student persistence and online retention rates. We contend that the ability to predict online retention rates based on course characteristics may be extremely useful to institutions, since it could allow them to target with extra resources those particular course sections at highest risk of high online dropout, such as: including dedicated course-type specific counseling and coaching, providing course-specific online readiness surveys or special course orientations, and providing course-specific peer tutors. This study seeks to address the need for information about how course-level characteristics may impact online course retention by identifying and exploring two key factors: the student's reason for taking the course (as an elective or to fulfill a distributional or major requirement); and course difficulty level.

BACKGROUND

While several studies have found no significant difference between student learning online versus in the face-to-face classroom (Bernard, et al., 2004; Russell, 2001), research nevertheless indicates a pervasiveness of non-completion in online learning. The online education literature consistently cites lower retention for online courses in comparison to face-to-face courses across higher education institutions in the U.S. (Angelino, Williams & Natvig, 2007; Morris & Finnegan, 2008-9; Tyler-Smith, 2006); retention in online learning programs is often reported as 7-20 percentage points lower than traditional campus-based programs (Hachey, Wladis & Conway, 2013; Moody, 2004; Nora & Plazas-Snyder, 2008; Patterson & McFadden, 2009; Smith & Ferguson, 2005). Based on extensive past findings, we expect to find that retention rates will be lower for online courses in comparison to face-to-face

courses. Although research has been conducted and findings reported of differences in student retention in online courses across fields (Finnegan, Morris & Lee, 2008-9; Neil, 2001), there seems to be little evidence in the online education literature looking at the impact of course level or a student's reason for enrolling in the course (to fulfill elective, distributional or major requirements). Thus, what is not clear in the literature is if the risk of drop out in the online modality is increased based on the type of online course that is taken.

Many studies have considered how student characteristics affect course outcomes. However, this study takes a different approach; it focuses on differences at the course level because we are interested in the results from a practical institutional perspective. Colleges administering online programs are often looking for ways to target interventions at students who are at the greatest risk of doing more poorly online than would be expected given their face-to-face performance. One way of targeting those students is to use student characteristics; however, this method is time consuming and difficult because it requires colleges to collect and track information on a number of student characteristics which are not routinely collected (e.g. motivation, work hours) and because it requires colleges to target students individually. This study seeks to see if there are particular courses which may have lower successful completion rates online than would be expected given the face-to-face successful completion rates of that same course (taught by the same instructor). If such courses can be identified, then colleges can target interventions to those courses at greatest risk, and in this way, target the students at greatest risk. The reason why these courses are at a greater risk online could be a number of things: it could be that the characteristics of students who take these courses make them particularly at-risk in the online environment, or it could be that there are characteristics of the courses themselves that make them more poorly suited to the online environment. The aim of this study is to identify which courses are at risk so that resources could be targeted to these classes; the goal of future work would be to explore the reasons behind any differences which are uncovered by this study.

A. Course Difficulty Level

In this paper, we define course difficulty as the level of a course, or whether a course requires credit-bearing prerequisites. For the college in this study, lower level courses consist of 100-level courses which have no prerequisites (other than possible developmental coursework); in contrast, 200-level courses and above require at least one 100-level course as a prerequisite. In this way, 200-level courses cover more advanced material, which is why we refer to them as having a higher difficulty level. There are, of course, other ways in which the difficulty level of a course could be interpreted, but we do not purport to cover all of those interpretations here; our goal is simply to distinguish between courses which have credit-bearing pre-requisites versus those that do not. Our reasons for focusing on this particular distinction are based on some evidence in the literature that students in lower-level courses may be more vulnerable to doing worse online than would be expected given their face-to-face performance.

Two recent studies of community college students found that students who took online classes early in their college careers were more likely to drop out than those who took only face-to-face courses (Jaggars & Xu, 2010; Xu & Jaggars, 2011), which might suggest that students enrolled in lower level classes which are typically taken earlier in a college career might have a greater risk of course drop-out. Since difficulty of instructional materials has been cited as one potential reason students drop out of online courses (Diaz, 2002), the level of difficulty of a course may be one factor that may make it more prone to higher attrition in the online environment. Some prior research has found a strong negative correlation between previous education in the discipline and dropping out of an online course, indicating that students may be more likely to drop out of lower level online courses, particularly when they are in a subject unrelated to their prior course experience. This suggests, therefore, that students are more likely to drop lower level online courses that are outside their major (Xenos, Pierrakeas & Pintelas, 2002).

