DOES THE NUMBER OF COLLEGE CREDITS EARNED IN A TECH PREP AND POSTSECONDARY ENROLLMENT OPTIONS PROGRAM PREDICT COLLEGE SUCCESS?

Bruce A. Meyer

A Dissertation

Submitted to the Graduate College of Bowling Green State University in partial fulfillment of the requirements of the degree of

DOCTOR OF EDUCATION

December 2011

Committee:

Patrick D. Pauken, Advisor
Rachel A. Reinhart, Advisor
Raymon Kresman
Graduate Faculty Representative
Jon A. Bisher
ABSTRACT

Patrick D. Pauken, Advisor
Rachel A. Reinhart, Advisor

The purpose of this study was to examine a Tech Prep Program located in Northwest Ohio and determine the degree to which college credits earned in high school through the Tech Prep and PSEO Programs predict college success and if there were any significant gender/race differences in credits earned and college success as well as high school origination. For the study there were 1,072 students who participated in the Tech Prep and PSEO Programs during the years of 2004-2008 attending 32 high schools. The data were gathered using the State of Ohio Higher Education Information System (HEI), which allows administrators to review and calculate information via the Internet that includes college credits earned by Tech Prep and PSEO Program high school students and whether or not they are still enrolled in college. Three research questions guided this study. Logistic regression was used to determine if the number of college credits earned in a Tech Prep and Post Secondary Enrollment Options Program predict college success. The results indicate that the number of college credits earned did significantly predict success; however, a higher number of credits were more likely to predict an unsuccessful outcome (not in school). T-test of independent samples examined differences in credit hours earned by college success. Similar to research question 1, the results from research question 2 showed that the number of college credit hours earned by students while in high school did significantly differ by college success with unsuccessful students having a higher
number of credit hours earned. Research question 3 examined the differences in credit hours earned and college success by gender, race or high school origination. No significant gender or race differences were found in the number of credit hours earned or college success. However, high school origination significantly generated differences in the number of credit hours earned but not college success.

Tech Prep and PSEO have become important elements in technical education and career development for many high school students across the nation. The results of this study indicate that programs such as Tech Prep and PSEO may promote college success and help create numerous opportunities for the “Neglected Majority” to attend college. The “Neglected Majority” is still very much present, but by allowing students to participate in programs such as Tech Prep and PSEO it is no longer being ignored.
DEDICATION

I dedicate this dissertation to my best friend and wife “Mrs. Wonderful,” Julia, who insisted that I pursue this degree, even when she knew it would entail great sacrifice on her part. Thank you, Julia, for your unconditional love, unwavering support of family, caring and giving spirit, as well as your continuous encouragement throughout the years. I am eternally grateful!
ACKNOWLEDGMENTS

I would like to recognize my dissertation committee of Drs. Patrick Pauken and Rachel Reinhart. They answered numerous questions and provided necessary feedback through this dissertation process. Your wisdom and guidance made a significant difference in the completion of this dissertation. Dr. Rachel Reinhart, you truly help put students at ease with your patience and teaching skill regarding quantitative statistics. Dr. Patrick Pauken, your energy and enthusiasm are truly contagious. And a very special thanks to Dr. Jon Bisher and Dr. Ray Kresman for serving on my Dissertation Committee.

Dr. Paul Johnson, thank you for your support and cooperation regarding my schedule. In addition, I want to acknowledge the faculty of the Leadership and Policy Studies Program who are truly interested in student success and learning.

I would like to express my appreciation to Dr. Marsha Bordner for guidance and mentoring through my first three years of Higher Education, thank you so much for the opportunity. Also, special thanks to Ed Harper and Dawn Hippler for their efforts in organizing and accumulating the data used in my dissertation. I cannot thank you enough!

Lastly, to the Leadership Studies cohort, I appreciate the friendliness and professionalism of the Tuesday night cohort group I had the privilege of taking classes with and the memorable dinner conversations. I felt as if we were always “all in this together” and that our mission of graduation was not to be denied. I will always look
back on these last four years as some of the best, and the memories will indeed last a lifetime!
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER 1: INTRODUCTION</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background of the Problem</td>
<td>1</td>
</tr>
<tr>
<td>Rationale</td>
<td>4</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>5</td>
</tr>
<tr>
<td>Research Questions</td>
<td>7</td>
</tr>
<tr>
<td>Significance of the Study</td>
<td>7</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>7</td>
</tr>
<tr>
<td>Limitations</td>
<td>10</td>
</tr>
<tr>
<td>Organization of the Study</td>
<td>11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER 2: LITERATURE REVIEW</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The History of Tech Prep Programs and Post Secondary Enrollment Options</td>
<td>13</td>
</tr>
<tr>
<td>Impact and Effectiveness of Tech Prep and Post Secondary Enrollment Options</td>
<td>18</td>
</tr>
<tr>
<td>What Are the Benefits of Articulation Agreements and Academic Rigor?</td>
<td>32</td>
</tr>
<tr>
<td>Industry Model and State Government Support</td>
<td>40</td>
</tr>
<tr>
<td>Conclusion</td>
<td>47</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER 3: METHODOLOGY</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Design</td>
<td>50</td>
</tr>
<tr>
<td>Participants</td>
<td>50</td>
</tr>
<tr>
<td>Data Collection Procedures</td>
<td>51</td>
</tr>
<tr>
<td>Research Questions</td>
<td>52</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>53</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Success Outcomes 57</td>
</tr>
<tr>
<td>2</td>
<td>Number of Credit Hours Earned and Outcomes 58</td>
</tr>
<tr>
<td>3</td>
<td>Gender and Race Differences and Credit Hours Earned 60</td>
</tr>
<tr>
<td>4</td>
<td>Means and Standard Deviation of Credits Earned by High School Origination 61</td>
</tr>
<tr>
<td>5</td>
<td>Gender by Outcome 62</td>
</tr>
<tr>
<td>6</td>
<td>Race by Outcome 63</td>
</tr>
<tr>
<td>7</td>
<td>Results by Research Question 65</td>
</tr>
</tbody>
</table>
CHAPTER 1: INTRODUCTION

Background of the Problem

When it comes to competing globally, the United States not only needs to get more students into college, but it also needs them to earn their degrees. That is the conclusion of business leaders and policymakers concerned with the education level of younger generations anticipated to replace 78 million baby boomers heading toward retirement (Measuring Up Report, 2008). Historically, the strength of the United States has been access to higher education, and the weakness has always been completion (Cellini, 2006).

Lawmakers have called Tech Prep Programs “a successful effort to prepare students for college and careers” (Hardi, 2000). Tech Prep helps students connect school to high skill, high demand technical employment as it consists of a collaborative network of support programs that blend college prep academics with technology career education. Programs are offered in career centers, high schools and colleges throughout the nation. The unique core of college Tech Prep is the pathway, a sequential course of study that includes at least two years of high school and two years of college education. Programs and courses using Articulation Agreements aimed at smoothing the transition from high school to college have become increasingly popular in the United States in recent years among students and 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).
The Ohio Initiative of Tech Prep is administered by the Ohio Board of Regents and the Ohio Department of Education. Funding is sustained by the U.S. Department of Education, Carl D. Perkins Career and Technical Education Improvement Act, State of Ohio, and local partners. The Tech Prep Program seeks to prepare students for the high skill, high demand technical careers required for an increasingly competitive global economy by stressing mathematics, science, communication and technology. Also emphasized is teamwork, hands on learning, work site experiences, critical thinking, and problem solving, which are key skill sets necessary for future employment. Tech Prep Programs are designed to be seamless, non-duplicative programs of study that combine high level academic and technical preparation in a variety of career fields (Ohio College Tech Prep website, 2010).

The Ohio College Tech Prep Advisory Council has expanded federal program standards to define more completely Tech Prep Programs, students, and essential criteria. Ohio College Tech Prep coordinates educational pathways that prepare students for college and careers in technical fields. Pathways form a specific course of study that combines business validated technology curriculum with college prep academics in high school and additional education and training at a two-year or a four-year college. Tech Prep’s goal is to create fully integrated, virtually seamless transitions between each educational stage and ultimately between education and the work world. While efforts throughout Ohio reflect local goals and needs of the particular service area, all college Tech Prep Programs have common components and a commitment to
sequence early career exploration by the students (Ohio College Tech Prep website, 2010).

Another opportunity that students have to earn college credit while still attending high school is a program called Post Secondary Enrollment Options (PSEO). According to the Ohio Department of Education website (2011), Post Secondary Enrollment Options (PSEO) is a program whereby Ohio’s high school students may opt to take college courses for both high school and college credit. PSEO is known in many states as dual enrollment. The program has been an important option for Ohio’s high ability students. In fact, the original intent of PSEO may have been to provide opportunities to high ability students. It is clear, however, from the work of a recent Ohio high school task force that there are many reasons other than advanced coursework that make it desirable for students to access PSEO.

Articulation agreements formalize the commitment to transfer a student’s high school work into college credit, advanced placement or additional benefits. Articulation agreements also list entrance and exit requirements, transferable coursework and advanced skills are also included in the curriculum (Zinser & Hanssen, 2006). An essential starting point for policymaking is agreement on the purpose of these programs and pathways that ideally serve as a bridge to college for underrepresented students, as well as a head start on college for those already on their way (Hoffman, Vargas & Santos, 2009).
Rationale

According to Sweat and Fenster (2006) there are approximately 750,000 high school participants and over $100 million in federal funds each year since 1991 for Tech Prep, it is well worth exploring whether Tech Prep Programs are effective. Currently, research regarding this topic is very limited. Research needs to be conducted to determine if the Tech Prep Program creates success for students after they leave high school with college credit earned in high school (Bragg, 2000). Colleges are now being asked to be more transparent when it comes to reporting graduation rates of their students. Accountability is also being monitored to show that colleges are investing taxpayer funds smartly. The Ohio Board of Regents website (2011) tracks both of these items each academic year. There is clear discussion taking place to tie graduation to potential state subsidies. All of these concerns point to having students well prepared when arriving on a college campus (Archibald & Feldman, 2008). Advocates of Tech Prep Programs, such as Sweat and Fenster (2006), claim that Tech Prep Programs inspire students to continue their education and training at the postsecondary level and at the very least, keep low-performing students interested in learning long enough to graduate from high school. Many states and programs do not track or report dual-enrollment outcomes. Fewer have unit-record longitudinal data systems that are capable of telling whether dual enrollees have better education outcomes compared to nonparticipants who are otherwise similar in social and academic background (Hoffman, Vargas & Santos, 2009). As a result, many educators and policymakers question whether Tech Prep Programs are living up to their promise? A review of
existing studies indicates there is a need for further research regarding the impact of college success for students who attend Tech Prep Programs while still in high school and the opportunity to improve the program’s effectiveness. We believe that no other studies exist or show this level of detail and results regarding college credit hours earned by Tech Prep and PSEO students while in high school; therefore, research needs to be conducted to determine if the programs create college success for students after they leave high school with college credits.

