Time to Bachelor's Degree Attainment: An Application of Descriptive, Bivariate, and Multiple Regression Techniques

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Abstract

This manuscript summarizes an institutional research study carried out at Bowling Green State University (BGSU) concerning factors affecting time to bachelor's degree attainment. Tuition sensitivity and concern about efficient use of institutional resources point to the need for decreasing students' time-to-degree. This study enlarges upon an earlier one; it investigated the effects of state- and institutionally-sponsored policies that were designed to decrease time-to-degree, and also some additional factors such as student participation in learning communities and first year programs. Time-to-degree decreased in four years since the previous study. Participation in a tuition discount program, total student credit hours earned, average credit hour load per semester, and student credit hours transferred were among the strongest predictors of time-to-degree. The study highlights the use of descriptive and bivariate statistical techniques, as well as important considerations in the use of applied multiple regression.

Introduction

This manuscript summarizes an institutional research study carried out at Bowling Green State University (BGSU) concerning factors affecting time to bachelor's degree attainment. While the full study report was meant for the BGSU administrative audience and necessarily included an extended discussion of the topic's relevance to policy and practice and an extended presentation of the results and discussion of the implications, this presentation will focus on the issue of greater interest to institutional researchers: the methodology (Bers & Seybert, 1999). The full study report including an expanded narrative, more references, and more results tables is available (BGSU, 2003).

Concerns on the part of students, parents, governmental agencies, and the media about ever-increasing tuition levels have led to calls to improve higher education effectiveness and efficiency. This external accountability mandate accompanied with institutional sensitivity about efficient use of scarce resources has pointed to the need for decreasing undergraduates' time to bachelor's degree attainment.

A small but growing literature has been developed during recent years concerning effects upon time-to-degree. Table 1 (pg. 2) provides a summary of this literature. Student academic preparation includes high school grade point average and standardized test scores. Student enrollment behaviors include stopping out, transferring between institutions, average credit hour load completed per term, dropping classes, and changing majors. Student financial need/financial aid includes types and amounts of aid and employment. Student enrollment behaviors have been found to have the greatest impact on time-to-degree attainment. Student academic preparation, college grade point average, demographic characteristics, and financial need/financial aid have also been found to have pervasive effects on time-to-degree.

The BGSU's Institutional Research Office carried out a comprehensive study in the Spring of 2000 (Knight, 2002) of the effects of a large set of potential predictor variables (student background characteristics, remedial class and summer freshman program participation, pre-enrollment perceptions, enrollment behaviors, student experiences and perceptions, financial aid data, and academic outcomes) on time- to-degree attainment (measured both in total terms elapsed and also total actual terms enrolled

Table 1
Summary of Significant Factors Affecting Time to Degree Attainment
from Previous Studies

	Institutional Commitment	Student Academic Preparation	Student College GPA	Student Demographic Characteristics	Student Enrollment Behaviors	Student Financial Need/ Financial Aid	Student Studying
Adelman (1999)				*	*		
Belcheir (2000)			*				
CSPEC (1988)					*	*	
DesJardins, Ahlburg, and McCall (2002)			*			*	
Duby and Schartman (1997)				*			
Hall (1999)					*		
Ishitani (2003)		*		*			
Knight (1994)		*	*		*		
Lam (1999)				*	*	*	
Noxel and Katunich (1998)	*						
OSRHE (1996)					*		
Volkwein and Lorang (1996)			*		*	*	
Zhu (2003)		*		*	*		*

prior to graduation) for the population of 1998-1999 baccalaureate graduates. Higher average credit hour load per semester, higher high school grade point average, being a dependent student as defined for financial aid purposes, and greater transfer credit hours were significantly related to *decreased* semesters *elapsed* prior to degree attainment, while greater number of failed classes and higher total credit hours at graduation were found to be significantly related to *increased* time-to-degree in terms of semesters *elapsed*. Higher average credit hour load per semester and greater transfer credit hours earned were found to be significantly related to *fewer* semesters *enrolled* prior to degree completion, while greater total credit hours earned, greater number of summer semesters enrolled, greater numbers of failed, cooperative education, withdrawn, and repeated classes, and participation in the Academic Forgiveness Program were found to be significantly related to *increased* time-to-degree in terms of semesters *enrolled*. Predictors that did not prove to be significant included dollar volume of student financial need unmet through financial aid, graduation with honors, the ratio of student credit hours earned at graduation to the minimum hours required in the student's degree program, almost all of the college experience and perceptions variables taken from two questionnaires. The study report recommended getting students, in appropriate circumstances, to carry heavier credit hour loads as a way to shorten time-to-degree. It also recommended that university policies (registration, financial aid, etc.) that define full-time enrollment for undergraduates as 12-credit-hours per semester should

be discussed in light of these findings, that BGSU should continue to monitor and improve class availability, and that reasons for extended time-to-degree should be discussed with students by a variety of persons within the University.

The Institutional Research Office was asked to repeat and enlarge upon the earlier study for the population of 2002-2003 baccalaureate graduates. One reason for this was to determine whether the findings of the previous study still held true after four years. A second reason was the availability of some additional possible predictor variables for the current study, such as intercollegiate athletic participation, employment (both on-campus and off-campus), and whether students participate in a number of learning communities and special programs during their first year of college. A Spring 2002 study by the Institutional Research Office (Knight, 2003) concluded that students who participated in these learning communities and first year programs were often better retained and sometimes had higher grade point averages, even after entering student characteristics were controlled. Finally and most importantly, the study was repeated to gauge the effects of state and institutional policies designed to decrease time-to-degree attainment. Ohio's Success Challenge Program provides performance funding to institutions whose students graduate in a "timely manner" (typically four years with some documented exceptions). In response, BGSU reviewed its curricula and took a number of steps to attempt to decrease time-to-degree; one of these is to provide tuition discounts to students to enroll in their final summer term if this allows them to complete their programs in 48 months. Evaluating the effects of the Success Challenge Program generally and of the Summer Success Challenge Tuition Discount Program specifically were important reasons for repeating the study.