B. Reason for Course Enrollment (to fulfill Elective, Distributional or Major Requirements)

In particular, there seems to be little research that looks at whether the decision to enroll in required versus elective online courses has an impact on online retention. Student perceptions of online learning have been shown to be a better predictor of outcomes at the post-secondary level than prior achievement grade point average [G.P.A.] (Lizzio, Wilson & Simons, 2002; Sutton & Nora, 2008). Moreover, across most disciplines, whether a course is an elective or requirement is a variable that has been linked to student attitudes (Babad, 2001). Consistently in the face-to-face course literature, elective courses receive better evaluations than required courses (for a review, see Darby, 2006). Given the influence of student perception on persistence, this suggests that retention for elective courses may be higher than required courses. However, Reed (1981) contends that persistence in a course is significantly related specifically to students' belief in the relevance of the course to their need and, further, found that students were much more likely to drop courses that were electives.

Rational choice theory may provide an additional framework, beyond that of student persistence, for examining student course selection, positing that individuals will base their activities and decisions on a cost-benefit analysis (Coleman & Fararo, 1992). If students believe there is a greater "pay off" from a specific course or set of courses, it may induce the student to persist. Students might consider there to be a greater "payoff" when selecting and completing courses that are required for the degree versus electives, and may therefore be more likely to persist in required courses. Additionally, to the extent that students perceive courses in the online environment to be less rigorous, it might be an inducement for enrollment; but may lead to greater attrition when students find the course to be more difficult than originally thought (Moody, 2004). Course workload and course difficulty are oft cited reasons for course withdrawal but often not the primary reason (Babad, Icekson & Yelenik, 2008; Summer & Johnson Community College, 2001). In a survey of 500 undergraduates enrolled in face to face courses, students primarily dropped a course due to "atmosphere" a composite of choices that reflected connection with the other students (the number of students, the quality of the discussion) and the physical conditions (classroom crowding and the characteristics of the room itself), factors which may be more nebulous in the online environment (Babad & Tayeb, as cited in (Babad, Icekson & Yelinek, 2008)).

At the college in this study, an interesting pattern was observed during a preliminary review of retention rates that motivated the focus of this study, and that seemed to suggest that the online environment may affect the retention rate more strongly for students taking courses as a distributional versus a major requirement. Retention rates in two different mathematics courses taught by the same professor in the same semester and with the same prerequisites were significantly different for the online versus face-to-face sections of the courses. Fundamentals of Mathematics (MAT 100) is taken by liberal arts majors as one option for fulfilling their mathematics distributional requirement and Mathematics for Health Sciences (MAT 104) is a required course in certain health care majors such as paramedics and nursing, with the course content entirely focused on applied problems in the field. In this example, the attrition rate in MAT 100 (the distribution requirement) was about double in the online class compared to its face-to-face counterpart; whereas the attrition rate in MAT 104 (the major requirement) was, in fact, slightly (but not significantly) lower in the online environment compared to the face-to-face version. These preliminary findings suggest that an exploration of course-level factors, such as a student's reason for taking a course (to fulfill elective, distributional, or major requirements), is a logical next step in building predictive models of online student persistence. If course-level factors can be identified which allow institutions to identify courses which are at the highest risk of proportionally higher attrition rates in the online environment than would be expected given their face-to-face attrition, then interventions can be targeted to these courses. The reason why some courses may be at a greater risk online could be that the characteristics of students who take these courses make them particularly at-risk in the online environment; however, targeting interventions at students with specific characteristics is more resource-intensive and difficult than targeting particular types of courses, so this study focuses on characteristics which are at the course rather than student level.