**Purpose of the Study**

The purpose of this study is to examine whether or not the number of college credits earned in Tech Prep and PSEO Programs predict continued success after high school as defined by college enrollment or completion. Are there any differences in the college credit hours earned and college success? In addition, are there significant gender/race differences in credits earned and college success or high school origination?

A Tech Prep Program could help students become more successful in their academic studies and then ultimately help add value to the organizations in which they could someday be employed. The quantitative data being examined are from the years of 2004 through 2008 and are gathered using the State of Ohio Higher Education Database that allows administrators to review information that includes college credit earned by the Tech Prep and PSEO high school students, what high school they attended, year of high school graduation, race, gender and whether or not the student is currently enrolled in college. The participants are Tech Prep and PSEO students from
the years of 2004 through 2008. During this period of time there have been 1,072 students included in Tech Prep and PSEO programs using the HEI data source. Although Tech Prep and PSEO use different funding models, they are included together in the data since the goal of Tech Prep and Post Secondary Enrollment Options is to accelerate student achievement by offering college level classes for college credits while students are still in high school (Ohio Board of Regents website, 2011). This study will be utilizing panel data that include student information and the necessary resources to calculate and organize the data that will indicate the student’s success. The Tech Prep and PSEO students are from high schools in the Terra Community College and Bowling Green State University Firelands service areas. The Northwest Ohio counties in the service area are Erie, Huron, Ottawa, Sandusky, Seneca and Wyandot. The Tech Prep Workforce Development Council oversees the Tech Prep Consortium and works with Bowling Green State University Firelands and Terra Community College. Area high schools in three vocational education planning districts work together to create seamless career-technical education programs that begin in the junior year of high school and continue through to an associate degree in college and beyond. The information regarding the students is captured through the State of Ohio Higher Education Database.
Research Questions

1. Does the number of college credits earned in a Tech Prep and Post Secondary Enrollment Options Program predict college success?

2. Do college credit hours earned differ by college success?

3. Do credit hours earned and college success differ by gender, race or high school origination?

Significance of the Study

This study will benefit leaders and educators associated with the Tech Prep Consortium by providing data and information helping to support their decisions and management regarding the Tech Prep and PSEO Programs and student success at the college level. It will also support policy decisions regarding Tech Prep and PSEO Programs. Furthermore, future employers will benefit from the fact that students are better prepared to enter the work force.

Definition of Terms

Articulation Agreements. Articulation agreements define the education and seamless transition from secondary programs to related college programs. These agreements formalize the commitment to transfer a student’s high school work into college credit, advanced placement or additional benefits. Articulation agreements also list entrance and exit requirements, transferable coursework and advanced skills included in the curriculum (Ohio Board of Regents website, 2011).

Bowling Green State University Firelands. Is a state supported satellite college that is connected to Bowling Green State University. BGSU Firelands is located near the
hores of Lake Erie in Huron, Ohio, about 60 miles east of Bowling Green, Ohio. It is a separate college of the Bowling Green State University system and has been a regional campus of BGSU since 1968, when the first building at the Huron location was opened. BGSU Firelands offers certificates, associate degrees, bachelor and masters degree (Bowling Green State University website, 2011).

**Career and Technical Education (CTE).** Organized educational activities that offer a sequence of courses that provide individuals with coherent and rigorous content aligned with challenging academic standards and relative technical knowledge and skills needed to prepare for future education and careers in current or emerging professions (Ohio Board of Regents website, 2011).

**College Credit.** College classes taken through the Tech Prep and PSEO programs while students are in high school and are accredited through the community college or university (Ohio Board of Regents, 2011).

**College Success.** College Success after high school is defined as still attending college by actual college enrollment or degree completion by the student.

**Dual Enrollment.** High school students being enrolled in two separate academically related institutions. Students may be dual enrolled at a local institution of higher learning, such as a community college or university. These students may take classes at either institution for credit toward their high school diploma, as well as for college credit (Ohio Association of Gifted Children website, 2010).

**Higher Education Information System (HEI).** A comprehensive relational data warehouse at the Ohio Board of Regents that contains data supplied by Ohio's colleges.
and universities via the use of the Internet. HEI also contains data supplied by several other federal, state, and local entities (State of Ohio Department of Higher Education Information System website, 2011).

*Workforce Development Council.* The Workforce Development Council oversees the Tech Prep Consortium and works with two colleges and area high schools in three vocational education planning districts to create seamless career-technical education programs that begin in the junior year of high school and continue through to an associate degree and beyond. The council includes business leaders and academic deans from the colleges.

*Tech Prep Consortium.* The Consortium is a team of individuals who work at the respective colleges and high schools to help formulate new programs and pathways.

*Post Secondary Enrollment Options (PSEO).* A program whereby Ohio’s high school students may opt to take college courses for both high school and college credit. PSEO is known in many states as dual enrollment (Ohio Association of Gifted Children website, 2010).

*Tech Prep Programs.* A collaborative network supports programs that blend college prep academics with technology career education. Programs are offered in career centers, high schools and colleges throughout Ohio (Ohio College Tech Prep website, 2010).

*Terra State Community College.* Is a two-year accredited, state-supported, commuter college located in Fremont, Ohio. Terra was founded as Vanguard Technical Institute in 1968 as a night school using the facilities of Vanguard Vocational Center.
Terra Technical College became Terra State Community College in the summer of 1994 and Associate of Arts and Associate of Science were added to the Associate of Applied Science degrees granted by Terra (Terra State Community College website, 2011).

**Limitations**

The focus of the study is narrowed to only include Tech Prep and PSEO students from high schools in the Terra Community College and Bowling Green State University Firelands service areas because of the limited access to data. One major limitation is that the HEI dataset that was provided by the Workforce Development Council and the Tech Prep Consortium did not distinguish between Tech Prep and PSEO and therefore this study examines strictly participation of these two programs. This study will utilize a correlational research design and will examine the relationship between college credits earned in high school through the Tech Prep and PSEO Programs and whether or not the program prepares students for college success regarding continued enrollment or graduation from a college or university and causal inferences will not be made.

The Northwest Ohio counties in the service area are Erie, Huron, Ottawa, Sandusky, Seneca and Wyandot. Limitations also include that instead of a nationwide study, the data are only collected from an area of Northwest Ohio that represents an area of six counties. Another limitation would be that students could stop attending college for personal reasons, financial considerations or choose to seek employment.
Organization of the Study

The remaining chapters are organized as follows: Chapter 2 reviews the literature on Tech Prep and Post Secondary Enrollment Options. Chapter 3 is an explanation of the research methodology used, data collection and procedures of the study. Chapter 4 presents the narrative in a descriptive form that includes the study’s results and an analysis of the data. Chapter 5 summarizes this study’s major findings and includes recommendations for any future research and policy implications.
CHAPTER 2: LITERATURE REVIEW

This present study addresses the research question of whether or not the number of college credits earned in a Tech Prep or Post Secondary Enrollment Options Program (PSEO) predicts student success by continued enrollment in college and or success in college degree completion. It also addresses the question related to any significant gender/race differences in credits earned and outcome achieved.

The goal of Tech Prep and Post Secondary Enrollment Options (PSEO) is to accelerate student achievement by offering college-level classes for college credits while students are still in high school. Although Tech Prep and PSEO use different funding models, they are designed to help high school students fulfill some of their higher education requirements at virtually no cost to the student (Ohio Board of Regents website, 2011). Through a variety of initiatives, such as Advanced Placement (AP), dual enrollment, joint/concurrent enrollment, early or middle college, and Tech Prep, high school students can enroll in college courses and earn credits that meet both high school and college requirements (Lynch & Hill, 2008). This chapter focuses on the history of the Tech Prep and PSEO programs, as well as the impact and effectiveness that such programs may play in the success of students. A review of the ways that both industry and states can help with the support of Tech Prep and Post Secondary Enrollment Options programs is also presented.
The History of Tech Prep Programs and Post Secondary Enrollment Options

The Carl D. Perkins Vocational Education Act of 1984 (PL 98-524), commonly referred to as Perkins I, amended the Vocational Education Act of 1963 (PL 88-210), which was designed to provide access to everyone while addressing the economic and social demands of America (Gordon, 2003). Perkins I was created to provide access to all students, including special populations, while addressing the needs of the economy. The Carl D. Perkins Vocational and Applied Technology Act of 1990 (PL 101-392), also known as Perkins II, was grounded in the notion that the U.S. was falling behind other nations in its ability to compete in the global marketplace, which in the end reflects the evolution of federal support for vocational education (Finch, 1999). Perkins II was intended to strengthen the workforce preparation process. This included integration of academics and vocational education, alliances between education and the workforce (including tech-prep) and closer linkages between school and work (Gordon, 2003). The passage of the Perkins legislation, particularly Perkins II, signified a major development in vocational education. In fact, scholars suggest that Perkins II represents the most dramatic shift in vocational education policy since the inception of federal funding to secondary education because the emphasis was placed on academics, as well as occupational skill development and learning (Hayward & Benson, 1993). With the dawn of a new millennium came the Carl D. Perkins Act of 1998 (PL 105-332), also known as Perkins III. This legislation called for a state performance accountability system in which the objective was to promote academic and technical performance,
integration of academics in vocational education, as well as postsecondary placement of students (Hayward & Benson, 1993).

