Tech Prep: Pathways to Success?

The Performance Of Tech Prep And Non-Tech Prep Students

At A Midwestern Community College

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Lawmakers have called Tech Prep programs “a successful effort to prepare students for college and careers” (Hardi, 2000). And in fact they are very popular programs, both among students and among institutions. In 1997 it was estimated that nearly two thirds of high schools and almost all community colleges in the country were associated with these programs (Pucel & Sundre, 1999). In Ohio the number of high school students enrolled in Tech Prep programs grew from 4,995 in 1997-1998 to 9,641 in 1999-2000 (Bragg, 2000a). But in reality “little is known about how Tech Prep affects student outcomes” (Bragg, 2000b). Early studies are promising. Preliminary results from a longitudinal study launched by Bragg and others show that the majority of Tech Prep students have engaged in substantial technical and academic coursework and have enrolled in a two or four year college within 3 years of high school graduation (Bragg, 2000b).

The current study looks at all students who participated in a Tech Prep program and who first enrolled at this large urban community college between Fall 1997 and Spring 2001. College performance and retention of those who participated in a high school Tech Prep program is contrasted with a comparable group of students who did not participate in such a program.

The Tech Prep program is designed to address the needs of students in the academic middle. The Tech Prep consortium in this area works with this college and 64 area high schools in eight vocational education planning districts to create seamless career-technical education programs that begin in the junior year of high school and continue through an associate degree in college and beyond. Tech Prep programs stress mathematics, science, communication and technology. They also emphasize teamwork, hands-on learning, work site experiences, critical thinking, and problem solving. There are nine different Tech Prep programs in the fields of Allied Health, Business, and Engineering that are available to students in this area.

Methodology

Sample

The Tech Prep group consisted of all students in the Tech Prep Consortium who first attended Sinclair Community College between the Fall of 1997 and 2001. Students were enrolled in one of nine programs available to tech prep students: Allied Health, Automotive Technology, Business Technologies, Electronic Engineering Technology, Engineering Cluster, Environmental Technology, Industrial Engineering Technology, Interactive Media Technology, and Information Technology. The great majority of Tech Prep students enter the college with a major in one of the following divisions: Allied Health Technologies, Business Technologies, and Engineering Technologies. Excluded from this study were Tech Prep students majoring in other academic areas such as Liberal Arts & Sciences or Fine & Performing Arts (n = 19), and Tech Prep students who were greater than 20 years of age when they entered Sinclair, since the intervening time between their High School program and their college entrance could be a confounding factor.

The comparison group consisted of all non-Tech Prep students who started at Sinclair in Fall 1997, Fall 1998, Fall 1999 or Fall 2000, and who had not transferred credits from any other institution. As with the Tech Prep students included in the study, the comparison group was limited to students who were under 20 years of age at the time they entered Sinclair, and who were majoring in Allied Health, Business, or Engineering programs. This group was also limited to students with no previous college experience.

The comparison group was selected so as to be comparable to the Tech Prep group in terms of the demographic and academic characteristics of minority status, gender, age at entry and academic program area. They are not representative of the overall college population at Sinclair.

Measures

Performance measures included scores on placement tests taken at the time of entry to the college, grades in the first college level math courses, grades in the first college level English

courses, and overall grade point average. First quarter to second quarter and first year to second year retention rates were also examined.

At Sinclair, each new incoming student who has no previous successful college experience is required to take a computer assisted placement test (COMPASS) divided into three areas: readings skills, writing skills, and mathematical skills. The scores on these tests determine which levels of English and Math the student is advised to take. The mathematic portion of the test has two phases: a numeric phase and an algebra phase. In order to continue on to take the algebra portion of the test, the student must do well on the numeric portion. High School course grades and grade point averages are not available for incoming students at Sinclair.

A student's cumulative grade point average is calculated every term for all quality points earned in transcripted courses. Quality points are essentially a numeric version of grade which are used to calculate grade point average. Quality points received for a course are based on the following standard scale: D = 1 quality point, C = 2 quality points, B = 3 quality points, and A = 4 quality points. All other grades (F (failure), W (withdrawal), and Z (failure due to nonattendance) are assigned zero quality points.

One entry-level mathematics course (100 level) and one entry level English course are core requirements for all degree programs at Sinclair, unless the COMPASS scores are high enough to exempt the student from lower level mathematics and/or English. Some programs require additional math and/or English courses, and therefore if the student tests out of the introductory course in that subject area, the first college level course taken might be beyond the introductory level. Consequently, grades in the first math college level math course and the first college level English course taken at Sinclair were used for the course grade analyses.