PURPOSE OF THE STUDY

The purpose of this study is to assess the extent to which student reasons for taking a course (to fulfill elective, distributional, or major requirements) and course difficulty level may be used as predictors of online versus face-to-face course outcomes. Therefore, the following questions are addressed:

1. Which combinations of course-level factors (elective vs. distributional vs. major requirements; level) have retention rates that are significantly lower online than face-to-face?
2. When comparing online and face-to-face sections of the same course, is the gap in retention rates larger for courses which students take as elective or distributional requirements than for courses which students take to fulfill major requirements?
3. When comparing online and face-to-face sections of the same course, is the gap in retention rates larger for lower-level (100-level) courses than for upper-level (200-level and above) courses?
4. Is there an interaction between a student's reason for taking a course (to fulfill elective, distributional or major requirements) and course difficulty level in predicting online versus face-to-face course retention? For example, is the correlation between a student's reason for taking a course and online course outcomes greater for lower-level courses than for upper-level courses?

METHODOLOGY

C. Data Source and Sample

This study utilizes data provided by the Office of Institutional Research from a large, urban community college in the Northeastern U.S. Enrolling approximately 23,500 students in degree-programs each year, the college meets the requirements to be deemed a "large institution", according to Allen & Seaman (2010). This is noteworthy as large institutions educate nearly two-thirds (64%) of all online students. The gathered data represents a diverse student body, as enrollees come from over 150 countries around the world. Eighty percent of the College's student population belongs to groups historically underrepresented in higher education: the College is classified as both a Minority Serving Institution and a Hispanic Serving Institution. The College has offered online classes since 2002, and currently offers a fully online Associate's Degree in Liberal Arts and provides over 135 online courses.

Data was compiled for 122 course sections (half taught online and half taught face-to-face). The course sections to be included in the sample were selected from a larger pool using the following methods: First, data were obtained for all online course sections taught from 2004-2010 (fall and spring semesters). Second, the sample was limited to include only those course sections for which an instructor taught the same course both face-to-face and online in the same semester, to control for instructor effects. Next, the sample was reduced to only those courses which the instructor had taught for at least three semesters, to limit the effects of instructor inexperience in the online environment. In total, 21 different courses taught by 23 different instructors both online and face-to-face were included. The courses were well distributed across disciplines, with three in business, one in nursing, five in the humanities, five in the social sciences, four in mathematics, and three in science disciplines.

D. Measures

For each section in the sample, student data was provided without identifiers and with unique identification numbers. This resulted in a total data set of 2,330 participants. The following information was obtained for every student: student major (used to determine if the course was taken as a requirement or elective) and the final grade in the course (including withdrawal status). The categorization of a course which a particular student took as an elective, distributional requirement, or major requirement was based on the requirements of that student's major: courses which did not fulfill any particular curriculum requirement (other than for general elective credits) were counted as electives; those that fulfilled a degree requirement that was not a part of the major's core curriculum were counted as distributional requirements, and courses that were either explicitly required as a part of the major's core curriculum, or which were elective major courses that were a part of the student's core major curriculum were counted as major requirements. Major requirements were not always limited to courses in the exact subject of the

student's major; sometimes they were in related fields but were included because they were listed by that major's department as curriculum requirements for the major in the college catalog.

The dependent variable which was the focus of this study was retention: students were categorized as having completed the course if they were still attending class after the tenth week of the semester (only fall and spring semesters were included in the analysis). Students who never attended the course or who received an incomplete grade were excluded from the analysis.

E. Data Analyses

First we perform significance tests using the Bonferroni procedure and z -scores to determine whether different types of courses in the sample had significantly different retention rates (online versus face-to-face; lower-level versus upper-level; elective versus distribution versus major requirements). Then we use these same types of significance tests to determine whether each subtype of courses (lower level; upper level; elective; distributional requirement; major requirement) has significantly lower retention online versus face-to-face. Based on current research literature, we expect that on average retention will be lower in online than face-to-face sections, but this behavior or the size of the gap may not be the same across all course types; therefore, we will then use binary logistic regression to determine if any differences in the size or direction of the gap between different course types (elective versus distributional versus major requirement) is significant.