The Carl D. Perkins Career Technical Educational Improvement Act of 2006 (PL 109-270), also known as Perkins IV, was a reauthorization of the Carl D. Perkins Act of 1998. The 2006 Carl D. Perkins Act has been authorized for six years and is expected to allocate approximately 1.3 billion dollars in federal aid to Career Technical Educational (CTE) programs in all 50 states. Perkins IV is ultimately intended to strengthen the focus on responsiveness to the economy while tightening up the accountability statement in regards to the integration of academics and technical standards (Threeton, 2007).

State and local funding supports the career and technical education infrastructure and pays teachers' salaries and other operating expenses. Federal funds provide the principal source for innovation and program improvement, and help to drive state support through a "maintenance-of-effort" provision in the federal law (Bragg & Layton, 1995). Perkins IV mandates that Tech Prep be administered at the local level through a consortium involving secondary and postsecondary educational institutions. Most consortia have involved a community college and its surrounding comprehensive high schools. Beyond this mandate, some consortia also have involved other types of secondary schools (such as vocational high schools or regional vocational schools), and some have affiliated with other types of postsecondary institutions (such as public technical institutes, proprietary schools, or four-year colleges and universities). Many also have formed partnerships with local business, industry, and
labor (Bragg & Layton, 1995). Whatever the composition, the primary goal of a Tech Prep consortium has been to craft a unified strategy for a given region of a state (or an entire state in some cases) to prepare students for work and careers, as well as for further education and training. Often, personnel employed by community colleges have been instrumental in managing the local Tech Prep consortia by acting as local Tech Prep coordinators (Bragg & Layton, 1995).

Although not usually reported to be formal, the vast majority of state leaders indicated that their states had instituted a state-level planning or implementation team (Fullan, 1991). Job Training Partnership Act (JTPA) and economic development agencies; state councils on vocational education; state committees of practitioners; and business, industry, and labor groups are examples of the teams. In some states, these participatory teams replicated the collaborative implementation occurring in local consortia and related research on educational reform suggests these participatory state teams are likely to have a positive impact on local programs over the long term (Fullan, 1991).

Ultimately six goals were identified for Tech Prep programs. The first and foremost goal identified that state leaders saw Tech Prep as a better way to meet student needs, especially for those students who typically have not chosen the college-prep track. Second, they described Tech Prep as an alternative curriculum pathway, especially in high school. Indicative of this goal was the observation that Tech Prep could “eliminate the general track,” which was perceived to provide little in the way of workplace skills. A third goal for Tech Prep focused on alternative teaching and
learning methodologies directed at making education meaningful for more students. Usually this goal was to be accomplished through the use of applied academics, the integration of academic and vocational education, or upgraded vocational curriculum. The need for a better link between school and work, college, and the community was described as a fourth goal for Tech Prep. This goal tied closely to the need for better mechanisms to assist youth in their transition from school to work. Fifth, Tech Prep was seen as a way to eliminate inefficiencies between secondary and postsecondary education, including reducing the escalating incidents of remediation for new college students. Finally, Tech Prep was described as a mechanism for preparing individuals for future workforce needs and strengthening the economy. Community colleges were viewed as especially critical to this workforce preparation goal of Tech Prep (Bragg & Layton, 1995).

The goals and philosophies of the Tech Prep Program have led to similar perspectives concerning the relationship between Tech Prep and vocational education. Traditionally, Tech Prep was viewed as a way to reform vocational education and a vital part of attempts to upgrade it. In the other, Tech Prep was seen as a larger educational reform blending vocational and academic education. In both cases, the emphasis of reform was focused more on secondary than postsecondary curricula. Only in a few cases was the subject of postsecondary curriculum reform raised, and usually these reforms involved the development of occupationally specific advanced skills curricula (Bragg & Layton, 1995).
Pollard (1991) described Tech Prep as a course of study designed to meet the needs for high school graduates to have a more technically oriented educational background through a balancing of high level academic courses and vocational courses. Tech Prep prepares students for the advanced courses required by two-year technical and community colleges. The establishment of Tech Prep education programs is viewed by many educators, especially those involved in postsecondary institutions, as a means of keeping students in school and providing them with marketable job skills (Pollard, 1991).

Another program that allows college credits and high school credit to be earned while in students are in high school is a program called Post Secondary Enrollment Options (PSEO). PSEO is a specific program established by the Ohio state legislature (The Ohio Association of Gifted Children website, 2010). PSEO was formed in 1989 and was originally only open to high school juniors and seniors. In 1997, eligibility was expanded to include students in grades nine through twelve in all public, non-public, and non-chartered schools (The Ohio Association of Gifted Children website, 2010). Ultimately the goals of Tech Prep and Post Secondary Enrollment Options (PSEO) are to accelerate student achievement by offering college level classes for college credits while students are still in high school.

According to the Ohio Association of Gifted Children website (2010), it is highly desirable to expose high school students to college courses early so that they understand that college is a much different environment than high school. PSEO students learn that they must be highly responsible to do well in a college environment.
A national study of dual-credit programs released by the Pew Charitable Foundation Study (2001) found that the benefits of the program include a savings in both cost and time, efficiency of learning (reduced repetition between grades 11-14), enhanced admission and retention rates in college, improved transitions from high school to college which allows students to “test the waters” of college learning and improving students’ access to college. The Pew Charitable Foundation Study (2001) also found that by creating alternatives to traditional high school, dual credit programs provide additional points of entry into post-secondary schooling for students whose options would otherwise be much more limited. The study found that dual-credit programs can blur the line between high school and college by integrating the two systems and thereby create a continuum of learning from high school to college (Ohio Association of Gifted Children website, 2010). The Post Secondary Enrollment Option has been one of the most effective forms of school choice in Ohio for over a decade (Ohio Association of Gifted Children website, 2010).

**Impact and Effectiveness of Tech Prep and Post Secondary Enrollment Options**

This section presents examples of educational program initiatives throughout the United States that have shown to be successful for students that participate in programs such as Tech Prep and PSEO. Tech Prep Programs are designed to address the needs of students in the academic middle and work with colleges, area high schools and vocational career centers to create seamless career technical education programs that begin in the junior year of high school and continue through to an associate degree in college and beyond (Krile & Parmer, 2002). Also emphasized in the Tech Prep
Programs are important characteristics such as teamwork, applied learning, work site experiences, critical thinking, and problem solving (Krile & Parmer, 2002). Tech Prep, as an educational initiative, certainly has received significant attention from educators and administrators alike.

Another example of an educational program initiative promoting college credit earned in high school is PSEO. The Ohio Association of Gifted Children web site (2010) suggests that PSEO is known in many states as dual enrollment. The program has been an important option for Ohio’s high ability students. In fact, the original intent of PSEO may have been to provide opportunities to high ability students. It is clear, however, from the work of a recent Ohio high school task force that there are many reasons other than advanced coursework that make it desirable for students to access PSEO. Some students do not fit well into the high school environment. Some need to have a more flexible learning environment. Some students, without this program, would clearly drop out altogether (The Ohio Association of Gifted Children web site, 2010).

Successful Tech Prep Programs

The intent of a study by Sweat and Fenster (2006) was to determine if a Tech Prep Program of study better prepared a student for success in Georgia’s technical colleges and if students performed at a higher academic level, and completed their studies faster than non-Tech Prep students. In this study three variables, which included high school preparation, academic performance, and faster graduation of Tech Prep and non-Tech Prep students, were analyzed. The students who participated in the study were Tech Prep students enrolled in a technical college and non-Tech Prep
students. Archival data from the Georgia Department of Technical and Adult Education’s (GDTAE) Computerized Banner Data System were used in this study, which represents a non-random method of convenience. Permission to use these data was given by the GDTAE and the study was approved by the Institutional Review Board. The results indicate no essential difference between Tech Prep students and their non-Tech Prep peers. With respect to GPAs, the research showed that Tech Prep students performed slightly worse than their non-Tech Prep peers. Students who were identified as Tech Prep students in Georgia received articulated credit at the technical college for certain identified courses that they took in high school. Therefore, Tech Prep students should have graduated faster than non-Tech Prep students who did not receive articulated credit. According to the analysis, Tech Prep students averaged 1.2 quarters over the standard time to complete their programs of study, as compared to non-Tech Prep students, who averaged 1.7 quarters over the standard time to complete their programs of study. Although many Tech Prep and non-Tech Prep graduates did not complete their programs of study in the standard amount of time, the Tech Prep graduates did complete their studies, on average, 0.50 quarters faster than the non-Tech Prep graduates (Sweat & Fenster, 2006).

In order to identify some of the elements of Tech Prep that are most effective, a study by Cellini (2006) assessed the effectiveness of programs in increasing the educational attainment of their participants. Using a sampling method of convenience and the data from the 1997 National Longitudinal Survey of Youth (NLSY97), a comparison was made using the educational attainment of Tech Prep participants with
the educational outcomes of their nonparticipating siblings. The data set represents a cohort of approximately 9,000 youths born between 1980 and 1984. In 2002 (the latest round released) the cohort ranged in age from 16 to 23, with over 7,750 respondents over age 18. The sample was restricted to the older respondents in order to more accurately measure decisions about labor force participation and postsecondary education after high school. The author found that on average, Tech Prep participants were more likely to complete high school and attend two-year colleges than their non-participating siblings, leading to higher aggregate educational attainment for program participants (Cellini 2006).

The academic performance of students who participated in a Tech Prep Program at Sinclair Community College, Ohio, was the subject of a published presentation by Krile and Palmer (2002). The comparison group consisted of all non-Tech Prep students who started at Sinclair between fall 1997 and fall 2000, and students who had not transferred credits from any institution. The Tech Prep consortium works with Sinclair, a large urban community 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 and beyond (Krile & Palmer, 2002).

