

**A Cohort Analysis of Student Attrition in Manufacturing and Engineering Technologist
and Technician Education Programs**

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Abstract

Using data from a cohort of first-time students enrolled in 16 public two-year colleges in a Midwestern state, this study examines patterns of and influences in student attrition in manufacturing and engineering technologist and technician education (METTE) programs. The study finds few significant differences with respect to student characteristics between leavers and persisters. However, enrollment behavior, academic achievement, and course-taking behavior differentiate those who leave in their first year of studies from those who graduate or persist to the second year.

Overview

Despite national data that suggests that degree completion results in higher earnings, many two-year college students leave school prior to earning a credential (Belfield & Bailey 2011; Bosworth, 2011; College Board, 2013). National estimates indicate that fewer than half of U.S. students who begin community college with the goal of earning a degree or certificate succeed six years later (Achieving the Dream, 2011). Many two-year college students arrive underprepared and almost 20 percent of traditional aged community college students never complete ten credits towards their credential (Bailey & Alfonso, 2005). Most attend part-time (Horn & Radwin, 2012). Many follow seemingly random pathways of full-time and part-time attendance as they progress toward their educational goals (Crosta, 2013).

The consequences of enrolling in postsecondary education without completing a degree go beyond the economic costs to the individual in terms of foregone earnings and greater frequency and longer duration of periods of unemployment. Individuals, who enroll, but leave before graduation, often incur significant debt to pay for college and have fewer resources to repay this debt than those who graduate. In addition, institutional costs of student attrition include the time, resources and tuition of faculty and postsecondary institutions (Schneider & Yin (2011). Society also bears higher costs in terms of lower rates of participation in local, state, and national governance, fewer resources to contribute to community service, greater consumption of public services, higher crime rates, and lower rates of economic growth and productivity (College Board, 2013; Institute for Higher Education Policy, 1998).

Understanding why students leave is important, but the development of indicators of retention and persistence may be just as important in designing effective interventions to reduce student attrition (Attewell, et al., 2012; Crosta, 2013; Wild & Ebbers, 2002; Horn & Nevill, 2006). To be useful in the two-year college context, these indicators require the kind of a detailed understanding of how student behavior with respect to enrollment, academic achievement, and course taking differ between those who leave without obtaining a credential and those who persist presented in this study.

Research Questions

This study addressed two questions:

1. Are there differences in demographic, educational attainment, work status, and economic background between students who leave and those who persist?
2. Can we identify a set of empirically-based indicators of enrollment behavior, academic achievement, and course-taking behavior that differentiate leavers from persisters?

Contributions of This Study

This study contributes to the literature on student attrition in several ways. First, the study focuses on two-year college students. Much of the original work on student retention and attrition examined the phenomena in the four-year, residential college setting (Tinto, 1975; Pascarella & Terenzini, 1991). The need for work about student retention and attrition in the two-year college setting is described by Bailey and Alfonso (2005), Horn & Nevill (2006), Wild & Ebbers (2002) among others. Second, this study takes a longitudinal approach to focus on student behavior and identify indicators rooted in this behavior. Relying on administrative data on student enrollment, academic achievement, and course-taking, it extends the work pioneered by Adelman (2005), Horn & Nevill (2006), Stratton, O'Toole, & Wetzel (2004, 2006), and O'Toole, Stratton, & Wetzel (2003), and Crosta (2013). Finally, the study examines students in a cluster of postsecondary career and technical education (CTE) programs, some of which include transfer options. This extends the traditional focus in two-year college research to include occupationally-oriented students with a broader set of goals and aspirations than students in traditional associate of arts or science programs (Wild & Ebbers, 2002).

Methods

Data and Sample

Initially for this study, records for the 3,468 full and part-time students who were first enrolled in one of 116 manufacturing engineering technologist or technician programs in FY2010¹ were extracted from a database created from the administrative files of 16 public two-year colleges in a Midwestern state. These files include all course enrollments and outcomes (including withdrawals) for all students enrolled in credit and non-credit courses together with information about student characteristics and program enrollment status in FY2010 and FY2011. Students in the initial sample of 3,468 were classified based on their subsequent enrollment status in FY2011 either as *leavers* who enrolled in FY2010 but left without receiving a credential prior to FY2011; *persisters* who graduated in the first year or enrolled in both FY2010 and FY2011; or *others* who graduated or enrolled in a different program in FY2010 or FY2011. Because the goal of the study was to examine differences between students who left without graduating with those who graduated or returned for a second year of study, students in the residual category were dropped from the analysis. This left a truncated total sample size of 3,273. Of these, approximately one-third left school prior to receiving an academic credential.