We then perform significance tests using the Bonferroni procedure and z -scores to determine whether online and face-to-face retention rates are significantly different for combinations of subtypes of courses (e.g. lower level electives), and we will follow this analysis with separate binary logistic regression models for lower level courses and for upper level courses that will compare the differences in size and direction for the gap between online and face-to-face courses among elective versus distributional versus major requirements.

RESULTS AND DISCUSSION

F. Preliminary Analysis of the Data

As a precursor to analyzing differences in retention in different online course types, we first analyze whether, in this sample, there are generally (not just online) differences in attrition rates among courses taken to fulfill elective versus distributional versus major requirements, or among upper versus lower level courses. Pooling all students in the sample in both online and face-to-face courses to compute retention rates for each category yields the data in *Table 1*, which includes tests for significance. (We note that Retention rates and Attrition rates are complements of one another: the Attrition rate is the percentage of students who withdrew from the course officially or unofficially [i.e. a student stopped attending class sometime before the tenth week of the semester – students who stop attending after the 10th week of classes receive an “F” grade instead], whereas the Retention rate is the percentage of students who did not withdraw officially or unofficially, but may have earned an “F” or “D” grade.)

Table 1 Retention rates for students in each classification of course type, with tests for significance.

	retention	<i>n</i>	<i>z</i>	<i>p</i>	<i>z</i> -score compares:
face-to-face	81.0%	1107	5.46	<0.0001	face-to-face vs. online
online	70.6%	887			
lower level	69.3%	1092	-8.16	<0.0001	lower level vs. upper level
upper level	84.9%	902			
elective	67.7%	449	-2.79	<i>ns</i>	elective vs. dist. req.
dist. req.	74.8%	980	-5.21	<0.0001	dist. req. vs. major req.
major req.	86.0%	565	6.98	<0.0001	elective vs. major req.

Results for p -values in bold are all highly statistically significant ($\alpha=0.01$, two-tailed), even when the Bonferroni

procedure is used to control for Type I error. The abbreviation *ns* means that the result is not statistically significant.

In *Table 1* it is apparent that attrition is higher: 1) in online courses compared to face-to-face courses; 2) in lower level courses compared to upper level courses; and 3) in courses that are elective or distributional requirements rather than major requirements. All of these differences are highly statistically significant ($\alpha=0.01$).

G. Differences in online versus face-to-face course retention rates for different combinations of course-level factors

The next step is to consider the interaction between the method of course delivery (online vs. face-to-face) with course type (elective vs. distributional requirement vs. major requirement) and level. Retention rates for each course-level factor can be seen in *Table 2* broken down by course delivery modality.

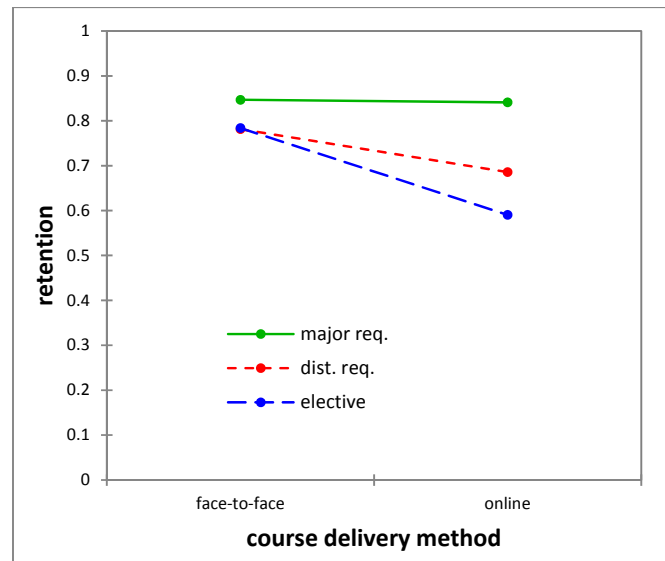
Table 2 Retention rates online and face-to-face for different course types, with tests for significance

	face-to-face retention	<i>n</i>	online retention	<i>n</i>	<i>z</i>	<i>p</i>
lower level	75.5%	593	61.9%	499	4.86**	<0.0001
upper level	87.4%	514	81.7%	388	2.35	<i>ns</i>
elective	77.8%	203	59.3%	246	4.17**	<0.0001
dist. req.	79.1%	560	69.0%	420	3.59**	<0.0001
major req.	86.0%	344	86.0%	221	0.02	<i>ns</i>