The results of this quantitative 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 (Krile & Palmer, 2002).

Certain limitations on the generalization of these findings should be noted. The number of Tech Prep students who had attended Sinclair up to this time was 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. Also, this study did not address other factors such as motivation to succeed and high school performance, which have previously been associated with college performance (Krile & Palmer, 2002).

A study by Shimony, Russo, Ciaccio, Sanders, Rimpici and Takvorvian (2002), demonstrates that the Med-Tech model used by the NYC Board of Education/City University of New York (CUNY) Tech Prep Consortium has a profound effect on academic achievement. This study measures the extent of the effect of academic achievement using the academic records of Med-Tech students and a matched control group of non-Med-Tech students. The school transcripts of both cohorts were reviewed to assess their educational standing and to determine whether the specific educational goals of the consortium were achieved. Some of these goals were directed toward the secondary school partners and others were directed toward the college partners, but all were identified as necessary in the original Tech Prep grant.
This report uses student data from the NYC Board of Education/CUNY Med-Tech program. Since its inception in 1991, the consortium has consisted of two New York City public high schools, both located on Staten Island, and its postsecondary partner, the College of Staten Island (CSI). The data for this study came from two comprehensive, zoned, neighborhood high schools located on opposite ends of Staten Island. One school, located on the north shore, has a population of 2,357 students, of which 54% are Black or Hispanic. The other school is located on the south shore and has a population of 3,851 students, of which 13% are Black or Hispanic (Shimony, Russo, Ciaccio, Sanders, Rimpici & Takviorvian 2002).

The Med-Tech group consisted of all the Med-Tech students from both high schools from the classes of 1994 to 1998. Most students entered the Med-Tech program at the beginning of their junior year of high school. Tech Prep Programs like Med-Tech are aimed at the middle two quarters of students, those who Parnell defined as the underserved population and whose prior academic records suggest that they may have difficulty succeeding in college without remediation. In this quantitative study, a non-random method of sampling for convenience was used. Members of the control group were selected on the basis of academic similarity to those in the Med-Tech cohort. Student transcripts were coded to identify gender and either Med-Tech participation or control group inclusion (Shimony, Russo, Ciaccio, Sanders, Rimpici & Takviorvian 2002).

One goal was to determine whether the Tech Prep model had a positive effect on overall academic achievement of its targeted student population, namely the middle
two quarters, including mainstreamed special education students. The data indicates that the Med-Tech group’s average grade improved by a greater percentage in all subjects, compared with grade change of the control group (Shimony, Russo, Ciaccio, Sanders, Rimpici & Takviorvian 2002).

Another goal of the Tech Prep Program was to maintain gender equity. Only Med-Tech students were included in this part of the study because there was interest in determining whether boys and girls achieved at similar rates as a result of the Med-Tech courses. In each assessment area, boys and girls performed comparably. The Tech Prep model clearly complies with the goal of gender equity. Another aspect of this study suggests that the Med-Tech program has a beneficial effect on retention rates and advancement into 4-year degree programs. CSI data indicate that more than 85% of the Med-Tech students entering CSI as freshmen are retained in programs or graduate on time. Another important factor in the success of the program is the participation of high school Med-Tech students in internships and apprenticeships in hospitals, nursing homes, and local laboratories. These work-based experiences allow students to see the practical application of mathematics, communications skills, and skills in the professional arena. The Tech Prep model links academics to work (Shimony, Russo, Ciaccio, Sanders, Rimpici & Takviorvian 2002).

**Programs That Help Create Opportunity For the Under Represented Populations**

Creating an interest for women in technology occupations at an early age was the focus of a study by Boudria (2002). Bristol Community College’s Tech Prep Program responded and was awarded the funding necessary to implement a series of activities to
address the need for young women to get involved in the various fields of engineering and technology. Crucial to the Women In Technology (WIT) Program’s success was the establishment of strong partnerships with industry, government, and education. The Bristol Tech Prep Consortium, with the support of educators from area high schools and the leadership and resources of local businesses, recruited female high school students to participate in project-based learning at local plants (Boudria, 2002).

The main goal of Bristol’s Tech Prep initiative was to develop a seamless connection among secondary schools, the community college and universities, and business/industry in order to prepare young women for careers in engineering and technology. To achieve that seamless connection, the Consortium first had to recruit advocates from the high schools and have an open dialogue with community college officials and faculty (Boudria, 2002).

The Women In Technology Program at Bristol Community College has had a positive impact on everyone involved, from the teams of high school students to the educators, administrators, and business partners who have promoted and participated in this initiative (Boudria, 2002). Women In Technology students are provided with exposure to careers in engineering, thus seeing a reason to continue their education. Of the WIT seniors who enrolled in the program from 1997 to 1998, 65% of the graduates have gone to college either in an engineering or computer technology field. Twenty-five percent have entered the workforce, and 10% attended college in other majors (Boudria, 2002).
If designed well, college-level work in high school can: increase the pool of historically underserved students who are ready for college, provide realistic information to high school students about the knowledge and skills they will need to succeed in postsecondary education, improve motivation through high expectations and the promise of free courses, decrease the cost of postsecondary education by compressing the years of financial support needed and create a feedback loop between K-12 and postsecondary systems around issues of standards, assessments, curriculum, and transitions from high school to college (Hoffman, Vargas & Santos, 2009). College credit attainment for students while still in high school is a strong indicator that the student is college ready, a goal increasingly set by states as the only sufficient outcome of high school (Hoffman, Vargas & Santos, 2009).

Each school is developed in partnership with a postsecondary institution whose courses make up the college portion of the student’s education. Students begin college-level work as early as ninth grade. Dual enrollment is perceived as a path to a postsecondary degree or credential not just for gifted students, but for those considered middle achievers or on a career or technical track (Hoffman, Vargas & Santos, 2009). An analysis conducted by the Florida Department of Education (2004) found that high school students who participate in dual enrollment were enrolling in colleges and universities at rates significantly higher than students who did not participate. In addition, Hispanic and African American students who took dual-enrollment courses were enrolling in higher education at higher rates than whites or any other ethnic group (Hoffman, Vargas & Santos, 2009).
Bailey, Hughes and Karp (2002) point to one state in particular that has moved towards the goal of better transition to college. Over the past few years, New York State has made the once-optional Regents Examinations mandatory for a high school diploma. At the same time, the City University of New York (CUNY) system was engaged in a self-evaluation, one result of which was the ending of remediation courses at all of its four-year colleges. Some colleges are now reporting applicants’ scores on placement examinations to their high schools. Orr (1999) found evidence of this in her research at four community colleges and notes that the high school teachers were surprised to learn how poorly their students had performed on the tests. The National Commission on the High School Senior Year (2001) recommends that college placement examinations be given to high school students as early as the 10th grade to help students and their parents begin to gauge their readiness for college-level work. As dual enrollment requires formal linkages between high schools and colleges, they are also a mechanism for promoting partnerships between the two education sectors (Bailey, Hughes & Karp, 2002). Promoting access to college for increasing numbers of high school students and providing the academic foundation for success in colleges, workplaces and communities are widely held goals for students, parents, educators and policymakers across the nation.

*Dual Enrollment Education That Works*

Improving the accessibility to college and improving the college experience for more students was the subject of an article by Lynch and Hill (2008) concerning the state of Georgia Dual Enrollment Programs and their effect on college success. In
Georgia, the number of high school students that dual enrolled in technical college courses increased dramatically from 1999 to 2004 and represented an important segment in the technical college system. Many see this as an outcome of increased collaboration between secondary and postsecondary institutions, particularly through Tech Prep designs; the availability and promotion of various forms of postsecondary options for high school students; or simply more interest from high school students in obtaining a postsecondary technical education (Lynch & Hill, 2008).

The study, conducted in collaboration with and funding from the Technical College System of Georgia (TCSG) and with cooperation from the Georgia Department of Education and the University System of Georgia (USG), focused specifically on dual enrollment of high school students in technical colleges and their subsequent transition into a public college or university; policies and processes used in administering the program; benefits and challenges; and how dual enrollment affects the students, high schools and colleges that participate. Among the findings was a marked increase in the number of participants in the state’s dual enrollment program; increased access to colleges for more students, especially for those who were historically underrepresented; nearly all dual enrolled students experienced postsecondary academic success in the technical college courses, and large numbers of participants earned postsecondary credentials (Lynch & Hill, 2008).

Students who successfully completed dual enrollment courses could usually transfer the credits into a postsecondary technical college program; however, it was much less likely the credits earned would transfer into a USG college or university.
Interesting, however, is that few survey respondents believed that this inability to transfer dual enrollment credits into a USG college or university negatively affected enrollment in high school dual credit technical courses. An increase in access to college technical education appears to be particularly favorable for students from low-income homes and those who graduated from high school with a technology/career preparatory or a dual seal diploma. Most dual enrollment instructors described their students as successfully using hands-on and work-based activities and thought these students had the ability to succeed in postsecondary education (Lynch & Hill, 2008).

Much of the interest in dual enrollment is based on its perceived potential for enabling more students to continue into higher education. The expectation is now that all students need to continue their education either immediately after completing high school requirements or at some point in the future. Most dual credit programs across the nation have focused on academically motivated and high performing students at the secondary level, while a few have targeted the economically and educationally disadvantaged who might not have opportunities to attend college. However, much of the focus remains on increasing the academic preparation of high school students and the numbers who continue into traditional baccalaureate-level degree programs (Lynch & Hill, 2008).