¹ Because the records are drawn from administrative agency files, they record enrollments relative to the state fiscal year, from July 1, 2009 to June 30, 2010.

Variables

Data included in the analysis fell in five categories drawn from the literature on student attrition and persistence and focus group discussions with program faculty, academic advisors, and administrators. These include:

Program identifiers including broad field of study, type of program (associate degree, one-year or two-year diploma);

Student characteristics including gender, age, ethnicity/race, work status at enrollment, economic disadvantage (Pell eligibility), and prior educational attainment (Adelman, 2005; Attewell et al., 2012; Horn & Nevill, 2006);

Enrollment behavior including number of terms enrolled in postsecondary courses (Horn & Nevill, 2006), number of postsecondary credits attempted in by term (Attewell et al., 2012; Horn & Nevill, 2006), enrollment intensity by term (Crosta, 2013; Horn & Nevill, 2006), and enrollment pattern across the year (Crosta, 2013);

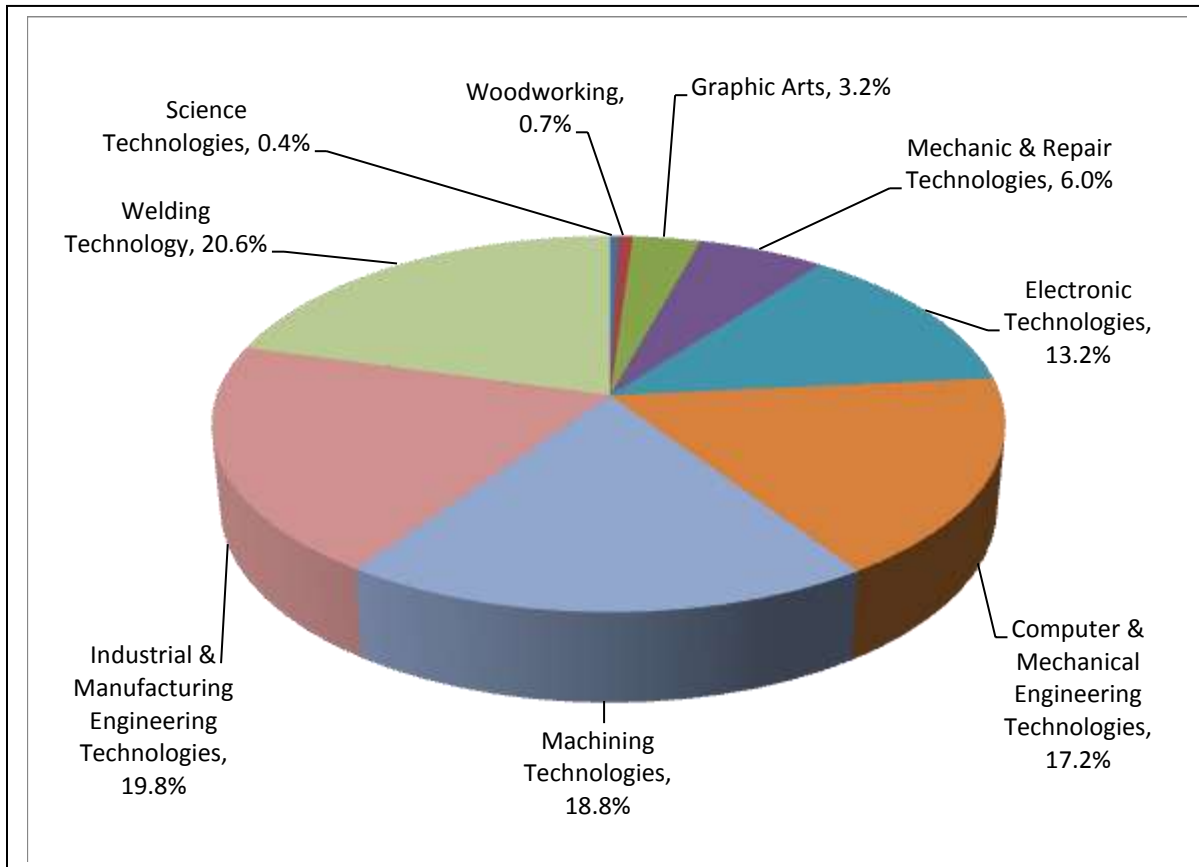
Academic achievement including fall term grade point average and cumulative grade point average for FY2010 (Adelman, 2005; Attewell et al., 2012), passed 2/3 of courses attempted by term (Wild & Ebbers, 2002), failed one or more courses in by term, and withdrew from one or more courses by term (Attewell et al., 2012); and

Course-taking behavior including number of all required program credits completed, number and percentage of required technical studies credits completed, number and percentage of general studies credits enrolled and completed, enrollment in specific kinds of general studies courses, enrollment in math course (Adelman, 2005; Attewell et al., 2012), number of math credits completed (Horn & Radwin, 2012), and enrollment in remedial or developmental education (Horn & Radwin, 2012).

