



Does online learning impede degree completion? A national study of community college students



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ABSTRACT

Using a nationally representative sample (The Beginning Postsecondary Student Survey, BPS 04/09), this study examined the associations between enrollment in credit-bearing distance education courses and degree attainment. We sought to determine whether US students enrolled in distance education courses during their first year of study at a community college tend to complete a degree (certificate, associate, or bachelor's) at significantly lower rates than those who were not enrolled in such courses or programs. Consistent with previous large-scale research at the State level in Virginia and Washington (Smith Jaggars & Xu, 2010; Xu & Smith Jaggars, 2011), we hypothesized that community college students who participate in distance education in early semesters graduate at lower rates than students who do not. Contrary to expectations, the study found that controlling for relevant background characteristics; students who take some of their early courses online or at a distance have a significantly better chance of attaining a community college credential than do their classroom only counterparts. These results imply that a new model of student retention in the age of the internet, one that assumes *transactional adaptation*, may be warranted.

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1. Introduction

Numerous recent reports have indicated that the United States is not producing sufficient numbers of college graduates and is thereby losing competitive advantage in the global economy (Hebel, 2006; Kelderman, 2013). These worries are magnified when the subject of investigation is the community college where completion rates are historically lower than in baccalaureate institutions (Goldrick-Rab, 2010). With six year national completion rates of approximately 20%, justifiably or not, community colleges have been the target of a great deal of criticism. This is particularly concerning given that national policy commentators continue to emphasize that community colleges are crucial to supporting the US economy (The College Board, 2008). Furthermore, spending on community college students has had a particularly poor return with regard to degree attainment. For example, the Delta project (Kirshtein & Wellman, 2012) concluded that “nearly half of instructional spending in community colleges goes to students (and credits) that do not attach to a degree or certificate” (p. 16).

Low rates of degree completion raise questions about efforts to increase access to higher education for community college students. We know from more than a decade of research that the fastest growing segment of higher education is distance education carried out through online learning (Allen & Seaman, 2011). Various estimates indicate that between 25% and 33% of the college students in the US are enrolled in at least one online course (Allen & Seaman, 2013; NCES, 2013). These estimates equate to between 5.5 and 7 million college students yearly nationwide, the majority of whom are community college students. In recent years the growth rate of credit-bearing online course enrollments has been roughly ten times the growth rate of US higher education generally (Allen & Seaman, 2011). In the most recent year for which data is available the population of online learners grew at over 9% while higher education generally saw a decline in enrollments (Allen & Seaman, 2013).

The sizable growth in online course and program offerings in community colleges across US coupled with unprecedented low graduation rates among community college students raises a series of unsettling questions such as: Has increased access via online learning simply

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resulted in more college students rather than more college graduates?; Does online learning merely increase a costly population of higher education learners without increasing the efficiency or effectiveness of college degree completion? Given the increased flexibility and convenience that is often cited as an advantage of online learning, this seems somewhat difficult to believe. However, significant evidence exists to suggest that online learning outcomes at the community college level are actually worse than comparable classroom based outcomes.

The purpose of the current study is to examine national data to examine whether evidence exists that can help to address these questions.

1.1. Conceptual perspectives

The attainment of college credentials is closely associated with and contingent on college retention, persistent, and departure. Although no specific model exists for online education, retention research in higher education more generally has been a focus of study for decades (Bean & Metzner, 1985; Pascarella & Terenzini, 1979; Tinto, 1975; Tinto & Cullen, 1973). Two primary models have been developed to explain retention patterns among traditional college students (e.g. Tinto, 1975; Tinto, 1998) and non-traditional students (e.g. Bean & Metzner, 1985). In essence Tinto's model depicts the decision to complete or depart from college as a matter of students' adaptation to the institution of higher education and the achievement of a sense of academic and social integration within the cultural setting of a college campus. Those students who are able to adapt and attain a sense of academic and social integration are retained and those who fail to adapt drop out.

For non-traditional learners, primarily commuter students in Bean and Metzner's (1985) model, the social dimensions affecting the decision to stay or leave college are largely replaced by psychological and environmental ones. Noting that commuter, part-time, and other non-traditional students frequently do not relocate to campus the work in this area focuses on different factors impacting the college departure decision. Encouragement from family, employers, and co-workers and perceived utility of coursework shapes the options and choices of non-traditional students far more than fitting into the social milieu of a college campus (Bean & Metzner, 1985). The retention and success of non-traditional students is thus seen to be dependent on psychological, pragmatic, and financial factors. Non-traditional students who manage to adapt to the demands of work, family, and college are retained and those who fail to make the necessary adjustments that fit participation in college into their lives depart.

