

# Using Community College Prior Academic Performance to Predict Re-Enrollment at a Four-Year Online University

Denise Nadasen  
*University of Maryland University College*

Alexandra List  
*Ball State University*

## Abstract

Students' re-enrollment in the subsequent semester after their first semester at a four-year institution is a strong predictor of retention and graduation. This is especially true for students who transfer from a community college to a four-year institution because of the many external or non-academic factors influencing a student's decision to re-enroll. This research study examines student learner characteristics and course-taking behaviors at the community college and first-term GPA at a four-year institution to predict the likelihood of re-enrollment for 8,200 students from two community colleges who transferred to an online, public, four-year institution. The logistic regression models showed that gender, age, and first-term GPA at the four-year institution were significant predictors of re-enrollment. These findings contribute to the growing literature on transfer students and may provide researchers and practitioners a greater understanding of how community college factors influence the progression and success for transfer students at four-year institutions.

## Introduction

Eighty percent of beginning community college students express an interest in transferring to a four-year university; however, within six years of transfer, only 15% of those students starting at a community college graduate with a four-year credential (Shapiro et al., 2012). While much research has focused on the academic performance of community college students at four-year institutions, less attention has been paid to issues of student persistence (e.g., Townsend & Wilson, 2006; Glass & Harrington, 2010). At the same time, persistence and graduation may have a greater impact on students' long-term goals than their performance at an undergraduate institution. The purpose of this paper is to

develop a model to predict community college transfer students' persistence at a four-year, online university. In particular, this paper operationalized persistence as students' re-enrollment in the immediate next semester after their first semester of transfer to the four-year institution. This measure of early persistence has been found to be a strong predictor of progress through the institution to graduation.

### Theoretical Frame

Research on undergraduate persistence has been guided by two theoretical perspectives on student attrition. The first is Tinto's (1975; 1987) *Student Integration Model*, which identifies four aspects of student-institution interactions that affect persistence. Specifically, Tinto emphasized students' *background characteristics* and *academic goal commitments* and their effects on students' *academic* and *social integration* into the transfer institution as key to preventing student attrition. *Background characteristics* include students' demographic attributes, family backgrounds, and experiences prior to college (Tinto, 1975). *Goal commitments* include learners' motivations for degree pursuit and educational expectations as well as *institutional commitment* to a particular university. *Academic and social integration* are a consequence of students' interactions with a variety of institutional features over time (e.g., office hours, extracurricular activities). Tinto emphasizes the central importance of students' institutional integration, both academic and social, by saying, "we learned that involvement matters and that it matters most during the first critical year of college" (Tinto, 2006, p. 3; Upcraft, Gardner, & Barefoot, 2005).

At the same time, academic and social integration into a transfer institution is not a given for many students. Building on Tinto's earlier work (1975), Bean and Metzner (1985) developed a model of attrition, reflecting the experiences of non-traditional undergraduate students. Non-traditional undergraduate students are those who are older (i.e., 25 and above; Stewart & Rue, 1983), enrolled part-time, non-residential, commute to campus, or represent some combination of these characteristics (Bean & Metzner, 1985). Understandably, this population of students is thought to undergo a socialization process different from that of traditional students like those conceptualized in Tinto's model (1975). Non-traditional students may have different experiences with and potential for institutional commitment and academic and social integration. Bean and Metzner (1985) suggest that this variation may be, in part, because older students exhibit more characteristics associated with maturity. They may, therefore, be less open to socialization processes. Further, because non-traditional students spend more time off-campus they may have more limited contact with socializing agents (e.g., faculty, peers) (Chickering, 1974). While non-traditional students may be less interested in an institution's social culture, they may be more concerned with an institution's academic offerings and credentialing.

Juxtaposing the experiences of traditional and non-traditional learners, for non-traditional students there may be (a) more limited interactions with faculty and peers as well as with college services (i.e., more limited social integration, as per Tinto, 1975), (b) similarity in academic focus and experience (i.e., work experience that parallels the classroom), (c) much greater interaction with the external, non-institutional environment (e.g., work and family commitments), (Bean & Metzner, 1985), and (d) different expectations of the university and the classroom (Houser, 2005).