A unique aspect of the study by Lynch and Hill (2008) is its contribution to understanding how career and technical education (CTE) differs from more traditional academic emphases in dual credit, and how it can address the broader outcomes of workforce preparation and lifelong learning as well as college preparation. The study
also provides evidence that technical college dual enrollment programs have the twin outcomes of both preparing students to transition into postsecondary education and preparing them for immediate employment after high school or for jobs that enable their participation in college and lifelong learning. Many interviewees and survey respondents in this study commented on the changes in students’ attitude toward school; increased confidence in their ability to handle college level work; and enhanced career planning and decision making as a result of participation in dual enrollment courses. From the data, it was concluded that dual enrollment in Georgia increased access to college for more students, especially to technical and two-year colleges. Access to college also improved for students from low-income groups who attended two-year and technical colleges and for work-oriented students (Lynch & Hill, 2008).

Further, dual enrolled expanded offerings for high school students, especially for students in high schools unable to offer a comprehensive CTE Program. Interesting too, was that so many students and administrators interviewed felt that the career preparation feature of the college-level course enabled students to acquire skills and credentials resulting in their ability to obtain “good” jobs and higher wages that will help with college costs. Up to 60% of high school administrators also thought the opportunities offered through dual enrollment encouraged many students not to drop out of high school. Various data sources indicated these students were more successful with postsecondary education. This success was based on grades, earned credentials, less need for remediation after transition, and improved confidence in their ability to handle college-level coursework (Lynch & Hill, 2008).
Dual credit programs are widely implemented in 47 states. They have become a joint secondary and postsecondary venture to assure that there are additional opportunities for high school students to develop, maintain, and advance their academic capabilities (Hale, 2001). There are more than 30,000 high schools in the United States, creating a greater demand on colleges and universities. There has also been an increase in student population (3-5%) as baby boomers send their children off to college (Boswell, 2000).

In the United States, there are 1,721 community colleges. These dual credit programs produce enrollment not only in general education but also in career and technical areas. These programs serve as an entry level for individuals moving from secondary to post secondary education. These factors result in reportable headcount and credit hour generation. Other benefits of dual credit programs to community colleges include recruitment of students and forging linkages with high schools (Boswell, 2000).

The ability of students to accumulate college credit, in some cases up to almost a full year’s worth, prior to entering college allows them to both shorten the time it takes to earn their degree and save significantly on the overall cost of their education. Some states have sought to encourage this, partly for fiscal reasons. In Utah, 75 percent of junior and senior year tuition at state universities is waived for students who earn an associate degree, with the help of dual enrollment, by the summer after their graduation from high school. Although this program is quite new, the large number of courses offered through the state’s concurrent enrollment programs, particularly in Salt Lake
City, gives reason to believe that some proportion of high school graduates will be able to take advantage of this option. Given the potential financial advantages of such programs, some advocates for their expansion have argued that limiting them to only the most academically able limits access to educational opportunity and is thereby contrary to the mission of public education (Greenberg, 1988).

Per national Tech Prep guidelines, both male and female students are encouraged to consider career areas not traditionally popular for their gender (Draeger, 2006). Many gender or culture specific programs, services, and scholarship opportunities, such as women in engineering technologies, Appalachian students, Hispanic students, and first-generation college students are now able to consider college. Collaboration with the college organizations responsible for these initiatives allows an increasing number of nontraditional students to successfully complete postsecondary Career and Technical Education (CTE) programs (Draeger, 2006).

Tech Prep has evolved into a school reform initiative that strengthens the academic preparation of students who typically pursue programs leading to employment that include technology based careers. PSEO is not just about additional coursework for enrichment, it is about delivery of service in a way that resonates with students who need something different, something more, and something faster (Ohio Association of Gifted Children website, 2010).

**What Are the Benefits of Articulation Agreements and Academic Rigor?**

Tech Prep and PSEO programs require that articulation agreements be in place to help define the education and seamless transition from secondary programs to related
college programs. While these agreements formalize the commitment to transfer a student’s high school work into college credit they also can include advanced placement or additional benefits such as academic rigor. In addition, articulation agreements list entrance and exit requirements, what course work will transfer and what advanced skills are included in the curriculum. This section will focus on several examples that deal with the impact of articulation agreements and academic rigor.

National data from the Advanced Technological Education (ATE) Program regarding articulation agreements for the transfer of two-year technical degrees to baccalaureate degree completion was the source of information for the study by Zinser and Hanssen (2006). The authors conducted a simple stage random method of sampling from the articulation agreements survey section as the basis for answering questions about the role of the ATE Program in promoting access to the baccalaureate degree. The data collection was a mixed methods design using quantitative and qualitative data to illustrate and help explain the extent to which ATE projects improve access to universities for technical students. The data for this study were obtained from the 2004 and 2005 annual surveys of ATE grantees (Zinser & Hanssen, 2006).

Based on the conclusions of the research, there appears to be three types of benefits from successful creation and implementation of articulation agreements. These include benefits that accrue to (a) students, (b) participating institutions, and (c) the broader community. Student benefits include elements such as reduced costs, schedule flexibility, broader access, and additional services such as career counseling. Institutional benefits include marketing, creating a pipeline of new students, and
sharing resources for teaching and curriculum development across institutions. Community benefits include providing trained workers. The benefits are the first key to success for articulation agreements, and the agreements must provide benefits to students, institutions, and the community according to Zinser and Hanssen (2006).

In an effort to promote Tech Prep Programs and the transition they create to college, Dare (2006) suggested in her article there may be a fundamental need to review what impact Career and Technical Education (CTE) Programs help in promoting college success. Vocational education, or career and technical education (CTE), is one academic pathway that is continuing to emerge as a boundary-spanning approach to facilitating students’ transition from high school to postsecondary education. Once considered a pathway for non-college-bound high school students, CTE has evolved to include an increased emphasis on rigorous academic preparation and integrated and articulated CTE courses and programs (Bragg & Kim, 2005).

In the past, Career and Technical Education has been viewed as an undesirable curricular track, one suitable only for students who will not go to college. Today, many high schools offer CTE that requires advanced academic skills to help students make the transition to college-level technical and professional studies. Indeed, DeLuca, Plan, and Estacion (2006) and Hudson and Hurst (1999) found that participation in a blended CTE and college preparatory curriculum prepares students for both college and work.

Specifically, of a group of students scoring in the middle two quartiles on eighth-grade math assessments, students who completed a concentration of secondary CTE courses along with a college preparatory curriculum increased their mathematics test
scores by an average of 27 points by the twelfth grade; students from the same two quartiles who completed only a college preparatory curriculum gained an average of 29 points. By comparison, students from the same two quartiles who only took a CTE concentration gained 22 points. Reading test score gains for the same group of students were 21 points for the combined curriculum, 22 for the college prep curriculum, and 18 for the CTE concentration (Hudson & Hurst, 1999).

Further, the U.S. Department of Education (2004) reported that secondary students participating in CTE increased their enrollment in academic courses over the past decade and demonstrated higher academic achievement than previous cohorts. Although only about 13% of all high school graduates participated in combined CTE and academic programs, these results offer strong evidence that those who do are as well prepared as students who only took a college preparatory curriculum and far better prepared than students who took a CTE concentration but who did not complete a rigorous academic curriculum to successfully transition to college (Hudson & Hurst, 1999).

Since its inception in the early 1990s, Tech Prep has focused on integrating academics with CTE courses and on partnerships between secondary and postsecondary education that support students’ transition to college. Tech Prep has accomplished these goals through articulating courses and programs, curriculum development, professional development, collaboration with business and industry, work-based learning, and career and educational planning (Bragg, Reger, Brown, Orr & Dare, 2002). Although the National Association of Vocational Education (U.S.
Department of Education, 2004) argued that Tech Prep is not a comprehensive reform model, and pointed out significant problems associated with identifying and tracking outcomes for Tech Prep students due to inconsistent implantation. Bragg, Reger, Brown, Orr, and Dare (2002) indicated that several exemplary sites across the country were successfully transitioning students to college, particularly in schools in which the Tech Prep initiative evolved into a College Tech Prep model. College Tech Prep emphasizes academic rigor along with CTE course-taking, as well as innovative approaches to articulation and dual credit. Like programs such as High Schools That Work (HSTW), Tech Prep served as a catalyst for the expansion of dual credit and dual enrollment programs across the country and helped educators sequence and aligns courses and programs across institutional boundaries (Bragg, Reger, Brown, Orr & Dare, 2002).

Initiatives like Tech Prep serve as wake-up calls for community colleges. Initiatives that target high school students who do not fit the traditional college student profile bring significant challenges for community colleges. One key strategy for addressing these challenges is to move beyond specific elements of individual programs to identify common, crosscutting situations that require consistent and effective leadership, management, and integration. Rather than dealing with each program discretely or randomly, community colleges should provide leadership in developing articulation-related policies and practices that support all students in their transition to college. Similarly, all CTE initiatives emphasize career and educational planning. Although high school CTE programs vary, community colleges must provide key
leadership throughout students’ transition processes (Bragg, Reger, Brown, Orr & Dare, 2002).

As learning and workforce needs evolve, and as key initiatives like Tech Prep provide more data to document their successes, educators are pushing historically discrete educational boundaries (Dare, 2006). Community colleges now have a range of models to use in partnering with high schools and supporting students’ transitions to postsecondary education. Community colleges need to provide leadership in supporting transition efforts. Today’s learners are less bound to space, place, and time than any prior generation of learners. Community colleges, in particular, are well positioned to partner with high schools to offer learning opportunities to students through articulated credit, dual credit, and dual enrollment programming. In addition, programs and initiatives that blend CTE with rigorous academic coursework are providing students with increasingly advanced sets of precollege learning experiences. Community colleges must be ready to meet these students’ needs and help them attain their educational and career goals (Dare, 2006). Perhaps the most important result of the establishment of Tech Prep consortia is the marked increase in the number of articulation agreements between secondary and postsecondary institutions. With the articulation between secondary and postsecondary institutions that is inherent in Tech Prep, students find that they cannot only enroll in college-level courses, but they can succeed in them (Reese, 2003).