Each college offers a variety of programs that are designed to meet the specific labor force needs of their region. Unlike in health occupation programs, there is little standardization of manufacturing and engineering programs across the technical college system. To facilitate the analysis, programs were grouped by CIP codes, within the three kinds of programs leading to different credentials. Figure 1 describes the distribution of students by fields of study included in the analysis.

Figure 1

**Distribution of Final Sample
by Field of Study**



Analysis

The first step of the analysis compared estimates of the likelihood of leaving or persisting across broad program categories and the three kinds of programs. No differences were observed by program category. Rates of attrition varied slightly by the kind of credential the program provides. In the first year of study, 33% of the students left the one-year diploma programs without completing the program credential as compared to 37% of the students in the longer associate degree and two-year technical diploma programs. Subsequent analyses maintained the distinction between kinds of program, but data were aggregated across program categories.

The second step in the analysis was to calculate estimates of the likelihood of leaving for each variable to identify indicators of student behavior and academic achievement that could be used to predict student attrition or persistence. The estimates are based on simple conditional probabilities. That is, for a given state of a variable, we calculated the likelihood of being either a leaver or persister. These estimates were then compared to the underlying estimate of the likelihood of attrition or persistence for the kind of program in which the students were enrolled. Simple two-way Chi-squared tests were used to identify variables that signaled a significantly increased likelihood of attrition.

Tables 1 through 6 summarize the findings of the analysis. For each category of each variable the tables provide estimates of the likelihood of attrition or persistence. Where the estimates vary significantly from the underlying distribution, the category is flagged with the significance level. Table 7 summarizes enrollment behaviors, academic achievement, and course-taking behaviors that are associated with a significantly greater likelihood of attrition in the first year. Conversely, Table 8 summarizes enrollment behaviors, academic achievement, and course-taking behaviors that are associated with a significantly greater likelihood of graduation or persistence in the first year.

No attempt was made to build a model of the process of student attrition or to reduce the set of potential indicators that might be correlated with each other. Instead, our goal is to create an initial set of indicators that instructors, academic advisors or counselors, and program administrators could use to identify students who are at risk of leaving their program without completing a program credential or to model the behavior of successful students. Recognizing that not all two-year college students share the goal of program completion, these indicators are offered as a way to flag the behavior of students for whom early intervention might lead to increased retention or, alternatively, to discussions that help students and college staff clarify the student's goals.

Table 1
Likelihood of Attrition or Persistence for Student Demographics

	Associate of Applied Science		One-year Technical Diploma		Two-year Technical Diploma	
	Leavers	Persisters	Leavers	Persisters	Leavers	Persisters
OVERALL	0.37	0.63	0.33	0.67	0.37	0.63
AGE AT ENROLLMENT						
17 to 19	0.35	0.65	0.27	0.73	0.32	0.68
20 to 24	0.41	0.59	0.36	0.64	0.37	0.63
25 to 34	0.36	0.64	0.22	0.68	0.40	0.60
35 to 44	0.41	0.59	0.43	0.57	0.32	0.68
45 to 54	0.31	0.69	0.30	0.70	0.43	0.57
55 or more	0.21	0.79	0.28	0.72	0.50	0.50
NONTRADITIONAL STUDENT						
	0.36	0.64	0.34	0.66	0.39	0.61
GENDER						
Female	0.34	0.66	0.40	0.60	0.40	0.60
Male	0.37	0.63	0.32	0.68	0.37	0.63
ETHNICITY/RACE						
Black	0.51*	0.49	0.54**	0.46	0.67**	0.33
Non-Hispanic White	0.35	0.65	0.30	0.70	0.35	0.65
Other	0.49	0.51	0.35	0.65	0.46	0.54
Not disclosed	0.42	0.58	0.35	0.65	0.44	0.56

Source: Special tabulation, Student Attrition Analysis File based on METTE Project Longitudinal Database.