Based on the differences identified between traditional and non-traditional students, Bean and Metzner (1985) conceptualized students' decisions to drop out as predicated on four general types of variables. The first of these are *background factors*, including students' demographics, past academic performance, and educational goals and expectations. The second consideration is that of students' *academic performance*, encapsulating learners' grades, study habits, and pursuit of a major at the transfer institution. The third set of factors reflects students' *intent to leave*. Considered to be more psychological, these factors include students' goal commitment, perceived utility of a desired credential, and institutional satisfaction. Finally, unique to this model, is the inclusion of *external factors* that may have a direct

effect on students' decisions to drop-out; these include finances, out-of-school work, and family commitments (Bean & Metzner, 1985).

The relation between the four factors identified may be said to be compensatory rather than independent. First, if students' academic outcomes are low, they may, nevertheless, persist, compensating for achievement deficits with high levels of psychological commitment. Further, even when academic performance is low, students will persist if external factors support their continued enrollment. Conversely, when external factors do not support persistence, for non-traditional students, even high academic performance may not be sufficient to ensure continued enrollment. As non-traditional students are much more closely affiliated with non-institutional environments than are traditional students residing on university campuses (Bean & Metzner, 1985; Metzner, 1984), Bean and Metzner suggest that—for non-traditional students—external factors have a much more pronounced effect on attrition decisions than do academic factors. At the institution level, understanding and supporting non-traditional student persistence may be particularly challenging as it may, in large part, be attributed to environmental factors that the institution may not be aware of or able to control.

## Literature Review

In light of Bean and Metzner's model identifying factors that may challenge the academic persistence of non-traditional students, a number of studies have investigated the nature of transfer students' retention at four-year universities. Much of the research has focused on tabulating the attrition, persistence, and graduation rates of community college transfer students and comparing these to the performance of native students (Bean, 1980; Bean & Metzner, 1985).

A report from the National Center of Educational Statistics (NCES; Radford, Berkner, Wheelles, Shepherd, & White, 2010) examined students' persistence not only at their institution of first enrollment (i.e., community college) but also at their transfer destination. NCES determined that for students starting their post-secondary education in community college, six years later 12.9% were still enrolled at the less-than-four-year institution, 6.7% were still enrolled at a four-year institution, and 46.0% were no longer enrolled at any institution, having left without earning a credential. Based on a 2004 cohort, whose enrollment and graduation status were computed in 2009, 54% had succeeded in either earning a credential or were still enrolled in a four-year institution. This number can be compared to the 2004 native cohort of students starting at four-year institutions, only 23.6% of whom had dropped out prior to 2009 without having earned a credential. As such, the persistence and graduation rate of native students at a four-year institution (76.4%) has been found to be over 20 percentage points higher than that of community college transfer students.

Looking more specifically at year-to-year retention, while rates for native students are well documented, little is known about the year-to-year retention of transfer students at either the community college or the four-year institution. From the first to the second year, first time freshmen have been found to be retained at a rate of 76.3% according to Herzog (2005), a bit higher than findings by Bartlett and Abell (1995), who place first-to-second year student retention between 60 and 70 percent. At the same time, rates of retention have been found to vary widely across institutions (Hagerdon, 2005; Summerskill, 1962) and demographic categories (Nora, Barlow, & Crisp, 2005). Although generally, first-to-second year retention has been found to be lower at the community college level than at four-year institutions (e.g., SREB Fact Book, 2007), to our knowledge, no robust, national statistics on community college transfer students' first-to-second year retention exist.