An updated and more sophisticated conceptual model is found in the work of Falcone (2011) who adds dimensions absent from prior work. In Falcone's model students bring forms of situational self-efficacy (*habitus*), various forms of capital (social, economic, cultural), and memberships in internal and external communities that shape goals and commitments to higher education and other priorities. All of these in turn impact students' experiences and perceptions of the academic and social realities of college life in both traditional or non-traditional contexts. These experiences shape the students perception of academic and social fit with higher education which then affects decisions to continue, to transfer, to attain a specific objective (e.g. a degree or certificate), or to depart (see Fig. 1).

None of these models (traditional/non-traditional/updated) explicitly reflect forms of institutional response to students, for example, the provision of online learning environments in higher education. The more flexible pathways afforded through internet-based forms of distance education might, however, enable college students to integrate more successfully the academic, social, psychological, professional, and familial dimensions of college participation. These new pathways and other categories of techno-social institutional adaptation may require a re-thinking of how we view not only retention, but also persistence, degree completion, and other variables related to educational attainment in the rapidly expanding sphere of online learning.

Conspicuously absent from previous accounts of college student retention is the interaction between institutional and individual adaptation. Until recently there appears to be an unexamined assumption in the conceptual literature that individual students, be they

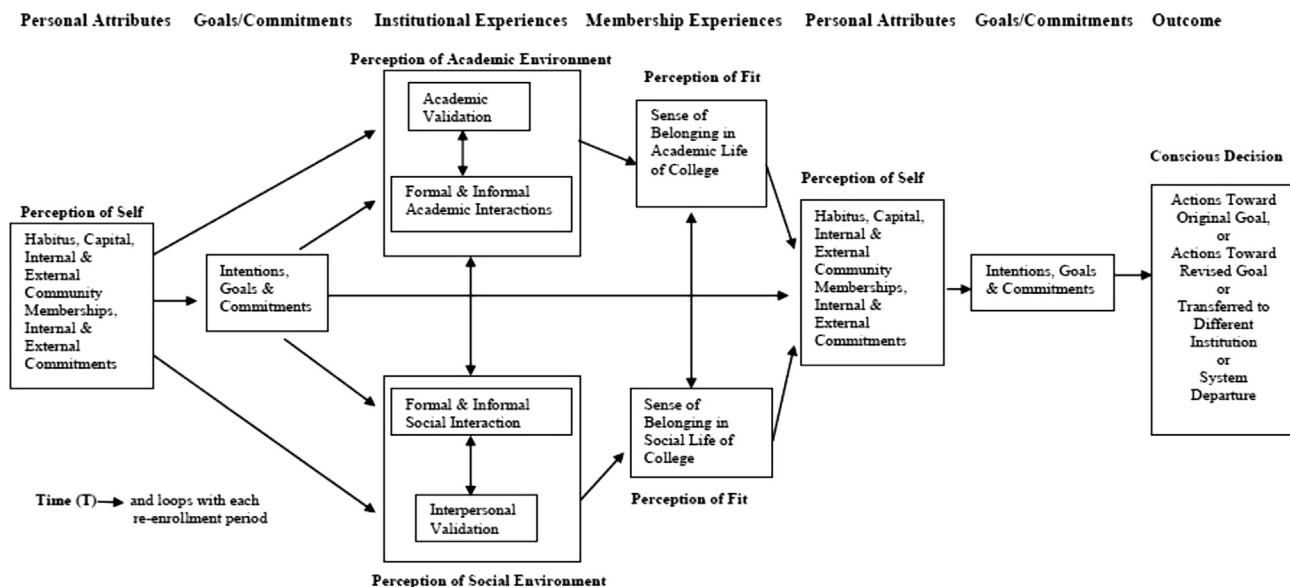


Fig. 1. Falcone's model of student persistence in higher education.

traditional 18–22 year old residential learners or non-traditional commuter, older, part-time, or distance students are responsible to adapt to a relatively inflexible, monolithic institution of higher education. In earlier models traditional residential students were assumed to undergo a challenging transition from life at home, with familiar friends and family to a temporally and physically altered existence with new surroundings and new acquaintances on campus. Success in this model depends on active academic and social adaptation on the part of the student. In non-traditional models of retention non-residential and part-time students are believed to confront competing priorities from family and professional lives that require additional support and encouragement for success. Success for non-traditional students assumes psychological, familial, financial, and or professional adaptation to higher education. Both traditional and non-traditional models assume adaptation on the part of the student, but fail to systematically articulate forms of institutional adaptation to the needs of students. In other words, no model examines the successful transition to college as necessarily and explicitly *transactional* in which both institution and individual change and respond to evolving needs.