** indicates significance level of $\alpha=0.01$ (one-tailed) for overall set of tests (adjusted to 0.0011 per test using the Bonferroni procedure)

In *Table 2*, retention followed the same pattern in the online environment as in the face to face environment: retention was greater in upper level and major requirement courses versus lower level and elective or distributional requirement courses. Additionally, the following course types had a highly statistically significantly ($\alpha=0.01$) lower retention rate online than face-to-face: lower level courses; elective courses, and courses that fulfill distributional requirements. This suggests that whatever factors lead to lower overall retention rates for lower level, elective, and distributional requirement courses (e.g. lower levels of student motivation) may be amplified by the online environment. The differences in online versus face-to-face course outcomes by course type are illustrated graphically in *Figure 1*.

Figure 1 Online and Face-to-Face Retention for Electives vs. Distributional Requirements vs. Major Requirements



It is evident from *Figure 1* that students who take an online course which fulfills their major requirements are roughly equally as likely to remain in the course whether they take it online or face-to-face, while students who take the course to fulfill a distributional requirement or as an elective are much more likely to withdraw online than in the face-to-face environment, with this difference particularly pronounced for electives. To determine if the slopes of the lines in *Figure 1* are statistically significant, we perform a binary logistic regression with retention as the dependent variable and course delivery method and course type as the independent variables; the model also includes the interaction between these two factors as a term in the regression equation. The results of this analysis can be seen in *Table 3*.

Table 3 Type III analysis for binary logistic regression analysis of the interaction effect of course delivery method and course type on retention

	Chi-square (LR)	Pr > LR
course delivery method	0.037	0.847
course type	7.328	0.026*
course delivery method*course type	8.661	0.013*
-2 Log Likelihood	2376.297	
R ² (Nagelkerke)	0.053	

* indicates significance level of $\alpha=0.05$

When the interaction between course delivery method and course type is taken into account, the interaction between course type and course delivery method is statistically significant ($\alpha=0.05$). In other words, the differences in slope that we see in the lines in *Figure 1* are statistically significant, and students in elective and distributional requirement courses have a much higher jump in attrition when they move to the online environment than students in major requirement courses.

But what happens if course type and level are combined? For example, would an upper level elective course have lower online retention or not? The next step in the analysis is to analyze differences in retention rates for the two factors of course type and level, both online and face-to-face.

H. How does course level interact with course type and the online environment in predicting course outcomes?

First we look at each subgroup of course level by type (e.g. lower level elective courses, upper level

distributional requirements, etc.), to see for which of these groups retention rates are lower in the online environment. This data is displayed in *Table 4*.

Table 4 Retention rates online and face-to-face for different combinations of course type, with tests for significance

level	type	face-to-face retention	<i>n</i>	online retention	<i>n</i>	<i>z</i>	<i>p</i>
lower level	elective	74.30%	105	52.10%	165	3.64	<0.0001**
lower level	dist. req.	75.90%	390	64.50%	290	3.24	0.0006**
lower level	major req.	75.50%	98	81.80%	44	-0.83	<i>ns</i>
upper level	elective	81.60%	98	74.10%	81	1.21	<i>ns</i>
upper level	dist. req.	86.50%	170	79.20%	130	1.68	<i>ns</i>
upper level	major req.	90.20%	246	87.00%	177	1.03	<i>ns</i>

* indicates a significance level of $\alpha=0.01$ (one-tailed) for overall set of tests (adjusted to 0.0017 per test using the Bonferroni procedure)

In *Table 4*, it is apparent that lower level courses taken as either electives or to fulfill distributional requirements have highly statistically significantly ($\alpha=0.01$) lower retention rates online than face-to-face, whereas this effect is not seen for major requirements or for upper level courses. In *Figures 2* and *3*, these differences are displayed graphically.