Research on community college and nontraditional students is complicated by conflicting definitions of *retention* and *persistence* as well as by variable standards for calculating persistence. For

example, retention rates for federally mandated reporting are computed for Fall-enrolled, first-time freshmen and thus may exclude many non-traditional students, students starting in a non-Fall cohort, or not working toward a degree. For students enrolled part-time, the window within which retention is calculated may not be sufficiently large to capture their progress toward a degree. From an institutional perspective, students who are not retained may be transferring to alternative institutions or stopping out (i.e., discontinuing their education for a variety of external reasons, beyond the institution's control). Shapiro et al. (2010) describe the challenges associated with computing retention as resulting from the diversity of pathways transfer students may pursue in obtaining a credential.

### **Predicting Retention**

Rather than computing a specific rate of retention, the focus of this paper was on modeling or predicting retention. A limited number of studies have adopted such an approach.

Based on a comprehensive review of the persistence literature, Peltier, Laden, and Matranga (1999) determined gender, race/ethnicity, socioeconomic status, high school GPA, college GPA, and their interactions to be most strongly associated with persistence. Whereas findings about the role of gender in persistence have been mixed (Reason, 2009; St. John et al., 2001), race/ethnicity and prior academic achievement have been robust predictors of persistence (e.g., Astin, 1997; Tross, Harper, Osher, & Kneidinger, 2000; Levitz, Noel, & Richter, 1999).

Murtaugh, Burns and Schuster (1999) used survival analysis to examine traditional, first-time freshmen retention between 1991 and 1996. In their investigation, 25% to 35% of the cohort examined had interrupted enrollment within this six-year period. Specifically, 13.5% of students stopped out for a single term, 10.8% stopped out for two terms, and 1.8% stopped out for three terms, after which they were required to undergo a readmission process. Minority students had a higher rate of withdrawal than did white students; also associated with withdrawal were age, high school GPA, first quarter GPA, area of study, and participation in freshman orientation. In summarizing their work, Murtaugh et al. (1999) highlighted the importance of pre-college characteristics in predicting persistence.

Wetzel, O'Toole, and Peterson (1999) used logistic regression to predict a dichotomous outcome variable (i.e., retained or not retained). Retention was significantly predicted primarily by academic factors, including GPA and the ratio of credit hours students earned to those they attempted. This ratio, termed *course efficiency*, will be the focus of this investigation.

### **Predicting Retention for Nontraditional Students**

While prior work has focused on predicting traditional student retention, more limited work has focused on the persistence of community college transfer students (e.g., Otero, Rivas, & Rivera, 2007). Based on theoretical work (Astin, 1975; Bean & Metzner, 1985; Tinto, 1975), it is reasonable to expect that community college transfer students' persistence may be affected by factors different from those affecting traditional learners. First, given that much of the literature on community college transfer students has focused on students' academic preparedness (Carlan & Byzbe, 2000), learners' prior academic experiences may be particularly important to examine. For community college transfer students, prior academic experience would include not only work from high school, but also college-level course work completed at the community college. Second, community college transfer students may be considered to be nontraditional learners. As such, these students may have strong, external, nonuniversity connections (e.g., family, work commitments, Bean & Metzner, 1985). Given the importance of such external factors in predicting nontraditional student persistence, it may be particularly important to examine community college transfer students' background characteristics and how these relate to academic factors at the four-year institution in predicting retention.

Wang (2008) used logistic regression and found that the probability of graduating with a bachelor's degree for students starting at community college was predicted by gender, SES, high school

curricula, educational expectations, community college GPA, college involvement, and math remediation. Persistence, prior to graduation, was predicted by community college GPA and locus of control. Similar to Wang (2008), this study will look to students' demographic characteristics and community college background factors (i.e., course-taking behaviors) to predict persistence or next-semester re-enrollment.

The target outcome in this study is first year re-enrollment. While this measure has been found to be associated with students' ultimate graduation, it may also be considered to be a metric of transfer students' *fit* or institutional integration in the first year of transfer. Measuring fit in the first year of transfer may be particularly important in understanding community college transfer student success and persistence. Krieg (2010) examined students at Western Washington University, an institution with a substantial population of community college transfer students comprising each class, and found that native (i.e., nontransfer) students were more likely to graduate, even after controlling for demographic characteristics and prior academic performance. Krieg (2010) compares the experience of community college students to that of freshmen at a four-year university. Community college transfer students may have difficulties adjusting to a new learning context; this may result in early attrition if students consider themselves to be incompatible with their new, four-year university environment.