Method

Setting and Participants

Bowling Green State University is a state assisted, Doctoral/Research Intensive university in a small city in northwest Ohio. Fall 2002 enrollment was 20,480.

Academic programs are offered at the associate degree through doctoral levels. Approximately one-half of undergraduates live on campus. The University has moderately selective admissions requirements. Approximately 90% of undergraduates are White, 94% are age 18-24, 92% are Ohio residents, and 94% are enrolled full-time. Additional information about BGSU is available at http://www.bgsu.edu/offices/ir/factbook/coverpage.htm

The study examined influences upon time-to-degree for the entire population of BGSU students earning bachelor's degrees in 2002-2003 (N=3,097). Transfer students (N=640) were excluded from the population; 2,457 remaining students constituted the population for the remainder of the analyses. These students were excluded because significant differences between transfer and "native" students were found in both total semesters enrolled and semesters elapsed to degree (7.2 semesters enrolled for transfer students vs. 10.2 semesters for native students and 8.8 semesters elapsed for transfer students vs. 13.8 semesters for native students) and also to allow greater comparability to most previously published studies. Please note that although transfer students were excluded from the study population, students may have had transfer credit through activities such as the Advanced Placement Program (AP), the College-Level Examination Program (CLEP), simultaneous high school and college enrollment, and through taking classes at other institutions, typically in the summer at an institution near to students' permanent residence.

The full study report (BGSU, 2003) provides an extended summary of the study participants, a specification of whose characteristics at the time of graduation also comprise the descriptive results of the study.

Design and Procedure

Data on students' time-to-degree, demographic and pre-college educational characteristics, enrollment behavior variables, academic outcomes, financial aid, learning community and first year program participation, parents' education levels, and program accreditation status were assembled into a series of data files by the Institutional Research Office.

There were two dependent variables in the study: semesters elapsed prior to degree attainment (including stop-out) and semesters actually enrolled prior to graduation. Most of the same potential predictor variables (student background characteristics, enrollment behaviors, financial aid data, and academic outcomes) as were used in the Institutional Research Office's 2000 study were used in the current one in order to test whether the same pattern of results still held, although, as noted earlier, some additional potential predictors that were not available earlier were also included. Although none of the BGSU First Year Student Questionnaire (FYSQ) variables were found to be significant predictors of time-to-degree in the earlier BGSU study, parents' education levels were extracted from FYSQ data for the current study because other recent published institutional studies found first generation status to be a significant predictor of longer time to graduation.

Dichotomous potential predictor variables were used in a set of *t*-tests with semesters elapsed prior to degree completion and actual semesters enrolled prior to degree completion used as the dependent variables in separate analyses. Continuous potential predictor variables were included along with the same two dependent variables in correlation analyses.

Two separate multiple regression analyses were carried out, one with semesters elapsed prior to degree completion as the dependent variable and another with semesters enrolled prior to degree completion as the dependent variable.

It is important to consider and deal with the issue of multicollinearity—strong relationships among the independent variables that cause instability in regression weights—before multivariate analyses such as multiple regression are carried out. Various methods of detecting multicollinearity exist, including inspecting the correlations between independent variables and relying upon the tolerance levels and variance inflation factors (VIFs) that are produced in the output of statistical analysis software, such as SPSS. For the current study, tolerance values close to zero were judged to indicate multicollinearity (Mertler & Vannatta, 2002). Various options are open to the researcher when multicollinearity is suspected, including standardizing some of the measures, combining related items into an index based upon the results of factor analysis, using alternative analysis techniques such as ridge regression, and dropping some independent variables from the analysis, the later of which was done in this study. Variables used in the univariate analyses noted above that were omitted from the regressions because of multicollinearity concerns included ACT sub-scores, grade point average at the end of students' freshman year and in general education classes, number of fall/spring and summer semesters enrolled, and student credit hours earned in fall/spring and summer semesters.

A special case of multicollinearity may exist when synthetic relationships occur between independent and dependent variables. This is illustrated in the current study by the use of the average credit hours completed per term variable as a predictor of semesters enrolled prior to degree attainment. Because average credit hours per term was calculated by dividing total credits hours earned by total semesters enrolled, a linear dependency exists between the independent and dependent variables. This creates a problem because "information provided by some of the variables is completely redundant with the information available from other variables and hence useless for the purpose of regression analysis" (Pedhazur, 1997). For this reason, average credit hours completed per term was not included in this study's multiple regression analysis

where total semesters enrolled served as the dependent variable, but it was included in the analysis where total semesters elapsed was the dependent variable, because no linear dependency exists there. The author must, in good conscience, admit that this problem escaped his attention when the earlier version of the study was carried out (Knight, 2002).

It should be noted that the two multiple regression analyses were also carried out with both dependent variables converted to their logarithmic and squared counterparts in an attempt to determine whether a non-linear relationship better fit the research models. The pattern of results was essentially the same and there was less than a 1% change in percentage of variance accounted for by either model, so the results are presented here using the more familiar approach.

The multiple regression analyses were carried out using the "direct" method of independent variable entry, which shows the full set of statistical output for all predictors entered. An alternative procedure that would have allowed the output to be considerably decreased would have been to have used the "stepwise" method. Both methods were used and the results of the stepwise method looked nearly identical to those shown in Tables 5 and 6 below except that the non-significant predictors were omitted. The researcher chose to highlight the results of the direct method to the BGSU audience so that everyone could examine all of the evidence and realize that some anecdotal "truths" (e.g., that race, employment, some forms of financial aid, etc. significantly impact time-to-degree completion) are not borne out.