We believe that recent technologies, pedagogies, and services that have been widely adopted throughout higher education (Allan & Seaman, 2013) allow for greater organizational flexibility and responsiveness reflected, *in part*, in online forms of distance education. The interactive nature of recent technologies and the social practices they enable create a transactional space, one that allows for mutual adaptation between the learner and the institution. One combination of interactive technologies and new social practices is represented in online learning. Rather than treating students as entities that adapt to an inflexible higher education environment, aided by the Internet and other interactive technologies, colleges must become social institutions sensitive to the unique goals and needs of individual students. It is reasonable to conceive online education options as one form of technology enabled *transactional adaptation* that may better explain patterns of community college success in the age of the internet. Despite the promise of online education from conceptual standpoint, a number of more recent studies have reported negative findings. Therefore, the degree to which the convenience long associated with traditional online education provide an alternate, more adaptive institutional pathway to college credentials and other desirable outcomes remains to be seen. Given the lack of support for the previously noted theoretical assumptions, in this investigation, we were guided by the following overarching question: Do community college students who avail themselves of online learning options complete college credentials at higher rates than those who do not?

1.2. Previous empirical findings

There is general consensus that online and distance education do not differ significantly from classroom education when defined by various course-level learning outcomes (Bernard et al., 2009; Means, Toyama, Murphy, Bakia, & Jones, 2009; Tallent-Runnels et al., 2006; Zhao, Lei, Yan, Lai, & Tan, 2005); However, little research exists examining outcomes at a broader level including persistence, attrition, and attainment of college credentials. The few studies addressing these outcomes have not been positive, especially for community college students. For example, previous researchers who have studied large samples of online learners in state systems (e.g. Smith Jaggars & Xu, 2010; Xu & Smith Jaggars, 2011) have reported several discouraging findings. Analyzing data on nearly 24,000 students in 23 institutions in the Virginia Community College system Smith Jaggars and Xu (2010) concluded that learners had a greater likelihood of failing or withdrawing from online courses than from face-to-face courses. The authors also found that students who took online coursework in early semesters were somewhat less likely to return to school in following semesters, and students who took a higher proportion of credits online were slightly less likely to attain a credential or transfer to a four-year institution.

These same authors (Xu & Smith Jaggars, 2011) also studied the Washington State Community College Systems and came to similar conclusions. Analyzing data from more than 51,000 students in 34 community and technical colleges Xu & Smith Jaggars found that although students with better educational preparation were more likely to enroll in online courses, these students were also significantly more likely to fail or withdraw from these courses than students who took traditional face-to-face classes. Washington State Community College students who took more online courses were also slightly less likely to complete a degree or transfer to a four-year college than those who took fewer online courses.

Taken together these studies do not provide much support for a strategy of increasing access to community college through online education, nor one that views online education as an adaptive transactional approach to the needs of community college students. In fact, the opposite conclusion can be drawn. Inferior outcomes for online learners do not support this form of distance education as an adaptive institutional response to the needs of community college students. Moreover, given the high costs associated with low completion rates one would infer that online learning produces more college students but fewer students with vital college credentials upon completion and is thus both less efficient and effective in achieving the goals of producing more college graduates in the US.

To further shed light on these issues, the current investigation attempts to build upon and add to the literature on the impacts of participation in online and distance education on community college degree completion by looking at a national, rather than State samples of community college students. While it is clear that the conclusions drawn from the students in Virginia and Washington don't hold great promise with regard to online learning, it may be that a national sample yields different results. We therefore utilize data from the *Beginning Post-Secondary Survey (04/09)* to determine if national trends are consistent with negative conclusions drawn from analysis of large-scale State level data.

1.3. The present study: scope and data analytic approach

The study focused on the degree completion rates of community college students with and without distance education experiences within their first year of college. Consistent with findings reported in previous studies, we hypothesized that degree completion rates are likely to be lower for students who were enrolled in distance education courses. To this end, we utilized the most recent data from the *Beginning Postsecondary Students Longitudinal Study (BPS:04/09)* collected by the *National Center for Education Statistics (NCES)*. BPS:04/09 tracks longitudinally a large sample of students who first enrolled in postsecondary education during the 2003–2004 academic year. Students participated in three rounds of data collection, during their 1st, 3rd, and 6th year after beginning college. More than 18,000 students participated in the study. Given that BPS:04/09 constitutes the most recent comprehensive national survey of students attending

Table 1
Percentages for the categorical study variables by distance education.