Demographic and Academic Characteristics

There were 291 Tech Prep students who fit the age and division requirements listed above, and who entered Sinclair between Fall 1997 and Spring 2001. Of these students 36.1% were female and 8.2% were members of ethnic minority groups (non-Caucasian). These

students entered the college with majors in the following academic divisions: Engineering and Industrial Technologies (51.2%), Allied Health Technologies (26.1%); and Business Technologies (22.7%).

There were 2,074 students in the overall Sinclair comparison group and their demographic and academic characteristics were quite similar to those of the Tech Prep population. The following table shows the academic and demographic distributions of both the Tech Prep and the Sinclair comparison groups.

Comparison of Demographic and Academic Characteristics

	Tech-Prep Group N = 291	Comparison Group N = 2,074
Gender		
Female:	36.1%	38.6%
Male:	63.9%	61.4%
Minority Status		
Caucasian:	91.8%	89.8%
Minority:	8.2%	10.2%
Age at entry		
Mean *	17.6	18.2
Median	18.0	18.0
Mode	18.0	18.0
Range	16-19	16-19
Academic Division		
Engineering Technologies	51.2%	47.3%
Allied Health Technologies	26.1%	29.3%
Business Technologies	22.7%	23.4%

* Statistically significant difference p<.001

As planned, there were no significant differences between the comparison group and the Tech Prep group in terms of gender, minority status or academic division. The Tech Prep students were, on average, about 7 months younger than the students in the comparison group. This may be explained by the fact that these students can gain proficiency credits for college courses while still in high school. Also, because of their participation in the program they are more aware of the

college and the opportunities it provides while they are still in high school than are other high school students.

Performance Measures

Entry Test Scores

All incoming students with no previous successful college experience are required to take entry skills assessment tests to determine whether they need to take remedial education courses or are ready for entry-level college courses. The following table presents the average entry test scores for the Tech Prep students and the comparison students.

Comparison of Entry Test Scores

	Tech Prep		SCC Comparison Group	
	(N)	Score	*(N)*	Score
Numeric Test Score*	*(290)*	60.74	*(2074)*	52.48
Algebra Test Score**	*(271)*	41.66	*(1493)*	39.15
Writing Test Score**	*(288)*	69.68	*(2058)*	58.51
Reading Test Score**	*(286)*	81.95	*(2053)*	77.18

t-test of mean difference: * p< .05, **p<.001

As the above table shows the Tech Prep students scored significantly higher on every portion of the entry test as compared to the non-Tech Prep students. In order to take the algebra portion of the test a student must score above a certain point on the numeric portion of the test. Not surprisingly, Tech Prep students were also significantly more likely than non-Tech Prep students (93% and 72% respectively) to take the algebra portion of the test *($X^2 = 60.2, p<.001$)* . While Tech Prep students may take the COMPASS exam as early as their junior year of high school, most took the tests just before their entry to Sinclair. Consequently, the scores reflect any learning that may have occurred while enrolled in the Tech Prep program during high school.

It is interesting to note that within the Tech Prep student population at Sinclair, those in the Allied Health programs scored significantly lower on the numeric *($F = 6.8, p<.01$)* and algebra sections *($F = 5.0, p<.01$)* of the COMPASS test compared to their Tech Prep counterparts in the

Business or Engineering programs. The average scores on the reading and writing portions of the test did not differ significantly.

Need for Remediation

Students scoring over 35 points on the Algebra portion of the COMPASS exam are placed in entry-level college math courses. Those with lower scores must first enroll in a remedial math course, and then, given a passing grade in that course, can proceed to entry-level college math. Placement in remedial math was also significantly different for the two groups. Thirty-seven percent of the Tech Prep students and 54% of those in the comparison group were required to take remedial math *($X^2 = 24.6, p<.001.$)* The Allied Health Tech Prep students were significantly less likely to test out of remedial math than were the Tech Prep students in the other program areas (*($X^2 = 10.4, p<.01.$)*.

Students who score above 75 on the writing portion of the test and above 80 on the reading portion are placed in entry-level college English courses. Those with lower scores must first enroll in one or more remedial courses that teach reading and/or writing skills before they can proceed to the college level course. There was a significant difference between these two groups in testing out of remedial English. While 74.4% of the comparison group required remedial English, only 45% of the Tech Prep students required remediation in either reading or writing *($X^2 = 97.6, p<.001$).* There was not a significant difference among the Tech Prep students by program area.

Performance in College Level Math and English Courses

The following table shows the distribution of grades in the first college level math course taken at Sinclair for students in the Tech Prep group and non-Tech Prep students.