Figure 2 Retention for Lower Level (LL) courses by type and delivery method

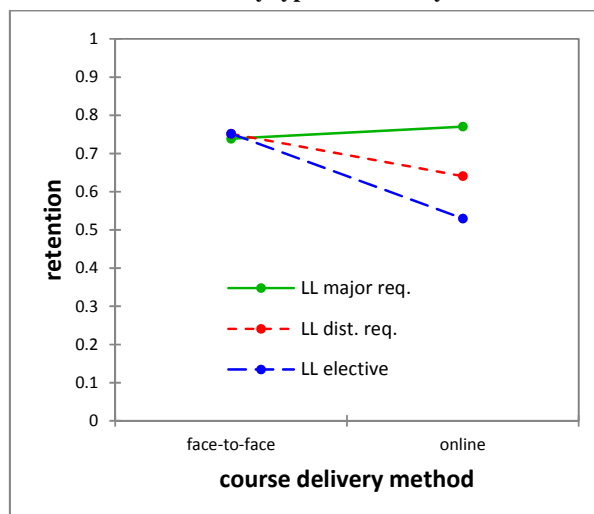
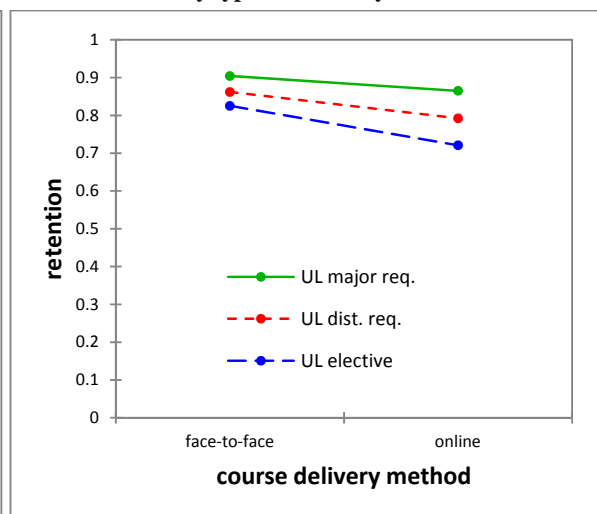


Figure 3 Retention for Upper Level (UL) courses by type and delivery method



For lower level courses (*Figure 2*), all types of courses (electives, distributional requirements and major requirements) have almost identical retention rates face-to-face, but in the online environment these retention rates spread very far apart, covering a range that is about thirty percentage points wide. For lower level courses in the online environment, major requirement courses have retention rates that are actually a bit higher than in the face-to-face environment (although this difference is not statistically significant), whereas distributional requirement courses have retention rates that are significantly lower online and elective courses have retention rates that are much significantly lower online. In contrast, for upper level courses, major requirement courses have higher retention than distributional requirement courses, which have higher retention than elective courses, but this pattern is nearly identical both online and face-to-face: the gap between courses is about the same both face-to-face and online, and the retention rates for each category, while slightly lower online, are not statistically different from the

retention rates for each corresponding category face-to-face.

To determine whether or not the differences in slopes in *Figures 2* and *3* are statistically significant, we performed a binary logistic regression, first on lower level courses only and then on upper level courses only, to determine what effect the interaction of course delivery method and course type might have on retention. These results can be seen in *Table 5*.

lower level courses	Chi-square (LR)	Pr > LR
course delivery method	0.226	0.634
course type	0.096	0.953
course delivery method*course type	7.356	0.025*
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-2 Log Likelihood	1556.1	
R ² (Nagelkerke)	0.042	
upper level courses	Chi-square (LR)	Pr > LR
course delivery method	6.889	0.009**
course type	12.385	0.002**
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-2 Log(Likelihood)	769.0	
R ² (Nagelkerke)	0.037	

** and * indicate significance levels of $\alpha=0.01$ and $\alpha=0.05$ respectively

In *Table 5*, we can see that once the interaction between course delivery method and course type is taken into account in the lower level course subsample, the interaction is statistically significant. So the differences in slope that are visible in *Figure 2* are in fact statistically significant, and knowing the type or delivery modality of a course alone does not provide us particularly useful information for predicting online course outcomes in lower level courses: instead the differences in retention rates among these different categories is better captured by knowing the course type and modality subcategory (for example, knowing that a course is online, or is an elective is not enough to predict a retention rate that might be different from average for lower level courses, but knowing that a course is an elective online is predictive of retention).