Variable	No distance education courses	Distance education courses	Total percent
Gender			
Male	44.05	34.25	42.8
Female	55.95	65.75	57.2
Race			
Caucasian	59.42	66.35	60.32
African American	16.19	9.72	15.35
Hispanic	14.95	15.0	14.94
Asian	4.48	4.44	4.47
Other	4.96	4.48	4.90
Disability	11.3	9.6	11.1
U.S. born	87.70	89.49	87.93
Remedial coursework	31.51	32.18	31.6
Type of high school attended			
Public	82.00	85.96	82.51
Private	4.90	3.07	4.66
Foreign	2.94	3.18	2.98
Other	10.16	7.7	9.84
Primary language: English	87.84	89.20	88.01
Reasons attending: financially affordable	69.64	66.43	69.22
Reasons attending: location	84.62	81.97	84.28
Reasons attending: family reasons	38.03	39.39	38.21
Reasons attending: program coursework	43.55	43.62	43.55
Reasons attending: reputation	36.16	32.79	35.73
First choice school accepted	93.89	93.01	93.78
High school degree type			
Traditional high school diploma	86.9	89.04	87.18
GED/completion certificate	9.78	7.02	9.42
Other	3.32	3.95	3.40
Degree goal first year			
Certificate	6.26	2.97	5.84
Associate's degree	28.05	28.79	28.15
Bachelor's degree	65.68	68.24	66.02
Degree program first year			
Certificate	5.17	4.02	5.0
Associates	94.82	95.98	95.0
U.S. born parents	76.54	77.71	76.69
Parents taking college courses	7.40	9.46	7.67
Parents' highest level of education			
Do not know/no high school diploma	11.77	6.75	11.12
High school	32.18	29.66	31.86
Vocational training/less than two years of college	12.84	13.30	12.9
Associate degree/more than 2 years of college	15.44	18.19	15.79
Bachelor's degree	16.83	18.71	17.08
Master's/professional/doctoral degree	10.94	13.38	11.25
Siblings in college before respondent	29.29	24.79	28.71
CC: accredited	4.10	0.4	4.50
CC: historically Black institution	2.21	1.24	2.09
CC: Hispanic serving institution	15.24	15.86	15.32
CC: in state of residence	95.88	95.07	95.77
CC: type of college			
Rural	31.51	32.71	31.67
Urban	33.33	32.42	33.21
Suburban	26.31	29.01	26.66
Other	8.85	5.86	8.46
Degree attainment			
Attained bachelor's degree	10.96	14.02	11.36
Attained associate's degree	15.44	19.87	16.01
Attained certificate	8.57	8.67	8.57
No degree, still enrolled	20.05	16.25	19.55
No degree, left without return	44.99	41.30	44.51
Transfer	39.63	42.96	40.06
Total	87.1	12.9	100

Note. The percentage is within category (no distance education vs. distance education). For the dichotomous variables percentages are presented only for the "Yes" response category.

postsecondary institutions, we are able to address the study's hypothesis to produce nationally generalizable findings that are directly applicable to current educational policies and practices related to online learning, retention, persistence, and degree completion.

The primary outcome of interest in the study was degree attainment. This variable was modeled as a function of enrollment in distance education courses at a community college level controlling for a range of background characteristics. That is, our study entailed comparison of groups – students enrolled in traditional face-to-face courses and students enrolled in distance education courses during their first year of study in a community college. In order for valid inferences to be drawn, the two groups had to be identical with respect to prior background characteristics. Conventional procedures for ensuring group equivalence in non-randomized experiments involve the use of covariates to

adjust for pre-existing differences or matching. These procedures are not optimal when there is a wide range of confounding variables (Rosenbaum & Rubin, 1984). However, propensity score analysis (Rosenbaum & Rubin, 1983) is the best alternative approach used to equalize two or more comparison groups and adjust statistically for self-selection bias in the context of observational studies not involving random assignment. In this approach, known confounding variables are combined to yield a single metric – a propensity score. The propensity score, typically derived with the means of logistic regression, conveniently summarizes all information on a set of confounding variables (covariates) and represents an estimated, conditional probability of being in the focal condition of interest (enrollment in distance education courses, in this case), given the pre-specified confounding factors. Unlike regression procedures—the standard methods used to control over different extraneous variables—the propensity score method can take into account numerous covariates simultaneously (D’Agostino, 1998) without regards to multicollinearity and lack of power, which often arise when many related control variables are utilized (Hong & Raudenbush, 2008). Because each participant, regardless of whether he/she has received or not received the treatment of interest, has a known probability score of being in the treatment, participants in one of the two conditions (i.e., enrollment in distance education courses) can be matched with the individuals in the other condition (i.e., enrollment in traditional face-to-face courses), based on their propensity scores. Alternatively, the estimated propensity scores can be used to create strata (or subclasses) including subjects of both groups with similar propensity scores (Rosenbaum & Rubin, 1983). Further unbiased group comparisons on outcomes of interest are then possible, regardless of the type of propensity score adjustment implemented (D’Agostino, 1998; Hong & Raudenbush, 2008).

