



Rio Grande Valley Linking Academic and Economic Development

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What We Studied

The need for more—and better—educated employees is predicated on several factors inherent in the workforce today. First, there is a growing shift in what job opportunities will be available to young workers. Second, existing gaps in education and employment are expanding. A preponderance of research has shown that the lack of a high school degree in this current day relegates a person to a lifetime of poorly paid, unskilled labor opportunities (Seidman & Ramsey, 1995). Further, low postsecondary attainment levels keep many more from experiencing high-paid, middle class job opportunities (Carnevale et al, 2010; Castellano et al, 2003). Gaps between disadvantaged, underserved populations extend inequity (Kao & Thompson, 2003; Ross et al, 2012; Lumina, 2015; U.S. Department of Labor [USDOL], 2015). Shifting economies in combination with growing demand for skills and education in the future will only exacerbate inequalities—unless appropriate interventions are implemented.

The jobs of tomorrow are here today. They require enhanced skill sets and higher levels of education. Attainment has already fallen behind economic development, though. Because traditional transitions and traditional approaches have not served all students well in the past, educators have turned focus to diverse options to meet requirements for academic achievement. These reforms meet college ready standards while also fulfilling student interests and developing career skills for the future. Technical coursework has been an ideal area for this type of reform implementation. Policymakers have turned towards practices which lead to better transitions between high school, higher education, and the workforce. This study looks at one such reform model. It examines student outcomes associated with participation in Career and Technology Education (CTE), specifically Tech Prep programming. The study explores the benefits of participation in Tech Prep across P-16+ transitions in both Texas and the Rio Grande Valley (RGV)—an area known for its unique context and widespread implementation of Tech Prep.

How We Analyzed the Data

The study is an exploration of the longitudinal outcomes related to participation in advanced CTE programming, Tech Prep. In addition, comparisons between the RGV LEAD (Rio Grande Valley Linking Academic and Economic Development) consortium area and the rest of Texas are investigated to identify impacts of implementation. For this study, one broad question covers the intent of analyses. How do advanced CTE programs, such as Tech Prep programming, affect student outcomes across the P-16+ pipeline? Specific questions guide research. These are:

- RQ1. What student- and school-level characteristics influence Tech Prep participation?
- RQ2. Relative to comparable students, what impact does Tech Prep participation have on high school transitions, higher education enrollment, developmental remediation, postsecondary attainment, and workforce participation?

Using data from the TEA (Texas Education Agency), THECB (Texas Higher Education Coordinating Board), and TWC (Texas Workforce Commission), cohorts of high school students graduated in 2009 and 2010 are tracked through four years of postsecondary access and five years of workforce participation. Methods consist of Propensity Score Matching (PSM) of students to control for selection bias. PSM includes a two-step process which first models the predicted probability of all students enrolling in Tech Prep, and then matches Tech Prep to non-Tech Prep students using a nearest neighbor sampling method. PSM creates a quasi-experimental control group for comparison. Multilevel logistic regression is then used to ascertain the odds of reaching each longitudinal outcome, including estimates of Tech Prep participation and models associated with the five key P-16+ areas.

What We Discovered

The first research question of the study—what student- and school-level characteristics influence Tech Prep participation—is examined with the full data sample from 2009 and 2010 high school graduation cohorts (see Table 1). Of individual student traits, gender is significantly related to Tech Prep. Hispanic students and students of low-SES backgrounds are more likely to enroll in Tech Prep. Though individual students from disadvantaged groups are more likely to participate, greater proportions of minority or low-SES students at the campus-level negatively affect participation. This suggests that schools serving disadvantaged populations struggle to provide Tech Prep opportunities to their students.

Tech Prep is associated with passing Texas State accountability exams (i.e., TAKS [Texas Assessment of Knowledge and Skills Test]) in both reading and mathematics. Moreover, positive associations are made between Tech Prep and college-ready diploma plans in Texas, both RHSP (Recommended High School Plan) and DAP (Distinguished Achievement Plan). Lastly, dual credit courses are positively connected to Tech Prep participation, increasing the predicted probability of enrollment with each additional course taken.

In all, findings suggest Texas models of Tech Prep draw in a more diverse student group compared to the traditional academic population. Results show Tech Prep as a positive tool for both middle and high achieving campuses though low achieving campuses, and those serving high proportions of disadvantaged students, demonstrate less success with participation. However, modeling suggests Tech Prep is a promising and viable program for P-16+ interventions.