Comparison of Performance in First College Level Math Course				
	Tech Prep Students		Sinclair Comparison Group	
Grade	*(N)*	Percent	*(N)*	Percent
A	*(28)*	12.7%	*(183)*	13.0%
B	*(62)*	28.1%	*(290)*	19.2%
C	*(60)*	27.2%	*(328)*	22.5%
D	*(29)*	13.1%	*(162)*	11.2%
F	*(23)*	10.4%	*(274)*	21.3%
W	*(19)*	8.6%	*(171)*	12.8%

The grade distribution of Tech Prep students was significantly different from that of non-Tech Prep students ($X^2 = 25.3, p<.001$). A larger percentage of Tech Prep students earned a passing grade than did students in the comparison group (81% received a letter grade of A, B, C, or D as compared to 66% of the comparison group). When D's are not included as success there is still a significant difference ($X^2 = 20.2, p<.001$) between the two groups with 71.2% of the Tech Prep group and 54.4% of the comparison group earning an A, B or C. Performance in the first college level math course did not significantly differ for Tech Prep students in the three different program areas.

When the grade distribution, the pass rates, and the success rates for the first college level English course were examined, there were no significant differences between the Tech Prep and the comparison groups. Tech Prep students in the Allied Health, Engineering, and Business program areas did not differ significantly from one another in their performance in the first college level English course.

The final measure of performance examined was the students' overall Grade Point Average (GPA). The average cumulative GPA for the Tech Prep students was 2.46. This is significantly higher ($t = 9.86, p< .001$) than the 1.87 average cumulative GPA for the comparison group. Grade Point Average was not significantly different for Tech Prep students in the three different program areas.

Retention

Tech Prep students and non-Tech Prep students were also compared in terms of their first quarter to second quarter (fall to winter) retention and their first quarter to second year (fall to fall) retention. The following table presents the results of this analysis.

	RETENTION			
	Tech Prep Students		Sinclair Comparison Group	
	(N)	Percent	*(N)*	Percent
First quarter to second quarter	*(130)*	73.0%	*(1,561)*	75.3%
First quarter to second year**	*(108)*	60.7%	*(1,003)*	48.4%

Chi-square test of distribution difference: ** p<.001

This retention analysis includes only students who started at the college in a fall term. First quarter to second quarter retention is defined as enrollment in the winter term following a fall entry. First year to second year retention figures include students enrolled at the college in their initial fall quarter, the following winter quarter and the following fall quarter. First quarter to second quarter retention was not significantly different for Tech Prep and non-Tech Prep students. There was, however, a significant difference in first quarter to second year retention between the two groups ($X^2 = 9.9, p<.01$). Tech Prep students were retained from their initial fall quarter to the following fall at a rate of over 60% while less than 50% of the non-Tech Prep students were still enrolled one year later.

When the Tech Prep students in the different program areas are compared, there are significant differences in both first to second quarter ($X^2 = 12.2, p<.01$) and first to second year retention ($X^2 = 17.3, p<.001$). The following table presents the results of this analysis:

Retention of Tech Prep Students by Program Area			
	Allied Health	Business	Engineering
Second Quarter Retention Rate	42.9%	73.2%	80.2%
Second Year Retention Rate	28.6%	51.8%	73.6%

As this table shows, Tech Prep students in the Allied Health programs are less likely to be retained than are their counterparts in the Business or Engineering program areas.

Conclusions

The results of this study suggest that participation in a Tech Prep program has a positive effect on subsequent college performance. The Tech Prep students considered here outperformed their non-Tech Prep classmates in a number of critical measures of collegiate success.

When compared to classmates who did not participate in a Tech Prep program prior to enrolling at Sinclair, Tech Prep students had higher entry assessment scores, were less likely to need remedial mathematics, were more likely to receive a passing grade in their first college-level math courses, and were more likely to be retained one year after their initial term of entry.

There are some interesting difference between Tech Prep students in the different program areas in terms of mathematic entry test scores and retention. Allied Health Tech Prep students did not perform as well and were not retained as well as their Tech Prep counterparts in the Business and Engineering areas.

Discussion

Certain limitations on the generalizabilty of these findings should be noted. The number of Tech Prep students who have attended Sinclair up to this time is still fairly small compared to the overall population of students the College serves. Certain criteria were used to limit the size of the control group, since the pool of students available to serve in that function was extremely large.

The comparison group in this study was randomly selected on the basis of demographic characteristics, course study area, and previous college experience to be roughly equivalent to the Tech Prep group. Using a different random selection of students as a comparison group might have changed the outcome. Also, this study does not address other factors such as motivation to succeed and high school performance, which have previously been associated with college performance.

Although the results of this study are encouraging and seem to indicate that participation in Tech Prep programs can be very beneficial, additional study is needed to see if these results hold up over time and with multiple populations. Ideally future studies should control for sophomore year high school GPA to insure that any differences are not due to incoming ability rather than the program itself. Additional research is also needed to explore the reasons for the differences between students in the Allied Health Tech Prep programs and students in the Business or Engineering Tech Prep programs.

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