Multiple regression analyses were carried out separately for females to examine conditional effects on time-to-degree.[1] The author initially wished to also examine conditional effects for students with lower than average ACT scores, students of color, and students in each college; however, the small group sizes (which are exacerbated by listwise deletion for missing data) led to situations where many of the independent variables functioned as constants and the relevancy of the results was questionable. While additional analyses could have been carried for any number of other possible sub-groups, this set was of greatest interest at the institution.

Multiple regression was used for the current study rather than path analysis, which was employed for the earlier version (Knight, 2002). While a sufficient theoretical basis exists to carry out a path analysis approach, it has become apparent to the researcher that decision makers at his institution do not understand this technique and view its results with suspicion. Despite the possible methodological advantages of path analysis, what is most important for institutional research is that the audience has confidence in and is able to use the results (McLaughlin, Howard, Balkan, & Blythe, 1998).

Results

Descriptive Analyses

Median semesters elapsed (including "stop out" semesters) from matriculation to degree attainment was 12. The median number of semesters of enrollment prior to degree completion for the population was 9. As shown in Figure 1 and Table 2, median semesters elapsed prior to degree attainment decreased, by an amount that was practically meaningful but not statistically significant, from 14 for the 1998-1999 graduating class and median semesters enrolled meangifully (but not significantly) decreased from 10.

Figure 1
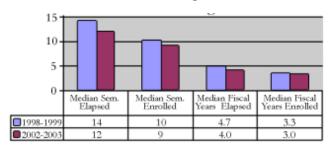**Time to Bachelor's Degree Attainment**

	Median Sem. Elapsed	Median Sem. Enrolled	Median Fiscal Years Elapsed	Median Fiscal Years Enrolled
1998-1999	14	10	4.7	3.3
2002-2003	12	9	4.0	3.0

Table 2
Mean Differences in Semesters Elapsed and Semesters Enrolled Between the 1998-1999 and 2002-2003 Studies

	Semesters Elapsed				Semesters Enrolled			
Study	M	SD	df	t	M	SD	df	t
2000	13.7	6.3	5040	-0.29	10.2	2.4	5040	-0.05
2003	13.7	7.1			10.2	2.4		

Bivariate Analyses

The results of the set of *t*-tests are shown in Table 3, which is sorted according to the *t* statistic value for semesters elapsed. Eighteen of the predictor variables showed significant differences with mean semesters *elapsed*; participation in the Academic Forgiveness Program, enrollment in the UNIV 131 class, graduation in the College of Technology, and participation in the Student Support Services Program were highly significantly related to *decreased* semesters elapsed, while students being defined as dependent for financial aid purposes, participation in the Honors, Postsecondary Enrollment Options, and Summer Success Challenge Programs, having financial aid record data available, and being female were highly significantly related to *increased* semesters elapsed. Twenty-nine of the predictor variables showed significant

Table 3
Mean Differences in Semesters Elapsed and Semesters Enrolled between Various Groups

Group	Semesters Elapsed M	SD	df	t	Semesters Enrolled M	SD	df	t
Dependent Financial Aid Status								
Yes	12.45	1.99	1715	31.19***	9.84	1.68	1715	13.65***
No	28.96	19.79			12.52	3.95		
Academic Forgiveness Program Participant								
Yes	51.79	23.31	2455	-25.27***	15.74	4.61	2455	-10.98***
No	13.47	6.30			10.13	2.19		
Honors Program								
Yes	11.60	1.28	2093	6.44***	9.32	1.46	2093	4.66***
No	12.39	1.62			9.86	1.51		
UNIV 131 Class Participant								
Yes	13.63	2.08	1097	-5.72***	10.58	2.06	1097	-4.26***
No	11.53	1.77			9.21	1.55		
College: Technology								
Yes	16.51	10.44	2455	-4.67***	12.50	2.50	2455	-13.25***
No	13.59	7.12			10.02	2.18		
Postsecondary Enrollment Options Program Participant								
Yes	11.44	1.88	2455	4.63***	9.41	1.94	2455	4.90***
No	13.97	7.65			10.24	2.28		
Student Support Services Participant								
Yes	17.62	13.01	2455	-4.38***	11.51	3.25	2455	-4.97***
No	13.66	7.14			10.13	2.23		
Participated in Summer Success Challenge Program								
Yes	11.84	0.65	2455	4.12***	9.76	1.14	2455	2.84**
No	13.96	7.72			10.21	2.35		
Financial Aid Record Data Available								
Yes	13.58	6.95	2455	3.82***	10.09	2.16	2455	5.35***
No	15.47	10.43			10.90	3.02		
Female								
Yes	13.34	7.34	2455	3.54***	9.92	2.15	2455	6.71***
No	14.41	7.42			10.54	2.40		
Financial Aid Received								
Yes	13.57	7.03	2455	3.34**	10.08	2.16	2455	5.36***
No	15.05	9.36			10.80	2.82		
UNIV100 Class								
Yes	12.56	1.57	2093	-3.18**	9.97	1.51	2093	-2.30*
No	12.27	1.61			9.77	1.52		
Graduate with Honors								
Yes	12.91	8.04	2455	3.11**	9.53	2.26	2455	7.67***
No	14.02	7.17			10.36	2.24		
Enrolled in English 110 Class								
Yes	15.14	9.07	2455	-2.91**	10.84	2.76	2455	-4.61***
No	13.63	7.20			10.10	2.21		
Health Sciences Residential Community								
Yes	11.54	1.23	1939	2.32*	9.17	1.22	1939	1.98*
No	12.06	1.30			9.63	1.35		