Note: * designates a value significant at the .05 level, ** at the .01 level. A two-way Chi-squared test was used to determine whether the observed frequencies were significantly different from the underlying probability of being a leaver or persister for each of the three kinds of program. For associate degree and two-year diploma programs; a value of .51 or higher is significant at .05 level and .55 or higher at .01 level for attrition; a value of .80 or higher is significant at the .05 level and .83 or higher at .01 level for persistence. For one-year technical diploma programs, a value of .47 or higher is significant at .05 level and .51 or higher at .01 level for attrition; a value of .79 or higher is significant at the .05 level and .82 or higher at .01 level for persistence. Blank cells indicate response is 10 or fewer and too small to provide reliable data. **NS** designates cells with too few entries to compute valid statistics.

Table 2						
Likelihood of Attrition or Persistence for Educational Background, Work, and Economic Disadvantage						
	Associate of Applied Science		One-year Technical Diploma		Two-year Technical Diploma	
	Leavers	Persisters	Leavers	Persisters	Leavers	Persisters
OVERALL	0.37	0.63	0.33	0.67	0.37	0.63
EDUCATIONAL ATTAINMENT						
Less than High School Graduate	0.48	0.52	0.37	0.63	NS	NS
High School Graduate	0.37	0.63	0.33	0.67	0.38	0.62
Postsecondary Experience	0.30	0.70	0.24	0.76	0.37	0.63
Not disclosed	0.47	0.53	0.15	0.65	0.34	0.66
RECENT HIGH SCHOOL GRADUATE						
Yes	0.36	0.64	0.30	0.70	0.33	0.67
No	0.36	0.64	0.33	0.67	0.39	0.61
Not disclosed	0.43	0.57	0.40	0.60	0.36	0.64
WORK STATUS						
Employed Full-time	0.37	0.63	0.27	0.73	0.50	0.50
Employed Part-time	0.35	0.65	0.33	0.67	0.23	0.77*
Underemployed	0.36	0.64	0.44	0.56	NS	NS
Unemployed	0.38	0.62	0.33	0.67	0.49	0.51
Not in Labor Force	0.33	0.67	0.40	0.60	NS	NS
Dislocated Worker	0.28	0.72	0.26	0.74	0.24	0.76*
Not disclosed	0.40	0.60	0.37	0.63	0.43	0.57
ECONOMICALLY DISADVANTAGED (PELL ELIGIBLE)						
Yes	0.34	0.66	0.35	0.65	0.35	0.65
No	0.38	0.62	0.31	0.69	0.40	0.60

Source: Special tabulation, Student Attrition Analysis File based on METTE Project Longitudinal Database.

Note: * designates a value significant at the .05 level, ** at the .01 level. See Table 1 for a description of the determination of significance. **NS** designates cells with too few entries to computer valid statistics.

Table 3
Likelihood of Attrition or Persistence for Enrollment Behavior

	Associate of Applied Science		One-year Technical Diploma		Two-year Technical Diploma	
	Leavers	Persister	Leaver	Persister	Leaver	Persister
OVERALL	0.37	0.63	0.33	0.67	0.37	0.63
NUMBER OF TERMS ENROLLED IN POSTSECONDARY COURSES						
None	0.69**	0.31	0.66**	0.34	0.71*	0.29
One term	0.51*	0.49	0.47*	0.53	0.53*	0.47
Two or more terms	0.24	0.76*	0.19	0.81*	0.28	0.72
NUMBER OF POSTSECONDARY CREDITS ATTEMPTED IN FALL TERM						
Attempted part-time course load	.42	.58	0.43	0.57	.51*	.49
Attempted full-time course load	.30	.70	0.25	0.75	.29	.71
INTENSITY OF ENROLLMENT BY TERM						
Full-time in Fall and Spring, not enrolled in Summer	0.18	0.82**	0.15	0.85**	0.17	0.83**
Full-time in Spring, not enrolled in Summer or Fall	0.28	0.72	0.22	0.78	0.27	0.73
Part-time in Spring, not enrolled in Summer or Fall	0.37	0.63	0.45	0.55	0.42	0.58
Part-time in Fall and Spring, not enrolled in Summer	0.36	0.64	0.31	0.69	0.48	0.52
No postsecondary courses in any term	0.69**	0.31	0.66**	0.34	0.71*	0.29
Full-time course load in Fall, not enrolled in Summer and Spring	0.80**	0.20	0.85**	0.15	1.00**	0.00
Part-time in Fall but not enrolled in Summer and Spring	0.84**	0.16	0.83**	0.17	0.92*	0.08
Part-time in Fall, full-time in Spring, not enrolled in Summer	0.18	0.82**	0.19	0.81*	0.36	0.64
Full-time in Fall, part-time in Spring, not enrolled in Summer	0.41	0.59	0.56**	0.44	0.64**	0.36
Part-time in Summer and full-time in Fall and Spring	0.13	0.87**	0.10	0.90**	0.06	0.94**

Source: Special tabulation, Student Attrition Analysis File based on METTE Project Longitudinal Database.