Academic rigor is the key to success, and Tech Prep has been hailed as a groundbreaking movement (Gilli & Gilli, 1994). The blend of rigorous academic and
technical study in high school, and links to community and technical colleges, provide a pathway to many high-tech careers that do not require baccalaureate degrees. But the coursework is not always enough to guarantee job placement. In Southern Maryland, where the Tech Prep consortium is one of the federal government’s model programs, educators have sought opportunities to give students valuable on-the-job work experience that qualifies them for advanced placement at a community college and journeyperson certification. Youth apprenticeship is one variety of work-based training that combines on-the-job work experience and related instruction to prepare students for employment and a broader understanding of a career cluster area. These programs provide pathways to traditional, registered apprenticeships but are not formalized through a training council. Though typically less lengthy than a traditional apprenticeship, youth apprenticeships do include paid work experience in the relevant career field. Graduates earn a high school diploma and, if agreements are in place, credits toward an associate degree or certificate. Most important, they provide the opportunity to learn under the direction of a mentor or master in an occupation (Gilli & Gilli, 1994).

In Anne Arundel County, Maryland, work experience coordinators are developing a youth apprenticeship program for the hotel-restaurant management industry. Again, the students involved are those already enrolled in work experience programs supervised by school personnel. The related instruction is provided by Anne Arundel Community College, and the courses are credited to a two-year certificate or degree program. Anne Arundel County also has placed students in registered
apprenticeships. These kinds of arrangements can smooth the way from high school into an apprenticeship and/or a community college program. Often, special arrangements must be made to bring the related instruction component of an apprenticeship into Tech Prep. Under ideal circumstances, Tech Prep agreements let students dually enroll in high school and community or technical college so they can earn credit at both institutions for completing one course. When developing related instruction for an occupation for the first time, a good start is to find out from the sponsor what academic skills are considered necessary to adequately master work skills (Gilli & Gilli, 1994). Sometimes courses will have to be tailor-made for an occupation. Often compromises must be made, such as having sponsors provide the related instruction at the job site at their own expense. At the same time the sponsor must be flexible and visionary in order to identify the thinking, computational and communication proficiencies to be developed and honed to ensure that students are prepared to adjust to future changes in the workplace (Gilli & Gilli, 1994).

Effective articulation agreements, policies and procedures, and extensive collaboration between high schools, community colleges, four-year institutions, and state higher education agencies all contribute to the success of the Tech Prep and Career Tech Programs. Graduating seniors require approximately 50% less remediation in college than non-Tech Prep students of the same age (Draeger, 2006). This data suggest that high school students should take full advantage of Tech Prep pathways to help develop and establish a plan for a bachelor’s degree.
Industry Model and State Government Support

All states, including Ohio, need to promote and establish consistent policies and parameters to help guide local entities that work with Tech Prep and PSEO by passing or supporting types of legislative framework that help promote local programs including industry models that have been shown to be successful. In this section, several articles will examine how industry and state government can be instrumental in creating success for programs.

According to Cantor (1999), Tech Prep Programs are viewed as a potential catalyst for what programs may be needed for curriculum development. A significant portion of the attention afforded Tech Prep has come from the secondary schools rather than from the community college sector. This disparity of attention might result from the perception that Tech Prep is a vocational initiative, rather than an initiative that has merits across all academic settings (Cantor 1999). The purpose of Cantor’s article was to discuss and describe the programmatic outcomes that Tech Prep has facilitated, some of which might not be completely recognized and appreciated by all community college educators and administrators.

Programs decided upon by the local consortium are scheduled into a long-term development plan, which is submitted to the state executive board of Tech Prep in Virginia. At the state level, professional instructional systems support is in place for the development of Tech Prep courses. Virginia’s programs are categorized into five career clusters—business and marketing; health, human and public services; communication arts and media; engineering technology; and agriculture and environmental/natural
resources. Any viable instructional design system needs to ensure that the programs offered are developed to valid industry standards and delivered in an instructionally sound manner. Through exposure to Tech Prep Program design, the faculty of Virginia’s community colleges are carrying these practices to program development in non-Tech Prep initiated curricula development (Cantor 1999).

The Tech Prep Program in Virginia has provided a structure for program development in the following ways. First, Tech Prep in Virginia has fostered closer liaisons with business and industry. By the formation of locally based consortia, secondary school teachers, community college faculty and local business and industry representatives, who participate in needs assessments to identify programs of study needed locally, and through promotion of these programs, including sponsoring of internships for both students and faculty, industry now has closer ties to education at both levels, and mutual trusts have developed. Next, Tech Prep in Virginia has served to foster program development in high-demand high-tech industries. The programs that have evolved have met immediate and long-term workforce needs in emerging high-tech industries. Such programs will undoubtedly sustain their level of state-of-the-art through close ties to industry. They will also provide a pathway to gainful careers for students. Thirdly, there has been a significant improvement in the levels of cooperation and communication between secondary school teachers and our community college faculty.

This cooperation and communication is particularly evident in the areas of curriculum development. With the statewide structure that have been developed, this
curriculum development has been guided through the use of an instructional systems design process, thus ensuring the rigor necessary to develop performance-based programs of study reflective of industry standards. Finally, the ensuing program designs have fostered contextual learning in the classroom. The instructional strategies that have emerged have infused vitality into the classroom and workplace. Student levels of excitement about learning have heightened when students see the connections between theory and reality—both in academic subjects and in technical subjects. All of the learning is connected to the work and workplace. Tech Prep has received favorable grades in Virginia. Virginia educators at both the community college and secondary school levels intend to continue to build upon the vitality and viability that this initiative has offered (Cantor, 1999).

Community colleges in North Carolina are following the requests of business and industry to articulate, collaborate, and develop partnerships with local sponsors to better train the adult workforce. These partnerships have resulted in the development of active Tech Prep Programs as revealed by 94% of the community college presidents who identified active programs at their college with at least one public school district. Moreover, 54% had articulation agreements or consortia with two or more school districts (Farmer & Honeycutt, 1999).

Implementing Tech Prep programs is not easy. There are many political ramifications both locally and at the state level. Turf wars can develop between community colleges and universities. A study by McDavid, Boggs and Stumpf (2005) regarding the Mississippi Tech Prep Programs state leaders were asked to pinpoint the
one major barrier to implementing Tech Prep in their state. Although no single major
barrier emerged, the following three dominated the responses: (a) negative attitudes on
the part of some educators, parents, and students toward vocational education; (b)
conflicts between secondary and postsecondary, and vocational and academic
educators; and (c) lack of needed resources.

In regard to the first barrier, negative attitudes were expressed through such
statements as, “Tech Prep is just another name for vocational education” and “Tech
Prep is an educational fad that will go away.” In the public view, Tech Prep is seen as
part of (or a continuation of) vocational education and this perspective leads to some
prejudging. Apparently, this perspective was adopted by some state leaders as well. If
this barrier is to be overcome, concerted efforts must be made either to improve the
image of vocational education or to put some philosophical distance between Tech Prep
and vocational education. One way to establish this philosophical distance may be to
explore how the commonalities between Tech Prep and the democratic approaches to
education advocated by John Dewey could be practiced more widely. A perpetuation
of tracking, whether called college prep and vocational education or college prep and
Tech Prep, is not likely to overcome the negative images held for work-oriented
education (McDavid, Boggs & Stumpf, 2005).

On the other hand, where Tech Prep was viewed as a total restructuring effort,
other barriers seemed to impose them. Turf battles were seen as creating difficulties in
efforts at collaboration between traditionally separated groups—secondary and
postsecondary or academic and vocational. Although admittedly quite difficult to
overcome, these battles also can be seen in a more positive light. This conflict may

demonstrate that, at least, communication has begun and that territories no longer are
taken for granted. Through conflict the need for change eventually may be dealt with
and consensus ultimately may be obtained. Sometimes the bonds formed by working
through conflict can yield greater commitment to a course of action than if the discord
had not occurred at all. Of course, strategies for managing conflict effectively are

essential if a healthy climate of communication is to be maintained throughout the
implementation process (McDavid, Boggs & Stumpf, 2005).

The third barrier was a lack of resources, specifically time, staff, and money. Only 21% of the states were contributing funds in addition to the federal dollars

provided, bringing into question who would take over funding for Tech Prep if federal
funding ends. If Tech Prep cannot be sustained with primarily federal funds, states and
localities must provide concrete support to institutionalize it. Particularly at the local
level, joint planning time and sustained leadership are two critical ingredients to
carrying out a successful local implementation effort. In the view of all the state leaders
interviewed, having adequate time, financial resources and knowledgeable people was
absolutely essential to implementing Tech Prep successfully (McDavid, Boggs &
Stumpf, 2005).

The research of McDavid, Boggs and Stumpf (2005) suggests that the definition

of Tech Prep is changing as practitioners build upon the skeletal federal program and
make it their own. In the implementation process, such changes are bound to happen.
Tech Prep is evolving and not yet in final form; however, practitioners across the
country indicate that a potential impediment to Tech Prep is its lack of clear identity. Is it vocational education by another name? Is it an attempt to reform vocational education? Or is it a total reform affecting all levels and dimensions of the educational system? Such questions may be at the heart of other problems such as turf battles between secondary and postsecondary education, failures in collaboration between academic and vocational educators, and the lack of resources allocated to states’ Tech Prep initiatives. Granted, these problems may be political in origin, but the politics are likely to be based on philosophical differences. To overcome this dilemma, it is crucial that leaders at all levels firm up goals for Tech Prep, not to the point of stagnation, but so that its uniqueness and importance is clearly visible (McDavid, Boggs & Stumpf, 2005).

