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## Tech Prep Persistence in Comprehensive High Schools: An Exploratory Study

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## Background

Tech Prep is a high school program of study. The student outcome objective is to prepare students to make the transition from high school to postsecondary pre-baccalaureate technical education, complete the postsecondary program without the need to take remedial academic courses, and then transition to commensurate employment. While the concept is not necessarily new-2+2 programs were around in the 1950's-the present day Tech Prep model can be traced to the writings of Dale Parnell (1985), who provided the rationale for Tech Prep's subsequent inclusion in the Carl Perkins Vocational and Applied Education Act of 1990. Since 1990, Tech Prep has become popular among federal policy makers, because it is consistent with their view that the goal of vocational education (now called career and technical education) is preparation for both full-time employment and postsecondary education below the baccalaureate level (National Center for Education Statistics [NCES], 2000). By 1995, the National Tech Prep Evaluation found that 70% of school districts that serviced 90% of all high school students reported they offered Tech Prep programs for a total enrollment of 737,635 students (Hershey, Silverberg, Owens, & Hulsey, 1998).

As defined by the Congressional Act, Tech Prep is a combined or articulated secondary and postsecondary program that leads to an associate degree or certificate in at least one field of engineering technology, applied science, mechanical, industrial, or practical arts, or trade, agriculture, health, or business. The basic program rationale is to provide junior and senior high school students with a focused program of both advanced academics and technical skills education that is articulated/coordinated with specific postsecondary technical education programs.

Tech Prep is an elective high school program of study much the same as college prep and career and technical education (CTE). Typically, students elect Tech Prep at the end of their sophomore year and begin the sequence of courses their junior year. During the junior and senior year Tech Prep students are required to take advanced math courses, applied science courses, and related occupational/technical courses.

### *Tech Prep Assessment*

The Perkins Acts of 1990 and 1998 require states to conduct implementation as well as student performance and outcomes assessments. Specifically, the federal act calls for the assessment of Tech Prep students' academic and technical achievement and postsecondary placement rates. Because Tech Prep student outcome performance assessment could not be done until students completed the program, early evaluation amounted to mostly counting the number of programs, enrollments, etc.

Although these implementation studies were relatively simple to conduct and involved mostly sending questionnaires to school districts, assessing student performance and outcomes was a different matter. Doing so required the ability to identify Tech Prep students at the district level, gain access to students' high school transcripts, and get mailing addresses in order to conduct follow-up studies. The logistics alone were paralyzing in many states. Thus, to date, other than the work of Bragg et al. (1999), the literature is largely silent in regard to Tech Prep student outcomes/performance assessment.

### *Tech Prep Persistence*

The state of Pennsylvania conducted an implementation assessment in 1995 (Gray, Palladino, & Sanogo, 1995). It was found that over half the districts and all the area vocational technical schools had implemented or were in the early adoption stage of implementing a Tech Prep program of study. Thus, it was deemed appropriate to proceed with a pilot Tech Prep

performance/outcomes assessment (Gray, et. al., 1998). One of the findings of the pilot outcomes/performance study was that among those counted as Tech Prep students, very few ever completed the entire program of study. This was particularly the case for Tech Prep programs in comprehensive high schools versus those in the state area vocational technical schools. For example, while two-thirds of Tech Prep students in Pennsylvania were enrolled in comprehensive high school programs, two-thirds of the completers were from area vocational technical schools. The estimated completion rate, when defined as completing the program of study, was less than 30%.

The finding that persistence was a problem in comprehensive high school Tech Prep programs was not unique to Pennsylvania. This finding was consistent with results from other states (see Brown, 1998; Brown, Pucel, Twohig, Semler, & Kuchinke, 1998).