Note: * designates a value significant at the .05 level, ** at the .01 level. See Table 1 for a description of the determination of significance. **NS** designates cells with too few entries to computer valid statistics.

Table 4
Likelihood of Attrition or Persistence for Academic Achievement

	Associate of Applied Science		One-year Technical Diploma		Two-year Technical Diploma	
	Leavers	Persister	Leaver	Persister	Leaver	Persister
OVERALL	0.37	0.63	0.33	0.67	0.37	0.63
FALL TERM GRADE POINT AVERAGE						
GPA of less than 2.0 in Fall term	0.67**	0.33	0.75**	0.25	0.74**	.26
GPA of 2.0 or better in Fall term	0.21	0.79**	0.17	0.83**	.22	0.78*
FIRST YEAR CUMULATIVE GRADE POINT AVERAGE						
Cumulative GPA of less than 2.0 in	0.67**	0.33	0.77**	0.23	0.73**	0.27
Cumulative GPA of 2.0 or better in first year	0.28	0.72*	0.25	0.75	0.41	0.59
ACADEMIC PROGRESS IN FALL AND SPRING TERMS						
Fall Passed Two-Thirds with 2.0 GPA	0.19	0.81**	0.16	0.84**	0.20	0.80**
Spring passed two-thirds with 2.0 GPA	0.09	0.91**	0.08	0.92**	0.13	0.87**
Spring did not pass two-thirds with 2.0 GPA	0.42	0.58	0.60**	0.40	0.52*	0.48
Not enrolled in Spring	0.74**	0.26	0.48*	0.52	0.86**	0.14
Did Not Pass Two-Thirds with 2.0 GPA	0.64**	0.36	0.73**	0.27	0.74	0.26
Spring passed two-thirds with 2.0 GPA	0.21	0.79**	0.21	0.79*	0.31	0.69
Spring did not pass two-thirds with 2.0 GPA	0.59	0.41	0.73**	0.27	0.72**	0.28
Not enrolled in Spring	0.85**	0.15	0.92**	0.08	0.94**	0.06
FAILED OR WITHDREW FROM ONE OR MORE COURSES IN FALL TERM						
Did not fail or withdraw from any courses	0.19	0.81**	0.14	0.86**	0.20	0.81**
Failed but did not withdraw from any courses	0.67**	0.33	0.66**	0.34	0.89**	0.11
Did not fail but withdrew from one or more courses	0.53*	0.47	0.62**	0.38	0.69**	0.31
Both failed and withdrew from two or more courses	0.54*	0.46	0.75**	0.25	0.60**	0.40

Source: Special tabulation, Student Attrition Analysis File based on METTE Project Longitudinal Database.

Note: * designates a value significant at the .05 level, ** at the .01 level. See Table 1 for a description of the determination of significance. **NS** designates cells with too few entries to computer valid statistics.

Table 5
Likelihood of Attrition or Persistence for Course-Taking Behavior in the First Year:
Program Completion, Technical Studies, and General Studies

	Associate of Applied Science		One-year Technical Diploma		Two-year Technical Diploma	
	Leavers	Persister	Leaver	Persister	Leaver	Persister
OVERALL	0.37	0.63	0.331	0.67	0.37	0.63
NUMBER OF REQUIRED PROGRAM CREDITS COMPLETED						
Completed no credits toward program requirements	0.77**	0.23	0.84**	0.16	0.81**	0.19
Completed only one to six required program credits	0.51*	0.49	0.46	0.54	0.43	0.57
Completed more than six required program credits first year	0.19	0.81**	0.17	0.85**	0.33	0.67
PERCENTAGE OF TECHNICAL STUDIES CURRICULUM CREDITS COMPLETED						
Completed no credits in required the technical studies curriculum	0.58**	0.42	0.63**	0.37	0.70**	0.30
Completed up to one-quarter of credits in required the technical studies curriculum	0.31	0.69	0.44	0.56	0.36	0.64
Completed between one-quarter and one-half the credits in required the technical studies curriculum	0.12	0.88**	0.33	0.67	0.13	0.87**
Completed more than one-half the required technical studies credits	NS	NS	0.09	0.91**	NS	NS
COMPLETED GENERAL STUDIES CREDITS THROUGH COURSEWORK OR CREDIT FOR PRIOR LEARNING						
Completed no general studies credits	0.63**	0.37	0.62**	0.38	0.62**	0.381
Completed any general studies credits	0.24	0.76**	0.19	0.81**	0.24	0.76*
ENROLLED IN GENERAL STUDIES COURSES						
Attempted at least one general studies course in communication skills, social or behavioral science, math, or natural science	0.33	0.67	0.29	0.71	0.34	0.66
Attempted no general studies	0.55**	0.45	0.48*	0.52	0.51*	0.49
Completed science course	0.23	0.77*	0.24	0.76	0.19	0.81**
Completed both math and science	0.20	0.80**	0.13	0.87**	0.13	0.87**