Community college transfer student fit has most commonly been examined by comparing students' academic performance at the community college vis-à-vis the four-year university. Typically, a decrease in performance (i.e., GPA) after transfer has been identified and termed transfer shock (Cejda, Kaylor, & Rewey, 199; Townsend, McNemy, & Arnold, 1993). However, Krieg (2010) has suggested that students' feelings of misfit at the four-year university may manifest more profoundly not in GPA decline, but as rapid attrition from the four-year institution. In other words, community college students who have difficulties integrating into their transfer institution may withdraw quickly, as early as their first semester or first year of transfer. Indeed, the majority of transfer student attrition has been found to occur in the first year of transfer, when students are new to the university setting (Ishitani, 2008; Laanan, 2001; Monroe, 2001).

Krieg (2010) further cautions that early attrition does not occur only among low performing students. Even high performing community college transfer students are more likely to drop out than are their native counterparts. This may be because transfer students have less immediate affiliation and integration into the transfer institution or because community college students may experience unique academic challenges upon transfer. For instance, transfer students are typically required to take a number of prerequisite courses before entering into a major (Krieg, 2010). Such findings are broadly consistent with Bean and Metzner's (1985) proposition that for nontraditional learners, even academic success may not be sufficient to ensure persistence.

### **Present Study**

The purpose of the present study was to examine a predictive model of community college transfer students' first-year persistence at a four-year, online university. In this study, persistence is defined as students' re-enrollment in the immediate next semester after their first semester of transfer. Re-enrollment, as a measure of early persistence, may be considered to reflect both students' integration into the transfer institution and commitment to continued enrollment until graduation.

### **Predictors of Community College Transfer Student Re-Enrollment**

In this study, three types of factors were examined in predicting re-enrollment. These were (a) *demographic factors*, (b) *community college background factors*, including course-taking behaviors, and (c) *course efficiency*, a novel variable developed as a summative measure of transfer students' progress at the community college. Demographic factors, found to impact persistence in prior research, were examined. These included age, gender, and race/ethnicity (see Reason, 2009, for a review). Community college background factors were examined to capture learners' prior academic experience. Rather than



examining GPA, a summative measure of academic performance, well-established as predictive of persistence in prior research (e.g., Reason, 2009; Wang, 2008), students' course-taking at the community college was examined for this research study. Examining course-taking allowed for a more fine-grained analysis of community college transfer students' academic preparedness. For example, math performance at the community college and the need for remediation have been found to be particularly strong determinants of students' success and persistence upon transfer (e.g., Wang, 2008). For transfer students, community college often represents a first encounter with college-level course work. As such, we considered an in-depth examination of course-taking behaviors at the community college and their association with persistence upon transfer.

Finally, a novel metric, *course efficiency*, was introduced as a summative measure of students' community college backgrounds. Students' course efficiency reflects the ratio of credits earned at the community college to the number of credits attempted. Although used infrequently in prior research (e.g., Wetzal et al., 1999), course efficiency captures students' track records in making successful progress toward meeting self-determined academic milestones. Rather than focusing on performance, course efficiency contextualizes students' course completion in terms of their own goals and expectations for progress.

For nontraditional students, course efficiency, or effectiveness and persistence in pursuing academic goals, may better reflect academic success than does absolute achievement, measured by GPA. While GPA only considers academic performance, course efficiency may better capture the real-world consequences of students' deviation from planned academic pathways in terms of time and added financial cost. Additional time and cost may pose particular threats to the successful degree completion of nontraditional students. For nontraditional students, decisions to persist have been conceptualized as a weighing of the costs and benefits of attending college (Tinto, 1986; Braxton & Hirschy, 2000). For instance, students may weigh the costs—financial, psychological, and social—of stepping out of the workforce to pursue a degree vis-à-vis the long-term earning potential associated with earning a credential. Course efficiency can be thought to reflect this type of cost-benefit calculus by presenting a single metric of the relative expediency of students' academic pathways judged against their self-determined goals. In the present study, we were interested in examining the extent to which course efficiency at the community college may predict re-enrollment at the transfer institution over and above the respective roles of demographic and community college background factors.