### *Significance of the Study*

Despite huge public investments, very few students in comprehensive high school complete the program of study. Programs are in place, students do elect to take the program, but many do not complete the course sequence. Meanwhile, high dropout rates and resultant high Tech Prep per pupil costs inevitably lead to questions regarding the worth of the program. The very future of Tech Prep funding could well depend on increasing completion rates. Yet little is known about why so few students do persist. These concerns provided the impetus for this pilot study.

### **Research Questions**

This study addressed two research questions:

1. Among Tech Prep program participants in comprehensive high schools, what 10<sup>th</sup> grade academic variables predict persistence?
2. What are the postsecondary experiences of Tech Prep participants, and do they vary between those who persist and those who do not?

Persistence is defined as completing the entire two-year high school Tech Prep sequence. Increasing persistence in any educational program requires first identifying those who are at risk of not persisting and understanding why. In the Tech Prep program examined in this pilot study, students elect Tech Prep at the end of the 10<sup>th</sup> grade and begin the course sequence in the 11<sup>th</sup> grade. Thus, of interest to educators is whether there are academic variables—factors that are potentially within a school's power to change—that predict those who will persist and those who do not.

Students who drop out of Tech Prep programs do not, as a rule, leave high school; they just stop taking the Tech Prep required courses. Therefore, a majority of Tech Prep non-completers do graduate from high school. An important question is whether those who persist and those who do not persist have different postsecondary experiences. If the educational intervention under investigation (Tech Prep) is effective, it would be expected that the postsecondary experiences of those who persist would differ from those who do not, and would be more in line with Tech Prep outcome objectives.

### **Methodology**

A pilot study approach was taken for this study. Specifically, it was decided that the most practical approach for this exploratory study was to select a single comprehensive high school that had a well-established Tech Prep program and was willing to participate in the study, thus giving the researchers access to student transcript data and student addresses for a follow-up study. A comprehensive high school program was chosen because the persistence rates had been found to be significantly lower than programs in regional vocational schools (Gray, 1998). In particular the researchers wanted to examine persistence in a comprehensive high school where the Tech Prep program was exemplary, meaning it had a full Tech Prep sequence of courses, faculty/administrative support, and working articulation agreements. And while a pilot study approach would result in small numbers for analysis purposes and limited generalization to larger populations, it would provide a base for future, more extensive studies into Tech Prep persistence.

The study was conducted in a mid-size suburban high school that had six years experience with its Tech Prep program and was recognized as an exemplary program. The Tech Prep program focused on Business, Engineering, and Health Occupations. The pilot study focused on the graduating class of 1999, which was the second class to have completed the Tech Prep sequence. The population for the study consisted of the 40 students who had elected the Tech Prep program of study in 1997 at the end of their sophomore year. Data was collected from the high school transcripts for all 40 students.

Discriminant analysis was employed. The dependent variable was persistence, defined as completing the entire two-year Tech Prep sequence of courses. The independent variables were level of math taken in the sophomore year, final grade point average for that math course, tenth grade school absences, and the grade point average for all courses taken in the tenth grade. These variables were selected to test whether prior academic achievement and commitment to high school (as indicated by total absences) were predictors of persistence.

All 40 students were sent a follow-up questionnaire. The questionnaire was developed with input from a panel of Tech Prep experts to insure that it covered Tech Prep outcome objectives. The questionnaire contained ten questions designed first to determine postsecondary status as of November following graduation; if working, whether the job was related to their Tech Prep program; and if in college at what level (diploma/certificate, associate degree, or baccalaureate). A second group of questions was answered only by those in college and sought to determine if respondents felt prepared for postsecondary education and whether they were required to take remedial education. A final set of questions to be answered by all respondents asked questions about their high school experience, including questions about why they selected Tech Prep and factors that may have affected their persisting or not persisting in the program.

The Dillman (1978) survey technique was employed. Non-respondents were contacted by phone to increase response rates. The final response rate was 80%. Analysis found that non-response was not systematic.

## Results

*Research Question 1:* Among Tech Prep program participants in comprehensive high schools, what 10<sup>th</sup> grade academic variables predict persistence?