Source: Special tabulation, Student Attrition Analysis File based on METTE Project Longitudinal Database.

Note: * designates a value significant at the .05 level, ** at the .01 level. See Table 1 for a description of the determination of significance.

Table 6
Likelihood of Attrition or Persistence for Course-Taking Behavior in the First Year: Math and Academic Disadvantage

	Associate of Applied Science		One-year Technical Diploma		Two-year Technical Diploma	
	Leavers	Persister	Leaver	Persister	Leaver	Persister
OVERALL	0.37	0.63	0.33	0.67	0.37	0.63
MATH COURSE EXPERIENCE						
Attempted any math course	0.31	0.69	0.27	0.73	0.32	0.68
Failed first postsecondary math course, regardless of whether it was the required math	0.59**	0.41	0.60**	0.40	0.64**	0.36
Passed first postsecondary math course	0.16	0.84**	0.15	0.85**	0.21	0.79**
PERCENT OF GENERAL STUDIES REQUIREMENTS COMPLETED						
None required			0.21	0.79*		
None completed	0.64**	0.36	0.62**	0.38	0.64**	0.36
1 to 25%	0.37	0.63	0.58**	0.42	0.42	0.58
26% to 50%	0.20	0.80**	0.32	0.68	0.31	0.69
51% to 75%	0.16	0.84**	0.26	0.74	0.13	0.87**
76% or more	0.21	0.79**	0.12	0.88**	0.18	0.82**
ACADEMICALLY DISADVANTAGED						
Enrolled in one or more basic education courses	0.37	0.63	0.34	0.66	0.45	0.55
Did not enroll in basic education courses	0.37	0.63	0.33	0.67	0.34	0.66

Source: Special tabulation, Student Attrition Analysis File based on METTE Project Longitudinal Database.

Note: * designates a value significant at the .05 level, ** at the .01 level. See Table 1 for a description of the determination of significance. **NS** designates cells with too few entries to computer valid statistics.

Table 7
Indicators of METTE Student Attrition in the First Year

	Associate of Applied Science	One-year Technical Diploma	Two-year Technical Diploma
Enrollment Behavior			
Not enrolling in any postsecondary courses in any term	X	X	X
Enrolling in only one term	X	X	X
Enrolling only in Fall term	X	X	X
Dropping course load from full-time in Fall to part-time in Spring term			X
Enrolling in only a part-time course load			X
Academic Achievement			
Attaining a GPA of less than 2.0 in Fall term	X	X	X
Attaining a cumulative GPA of less than 2.0 for first year	X	X	X
Not passing two-thirds of courses attempted in Spring term with 2.0 GPA	X	X	X
Not enrolling in Spring term regardless of academic achievement in Fall term	X	X	X
Course-Taking Behavior			
Completing no credits toward program requirements	X	X	X
Completing only one to six required program (technical studies + general studies) credits	X		
Completing none of the required credits in the technical studies curriculum	X	X	X
Completing none of the required general studies credits	X	X	X
Failing first postsecondary math course, regardless of whether it was the required math	X	X	X
Failing and/or withdrawing from any postsecondary courses	X	X	X