2. Method

2.1. Data sources

Data for BPS 04/09 were collected from approximately 16,100 first time beginning students at three points in time (in spring of 2004, 2006 and 2009) and included a variety of socio-demographic characteristics, school and work experiences, and outcome variables such as academic performance, persistence and degree attainment. Participants in BPS represent a target population of approximately 4,000,000 first time beginning post-secondary students. Of these, approximately 43.1% were first enrolled in two-year public institutions offering an associate’s or a certificate degree. The analytic sample was delimited to community college students who were pursuing a degree (certificate or associate’s), were enrolled in a degree program, and had a high school diploma or certificate. Community college students without a goal to attain a degree ($N \approx 560$) were enrolled in a non-degree program ($N \approx 920$) and those without a high school diploma ($N \approx 110$) were excluded. The resulting sample consisted of approximately 4600 cases. Weighted analysis indicated that 12.9% of these first-year college students had taken one or more distance education courses during their first year of study. Based on weighted analyses, the rates of degree attainment were somewhat higher for students participating in distance education in 2003/04 (See bottom of Table 1). Descriptive statistics for the demographic variables and variables used in propensity score estimation are presented in Tables 1 and 2, respectively.

2.2. Measures

The propensity score method utilizes terminology from randomized experiments, which divides the measures into three categories: *confounding covariates*, *treatment and outcomes* (Stuart & Green, 2008). The *treatment variable* of interest was participation in distance education in the first year of postsecondary education. The variable was derived from one item of the BPS/04 student survey, asking the respondents to indicate whether they had taken distance education courses or not in 2003/04. The *outcome variable* in the analysis was persistence – completion of a certificate or an associate degree within the 6-year time frame of the study.

Confounding covariates are associated with both the selection into treatment group and outcome (Rosenbaum & Rubin, 1983), and therefore were used to construct a propensity score in attempt to control for selection bias. The following person, family and contextual variables were used in propensity score estimation: (a) person variables: gender, age, race, risk index of dropping out (NCES derived), disability status, place of birth (U.S. vs. not), remedial coursework eligibility, traditional high school diploma or not (GED, certificate of completion, homeschooled), type of high school (public, private, other), total amount of loans during the first year, total amount of aid during the first year, primary language spoken at home (English vs. not), location, affordability, nature of coursework, reputation and family as reasons for attending the first year institution, acceptance in first choice institution, number of institutions applied to, number of institutions accepted; (b) family variables: gross adjusted family income, parents’ highest level of education, family size, siblings in college before respondent, parents taking college courses, parents’ place of birth (U.S. vs. not); and (c) institutional variables: distance from home,

Table 2
Means and standard errors for the continuous study variables by distance education.

Variable	No distance education		Distance education		Total	
	M	SE	M	SE	M	SE
Age	22.95	0.23	24.01	0.70	23.08	0.21
Risk index	2.03	0.06	2.14	0.15	2.0	0.05
Total loans (sign)	435.25	37.40	294.14	50.54	417.0	20.89
Number of institutions accepted	1.56	0.02	1.57	0.05	1.59	0.02
Number of institutions applied	1.77	0.03	1.82	0.07	1.84	0.03
Total aid first year	1738.61	78.14	1651.62	147.02	1724.4	52.87
Home distance from home–first institution	34.40	3.80	51.74	12.10	36.64	3.89
Adjusted family income	46,020.18	1401.59	46,397.80	3456.68	46,069.01	1418.08
Family size	3.59	0.04	3.61	0.09	3.62	0.04
Institutional enrollment – first year institution	9311.77	492.41	9607.07	752.68	9349.95	584.77
Percent receiving federal aid – first year institution	36.75	1.63	35.76	1.87	36.62	1.78
Months of enrolled full time	21.73	0.39	22.52	1.03	21.73	0.39

historically black institution, Hispanic serving institution, accreditation, in-state institution, size of enrollment, percent of student body receiving federal grants, and type of institution (rural, suburban, urban or other).

2.3. Procedure

The data analytic procedure consisted of three steps. *First*, we estimated a student's propensity of distance education participation as a function of all covariates. *Second*, we stratified the sample into five strata on the basis of participants' estimated probability of being a distance education participant and checked if balance within strata on covariates was achieved. *Lastly*, since the cases falling in each stratum (both students in a distance and non-distance program) have the same distributions on the observed covariates, we controlled for propensity score and were thus able to estimate differences in degree attainment between students with documented participation in distance education and students without distance education participation. To achieve this, we carried out a binary logistic regression analysis with the measure of degree attainment as a dependent variable, controlling for propensity score and three additional confounding factors – degree goal (certificate, associate, or bachelor's degree), number of institutions attended, number of interruptions in continuous enrollment, and months of full time enrollment.