Table 1: Odds of Participating in a Tech Prep Program in High School

	Coefficient	SD
FIXED EFFECTS		
<i>Intercept, γ_{00}</i>	-3.063	0.095
Student (Level 1). β_{1j}...		
<i>Grad Year (2009), γ_{10}</i>	-0.102**	0.009
<i>Days Absent, γ_{20}</i>	-0.002**	0.000
<i>Gender (Female), γ_{30}</i>	0.047**	0.008
<i>Low-SES, γ_{40}</i>	0.104**	0.009
<i>Black, γ_{50}</i>	0.018	0.022
<i>Hispanic, γ_{60}</i>	0.146**	0.020
<i>White, γ_{70}</i>	-0.004	0.019
<i>LEP, γ_{80}</i>	-0.648**	0.028
<i>Special Education, γ_{90}</i>	-0.085**	0.016
<i>Gifted & Talented, γ_{100}</i>	-0.354**	0.014
<i>Met Exit Math, γ_{110}</i>	0.198**	0.012
<i>Met Exit Reading, γ_{120}</i>	0.097**	0.018
<i>Dual Credit, γ_{130}</i>	0.068**	0.003
<i>RHSP Diploma, γ_{140}</i>	0.163**	0.013
<i>DAP Diploma, γ_{150}</i>	0.173**	0.018
School (Level 2). β_{0j}		
<i>RGV, γ_{01}</i>	2.154**	0.298
<i>Percent Low-SES, γ_{02}</i>	-0.005**	0.002
<i>Percent White, γ_{03}</i>	0.019**	0.002
<i>Rated Acceptable, γ_{04}</i>	0.115**	0.031
<i>Rated Exemplary, γ_{05}</i>	-0.011	0.029
<i>Small School, γ_{06}</i>	-0.042	0.080
<i>Large School, γ_{07}</i>	0.251**	0.084
	Variance	SD
RANDOM EFFECTS		
<i>Institution (Intercept), u_{0j}</i>	4.674	0.216

Note. ** $p < .01$, * $p < .05$; Students=534,035 High Schools=1,776

The second research question explores the impacts of CTE Tech Prep participation on longitudinal outcomes related to the P-16+ pipeline. These are calculated using a quasi-experimental sample which has been propensity scored and matched to decrease selection bias. The odds of each outcome indicators, and campus characteristics. Regression models were organized into five key areas along the P-16+ pipeline: 1) high school transitions, 2) postsecondary enrollment, 3) developmental education, 4) postsecondary attainment, and 5) workforce participation.

High School Transitions

High school transitions refer to the year after high school graduation and include four models: participating in any form of higher education, attending either a community college or university, and transitioning to the workforce. Overall, students from disadvantaged backgrounds and low achieving students are less likely to enter higher education, and have slightly greater odds of working after high school. These models produce the largest amount of Tech Prep interactions in connection with student traits. As an example, female students in Tech Prep have a 66% predicted probability of enrolling in higher education after high school while women in the control group only show a 54% likelihood of transition. Tech Prep participation results in greater odds of enrollment in higher education for students, particularly students from disadvantaged backgrounds (Bragg et al, 2002; Brown, 2003). Student achievement and rigor also plays a role, especially in the transition to the university level. In all, there are differences between postsecondary institution types as students transition from high school to higher education. Students from disadvantaged backgrounds and lower achievement groups (e.g., LEP, special education) are more likely to enter community colleges than universities. These differences are often positively moderated by Tech Prep participation. Significant interactions show Tech Prep has its best success in preparing students for enrollment at two-year institutions rather than the university level.

Postsecondary Enrollment

Three models estimated the odds of enrollment in higher education up to four years after high school graduation: overall, community college, and university attendance. Many interactions between Tech Prep and student traits impact enrollment over time; these provide for greater odds of postsecondary access for Tech Prep students. Impacts are often the largest at the community college level. In cases where students have lower odds of enrollment (e.g., days absent, LEP, special education), Tech Prep moderates the effect, enhancing the odds of participation. For example, special education students in Tech Prep have a 53% predicted probability of postsecondary enrollment compared to special education students in the control group with a lower chance at 40%. These findings suggest that participation in Tech Prep increases enrollment for students less likely to attend higher education due to special needs or decreased motivation. There are increases to the odds of enrolling at the university level for Tech Prep students who participated in dual credit and CTE courses while in high school. This suggests advanced courses, and dual coursework in particular, may improve four-year matriculation patterns.