Table 3 (continued)
Mean Differences in Semesters Elapsed and Semesters Enrolled between Various Groups

Group	Semesters Elapsed				Semesters Enrolled			
	M	SD	df	t	M	SD	df	t
State Resident								
Yes	13.85	7.62	2455	2.13*	10.21	2.30	2455	3.09**
No	12.58	2.48			9.64	1.77		
College: Health and Human Services								
Yes	12.68	6.35	2455	2.05*	9.59	1.60	2455	3.54***
No	13.85	7.46			10.22	2.31		
Participated in the Honors Program								
Yes	11.46	1.31	2455	2.01*	9.34	1.74	2455	2.36*
No	13.80	7.44			10.18	2.28		
University Program for Academic Success								
Yes	12.36	1.18	1939	−1.92	10.03	1.18	1939	2.43*
No	12.04	1.30			9.61	1.36		
FAFSA Data Available								
Yes	13.63	6.29	2455	1.71	10.11	2.08	2455	2.24*
No	14.23	10.21			10.36	2.81		
Enrolled in Mathematics 095 Class								
Yes	14.15	6.68	2455	−1.14	10.65	2.52	2455	4.70***
No	13.69	7.52			10.07	2.21		
College: A&S/Musical Arts–Arts								
Yes	13.13	3.07	2386	1.06	10.08	2.12	2386	0.43
No	13.66	7.07			10.14	2.20		
Multicultural and Academic Initiatives								
Yes	12.18	1.57	2093	1.02	9.61	1.53	2093	1.46
No	12.33	1.61			9.82	1.51		
College: A&S–Communications								
Yes	13.20	6.04	2386	1.02	9.76	1.91	2386	2.86**
No	13.66	6.90			10.18	2.22		
Literacy Serve and Learn								
Yes	10.82	0.61	935	0.96	8.67	0.75	935	0.77
No	10.88	0.48			8.76	0.94		
Art Freshman Interest Groups								
Yes	10.96	0.20	920	−0.91	8.78	0.90	920	−0.10
No	10.92	0.33			8.77	0.91		
Enrolled in EDCI 100 Class								
Yes	14.13	5.71	2455	−0.90	.53	2.16	2455	2.98**
No	13.72	7.60			10.12	2.28		
College: Education and Human Development								
Yes	13.57	6.70	2455	0.87	10.02	1.82	2455	2.23*
No	13.85	7.68			10.24	2.44		
Springboard Program								
Yes	12.23	1.44	2093	0.84	9.81	1.37	2093	0.84
No	12.33	1.62			9.81	1.53		
Students of Color								
Yes	13.36	4.55	2361	0.82	10.35	2.40	2361	−1.04
No	13.83	7.56			10.17	2.27		
Accredited Program								
Yes	13.69	6.82	2455	0.77	10.25	2.25	2455	2.66**
No	13.94	8.52			9.99	2.32		
Years Participating in Intercollegiate Athletics								
Yes	12.00	1.25	2347	0.75	10.00	1.41	2347	0.753
No	13.80	7.56			10.18	2.31		

Table 3 (continued)
Mean Differences in Semesters Elapsed and Semesters Enrolled between Various Groups

	Semesters Elapsed				Semesters Enrolled			
Group	M	SD	df	t	M	SD	df	t
College: Business Administration								
Yes	13.56	6.62	2455	0.61	10.40	2.56	2455	–2.22*
No	13.81	7.53			10.12	2.21		
President's Leadership Academy								
Yes	11.88	1.46	1939	0.53	10.00	1.86	1939	–1.13
No	12.05	1.30			9.62	1.35		
College: A&S–Humanities								
Yes	13.45	3.63	2386	0.20	9.93	2.13	2386	0.81
No	13.62	6.89			10.14	2.19		
College: A&S–Social Sciences								
Yes	13.71	7.22	2386	–0.20	9.78	2.02	2386	2.48***
No	13.60	6.78			10.17	2.20		
College: A&S–Mathematics and Sciences								
Yes	13.56	8.59	2386	0.11	9.73	2.41	2386	2.46*
No	13.62	6.67			10.17	2.17		
Chapman Community								
Yes	12.34	1.77	2093	–0.10	9.53	1.50	2093	1.89
No	12.32	1.60			9.82	1.52		
BG Effect								
Yes	12.35	1.34	2093	–0.07	10.43	1.44	2093	–1.99*
No	12.32	1.61			9.80	1.52		
Freshman Interest Groups								
Yes	12.08	1.33	1924	–0.03	9.38	1.33	1924	1.80
No	12.08	1.25			9.65	1.34		
*p < .05 **p<.01 ***p<.001								

differences with mean semesters *enrolled*; graduation in the College of Technology, participation in the Academic Forgiveness Program, participation in the Student Support Services Program, enrollment in the MATH 095, ENG 110, and UNIV 131 classes were highly significantly related to *decreased* semesters enrolled, while students being defined as dependent for financial aid purposes, graduation with honors, being female, receiving financial aid, having financial aid record data available, participation in the Postsecondary Enrollment Options Programs, participation in the Honors Program, graduation in the College of Health and Human Services, and graduation in the social sciences were highly significantly related to *increased* semesters enrolled.

The results of the correlation analyses appear in Table 4, which is sorted according to the size of the correlations with semesters elapsed. Most of the continuous predictor variables were significantly correlated with time-to-degree,

both in terms of semesters elapsed prior to degree attainment and semesters enrolled prior to degree attainment. Greater average student credit hours earned per semester, greater high school grade point average, higher grade point average at end of the freshman year, higher grade point average at graduation, and higher grade point average in general education classes were highly significantly correlated with *decreased* time-to-degree, while greater number of fall, spring, and summer semesters enrolled, greater total student credit hours earned, greater number of quarters employed off campus, greater number of classes failed and repeated, and greater number of cooperative education classes completed were highly significantly correlated with *increased* time-to-degree. Greater number of student credit hours transferred was significantly correlated with *increased* average semesters elapsed, but *decreased* average semesters enrolled.