Of the 40 students who elected Tech Prep in 1997, 28 or 70% did not finish the program. Males comprised 50% of both completers and noncompleters. Stepwise discriminant analysis resulted in two variables being statistically significant in predicting persistence at the .05 alpha level: sophomore year grade point average and the level of math taken in the sophomore year. The

discriminant analysis model correctly classified 75% of the cases. Students with 10th grade point averages of C or less and who were taking math below the level of Algebra I/Applied Math II were likely not to persist in Tech Prep (Tables 1, 2, and 3).

Table 1  
*Tenth Grade Academic Variables for Tech Prep Students*

Academic Variables	Completers	Completers
Algebra I/Applied Math II	83%	64%
Final Math Grade	C+	C
GPA	C+	C
Absences	8.2	10.2

Table 2  
*Stepwise Discriminant Analysis Structure and Function Coefficients*

Discriminating Variable	Standardized Function Coefficient	Structure Coefficient Pooled Within Group Correlation
GPA	1.044	.789
Math Level: Algebra I/Applied Math II Or Higher	.655	.265

*Note.* Completers coded 1 and non-completers coded 0.  
Chi Square = 15.924; df = 2 p = .001; Wilk's Lambda = .650

Table 3  
*Discriminant Analysis Grouped Classification Results*

Actual Group	N	Predicted Group Membership	
		COMPLETER	NON-COMPLETER
Completer	12	10 (83.3%)	2 (16.7%)
Non-completer	28	8 (28.6%)	20 (71.4%)

*Note.* Percent of cases correctly classified: 75%

*Research Question 2:* What are the postsecondary experiences of Tech Prep participants, and do they vary between those that persist and those that do not?

A follow-up questionnaire was sent to all 40 students who started the Tech Prep program in 1997 and graduated in June of 1999. The final response rate was 80%. The questionnaire was sent in February of 2000.

Questionnaire results (see table 4) indicated that more Tech Prep completers were full-time students (91%) than non-completers (45%). Completers were more likely to be enrolled in associate degree programs while non-completers, if in college, were more likely to be enrolled in nondegree diploma/certificate technical schools. Completers were only 10% more likely to enroll in a college program/major related to their Tech Prep program area than non-completers. Of those students in college, non-completers were more likely to be taking one or more remedial courses (70%) but more than half (54%) of completers were also taking one or more remedial courses as well. Math was the most common type of remedial course taken by both groups.

Table 4  
*Postsecondary Experiences*

<b>Experiences</b>	<b>Completers</b>	<b>Non-completers</b>
College: Non-degree	8%	26%
College: A.S.	50%	16%
College: B.S.	33%	11%
Non-student	9%	47%
Remedial Courses	54%	70%
Major Related to Tech Prep Program	45%	30%

The questionnaire included questions regarding the high school experience and Tech Prep. Table 5 summarizes these responses.

Table 5  
*Responses to Follow-up Questionnaire*

<b>Survey Questions</b>	<b>Completers</b>	<b>Non-completers</b>
High school prepared me for what I am doing now.	75%	45%
I wish I had studied more in high school.	50%	80%
I worked more than 25 hrs/week while in high school.	25%	44%
I felt I had career direction.	67%	45%
The math required in Tech Prep was not too difficult.	92%	83%

I knew what Tech Prep was when I selected it.	83%	50%
My counselor recommended Tech Prep.	67%	74%
My career interest changed.	17%	54%

Non-completers were less likely to indicate that their high school education prepared them for what they were doing in November following their May high school graduation and indicated they wished they had worked harder while in high school. Eighty percent of non-completers reported they worked during their senior year compared to 67% of completers, and non-completers were twice as likely to have worked more than 25 hours per week.

Approximately two-thirds of Tech Prep completers indicated they had a career direction compared to only two-fifths of non-completers. Likewise, completers were much less likely (17%) to indicate their career interests changed while they were in the Tech Prep program compared to noncompleters (54%). These responses suggest that in general non-completers exhibited a lower level of career development/maturity in high school than completers.