### Online Context

In this study, predictors of persistence were examined in a unique context: an online university. There are a number of reasons why distinct models of persistence need to be developed for students learning online. For one, even compared to nontraditional students, these learners may struggle with institutional integration because they may have more limited direct, in-person contact with socializing agents like faculty and peers. For another, their institutional interactions may be different in nature (e.g., asynchronous and requiring a greater degree of written communication). Online learners' institutional integration may further be hampered by difficulties connecting with an institution with limited physical infrastructure and facilities.

Learner factors likewise contribute to difficulties with online institutional integration. First, students enrolling in an online university often do so because of limited resources. Specifically, students may pursue online learning because of work or family commitments that prevent their enrollment in a brick-and-mortar institution. In turn, such external commitments may interfere with students' institutional integration and make the cost of pursuing an education particularly high. Further, when learning online, it may be more difficult for students to quickly and directly receive help from professors or peers. Indeed, learning online has been found to require students to be more responsible and self-

directed in their learning (Diaz & Cartnal, 1999; Vonderwell, 2003); however, this may also serve to limit students' openness to institutional integration.

Taken together, both institutional and student factors associated with online learning may combine to reduce students' likelihood of integration into an online university, contributing to attrition. Risk of withdrawal may increase all the more for students transferring from a brick-and-mortar community college to a four-year, online university. Both going from a community college to a four-year institution and transitioning from an in-person learning environment to learning online may contribute to students perceiving a mismatch between themselves and their transfer destination, resulting in withdrawal. Put simply, students unfamiliar with the demands of online learning may make a decision that it is "not for them," and therefore fail to persist.

Considering the increased risk of withdrawal associated with learning online, particularly for community college transfer students, examining persistence in this population is of particular importance. In this study, students' demographic factors, community college course-taking behaviors, and course efficiency were used to predict re-enrollment among community college transfer students enrolled at a four-year university.

This research study addresses the following research questions:

1. To what extent do demographic characteristics predict re-enrollment for community college transfer students at an online, four-year university?
2. Controlling for demographic factors, to what extent do community college course-taking behaviors predict re-enrollment for community college transfer students at an online, four-year university?
3. To what extent does course efficiency at the community college predict re-enrollment for community college transfer students at four-year, online university, once demographic and community college background factors are controlled for?

## Methods

### Participants

Participants were 8,200 community college transfer students enrolled in a four-year online university during an 11-semester window (Fall 2005 – Spring 2011). Students had transferred from two area community colleges, constituting the two largest institutions of origin for students transferring to the four-year university. The sample was majority female (57.5%,  $n=4715$ , 41.3% male,  $n=3387$ ) and had a mean age of 28.68 ( $SD=8.43$ ) years in their first semester of transfer. The sample was racially and ethnically diverse, 21% White ( $n=1727$ ), 43.2% African American ( $n=3546$ ), 10.2% Hispanic/Latino ( $n=837$ ), 10.6% Asian ( $n=866$ ), 0.90% Native American ( $n=76$ ), with 14.0% of the sample not specifying a race.

### Measures

Data for this study were collected through a cross-institutional collaboration between two partner community colleges and a four-year university serving as the transfer destination. Student records were matched across institutions and a combined dataset, reflecting students' records prior to and following transfer, was developed. Demographic factors, courses taken at the community college, community college course efficiency, and first-term GPA at the transfer institution were all used to predict students' persistence, measured as next semester re-enrollment.

**Independent variables.** Four types of predictor variables were used in analyses: learners' (a) *demographics*, (b) community college *course-taking behaviors*, (c) *course efficiency*, and (d) *first-term GPA* at the transfer institution. Each predictor variable will be explained below.