Table 4
Correlations of Semesters Elapsed and Semesters Enrolled with Various Other Variables

Variable	Semesters Elapsed	Semesters Enrolled
Number of Fall and Spring Semesters Enrolled	.589***	.869***
Average Student Credit Hours Earned per Semester	−.323***	−.743***
Student Credit Hours Earned at Graduation	.311***	.432***
Total Quarters Employed Off-Campus	.235***	.209***
High School Grade Point Average	−.284***	−.317***
Number of Classes Failed	.247***	.416***
Number of Summer Semesters Enrolled	.231***	.664***
Student Credit Hours Transferred	.217***	−.063**
Number of Major Changes	.170***	.288***
Student Credit Hours Earned at End of Freshman Year	−.166***	−.160***
Student Credit Hours Earned in Summer Semesters	.161***	.415***
Grade Point Average at End of Freshman Year	−.159***	−.268***
Number of Classes Repeated	.156***	.387***
ACT Math Score	−.147***	−.161***
Number of Classes Withdrawn	.136***	.243***
ACT Composite Score	−.119***	−.160***
ACT English Score	−.114***	−.167***
Total Semesters Employed On-Campus	−.109***	−.032
ACT Reading Score	−.103***	−.135***
Expected Family Contribution (total across years)	−.097***	−.023
Unmet Financial Need (total across years)	.091***	.061**
Grade Point Average at Graduation	−.067**	−.251***
Mother's Education Level	−.066*	−.041
Student Credit Hours Earned in Fall and Spring Semesters	.058**	.239***
Non-Need-Based Grant Dollars Received (total across years)	−.056**	−.065**
Grade Point Average in General Education Classes	−.051*	−.226***
Number of Cooperative Ed. Classes	.044*	.274***
Need-Based Loan Dollars Received (total across years)	.042*	.072***
Need-Based Employment Dollars Received (total across years)	−.034	.004
Student Credit Hours Earned in General Education Classes	.034	.022
ACT Science Reasoning Score	−.033	−.071**
Father's Education Level	−.031	−.030
Need-Based Grant Dollars Received (total across years)	.031	.064**
Number of Minors at Graduation	−.023	−.058**
Non-Need-Based Loan Dollars Received (total across years)	.004	.038
Number of Majors at Graduation	−.002	.079***
*p < .05 **p<.01 ***p<.001		

Table 5
Regression Analysis Summary for Predicting Semesters Elapsed Prior to Degree Attainment

Variable	B	SEB	ß
Summer Success Challenge Program Participant	1.679	.112	−.566***
Student Credit Hours Earned at Graduation	0.009	.002	.219***
Average Student Credit Hours Earned per Semester	−0.040	.011	−.202***
President's Leadership Academy Participant	−0.357	.128	−.130**
Dependent Financial Aid Status	0.575	.197	.112**
Enrolled in EDCI 100 Class	−0.093	.048	−.082
Student Credit Hours Transferred	−0.004	.003	−.080
Honors Program Participant	0.071	.042	.078
Number of Cooperative Ed. Classes	0.023	.017	.072
College: A&S-Humanities	0.139	.093	.071
Springboard Program Participant	0.089	.059	.067
College: Business Administration	0.058	.049	.064
Non-Need-Based Loan Dollars Received (total across years)	0.000	.000	.061
Post Secondary Enrollment Options Program Participant	−0.061	.045	−.061
Graduated with Honors	−0.040	.031	−.059
College: A&S-Communications	0.063	.055	.057
Health Sciences Residential Community Participant	0.115	.078	.055
Number of Majors at Graduation	−0.078	.060	−.055
College: A&S-Social Sciences	0.055	.056	.054
Number of Minors at Graduation	0.030	.029	.050
College: A&S-Math and Science	0.058	.064	.049
Student Credit Hours Earned in General Education Classes	0.002	.002	.049
College: Technology	−0.101	.094	−.048
Number of Classes Repeated	0.028	.027	.046
Number of Classes Withdrawn	−0.031	.029	−.043
Need-Based Loan Dollars Received (total across years)	0.000	.000	.041
State Resident	−0.068	.071	−.041
Student Credit Hours Earned at End of Freshman Year	0.002	.003	.039
Accredited Program	0.024	.039	.034
Received Financial Aid	−0.075	.089	−.034
Freshman Interest Groups Participant	−0.047	.056	−.033
Total Quarters Employed Off-Campus	0.003	.004	.033
College: A&S/Musical Arts-Arts	0.038	.061	.032
Non-Need-Based Grant Dollars Received (total across years)	0.000	.000	.028
Mother's Education Level	0.005	.008	.024
Expected Family Contribution (total across years)	−0.000	.000	−.024
ACT Composite Score	−0.002	.005	−.022
Enrolled in MATH 095 Class	0.022	.046	.020
Race/Ethnicity (Student of Color)	0.026	.065	.019
Father's Education Level	−0.004	.008	−.018
Number of Classes Failed	−0.010	.027	−.017
College: Health and Human Services	0.015	.050	.014
Number of Major Changes	−0.005	.014	−.014
Intercollegiate Athletics Participant	0.007	.023	.012

Table 5 (continued)
Regression Analysis Summary for Predicting Semesters Elapsed Prior to Degree Attainment

Variable	B	S E B	ß
Student Support Services Program Participant	–0.035	.129	–.012
UNIV 100 Class Participant	0.011	.039	.012
Need-Based Grant Dollars Received (total across years)	0.000	.000	.011
Enrolled in ENG 110 Class	–0.015	.062	–.010
Sex (Female)	–0.007	.031	–.009
UNIV 131 Class Participant	0.036	.262	.005
Art Freshman Interest Groups Participant	0.007	.076	.004
High School Grade Point Average	0.003	.041	.004
University Program for Academic Success Participant	–0.007	.107	–.003
Total Semesters Employed On-Campus	0.000	.004	–.002
BG Effect Participant	0.002	.155	.000
Literacy Serve and Learn Participant	0.000	.049	.000

Note. R^2 = .48 (N = 479, p < .001).
*p < .05   **p < .01   ***p < .001.