Table 8
Indicators of METTE Student Graduation or Persistence to the Second Year

	Associate of Applied Science	One-year Technical Diploma	Two-year Technical Diploma
Enrollment Behavior			
Enrolling in two or more terms	X	X	
Enrolling full-time in Fall and Spring terms	X	X	X
Increasing course load from part-time in Fall to full-time in Spring term	X	X	
Academic Achievement			
Attaining a GPA of 2.0 or greater in Fall term	X	X	X
Attaining a cumulative GPA of 2.0 or greater for first year	X		
Passing two-thirds of courses attempted in Fall and Spring term with 2.0 GPA	X	X	X
Passing two-thirds of courses attempted in Spring term with 2.0 GPA	X	X	
Course-Taking Behavior			
Completing more than six required program (technical studies + general studies) credits	X	X	
Completing 1/4 to 1/2 of the required credits in the technical studies curriculum	X		X
Completing 1/2 to 3/4 of the required credits in the technical studies curriculum		X	
Completing any of the required general studies credits	X	X	X
Completing 1/4 to 1/2 of the required credits in the general studies curriculum	X		
Completing 1/2 to 3/4 of the required credits in the general studies curriculum	X		X
Completing more than 3/4 of the required credits in the general studies curriculum	X	X	X
Attempting science course	X		X
Attempting math and science courses	X	X	X
Passing first postsecondary math course, regardless of whether it was the required math	X	X	X
Not failing and/or withdrawing from any postsecondary courses	X	X	X

Results and Implications

This study was conducted as an initial analysis of a cohort of students enrolled in 116 METTE programs at sixteen technical colleges in the WTCS. Building on a preliminary analysis of student attrition for three programs at one college, it provided us with a methodology and techniques to examine research questions of interest to METTE program instructors and college administrators; develop a conceptual framework for addressing these questions; and construct an analytical database and procedures to operationalize our framework.

We began our analysis seeking to answer two questions about student attrition in METTE programs. First, to what extent do differences exist in demographic, educational attainment, work status, and economic background between students who leave and those who persist? Second, can empirically-based indicators of enrollment behavior, academic achievement, and course-taking behavior be identified that differentiate leavers from persisters? To better understand student attrition, we created a longitudinal database of students who first enrolled in METTE in FY2010. We used this database to examine the socio-demographic and educational attainment, and the first year enrollment behavior, academic achievement, and course-taking patterns of two subgroups of these students—“persisters” who continue taking courses beyond the first year or graduated from a one year program and “leavers” who abandon their studies prior to graduation in three different kinds of programs: associate degree and one- and two-year diploma programs.

With the exception of an elevated likelihood of leaving for black students, this study found no significant difference in student demographics and other personal characteristics between leavers and persisters. However, our findings point to patterns of enrollment, academic achievement, and course-taking behavior that could be useful to administrators seeking to identify students at risk of leaving and in modeling successful behavior for students who persist or complete their degree or diploma in the first year of study. That is, for this relatively heterogeneous group of students enrolled in manufacturing and engineering programs, it is not as important who the students are as what they do and achieve in their studies.

Throughout our analysis we have sought to identify significant differences between the behavior and academic achievement of leavers and persisters occurring in their first year of program enrollment. By highlighting these differences, we were able to develop a series of easily operationalized measures of student behavior and academic achievement that could be used by college instructors, academic advisors, and administrators to identify students at risk of leaving prior to program completion. Although the work reported here should continue to be considered a preliminary analysis, the results of the study have provided some insights into the characteristics of METTE program students, their behavior, and academic achievement.

Our analysis of the enrollment behavior of 2,814 students enrolled in METTE programs in FY2010 in the WTCS indicate that in their first year of studies, about one-third of the students in associate degree and two-year diploma programs left college after the first year and prior to program completion. About one-half of the students in one-year diploma programs left after the first year and prior to program completion.

Key findings include:

Student Characteristics. We observed no significant differences across a range of socio-demographic characteristics between leavers and persisters.

Enrollment Behavior. Leavers are less likely to exhibit continuity and intensity of enrollment. Leavers who enrolled in Summer or, more commonly, Fall term, are much less likely to be retained to the Spring term than are persisters. If they were attending school full-time in the Fall semester, leavers are much more likely to move to part-time² enrollment in Spring than persisters. If they were attending school part-time in the Fall semester, they are much more likely to abandon their studies altogether in the Spring term than are those who persist to the second year.

Academic Achievement. Leavers struggle more academically than do persisters. Fall term GPA and cumulative GPA over the first year of enrollment tended to be lower for leavers than for persisters. Leavers were more likely than persisters to fail or withdraw from courses. They were also less likely to pass two-thirds of the courses attempted in both Fall and Spring.

Course-Taking Behavior. Leavers lack academic momentum in their studies as compared to persisters. Leavers attempt and complete fewer postsecondary courses overall than persisters. They also complete fewer of the technical studies and/or general studies credits in their METTE program in their first year of enrollment than do persisters. Leavers are more likely to avoid completing their general education requirements in favor of completing technical studies courses. This is particularly true of the associate degree students. If leavers take general studies courses, they are most likely to enroll in math. Leavers in associate degree and two-year diploma programs are more likely to avoid taking required math courses and to have failed at least one math course than are persisters. Given their poorer academic performance, we might expect leavers to be more likely to have been deemed academically disadvantaged and enrolled in developmental or remedial courses than persisters, but no differences were observed between the two groups.