**Learner characteristics.** Four primary demographic variables were considered. These were (a) *age*, (b) *gender*, (c) *race/ethnicity*, and (d) *marital status*.

**Course-taking.** A variety of course-taking behaviors at the community college were examined in the model. These included the subject areas of courses taken and course attributes (e.g., honors).

*Subject areas.* Whether or not students took courses in four different subject areas at the community college was examined. Specifically, dichotomously coded variables for whether or not students had taken courses in *math*, *English*, *speech*, or *computers* were entered as predictors into the model. Courses in these four subject areas were considered to be gateways, mandatory for students seeking a credential and granting students access to higher-level classes across subject areas.

*Course attributes.* Based on an examination of community college student records, three course attributes distinguishing the academic offerings students experienced in community college were considered. Specifically, these were whether or not students had taken a course designated as (a) honors or not or (b) developmental or not at the community college. Also, a dichotomous variable for whether or not students had ever taken an (c) online course was entered into the model. This was considered to be a particularly interesting predictor to examine as our sample included students transferring from brick-and-mortar community colleges to an online institution. Having prior experience in online learning may have improved students' persistence by increasing their familiarity with learning online.

**Course efficiency.** Course efficiency, defined as the ratio of credits earned at the community college to credits attempted, was included as a summative measure of students' community college experiences. In modeling students' community college backgrounds, we considered it important to reflect how many credits students had earned at the community college relative to what their aims were. Credits earned was considered to be an important metric, having implications for timely graduation, and allowing the experiences of students enrolled in community college for varying durations, prior to transfer, to be directly compared.

**First-term GPA.** Finally, as per prior research, first-term GPA at the transfer institution was entered into the model as a predictor of re-enrollment.

**Dependent variable.** Individual difference factors, community college course-taking behaviors, course efficiency, and first-term GPA at the transfer institution were collectively used to predict students' re-enrollment. **Re-enrollment referred to students' enrollment in the subsequent semester, following their first semester of transfer.** Logistic regression was used to predict re-enrollment. Re-enrollment was modeled based on variables associated with students' academic careers at both the community college and the four-year university.

## Results

Three hierarchical logistic regressions were run predicting the dichotomous outcome variable, re-enrollment. The first considered only students' demographic information and first-term GPA at the transfer institution as predictive of re-enrollment. The second regression examined the extent to which demographic information, community college course-taking, and first-term GPA at the transfer institution were predictive of re-enrollment. Finally, a full model of student re-enrollment was examined, including



demographic factors, community college course-taking, course efficiency, and first-term GPA as predictors.

### Demographic Characteristics

In the first model, students' demographic characteristics (i.e., gender, age at transfer, race/ethnicity, and marital status) were entered at Step 1 and first-term GPA at the transfer institution were entered at Step 2. The model was overall significant,  $\chi^2(9) = 655.51, p < .001$ . Specifically, 71.2% of participants were correctly classified as having re-enrolled or not. Looking at pseudo- $R^2$  measures, between 7.77 and 10.81% of variance in re-enrollment was explained by the model, according to Cox and Snell's  $R^2$  and Nagelkerke's  $R^2$ , respectively.

Looking at the individual predictors in the model, gender ( $\beta = 0.16, SE(\beta) = 0.05, p < 0.01$ ), age ( $\beta = -0.01, SE(\beta) = 0.00, p < 0.001$ ), marital status ( $\beta = 0.31, SE(\beta) = 0.07, p < 0.001$ ), and Black ( $\beta = 0.29, SE(\beta) = 0.06, p < 0.001$ ) and Asian ethnicity ( $\beta = 0.19, SE(\beta) = 0.09, p < 0.05$ ) were all significantly associated with re-enrollment, as was first-term GPA ( $\beta = 0.44, SE(\beta) = 0.02, p < 0.001$ ).