Multivariate Analyses

The results of the regression analysis with semesters *elapsed* prior to degree attainment as the dependent variable are shown in Table 5. The regression model explained 48% of the variance in total semesters elapsed to degree attainment. The significant predictors with the largest effect sizes included participation in the Summer Success Challenge Program, average student credit hours earned per semester, participation in the President's Leadership Academy (related to decreased time-to-degree attainment), student credit hours earned at the time of graduation, and students being defined as dependent for financial aid purposes (related to increased time-to-degree attainment).

The results of the regression analysis with semesters *enrolled* prior to degree attainment as the dependent variable are shown in Table 6. The regression model explained 50% of the variance in semesters enrolled to degree attainment. The significant predictors with the largest effect sizes included student credit hours transferred, graduation in the arts disciplines, students being defined as dependent for financial aid purposes,

need-based loan dollars received, students enrolling in the College Reading and Learning Skills (EDCI 100) class (related to decreased time-to-degree attainment), the number of cooperative education classes completed, student credit hours earned at graduation, the number of classes repeated, participation in the Art Freshman Interest Groups Program, participation in the Post Secondary Enrollment Options Program, participation in the Honors Program, graduation from the College of Technology, and students receipt of financial aid (related to increased time-to-degree attainment).

The multiple regression analyses were carried out separately for females to examine conditional effects on time-to-degree. The effects for females on semesters elapsed prior to degree attainment (shown in Table 7 on pg. 13) were similar to the results for all students, except that dependent financial aid status was not significant for females and average non-need-based loan dollars received was a significant predictor. Table 8 (pg. 13) shows a similar pattern of effects for females on semesters enrolled prior to degree completion as for the whole population, except that participation in the Post Secondary Enrollment Options Program had an even greater effect for females,

Table 6
Regression Analysis Summary for Predicting Semesters Enrolled Prior to Degree Attainment

Variable	B	SEB	ß
Number of Cooperative Ed. Classes	0.415	.042	.461***
Student Credit Hours Earned at Graduation	0.039	.005	.349***
Student Credit Hours Transferred	−0.052	.008	−.335***
Number of Classes Repeated	0.315	.074	.186**
Art Freshman Interest Groups Participant	0.600	.206	.136**
ACT Composite Score	−0.028	.014	−.112
College: A&S/Musical Arts−Arts	−0.365	.167	−.110*
Dependent Financial Aid Status	−1.575	.536	−.110**
Need−Based Loan Dollars Received (total across years)	−0.000	.000	−.105*
Post Secondary Enrollment Options Program Participant	0.294	.122	.104*
Honors Program Participant	0.237	.114	.094*
Mother's Education Level	−0.002	.021	−.093
Enrolled in EDCI 100 Class	−0.291	.131	−.091*
College: Business Administration	0.223	.133	.087
College: Technology	0.508	.256	.086*
Number of Classes Failed	0.132	.074	.080
Received Financial Aid	0.493	.242	.080*
Number of Classes Withdrawn	0.153	.079	.075
Expected Family Contribution (total across years)	−0.000	.000	−.070
College: Health and Human Services	0.195	.137	.067
BG Effect Participant	0.730	.423	.063
Race/Ethnicity (Student of Color)	−0.211	.178	−.057
Total Semesters Employed On−Campus	0.013	.011	.053
Student Support Services Program Participant	0.412	.353	.050
State Resident	0.223	.194	.047
Non−Need−Based Loan Dollars Received (total across years)	0.000	.000	.045
Chapman Community Participant	−0.193	.166	−.043
College: A&S−Math and Science	−0.136	.176	−.041
Father's Education Level	−0.021	.022	−.039
Summer Success Challenge Program Participant	−0.310	.305	−.037
College: A&S−Humanities	−0.198	.256	−.036
Enrolled in MATH 095 Class	0.107	.127	.035
UNIV 100 Class Participant	0.093	.107	.035
Literacy Serve and Learn Participant	−0.117	.135	−.034
Enrolled in ENG 110 Class	−0.137	.171	−.031
College: A&S−Communications	−0.088	.150	−.028
UNIV 131 Class Participant	0.085	.719	.024
Need−Based Grant Dollars Received (total across years)	−0.000	.000	−.023
Number of Major Changes	−0.022	.038	−.023
Sex (Female)	0.047	.086	.023
Health Sciences Residential Community Participant	−0.132	.215	−.022
Non−Need−Based Grant Dollars Received (total across years)	−0.000	.000	−.021
Total Quarters Employed Off−Campus	0.005	.010	.021
Springboard Program Participant	0.071	.163	.019
Accredited Program	−0.036	.107	−.018

Table 6
Regression Analysis Summary for Predicting Semesters Enrolled Prior to Degree Attainment

Variable	B	SEB	ß
University Program for Academic Success Participant	-0.013	.294	-.017
Intercollegiate Athletics Participant	0.022	.063	.014
President's Leadership Academy Participant	-0.011	.350	-.014
Need-Based Employment Dollars Received (total across years)	0.000	.000	.007
Number of Minors at Graduation	0.011	.080	.007
High School Grade Point Average	-0.014	.111	-.006
Student Credit Hours Earned at End of Freshman Year	-0.001	.007	-.006
Freshman Interest Groups Participant	0.018	.152	.004
Student Credit Hours Earned in General Education Classes	0.000	.004	-.004
Number of Majors at Graduation	-0.007	.164	-.002
Graduated with Honors	0.001	.086	.001
College: A&S-Social Sciences	0.000	.155	.000

Note. $R^2 = .50$ (N = 479, $p < .001$).
*$p < .05$ **$p < .01$ ***$p < .001$.

and that, unlike for all students, the number of courses from which females withdrew had a significant effect on time-to-degree. Please note that only significant effects at $p < .05$ are shown for Tables 7 and 8 in order to conserve space.