3. Results

Initial examination of the available data revealed that students who had taken some of their courses online appeared to be attaining associate's degrees at higher rates than those who had not. For example, 13.5% of students in the BPS Survey who had taken some of their courses online or at a distance in 2004 had attained an associate's degree by the 2008–2009 academic year. This compared to a four-year associate's degree completion rate of only 8.9% of students who had not taken courses online or at a distance. For students who had taken some of their distance course via the internet in 2004, i.e., online distance education, the associate's degree completion rate was even higher, 14.1% compared to 8.9% of student who had not taken online courses. This initial analysis, however, does not take into account other factors that might contribute to higher success rates among students who take online courses.

3.1. Propensity score estimation

Using binary logistic regression, we modeled the probability of participation in distance education as a function of the 40 covariates listed in Table 1 and described in previous sections. The study's design effects were not taken into account at this step, because inferences about the population-level propensity score model were not sought (see Zanutto, Lu, & Hornik, 2005). With this in mind, the results from the logistic regression analysis do not represent population parameters. Table 3 presents only the effects which are significant at α of .10.

Results indicate that female students ($p < .001$), older students ($p < .001$), students from larger families ($p < .05$), and students with a higher amount of institutional aid ($p < .01$) and loans ($p < .05$) were more likely to take distance education courses. In addition, students whose residence was at a greater distance from the institution and those of greater risk of not completing a degree were somewhat more likely to be enrolled in distance education courses ($p < .10$). The odds of taking distance education courses were lower for black students as compared to white students ($p < .001$) as well as for students who had indicated that location ($p < .05$) represents a reason for attending a particular institution.

3.2. Stratification and balance checks

The sample was further divided into five strata based on the estimated distance education propensity scores. Table 4 shows the distribution of distance and non-distance education students within each stratum. Because ensuring a balance between treated and non-treated students is crucial, we performed a series of additional analysis to check if students belonging to the treatment and non-treatment groups within each stratum were comparable. Statistical hypotheses testing involved using each covariate from the stage of propensity score estimation as a criterion regressed on treatment and dummy coded propensity score stratum. Lack of systematic differences is assumed when less than 3–5% of the tests of group differences are significant (Hahs-Vaughn & Onwuegbuzie, 2006). A balance with respect to the distribution of covariates within each stratum was achieved; none of the effects of distance education on the covariates were statistically significant.

Table 3
Predictors of enrollment in distance education courses.

Predictor	B	SE (B)	Wald F	P	Odds ratio
Intercept	-3.106	0.916	11.504	0.001	0.045
Female	0.342	0.099	11.958	0.001	0.71
Age	0.024	0.007	10.667	0.001	1.024
Race			17.67	0.001	
Risk index	0.069	0.037	3.58	0.058	1.072
Total loans	0.000	0	4.49	0.034	1
Reason for attending: location	-0.255	0.123	4.295	0.038	0.775
Total aid	0.000	0	7.189	0.007	1
Distance from home	0.000	0	3.192	0.074	1
Family size	0.077	0.033	5.325	0.021	1.08

Table 4
Stratum membership: percentages by distance education.

Strata	Distance education courses	No distance education
Stratum 1	6.74	93.26
Stratum 2	9.88	90.12
Stratum 3	11.16	88.84
Stratum 4	14.20	85.80
Stratum 5	19.05	80.95

3.3. Differences between distance education students and non-distance education students in degree attainment

We evaluated two logistic models. The outcome variable in all analyses was highest degree attained (certificate, associate and bachelor's combined) with "no degree" as a reference category. The baseline model presented in Table 5 (*Model 1*) included only distance education as a predictor of completion of highest degree. Results indicated that the odds of graduating increase for students with distance education coursework during their first year of study, pseudo $R^2 = .004$, Wald $F(1, 240) = 5.76$, $p = .016$. Degree completion is likely to be contingent on a variety of other factors. To account for this possibility, in the second model (*Model 2*) we assessed the impact of distance education controlling for propensity score stratum membership, degree goal in the first year (certificate, associate, or bachelor's terminal degree), number of months attended full time, number of interruptions in continuous enrollment and number of institutions attended. All variables contributed significantly to the prediction of degree attainment, Wald $F(10,230) = 39.932$, $p < .001$. Number of institutions attended does not increase the odds for degree completion ($B = .072$, *n.s.*). The number of periods of interruptions in continuous enrollment had a negative effect on the likelihood of degree attainment ($B = -.232$, $p < .01$) while number of months of full time enrollment increase the chances of degree attainment ($B = .062$, $p < .001$). All other being equal, students whose initial goal was to earn a certificate were about three times more likely to graduate ($B = 1.168$, $p < .001$) while there were no differences in the odds of degree completion between students with plans for a bachelor and those with a goal to earn an associate degree ($B = .184$, $p > .05$). The effect of distance education diminished with the inclusion of the controls but retained its significance ($B = .300$, $p < .05$) suggesting that the factors considered only partially explain differences in degree attainment rates.