Implications

Some of our findings point to patterns of enrollment, academic achievement, and course-taking behavior that could be useful to administrators seeking to identify students at risk of leaving. In particular, failure to enroll in postsecondary courses in multiple terms, successfully complete required coursework, accumulate more than six credits needed for program completion, and pass a postsecondary math course differentiate students who leave from those who persist to the second year of studies. These measures could be easily incorporated in learning support networks, early warning systems, and safety nets – all of which have been demonstrated to assist students in avoiding premature departure (Kuh, et al., 2006).

² Because part-time enrollment in two-year colleges is common, we examined subcategories of part-time enrollment including enrolling in 1 to 3 credits, 4 to 6 credits, and 7 to 11 credits. The results of the analysis were the same regardless of the number of credits fewer than 12 for which the student was enrolled.

For example, colleges might work with employers to develop short-term certificates that recognize completion of discrete, initial portions of longer one or two-year programs that teach high-demand skills and knowledge. This could result in creating series of stackable certificates that students complete to: (a) demonstrate progress toward degree completion; (b) meet immediate employability needs; and (c) offer optional pathways to degree completion and career laddering. Other findings point to changes that would strengthen the academic advising services and support student success at technical colleges. Recognizing that most students enroll in a technical college to gain job-related skills, colleges might develop more effective ways of collecting information about students' long and short term objectives while maintaining financial aid eligibility when appropriate. In addition, they could expand early alert systems to include evidence-based indicators such as those described in this study to identify students at risk of leaving prior to program completion to facilitate appropriate and timely advising and provision of needed student support. Finally, college could implement strategies to better integrate general studies courses and technical studies to insure students gain critical thinking, problem solving, global perspectives, and communications skills in both classroom and real-world settings.

Limitations

First, this study examined the behavior and characteristics of a group of students enrolled in METTE programs in a single state. The behavior and characteristics of these students and their experiences in Wisconsin's technical colleges may differ from those of students in other disciplines or in two-year colleges which place less emphasis on liberal arts or pre-professional programs than does the WTCS.

Second, despite the large numbers of records involved in the METTE database, asking questions about student outcomes even for groups of programs at multiple colleges can quickly lead to small cell sizes and potentially to inappropriate disclosure of identifiable information. The METTE data use agreement requires us to take steps to avoid revealing results that might lead to the inadvertent disclosure of student identity. This means that information about specific programs in specific colleges cannot be provided.

Third, administrative data collected and processed by state agencies is typically made available to researchers after the agency that collected the data has extracted the information from the database for its own purposes. This results in significant lags in the availability of student data from state agencies. The most recently available data provided by the WTC System Office to the METTE project are records for students enrolled in FY2012. The experiences of the students reported in this study appear to mirror those in other studies of student attrition, but labor market and economic conditions tend to drive two-year college enrollments and the business environment METTE students are facing now are substantially different than those these students were facing in FY2010 during the great recession (Dresser et al., 2012). Finally, longitudinal studies such as this must start in the past and do not necessarily represent current practice at the colleges. Nevertheless, careful analyses of these data, however, can provide insights not readily available from other sources of information.

Next Steps

This analysis has helped us develop a framework for data analysis, refine the definition of key variables, and develop procedures for manipulating data from the METTE Project database. This study was intended to move beyond an earlier analysis of individual programs at a single college to examine student attrition from METTE programs in all sixteen technical colleges in Wisconsin. Together with the information gained from our earlier work on employment outcomes for leavers, the results of this analysis point to three directions for future research. First, an obvious question is what happens to students who leave in the first year. To explore this, we will link the data on leavers and program graduates to state labor department information to examine labor market outcomes for METTE leavers and graduates. In addition, linking to information from the National Student Clearinghouse will provide a way to identify students who, although they left a METTE program prior to program completion, may have enrolled in another postsecondary institution. Second, although a large number of students leave after the first year, a sufficient number remain so that we can extend our analysis of enrollment, academic achievement, and course-taking behavior over a longer period of time. This will permit us to examine differences and similarities between students who leave school and subsequently return (i.e., stopouts). Third, another possible direction for future research would be to look in more detail at the sets of courses that leavers complete to try to determine common patterns of course completion that could be packaged by the colleges as short-term stackable certificates that would recognize course completion and skill acquisition.

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