Nearly 900 local consortia working to implement Tech Prep, it appears that roughly 75% of the country’s public two-year colleges are involved. When the first cohort of Tech Prep students graduates from high school, these colleges stand to gain a well-prepared group of students who will be highly motivated to acquire associate’s degrees. Indications are that efforts in curriculum integration, collaboration, and restructuring are beginning to take place at the secondary level to ensure that these students are better prepared for the postsecondary level. Certainly, community colleges stand to benefit from these developments. Many two-year postsecondary institutions are providing leadership to their local consortia; however, it seems clear that for Tech Prep to succeed in the long run, two-year colleges must do more. They must take a proactive role in developing and implementing curricula that demonstrate the
integration of vocational and academic education. Students who are successful with Tech Prep at the secondary level are bound to demand it at the college level as well. Two-year colleges also must be aggressive in developing curricula that provide the advanced academic and technical skills needed by the workforce (Hull 1993). As secondary schools increase the rigor of their curriculum, students matriculating into postsecondary schools will need to avail themselves of the higher level competencies that employers seek from community college graduates (McDavid, Boggs & Stumpf, 2005).

States need to play a more active role in Tech Prep implementation to ensure its long-term effectiveness for years to come. State policy that parallels the federal legislation with clear definitions, goals, and expectations for local Tech Prep Programs and students is essential. Once state policy is in place, state leaders need to become actively involved in promoting general awareness of Tech Prep by the public and among educators. When practitioners realize that state leaders in all areas of education support Tech Prep, then vocational and academic (and secondary and postsecondary) educators can more readily see the need for change (McDavid, Boggs and Stumpf, 2005).

Districts, colleges, or states must cover tuition and fees for college courses if dual enrollment is to be made accessible to lower-income students. The costs associated with maintaining the high school-college partnership, such as employing a liaison who coordinates and supports the alignment of curriculum and professional development from grades 9 to 14 must be addressed (Hoffman, Vargas & Santos, 2009).
Conclusion

This literature review helps demonstrate an understanding of the impact of Tech Prep and Post Secondary Enrollment Option Programs on students’ educational attainment following their participation in Tech Prep and PSEO Programs. A Post Secondary Enrollment Options (PSEO) Program allows high school students to enroll in a college course prior to high school graduation, giving them first-hand exposure to the requirements of college-level work while gaining high school and college credit simultaneously (Greenberg, 1988). It is possible that further gains for participation will be realized in their academic careers because some students may take longer to graduate. For example, participants who began their postsecondary education in two-year colleges are more likely to transfer to four-year colleges and complete baccalaureate degrees than non-participants, and participants enjoy higher wages than their counterparts after graduation (Cellini, 2006).

The research strongly suggests that Tech Prep and PSEO can prepare high school students for college and give them momentum in completing a degree or credential. Moreover, it shows that these benefits extend to groups who are typically underrepresented in college (Hoffman, Vargas & Santos, 2009). Dual enrollment is no panacea and is not necessarily easy to implement. Dual-enrollment pathways and early college schools require that high schools and colleges work in close partnership, negotiating financing across the two systems and using dual enrollment as a laboratory for aligning standards across secondary and postsecondary education (Hoffman, Vargas & Santos, 2009). These partnerships are challenging to build and sustain
precisely because the country’s secondary and postsecondary systems are, by design, disconnected and uncoordinated. Their differing academic calendars, course schedules, crediting systems, and organizational norms can make partnership difficult. Accelerated learning programs have the potential to reconcile these divisions but are also constrained by them (Hoffman, Vargas & Santos, 2009).

In preparing today’s students to participate successfully in tomorrow’s workforce, which may include high-tech jobs that have not yet been defined yet, Tech Prep Programs are critical for developing the proper skill sets. Students, as well as the organizations that serve them by delivering Tech Prep and Career Technical Education (CTE), need to continually develop by expanding their frame of reference for processing new information and knowledge. Relationships between abstract concepts and practical applications need to be continuously reinforced for students by the educational team of faculty and business partners. Students need to distinguish among multiple occupations within single career fields, and recognize and gain transferable skills across those fields. Employers need to be engaged to design and deliver education and career preparation so that workforce needs are met (Draeger, 2006).

More time and research is needed to adequately assess the longer term impacts of Tech Prep and know definitively which educational innovations work for the middle majority. “If a school’s career academy is evaluated and shows itself proficient, it should have higher graduation rates, higher GPAs, increased attendance and more students going on to postsecondary education” (Delano & Middelsteadt, 2005).
A review of existing studies indicates there is a need for further research regarding the impact of college success for students who attend Tech Prep and PSEO Programs while still in high school. We believe that no other studies exist or show this level of detail and results regarding Tech Prep and PSEO students and therefore research needs to be conducted to determine if the program creates success for students after they leave high school with college credits.
CHAPTER 3: METHODOLOGY

This chapter presents a summary of the methodology designed to address answer the research questions about the Tech Prep and PSEO Programs located in Northwest Ohio. This chapter will present the research design, participants, instrumentation used, the data collection procedures applied, the data analysis and the assumptions and limitations that must be considered.

Research Design

This study utilized a correlational research design and investigated the degree to which college credits earned in high school through the Tech Prep and PSEO Programs predict college success. This design is appropriate since the study examined the relationship among the variables. In addition, gender and race as well as high school origination differences regarding credits earned and college success were examined. The researcher utilized a secondary data source from Tech Prep Workforce Council. Data and information are based on annual college credits taken by students in high schools within the service area of Terra Community College and Bowling Green State University Fireland’s campuses.

Participants

The participants were high school students who were enrolled in Tech Prep and PSEO programs in Northwest Ohio from the years of 2004 through 2008. During this period of time 1,072 students attended the Tech Prep and PSEO Programs. The Tech Prep Workforce Development Council data from the state of Ohio Higher Education Information (HEI) system include both Tech Prep and PSEO information. Although
Tech Prep and PSEO use different funding models, data from both programs were analyzed together since the goal of both programs is to accelerate student achievement by offering college level classes for college credits while students are still in high school (Ohio Board of Regents website, 2011). The Tech Prep and PSEO students were from high schools in the Terra Community College and Bowling Green State University Firelands service areas. The Northwest Ohio counties in the service area are Erie, Huron, Ottawa, Sandusky, Seneca and Wyandot.

**Data Collection Procedures**

The data were gathered using the HEI system, a secondary data source, which allows administrators to review and calculate information via the Internet. The HEI system includes a database that is maintained and updated by the Tech Prep Workforce Council coordinator. The council includes business leaders and academic deans from the two aforementioned colleges mentioned previously. The Workforce Development Council oversees the Tech Prep Consortium. Each Tech Prep Consortium is required to submit to the Ohio Board of Regents’ HEI system data for their secondary Tech Prep and PSEO students. The Consortium is a team of individuals who work at the respective colleges and high schools to help formulate new programs and pathways and works with two colleges and area high schools in three vocational education planning districts to create seamless career-technical education programs that begin in the junior year of high school and continue through to an associate degree and beyond. Information in the HEI system includes the career center attended by each student, high school of origination, year of high school graduation, number of college credit hours
earned while in high school, race, and gender and whether or not the student is attending college/graduated or is no longer enrolled. According to the Ohio Board of Regents website (2011), the State is now measuring the number of college credits earned while students are still in high school in an effort to establish accountability at the high school and college.

The relevant data were provided in a database by the Tech Prep Workforce Council, which standardized the procedure through administration that is independent of the schools. The data and information for this study were based on the annual college credits earned by students in high schools within the service area of Terra Community College and Bowling Green State University Firelands campuses. The progress of the students is verified through the HEI each year by the Tech Prep Consortium and Tech Prep Council. The data were sorted and summarized by the researcher on an Excel spreadsheet by high school, year of high school graduation, number of college credit hours earned in high school, race, gender and whether or not the student is attending college/graduated or is no longer enrolled.

**Research Questions**

1. Does the number of college credits earned in a Tech Prep and Post Secondary Enrollment Options Program predict college success?
2. Do college credit hours earned differ by college success?
3. Do credit hours earned and college success differ by gender, race or high school origination?
Data Analysis

This study utilized a variety of statistical analyses within SPSS. First, descriptive statistics were utilized to summarize all variables. Inferential techniques were used to examine each research question and applied an alpha of .05 to determine statistical significance. To analyze the first research question regarding if the number of college credits earned in a Tech Prep and PSEO Program predict college success, a logistic regression was conducted to determine the “odds” of the dependent variable occurring when the independent variables were present. Logistic regression was selected because the independent variable was quantitative and represented the number of college credits earned through the Tech Prep and PSEO Programs by students while they attended high school. The dependent variable, college success outcome, was dichotomous and represented the outcome of participation in the Tech Prep/PSEO program. For this variable or outcome, students were categorized as those who were currently enrolled in college or who had graduated and those who were not currently enrolled in college or who had not graduated.

The second research question addressed whether college credit hours earned differed by college success. A t-test of independent samples was used to examine the differences regarding the number of credit hours earned while students were in high school and how the data impacted college success. This question is the inverse of research question one. For question two, college success was the categorical independent variable, and the dependent variable was the number of credit hours earned.
To examine the third research question regarding if there were significant differences by gender, race or high school origination in college credits earned and college success, the following tests were performed. Two t-tests of independent samples were conducted using race and gender as the independent variables and the number of college credits earned was the dependent variable for both analyses. The t-tests were used to determine whether the means of two groups were statistically different from each other. This analysis is appropriate whenever you want to compare the means of two groups, gender and race in this case. To examine if the independent variable of the originating high school played a role in the number of college credits earned by the students who participated in Tech Prep and PSEO, an analysis of variance was used. Finally, a Chi-Square Test of Independence was used to investigate whether distributions of categorical variables differ from one another, in this case, if college success differed by gender, race and high school origination.