The questionnaire also asked questions about the Tech Prep program and why they selected it. Both completers and non-completers did not feel the math, science, or communications courses required in the Tech Prep program were too difficult. Non-completers, however, were more likely to indicate they did not know what Tech Prep was when they elected it and were more likely to indicate they did so because their counselor recommended it.

### Discussion and Recommendations

The purpose of the research was to conduct a pilot study to investigate reasons for the lack of student persistence in Tech Prep programs located in comprehensive high schools. Several different explanations may address the findings of this study.

Considering the discriminant analysis results only, it seems reasonable to conclude that students drop the program because they have insufficient academic skills when they enter the program. Two variables, taking Algebra I/Applied Math II or higher in the sophomore year, and combined sophomore year grade point average of C+ or above, correctly classified 75% of the cases. Tech Prep participants who as sophomores were taking math below Algebra I/Applied Math II and who had average to below average grades overall in their sophomore year were more apt to drop out of the Tech Prep program. Questionnaire results, however, suggest other explanations.

While it would appear that poor academic skills, particularly in math, was the reason for lack of persistence, few non-completers indicated in the follow-up survey that they thought the math courses required in Tech Prep were too difficult. Furthermore, the high school studied in this pilot offered a special summer school for Tech Prep students who were having academic trouble. Thus, poor academic skills alone do not seem to adequately explain why students dropped the program.

Although non-completers did not think the required Tech Prep math course work was too difficult, they did tend to say that they did not know what the program was all about in the first place. Also of note, noncompleters were more likely to report that they were working more than 25 hours a week at outside jobs, and that they wished they had worked harder in their courses while in high school. They also indicated that the main reason they dropped the Tech Prep program was because of changing career interests. Survey results suggest that as a group they had less career direction/maturity than completers to make the decision to take Tech

Prep. Finally, while both completers and non-completers mostly indicated that the guidance counselor was the most influential in choosing to elect Tech Prep, counselor influence was the strongest among non-completers. These results suggest a more complex scenario about those who do not persist and why.

Questionnaire results suggest a description of non-completers as teenagers who are relatively uncommitted to school in general—who work very little on academics, and are thus not doing very well academically. They are, perhaps, more interested in their part-time employment, and have yet to crystallize career interests. The majority of students in this study who dropped the program were passive about electing it in the first place, having done so because a counselor or teacher recommended it, and did not really understand the program or seem to care about it one way or another. It could well be that the reason the academic variables of level of math and overall sophomore year GPA predicted so accurately those who would fail to persist is that these variables were really a proxy for lack of overall commitment to school in general.

In summary, two conclusions are possible: One is that those students who elected Tech Prep but did not persist dropped the program because they lacked overall commitment to high school and adequate academic skills to pass the required courses. In addition, they had insufficient career direction to make an informed decision to take Tech Prep and, therefore, were never committed to the program and should probably never have been encouraged to elect the program in the first place. A second possible conclusion is that these teens are *exactly* the type of student that Tech Prep is intended to serve—meaning the non-baccalaureate bound—and, therefore, program modifications are necessary to ensure more desirable outcomes. No doubt there would be considerable disagreement among Tech Prep proponents regarding which conclusion is correct.

Regardless of which conclusion is endorsed, this study does suggest two important program design imperatives. Those who failed were poor students, particularly in math, and generally lacked a sufficient career focus to make an informed decision to take Tech Prep. They had little commitment to their decision to enroll in the program. Therefore, schools should provide opportunities for intensive remedial math for students considering or pursuing the Tech Prep option. Secondly, schools offering Tech Prep curricula, originally designed as junior/senior year programs, must make efforts well before the junior year to identify potential Tech Prep students, and then work with them to establish a career focus.

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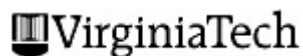
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