### Community College Course-taking Behaviors

A second model was run to examine the extent to which community college course-taking behaviors could predict re-enrollment over and above students' demographic characteristics. Hierarchical regression was used, with demographic characteristics entered at Step 1, community college course-taking behaviors entered at Step 2, and first-term GPA at the transfer institution entered at the final step. The model was overall significant,  $X^2(16) = 695.95, p < .001$ , with 71.38% of students correctly classified as re-enrolled or not. The variance explained was between 8.23% according to Cox and Snell  $R^2$  and 11.45% according to Nagelkerke's  $R^2$ .

In terms of the individual predictors in the model, while demographic characteristics, particularly gender ( $\beta = 0.15, SE(\beta) = 0.05, p < 0.01$ ), age at first transfer ( $\beta = -0.01, SE(\beta) = 0.00, p < 0.01$ ), marital status ( $\beta = 0.30, SE(\beta) = 0.07, p < 0.001$ ), and identification as African American ( $\beta = 0.26, SE(\beta) = 0.07, p < 0.001$ ) were significant predictors of re-enrollment, course-taking in specific subject areas was not (English,  $p = 0.59$ ; Speech,  $p = 0.38$ ; Computers,  $p = 0.38$ ). However, enrollment in math courses was significantly associated with re-enrollment ( $\beta = 0.13, SE(\beta) = 0.06, p < 0.05$ ). While having taken honors courses was not a significant predictor in the model ( $p = 0.29$ ), having taken developmental courses ( $\beta = 0.15, SE(\beta) = 0.06, p < 0.01$ ) and classes online ( $\beta = 0.12, SE(\beta) = 0.05, p < 0.05$ ) were both significantly associated with re-enrollment. Finally, first-term GPA was a significant predictor in the model ( $\beta = 0.44, SE(\beta) = 0.02, p < 0.001$ ).

### Course Efficiency

The final model examined the full cadre of predictors, including students' demographic characteristics, course-taking behaviors at the community college, community college course efficiency, and first-term GPA. The model was overall significant, with 71.31% of students successfully classified as re-enrolling or not. According to Cox and Snell's  $R^2$  8.35% of variance in re-enrollment was explained, whereas according to Nagelkerke's  $R^2$  11.61% of variance was explained.

Looking to the individual predictors, demographic characteristics [i.e., gender,  $\beta = 0.15, SE(\beta) = 0.05, p < 0.01$ ; age,  $\beta = -0.01, SE(\beta) = 0.00, p < 0.05$ ; marital status,  $\beta = 0.30, SE(\beta) = 0.07, p < 0.001$ ; and identification as African American, as compared to White,  $\beta = 0.25, SE(\beta) = 0.07, p < 0.001$ ] were all significant predictors in the model. Further, while course-taking in particular subject areas was not significantly predictive of re-enrollment [i.e., English,  $p = 0.72$ ; Math,  $p = 0.05$ ; speech,  $p = 0.20$ ; computers,  $p = 0.41$ ], enrolling in developmental education,  $\beta = 0.14, SE(\beta) = 0.06, p < 0.05$ , and taking courses online,  $\beta = 0.10, SE(\beta) = 0.05, p < 0.05$ , were significant predictors in the model. Finally, both course efficiency,

$\beta = -0.00$ ,  $SE(\beta) = 0.00$ ,  $p < 0.01$ , and first-term GPA at the transfer institution,  $\beta = 0.46$ ,  $SE(\beta) = 0.02$ ,  $p < 0.001$ , were significant predictors of re-enrollment.

Interestingly, minority status (i.e., reporting African American race/ethnicity) in the full model as well as in models prior was positively associated with retention. As compared to White students, African American students were 1.25 times more likely to re-enroll, holding all other factors consistent in the model. This is a notable finding given that minority status has often been considered to be a risk factor for college completion (Murtaugh et al., 1999). Further, course efficiency in the final model was a slightly negative predictor of re-enrollment at a four-year institution.