4. Discussion

4.1. Empirical findings

There are several notable findings that are worth discussing in this study. Unlike previous researchers who studied community college students who participated in online and distance education (Xu & Smith Jaggars, 2011; Smith Jaggars & Xu, 2010) we did not find that such students were necessarily better-prepared academically. Using an NCEES derived risk category for drop out we found an overrepresentation of higher risk drop out among distance students on six of the seven variables that make up that category. We also found that students who went to private high schools were underrepresented among those who took online and distance courses. We therefore conclude that online and distance students appear to be no better academically prepared and possibly somewhat less academically prepared and/or less likely to graduate than students who did not take distance or online courses.

Despite this potential initial disadvantage we were unable to replicate findings from previous studies indicating that online and distance community college students were less likely to complete a community college credential. Again, this national level data yields the opposite conclusion. Evidence suggests that early participation in online learning and distance education predicts higher rates of degree attainment even when self-selection bias is controlled for. In contrast to concerns expressed by Smith Jaggars & Xu (2010), this does not appear to be an

Table 5
Results from logistic regression predicting attainment of highest degree.

Predictor	Model 1				Model 2			
	B	t	p	Odds ratio	B	t	p	Odds ratio
Distance education coursework ^a	0.316	2.423	0.016	1.372	0.300	2.052	0.041	1.249
Propensity score strata ^b					Wald $F(4,240) = 4.658$, $p = 0.001$			
Stratum 1					-0.508	-3.114	0.002	0.602
Stratum 2					-0.547	-3.459	0.001	0.578
Stratum 3					-0.513	-3.082	0.002	0.599
Stratum 4					-0.269	-1.866	0.063	0.764
Degree goal ^c					Wald $F(2,240) = 12.602$, $p < 0.001$			
Certificate					1.168	5.009	0.000	3.216
Associate					0.184	1.204	0.230	1.202
Months full time					0.062	15.366	0.000	1.064
Number of enroll.					-0.232	-3.078	0.002	0.793
Interruptions								
Number of institutions attended/transfer					0.072	0.806	0.421	1.075
Overall model	Wald $F(1,240) = 5.871$, $p = 0.016$				Wald $F(10,230) = 39.932$, $p < 0.001$			

Note.

^a Reference category: no distance education.

^b Reference category: stratum 5.

^c Reference category: bachelor's degree goal.

effect of better, more motivated, or more academically prepared students self selecting into distance education. It appears to hold true for all students in this national sample. In fact, given the overrepresentation of students *at risk of not attaining a degree* among distance education students and online learners these results are particularly surprising. By some measures distance education students are somewhat less prepared (e.g. fewer of them attended private high schools) but still have a better chance of graduating college than students who do not take distance education courses. Put simply, at a national level, even potentially less prepared students who participated in distance education early in their college careers were more likely to attain a degree than students who had not done so.

Given these results we tentatively concluded that rather than representing an inefficient or ineffective path to the completion of valuable college credentials for community college students online learning appears to represent a boost to degree completion. Ongoing investment in online learning as an alternative form of access to a college degree is thus supported by this data.

If the goal of online education, as many have asserted, is to increase access and opportunity to attend and complete college, this data suggests that there is significant progress toward achievement of this goal. Online learning appears to represent a new path that for some students is far more efficient and effective in allowing access to and graduation from college. The initial conclusion that more than 14% of community college students who took courses online or at a distance had completed a credential four years later (versus less than 9% of those who had not) suggests that more study is warranted.

Our analysis also confirms what previous commentators had long suggested (Kramarea, 2001; Smith Jaggars & Xu, 2010). Women are overrepresented among students who take online and distance courses. Extending results from Smith Jaggars & Xu (2010), students in this national data set who participate in online and distance education are also more likely to receive financial aid and have loans. This may be an artifact of higher levels of enrollment in private, for profit institutions that have a demonstrated capacity to ensure distance students get maximum financial aid relative to public institutions (Clayton, 2011). Federal student loan data indicates that students at for-profit institutions borrow more (and default more frequently) than those at public institutions (US Dept of Education, 2010).