Table 5 also gives the results of a binary logistic regression analysis on upper level courses; in this model the interaction term was omitted because it was not significant, and both course modality and type are significant predictors of retention, which is what we would expect from looking at the graph: for upper level courses, online retention rates are slightly but significantly lower, and the retention rates for major requirements are higher than for distributional requirements, which are in turn higher than for electives, in both the online and face-to-face modality. Planned pairwise comparisons during the binary logistic regression analysis (not shown here for the sake of brevity) show that distributional requirements and electives had statistically lower retention rates overall, but that the difference between elective and distributional requirements was not significant. This means that for upper level courses, unlike for lower level courses, the effects of the online environment on retention seem to be roughly the same across all course types.

I. Limitations

This research was limited to a specific sample chosen from a single community college, and as such, these results may not necessarily generalize nationally or to four-year institutions. However, this limitation is mitigated in several important ways. First, the community college in this study has a very diverse student body. Second, because the study focuses on a large urban community college, the sample the data was drawn from is representative of the type of institution which educates the vast majority of community college students in the U.S., since 82% of all community college students attend institutions in or on the fringe of mid- and large-sized cities (U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics (NCES), 2003). This suggests that research based on

the college in this study may be relevant to a large proportion of community college students nationally. Finally, studying students within a single institution rather than across institutions limits threats to internal validity, because faculty conditions, course requirements and institutional elements are more uniform within a single institution (Nora & Cabrera, 1996).

In addition, controlling courses for instructor and semester (including in the sample only pairs of course sections taught by the same instructor both online and face-to-face in the same semester) limits the particular choice and total number of instructors included in the sample, and therefore each instructor has greater possible influence on the results. Because all the instructors in this sample taught online for at least three semesters (and many of them much longer) and because the college in this study does not let faculty continue to teach a course online if they have had relatively low retention rates, it is unlikely that a small number of faculty with particularly low retention rates strongly affected the results, but it is necessary to repeat this study with larger sample sizes at other institutions to confirm the general trends observed here.

Additionally, the differences in significance for factors in the models included in *Table 5* for lower level courses versus upper level courses is not in and of itself proof of a three-way interaction between course type, level, and delivery method. Technically only a larger binary logistic regression model containing all two-way and three-way interactions could ascertain the statistical significance of the differences between the trends seen in *Figure 2* for lower level courses versus those seen in *Figure 3* for upper level classes. However, the sample size in this particular study was not sufficiently large to allow for the necessary statistical power to perform such a test. As such, the differences observed between the patterns seen in *Figure 2* and *3* should be interpreted as preliminary results only, which should be tested with larger samples. From the institutional perspective, the results of such a statistical test may be less relevant: to improve online retention rates, it may not be necessary to ascertain for certain whether the patterns observed for upper level courses in *Figure 3* are truly significantly different from those observed for lower level courses in *Figure 2*; rather, the simple fact that lower level courses taken as electives or distributional requirements have the highest drop in retention when moved to the online environment suggests that targeting this specific subgroup of courses for extra support in the online environment may be sufficient to improve overall online attrition.

Lastly, this research did not explore differences in student characteristics. Numerous studies, including our own (e.g. Jaggars & Xu, 2010; Wladis, Hachey, & Conway, In Press; Wladis, Hachey, & Conway, n.d.; Wladis, Conway, & Hachey, n.d.; Xu & Jaggars, 2011), have shown that students who possess certain non-traditional characteristics, including being older, working, attending part-time and supporting dependents, are more likely to enroll in online courses. These same characteristics are also factors which have been shown to negatively impact persistence, regardless of the course modality. However, the goal of this research is not to compare outcomes of online versus face-to-face students directly. Rather, the goal of this study is to look at the *interaction* between the online medium and course characteristics, which focuses instead on exploring when the gap between online and face-to-face completion rates is significantly larger or smaller for different types of courses.