Developmental Education

The majority of student traits positively impact odds of enrollment in DE; students from disadvantaged backgrounds or those enrolled in special programs often have the highest odds of participating in developmental remediation. This study finds positive relationships with readiness. Low-SES students who participated in Tech Prep have lower odds—a 46% probability of developmental coursework—compared to low-SES control peers with a probability of 55% developmental enrollment. Tech Prep interacts with indicators of achievement and rigor as well. While increased achievement decreases the odds of DE, participation in Tech Prep lowers the odds of DE even further. Indicators of achievement which Tech Prep interacts with include: dual credit, CTE, dual-CTE, and college ready diplomas. Tech Prep is associated with greater odds of DE participation in mathematics modeling according to dual credit, CTE courses, and DAP diplomas. This indicates that Tech Prep students with higher achievement according to these traits may still have deficiencies in college ready math leading to non-credit bearing courses. Working in the transition year increases odds of developmental enrollment. Tech Prep interacts with transition employment to decrease odds of DE participation. Overall, Tech Prep programs have mostly positive impacts on college readiness.

Postsecondary Attainment

These results were calculated only for students who enrolled in higher education. Tech Prep increases the chances of attaining a higher education credential, especially given indicators of academic achievement and rigor. Participation in

Tech Prep interacts with gender, dual credit, CTE, and college diploma type (e.g., RHSP and DAP) to strengthen the predicted probability of earning a postsecondary credential. Tech Prep interacts with gender, special education, GT, and CTE to increase the odds of attaining an associate's degree. Positive interactions between Tech Prep and absences, dual credit, and CTE are found in the bachelor's degree model, though Tech Prep has negative impacts in combination with diploma types. Gender, CTE, and dual-CTE all positively interact with Tech Prep in the odds of obtaining a higher education certificate. In this study, Tech Prep is positively associated with a number of predictors, and participation expands the possibility of postsecondary attainment. Specifically, Tech Prep students who transition to higher education the year after high school have greater odds of attainment (e.g., an 86% predicted probability compared to 78% for non-Tech Prep peers). Tech Prep helps women to earn a degree and enhances the impacts of CTE in earning a credential at two- and four-year institutions. Students who are involved with the program and also take rigorous coursework in high school (e.g., dual credit courses, college ready diploma plans, etc.) are more likely to succeed in higher education than similar students in the control group. These findings provide evidence that Tech Prep is a viable tool for success beyond traditional academic tracks.

Workforce Participation

CTE participation has previously been connected to greater workforce outcomes compared to traditional academic students in both the year after high school graduation and seven years out (Bishop & Mane, 2004; Castellano et al, 2003). Individual traits such as gender or degree attained also relate to long term earning capacity in connection with CTE (Maguire, Starobin, Laanan, & Friedel, 2012). This study finds similar trends in CTE Tech Prep participation. Tables 17-18 describe the odds of workforce participation within a year of completing a postsecondary credential. Several student traits positively impact the odds of working after the completion of a postsecondary credential. Women have greater odds of employment as do students from each ethnic group. Tech Prep participation is associated with lower proportions of women and higher proportions of Black students who take on second jobs. Achievement is, for the most part, linked to greater workforce participation. Working within the transition year after high school leads to a greater probability of working within the transition year after higher education—larger odds still for Tech Prep students (71-72% probability). Students with certificates are associated with the highest probability of workforce participation followed by students with bachelor's and associate's degrees (which share similar chances of employment). Tech Prep slightly increases the odds of having a job after earning a bachelor's degree.

Policy Recommendations/Implications

Findings provide strong evidence for the efficacy of Tech Prep models in Texas and beyond. Tech Prep participation increases opportunities to transition to higher education after high school, providing stronger pathways to community college and greater odds for traditionally disadvantaged students. When paired with increased rigor and CTE coursework, program participation works to improve enrollment over time and expand matriculation into four-year institutions.

Tech Prep has positive impacts on college readiness as well, decreasing the chances of developmental remediation. Importantly, Tech Prep interacts with a number of student traits, increasing the likelihood of postsecondary attainment at all levels. After postsecondary graduation, Tech Prep moderates the odds of workforce participation. Tech Prep is shown to have far reaching impacts on students long after they complete their high school careers. Impacts vary across P-16+ transitions, institutions, and types of students. Findings suggest Tech Prep is a valuable option to increase P-16+ transitions either for targeted populations or entire campuses.

The University of Texas at Austin ERC is a research center and P-20/Workforce Repository site which provides access to longitudinal, student-level data for scientific inquiry and policymaking purposes. Since its inception in 2008, the Texas ERC's goal is to bridge the gap between theory and policy by providing a cooperative research environment for study by both scholars and policy makers. As part of its mission, the ERC works with researchers, practitioners, state and federal agencies, and other policymakers to help inform upon critical issues relating to education today.

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