There are a number of limitations to this study. Because data is not available on more recent online and distance course taking patterns in the BPS we do not know if students who took online and distance courses early in their careers continued to do so. Prior results at the State level (Smith Jaggars & Xu, 2010) indicate that online course enrollments increased dramatically across the four-year period of their study. If additional data were available at a national level we would have better understanding of the role of flexibility and convenience frequently discussed as advantageous for longer term online learners. Do students who begin taking online courses continue to do so and do online course taking patterns expedite completion of a college credential? We don't currently have the national evidence to make such a conclusion. We suggest that given the very large growth in online learning in the US it is advisable for the US Department of Education to strongly consider broadly expanding collection of data related to online learners.

4.2. Conceptual possibilities

The longstanding literature on student departure from higher education is the main source of conceptual thinking and possibility in this arena. Previous models have portrayed students as adaptive organisms confronted with challenges in both traditional (residential) and non-traditional higher education environments. It has long been assumed that successful students adapt to the demands of higher education institutions. We believe that a discussion of a transactional adaptive approach is long overdue. Providing choice, flexibility, and convenience represented by online forms of distance education represent but one way in which institutions can adapt to address the needs of a rapidly growing population of non-traditional students. This study provides a revised and updated view of Falcone's model that attempts to reflect how institutions of higher education might be seen as partners in a transactional adaptation system (see Fig. 2) with empirical support for the notion that one form of adaption, online learning, may provide better pathways to educational attainment. However more granular investigations of online services are much needed. For example, recent advances in data mining, academic analytics, and early warning

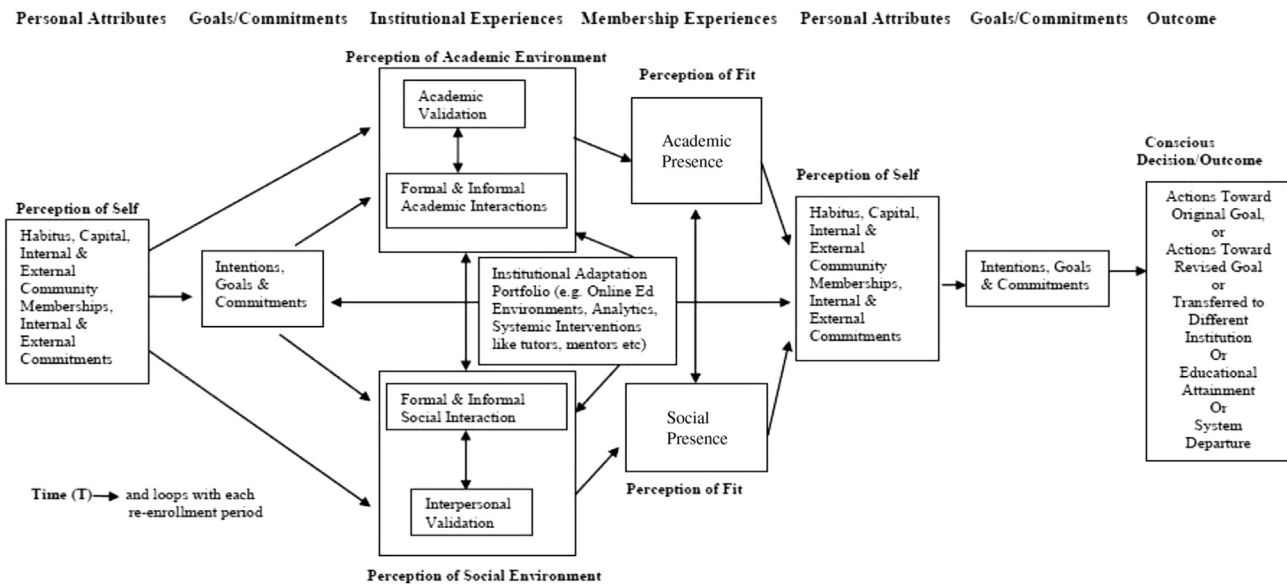


Fig. 2. New model including dimensions of technology-enabled institutional adaptation.

systems that aim to predict and head off student difficulties before they lead to drop out represent fertile ground for understanding transactional adaptation in the age of the internet. Other promising forms of technology enabled institutional intervention research that can be tied to predictive analytics include student mentoring, proactive advising, and online tutoring (Campbell, DeBlois, & Oblinger, 2007; Ferguson, 2012).

The evidence presented here provides reason to believe that technology enabled institutional adaptation can be beneficial. Much more work is needed to investigate other forms of adaption in which higher education institutions can engage to produce better outcomes, especially at the community college level, and especially as they relate to degree completion. The future of our students and thus of our nation depends on it.

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