It is possible that certain types of courses attract students who are more likely to be at risk in the online environment, and that this could explain any significant differences in the online-versus-face-to-face course completion gap for specific course types; our study does not discount this as a possible reason for differences in outcomes for different types of courses. For example, students who are enrolled in more advanced level courses have already succeeded to an extent that has not (and may not) occur for students enrolled in lower level courses, and this may explain the differences in the online-versus-face-to-face course completion gap for higher versus lower level courses. Whatever the reason for larger gaps in specific types of courses, identifying courses with larger gaps could allow institutions to target interventions specifically to those course types. Identifying courses that are at highest risk in the online environment allows resources to be targeted to these classes, and then the goal of future work would be to explore the reasons behind differences which have been uncovered by this study.

IMPLICATIONS

J. For Practice

Ludwig-Hardman & Dunlap (2003) contend that individualization in learner support services is greatly needed to increase retention in online courses. This research suggests that online course retention rates can be improved by providing extra support targeted specifically to lower level courses which are typically taken as electives or to satisfy distributional requirements. Such support could include self-assessment and orientation tools which could be used to help these students assess their perceptions and preparedness for the course; at the course level, E-advisors could provide an early mechanism for academic counseling; additional technical support staff could assist students with technical difficulties specific to the online environment; and peer tutors could assist students with the course content. Such measures could improve retention rates for these courses where students are at highest risk of dropping out, and therefore, improve retention online overall by targeting just the subgroups of courses at highest risk (thereby more efficiently allocating resources). In particular, for the sample in this study, if an intervention that was effective enough to improve retention online versus the face-to-face in comparable courses were targeted only at lower level elective and distributional requirement courses, the overall online persistence rate would have gone from 70.6% to 78.4%, and this increase in overall online course persistence would be sufficient to close the gap with overall face-to-face persistence rates (80.0%). The 78.4% online persistence rate that could be obtained by such an intervention is not statistically significantly different from the 80.0% face-to-face persistence rate (at the $\alpha=0.05$ level with a one-tailed z -test). This suggests that if a sufficiently effective intervention could be implemented, any online and face-to-face attrition rate gap could be closed by targeting just roughly half of the online courses offered at this college.

Some institutions might conclude from these results that they should limit or prohibit certain types of courses to be taught online, because those courses have a lower retention rate online than face-to-face. While this might help to control online retention, in practice it would be impractical by limiting access for a huge number of students, and would misapply the conclusions of this analysis. It is important to note that the designation as an elective or distributional requirement lies with the student, not the course, as it depends upon a student's major. For example, English 201 may be taken at the college in this study by many students as a distributional requirement, but for English or Writing majors, this course actually fulfills their major requirements. Even if it were practical, removing all the students from online courses who took the course as an elective or a distributional requirement would require prohibiting more than half of the online students from taking courses online, which would defeat the purpose of online education in providing greater access. In particular, the many students who do succeed in these online courses would have fewer course options and may therefore be less likely to persist in college and complete college degrees. Furthermore, removing certain types of courses from the online environment may not actually improve overall online retention. For example, it may be that lower level online courses have lower retention because they contain a much higher proportion of students taking an online course for the first time. If this is the case, eliminating lower level online courses would then likely simply shift increased drop-out rates from lower level to upper level courses.

K. For Research

This study has shown that the type of course in which students enroll can have a drastic effect on their likelihood of withdrawal from online courses. However, before larger generalizations can be made about which types of courses lead to lower retention online in the general college student population, this analysis should be repeated with diverse samples across different campuses. In addition, the reasons for the lower rates of retention in lower level online classes taken as electives and distributional requirements are unclear, and further research could help to explain the reasons for these results.

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