## Discussion

This study examined factors associated with community college transfer student persistence at a four-year online university. Variables associated with performance at both the community college and the institution of transfer were examined. Consistent with prior research, demographic variables were found to be significantly associated with re-enrollment. In particular, both age and marital status were found to have a positive association with persistence. While it may be the case that nontraditional students, who are older and face the demands of balancing career and family, may struggle with prioritizing academics, it seems that for these students, added maturity serves to improve academic achievement. Older students, potentially working while in school, may also benefit from their work paralleling activities in the classroom.

An important finding in this study is that across models, African American students were more likely to persist than were their White counterparts. While prior work has associated minority status with lower academic achievement (Brown, Brown, Beale, & Gould, 2014; Gentry, 2014; Farmer & Hope, 2015), it may be the case that minority students are motivated to persist, even in the face of academic challenge. Alternately, it may be the case that when provided with the autonomy and flexibility afforded by online learning, minority and other at-risk students are able to successfully persist in their academic pursuits. Further examining the interaction between measures of both achievement and persistence for at-risk students is a promising avenue for further investigation.

Course-taking at the community college was found to have a limited effect on persistence. Specifically, students' course-taking in particular subject areas was not a significant predictor of re-enrollment. This may have been because all students were required to take core courses in specific subject areas, limiting their variability. Alternately, it may have been the case that not taking courses in particular subject areas was associated with students' intent to transfer and to complete required courses at the transfer institution. Further work should consider how constellations of courses taken or majors pursued may impact persistence at the transfer institution. Indeed, transfer students' academic performance has been found to differ across subject areas (Cejda, Kaylor, & Rewey, 1998), however the associations between areas of study and persistence have not been as well documented.

At the same time, students' enrollment in a developmental course and an online course during their time in community college was positively associated with re-enrollment at the transfer institution. While taking a developmental course may be associated with limitations in community college students' preparedness, this may also signal students' commitment to building fundamental skills necessary for academic success. Online course-taking at the community college may have served to prepare students for the demands of learning in a fully-online university. Further, taking courses online may have helped students decide whether learning online was a good fit for their needs and desires as a student. Both completing developmental course work and attempting an online course at the community college may be indicative of students' forethought and planning to transfer to a four-year institution.

Course efficiency at the community college was a strong predictor of persistence at the transfer institution. In addition to reflecting students' abilities and motivation to complete course work successfully, course efficiency may have provided transfer students with an advantage upon transfer. Specifically, students with a high rate of course efficiency may have completed more credits at the community college in a shorter amount of time. This means that they may have transferred to a four-year institution with more time and energy ready to dedicate to degree pursuit—a particular concern for non-traditional learners. More needs to be known about whether course efficiency at the community college best reflects students' academic abilities, skills in successfully completing course work, or some combination of these two factors. However, considering the strength of course efficiency in predicting early persistence, more work is needed to better understand this factor and to provide community college students with interventions to support efficient and efficacious course-taking.

The strongest predictor of persistence was first-term GPA at the transfer institution. This was an expected finding. The strong association between first-term GPA and persistence may come, in part, from these measures being captured at the same institution, within a close period of time. Further, these two measures may be closely associated because transfer students consider first-term GPA in their decisions to persist or withdraw. Students may use first-term GPA as a barometer not only of their academic performance but of their institutional fit as well (Krieg, 2010). Results in this study are consistent with prior research that has considered first-term GPA to be a measure of students' institutional integration.

## Conclusions and Implications

This study contributes to the literature on community college transfer student success in at least four ways. First, it tracks the academic trajectories of a robust student sample across institutions, from community college to a four-year university. Second, this study examines student persistence in a unique academic context—in a four-year, online university. Third, in addition to using well-documented predictors of persistence, including demographic factors and first-term GPA, this study examined the role of a novel factor, course efficiency, in predicting student persistence. Finally, by examining specific courses taken at the community college, this study provides insight into potential areas for intervention to improve community college students' transition from a two-year to a four-year institution.

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Correspondence concerning this article should be addressed to Institutional Research, University of Maryland University College, 3501 University Boulevard East, Adelphi, MD 20783.

Contact: [denise.nadasen@umuc.edu](mailto:denise.nadasen@umuc.edu)

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