Discussion

Before proceeding with a discussion of the implications of the findings, mention of the study's limitations is in order. The study was designed to examine the impact of a number of factors on time-to-degree attainment for a group of students who did in fact graduate. It does not, by design, address issues related to students who did not graduate. Data on parents' educational levels (gained from the BGSU First Year Student Questionnaire) were not available for the majority of students in the study. Some of the learning communities and first year programs were new at the time that students in the study could have participated in them; it is possible that effects on time-to-degree for freshmen participating in such programs this year, for example, could perhaps be different. Finally, it is certainly true that not all factors (e.g., motivation, time management skills) that could potentially significantly predict time-to-degree are included in the study.

Another limitation is the issue of low frequencies for some values within the categorical values. For example, fewer than 5% of students in the study participated in the Academic Forgiveness Program, the Honors Program, or the Student Support Services Program. Pedhazur (1997) notes that statistical tests (especially multiple regression) are more sensitive when they are based upon equal group sizes and that equal group sizes minimize distortions associated departures from various assumptions underlying statistical tests. There is a danger in attributing substantive differences to variables with highly unequal group sizes because group membership may be serving as a proxy for other important characteristics. For example, students in the Academic Forgiveness Program were generally older, commuters, had lower ACTs, and were less likely to participate in learning communities and first year programs; Honors Program participants had higher ACTs and high school GPAs and brought more college credit earned during high school with them to BGSU. Multicollinearity indicators notwithstanding, it may be these characteristics, rather than membership in these programs, that really led to differences in time-to-degree.

Table 7
Regression Analysis Summary for Predicting Semesters Elapsed Prior to Degree Attainment for Females

Variable	B	SEB	ß
Summer Success Challenge Program Participant	-1.821	.126	-.619***
Student Credit Hours Earned at Graduation	0.009	.002	.217***
Average Student Credit Hours Earned per Semester	-0.041	.012	-.196**
Presidents Leadership Academy Participant	-0.388	.165	-.118*
Non-Need-Based Loan Dollars Received (total across years)	0.000	.000	.103*

Note. R^2 = .55 (N = 354, p < .001). Only significant effects at p < .05 are shown.
*p < .05 **p < .01 ***p < .001.

Table 8
Regression Analysis Summary for Predicting Semesters Enrolled Prior to Degree Attainment for Females

Variable	B	SEB	ß
Student Credit Hours Earned at Graduation	0.043	.007	.403***
Student Credit Hours Transferred	-0.060	.009	-.402***
Number of Cooperative Ed. Classes	0.379	.059	.371***
Presidents Leadership Academy Participant	0.346	.091	.206***
Post Secondary Enrollment Options Program Participant	0.444	.145	.163**
Number of Classes Withdrawn	0.277	.106	.131**
Art Freshman Interest Groups Participant	0.537	.269	.122*
Dependent Financial Aid Status	-1.690	.845	-.098*

Note. R^2 = .46 (N = 354, p < .001). Only significant effects at p < .05 are shown.
*p < .05 **p < .01 ***p < .001.

As noted above, this study excluded students who were categorized as transfer students, because they brought credit hours toward graduation with them when they entered the University and graduated significantly more quickly. Because BGSU is a primarily traditional residential university and attention to the success of students who transfer in has not historically been viewed as a significant aspect of the institution's mission, the study did not reflect their experiences. At other institutions where transfers are a significant part of the mission (or perhaps at another time at BGSU), categorical measures for type of transfer institution and a measure of credit hours transferred in could be included in the time-to-degree models. Some time-to-degree predictors, such as high school GPA, data gained from surveys, participation in learning communities and first year programs, etc. may likely not be available for transfer students.

One obvious implication of the study is that Ohio's Success Challenge Program has been successful in decreasing time-to-degree at BGSU as evidenced by decreased median time-to-degree for 2002-2003 bachelor's degree graduates. A recent report produced by the BGSU Provost's Office indicates that Success Challenge funds have been used in a wide variety of ways to facilitate student success, including funding for learning communities and first year programs, enhancement of services in the Student Financial Aid Office, funding for the Honors Program, expansion of services in Academic Enhancement, enhancements of assessment of student learning, redesign of General Education classes, curricular redesign to facilitate four-year degree completion, funding for the Bowling Green Experience, support for student travel, and expanded research opportunities for undergraduate students. The Summer Success Challenge Tuition Discount Program has also clearly facilitated timely graduation at BGSU, although this finding is somewhat recursive in nature because only students who were likely candidates for timely graduation could participate in the Program.

Participation in the President's Leadership Academy, enrollment in the College Reading and Learning Skills (EDCI 100) class, and graduation in the arts disciplines facilitated more timely degree attainment in the current study. It would be worthwhile to follow up with more research that explores the uniqueness of these educational environments for promoting decreased time-to-degree.

Because students' completion of a greater number of credit hours per term remains a significant predictor of decreased time-to-degree, it is useful to repeat some of the implications related to this finding that were noted in the earlier study. As Volkwein and Lorang (1996) note, many baccalaureate programs require a student credit hour load of 16-17 or greater per semester for students to graduate in four years without enrolling in summer (this also excludes the need to take remedial or elective classes, change majors, etc.). Yet campus policies allow students to be considered as "full-time" for registration, fee payment, financial aid (federal and state policies come in to play here as well), and other purposes if they enroll with just 12 semester credit hours per term. While a lighter class load may be in the best academic or personal interest of some students, a systematic approach to academic advising that encourages students to take higher class loads when warranted would significantly decrease time-to-degree

attainment for most students. Advising interventions may also help to decrease the number of failed, dropped, or repeated classes.

As was the case in the Spring 2000 study, the fact that enrollment in cooperative education classes had a relatively strong effect upon increased time-to-degree illustrates the important caveat that timely degree completion is not all that matters in terms of college student outcomes. Both analytical and student self-report evidence supports the fact that enrollment in cooperative education classes, involvement in internships, etc., while extending time-to-degree, significantly improves student learning and skill development, affective outcomes, career prospects, and the like. Significantly reducing time-to-degree could perhaps demand a trade-off against other long-term (and maybe more important) outcomes. As is often the case in higher education policy and practice, and as has been observed by many, the actions we take and the outcomes we hope to facilitate are ultimately a function of our values. In that vein, decision makers should perhaps be reminded that the graduation (requiring whatever length of time) of some at-risk students may be at least as important as the timely graduation of all students.

It should be recognized that some interventions, such as the efforts funded through the Success Challenge Program, can be carried out fairly quickly for current cohorts of students, while others, such as encouraging enrollment behaviors that support more rapid graduation, will be most effective when applied to entering students and thus will take more time for their effects to be seen. Still others, such as recruiting large numbers of freshmen who already have some college credit and changing financial aid policies, may require even longer term institutional attention. It should also be noted that not all effects operate on students consistently during the whole time that they are enrolled. (G. McLaughlin, personal communication, February 2, 2004). For example, students' ability to finance college may be more of a problem at the end of their college careers (as tuition rises, freshman-only scholarships are no longer available, family financial circumstances change, etc.) than at the beginning, so that employment may lengthen time-to-degree to a greater extent in students' final years. Finally, it is the case that the opposite of some factors that inhibit time-to-degree may not necessarily facilitate it beyond a certain degree; to draw upon the previous example, not having sufficient funds and needing to be employed may lengthen time-to-degree, but having more than enough funding will not necessarily shorten it.

Editor's Notes

This article discusses a topic becoming more important in many institutions – the time it takes for students to complete a degree. As Knight notes – this is becoming an operational definition of the efficiency of an institution.

His use of multiple levels of statistics gives us a feel for what can be done with the different levels of sophistication. His use of a large and diverse set of independent measures helps the reader understand that many of these factors are related to the time required to complete a degree and therefore the assessment of an institution's "efficiency" must deal with the type of student and type of programs that the institution provides.

There are several key points that are very interesting to consider.

What is the appropriate measure of "time-to-degree"? When Knight used two alternatives he found that the metric made a difference. One might also use the number of hours or courses taken. One might count summer terms and distance courses in alternative manners. The point is that the selection of a dependent measure and how it is measured is not a forgone conclusion. The presence of Web courses and independent paced courses adds to the complication.

What is the best methodology to explain or to anticipate "time-to-degree"? The use of a specific methodology and more importantly the use of specific variables is dependent on the use of the study. Knight notes the multicollinearity of some of the academic skills measures. He concludes that some of them should be deleted from the analysis. One alternative is to use Path Analysis with its multiple equations and its direct and indirect effects for those multicollinearities that occur at different points like HS GPA, ACT, Freshman Grades, etc. The limitation of needing to explain results is a real issue and in this case explains his selection of the simpler linear regression methodology.

There is a third alternative that can be used in the situation where there are multiple decision points: the selective inclusion of blocks of variables based on what is known at a given point in time. For example, if one is trying to estimate time-to-degree prior to admission, only those measures known at that time would be included in the equation. If one were looking at making decisions about the student after the first year, then a larger set of measures would be included.

This use of blocks of variables based on point-in-time also deals with the issue of using the average number of hours that a student took per term. If the equation were being developed at the end of a students program then it might be appropriate to include the average number of hours per term for a dependent measure which looks at time-to-degree based on entrance to exit. On the other hand if the intent were to anticipate the time-to-degree based on characteristics following the first term of enrollment then a measure of the number of hours taken in the first term would be the independent variable appropriate to include.

What to do about transfer students and hours taken outside the institution? While the demography for Knight's sample is such that transfers can be excluded, there is an issue for those who have a large number of transfer

students. How should these students be included in an analysis? How do you use prior experience as an independent variable or set of variables? Do you need to split the transfers into different sub-groups and look for different models?

This work joins an increasing exploration of studies based on national data bases as well as this type of study based on a single institution's data base. These national studies, such as work by Clifford Adelman using the National Education Longitudinal Study of 1988 (NELS:88) and by Alberto Cabrera using the High School and Beyond data base (HS&B) are helping us understand that the paths through our institutions are less and less likely to be the traditional linear sequence of the past. Knight properly includes transfer hours despite the exclusion of transfers because more and more students, even those who begin as freshmen, are augmenting the courses in their primary institution with credits from other sources.

In summary, as with any good research, Knight answers one set of questions – and raises the next set in the process.

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End Note

The appropriateness of moderating the regression equation on gender can be checked by looking at the combined Error SS from the moderated regressions and the Error SS from the combined equation. The smaller combined ESS is associated with the decrease in Error df and the ratio of the decreases is an estimate of variance independent of the smaller estimate, so the ratio is distributed as an f statistic (G. McLaughlin, personal communication, May 15, 2004). In this study the ratio was not statistically significant.

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