Assumptions and Limitations

This study was based on the assumption that students put forth their best effort when completing the Tech Prep and PSEO Program. This study also assumed that data was up to date and accurately reported. Several limitations also detract from the study. One major limitation is that the HEI dataset does not distinguish between Tech Prep and PSEO participation. Another limitation of this study is that it uses regional data from Northwest Ohio rather than state or national data. In addition, college success is defined as either having graduated from a four-year university/two-year college or still
in college. In contrast, some students may be quite successful in college but are taking a break due to personal or financial reasons and therefore be categorized as unsuccessful.
CHAPTER 4: RESULTS

The purpose of this quantitative study was to examine the Tech Prep and PSEO Programs located in Northwest Ohio and determine the degree to which college credits earned in high school through the Tech Prep and PSEO Programs predict college success and if there were any significant differences in credits earned and college success based upon gender, race or high school origination. This chapter presents the statistical results of data analysis for students in high schools within the service area of Terra Community College and Bowling Green State University Firelands campuses. From 2004-2008, there have been 1,072 students attend Tech Prep and PSEO Programs in the service area. The data collected were organized and analyzed by frequency distribution, descriptive statistics, and correlations using Microsoft Excel and the Statistical Package for the Social Sciences (SPSS). This chapter is organized into two sections. First, characteristics of the sample are presented and second, the results of the analysis for each research question are presented.

Characteristic of the Sample

For the study, 1,072 students participated in the Tech Prep and PSEO Programs during the years of 2004-2008 attending 32 high schools. Of the students studied in the survey, 916 (85.4%) were Caucasian. Of the remaining 156 students, 60 (5.6%) were Hispanic, 53 (4.9%) were African American, 39 (3.6%) students were of unknown race, and 4 (.4%) students were of Asian descent. For the purpose of analyzing Research Question #3, students were categorized as either “Caucasian” or “Other” due to the low
minority group frequencies. With regard to gender, 456 (42.5%) were females and 615 (57.4%) were males, with one student not reporting gender.

Research Question 1

Does the number of college credits earned in a Tech Prep and Post Secondary Enrollment Options Program predict college success?

The independent variable was the number of college credits earned through the Tech Prep and PSEO Programs by students while they attended high school. The dependent variable, college success outcome, was categorical and represented the outcome of participation in the Tech Prep/PSEO program. For this variable, or outcome, students were categorized as those who were currently enrolled in college or who had graduated and those who were not currently enrolled in college or who had not graduated. A frequency distribution (see Table 1) indicated that the majority (54.9%) of the students who were a part of this study were categorized as being in school or had graduated from college at the time of the study.

Table 1
Success Outcomes

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not In School</td>
<td>484</td>
<td>45.1</td>
</tr>
<tr>
<td>In School/Graduated</td>
<td>588</td>
<td>54.9</td>
</tr>
<tr>
<td>Total</td>
<td>1,072</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Logistic regression analysis was conducted to determine if the number of credit hours earned predicted college outcome success. Results indicated that the number of
college credits earned does significantly predict college outcome success (-2 Log Likelihood= 1468.81, \( \chi^2 (1) = 7.19, p<.007 \)) and correctly classified 54.7% of the cases. The extremely large -2 Log Likelihood indicates that the model fit is questionable. The regression coefficients (B = -.016, Wald=7.01, \( p = .008 \), Odds Ratio = .984) reveal a negative relationship in that a successful college outcome is predicted by lower college credits earned in Tech Prep and PSEO. In addition, the odds ratio was quite small and indicated little change in the likelihood of college credits earned playing a role in college success.

**Research Question 2**

Do college credit hours earned differ by college success?

College success was the categorical independent variable, and the dependent variable was the number of credit hours earned. A \( t \)-test of independent samples was used to examine if the number of college credit hours earned while students were in high school differed by college success. Table 2 reports the outcomes by the number of students with the average college credit hours earned while they were in high school.

**Table 2**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>( n )</th>
<th>( M )</th>
<th>( SD )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not in School</td>
<td>484</td>
<td>18.78</td>
<td>10.81</td>
</tr>
<tr>
<td>In School/Graduated</td>
<td>588</td>
<td>17.11</td>
<td>9.47</td>
</tr>
</tbody>
</table>

The \( t \)-test results revealed significance regarding number of college credit hours earned by students while still in high school, \( t(1070) = 2.69, p = .007 \), two-tailed.
However, the data indicate that the mean number of credit hours earned by the students with an unsuccessful outcome ($n=484, M=18.78$) was significantly higher than the students with a successful outcome ($n=588, M=17.11$).

**Research Question 3**

Do credit hours earned and college success differ by gender, race or high school origination?

Groups were compared using race, gender, and high school origination as the independent variables and the number of college credits earned as the dependent variable. To examine if the independent variable of the originating high school played a role in the number of college credits earned by the students who participated in Tech Prep and PSEO, analysis of variance (ANOVA) was used. A $t$-test of independent samples was conducted to determine if credit hours earned differed by gender or race. Table 3 presents the results of gender and race differences in credit hours earned. With respect to females ($n=456, M=17.62$) and males ($n=615, M=18.02$), male students took slightly more credit hours than their female counterparts did but the difference was not statistically significant. Similarly, there was no significance difference found related to race. On average, Caucasians ($n=916, M=17.91$) and other races ($n=156, M=17.60$) earned a similar number of credits while in high school.
Table 3

Gender and Race Differences and Credit Hours Earned

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>456</td>
<td>17.62</td>
<td>10.02</td>
<td>-0.63</td>
<td>0.527</td>
</tr>
<tr>
<td>Male</td>
<td>615</td>
<td>18.02</td>
<td>10.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>916</td>
<td>17.91</td>
<td>10.39</td>
<td>0.35</td>
<td>0.726</td>
</tr>
<tr>
<td>Other</td>
<td>156</td>
<td>17.60</td>
<td>8.48</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Another factor, high school origination (Table 4) identifies the high school where each student came from when participating in the Tech Prep or PSEO programs. An ANOVA was used to examine if the originating high school played a role in the number of college credits earned by each of the students who participated in Tech Prep and PSEO. Table 4 reports the high school where the students attended, the number of students participating in the Tech Prep and PSEO Programs, and the mean number of credit hours earned. Results of the ANOVA indicated the number of credit hours earned significantly differed by the high school of origination; $F(30, 1036) = 5.68$, $p < .0001$. 
Table 4

Means and Standard Deviation of Credits Earned by High School Origination

<table>
<thead>
<tr>
<th>High School</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>f Not in School</th>
<th>f In School/Graduated</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>192</td>
<td>22.32</td>
<td>12.06</td>
<td>96</td>
<td>96</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
<td>19.35</td>
<td>9.25</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>31</td>
<td>18.00</td>
<td>5.24</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>105</td>
<td>13.02</td>
<td>5.57</td>
<td>53</td>
<td>52</td>
</tr>
<tr>
<td>4</td>
<td>24</td>
<td>17.63</td>
<td>6.73</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>5</td>
<td>86</td>
<td>17.10</td>
<td>8.85</td>
<td>26</td>
<td>60</td>
</tr>
<tr>
<td>6</td>
<td>90</td>
<td>16.81</td>
<td>8.82</td>
<td>28</td>
<td>62</td>
</tr>
<tr>
<td>7</td>
<td>11</td>
<td>26.27</td>
<td>14.53</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>34</td>
<td>19.97</td>
<td>9.70</td>
<td>13</td>
<td>21</td>
</tr>
<tr>
<td>9</td>
<td>44</td>
<td>10.95</td>
<td>7.19</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>35</td>
<td>20.74</td>
<td>7.90</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>11</td>
<td>48</td>
<td>20.92</td>
<td>12.76</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>12</td>
<td>13</td>
<td>13.31</td>
<td>6.80</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>13</td>
<td>34</td>
<td>15.29</td>
<td>5.33</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>14</td>
<td>7</td>
<td>12.86</td>
<td>4.30</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>44</td>
<td>14.48</td>
<td>10.64</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>16</td>
<td>27</td>
<td>15.89</td>
<td>7.86</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>17</td>
<td>18</td>
<td>15.22</td>
<td>11.27</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>18</td>
<td>32</td>
<td>20.69</td>
<td>7.46</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>19</td>
<td>9</td>
<td>12.67</td>
<td>1.00</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>20</td>
<td>6</td>
<td>11.33</td>
<td>3.72</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>21</td>
<td>19</td>
<td>12.26</td>
<td>9.32</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>22</td>
<td>7</td>
<td>16.43</td>
<td>11.37</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>23</td>
<td>14</td>
<td>14.14</td>
<td>10.12</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>24</td>
<td>37</td>
<td>23.54</td>
<td>13.22</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>26</td>
<td>11</td>
<td>21.00</td>
<td>5.42</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>27</td>
<td>32</td>
<td>21.34</td>
<td>12.93</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>28</td>
<td>5</td>
<td>15.80</td>
<td>4.49</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>29</td>
<td>10</td>
<td>10.80</td>
<td>3.80</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>30</td>
<td>13</td>
<td>18.85</td>
<td>6.95</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>31</td>
<td>9</td>
<td>20.11</td>
<td>7.80</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>
Table 5 presents gender statistics by outcome (Not in School vs. In School); one student chose not to identify gender. A Chi-Square Test of Independence was conducted to determine if college success differed by gender. Reviewing the data indicates that for both genders the number of students who were in school/graduated was higher than the number of students who were not in school. Although the frequencies indicated higher rates of successful outcomes in comparison to unsuccessful outcomes for females, no significant gender differences were found in college success; \( \chi^2 = 2.092, n = 1,071, p = .148. \)

Table 5

*Gender by Outcome*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Outcome</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not In School</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>194</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>289</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>483</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In School/Graduated</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>262</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>326</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>588</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1071</td>
</tr>
</tbody>
</table>
Table 6 reports statistics by outcome (Not in School or In School/Graduated) and race. A Chi-Square Test of Independent Samples was conducted to determine if college success differed by race and showed no significant race differences in college success. The $\chi^2=0.006, n=1,072, p=.940$.

Table 6

<table>
<thead>
<tr>
<th>Race</th>
<th>Not In School</th>
<th>In School/Graduated</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>414</td>
<td>502</td>
<td>916</td>
</tr>
<tr>
<td>Other</td>
<td>70</td>
<td>86</td>
<td>156</td>
</tr>
<tr>
<td>Total</td>
<td>484</td>
<td>588</td>
<td>1,072</td>
</tr>
</tbody>
</table>

Finally, a Chi-Square of Independence was conducted to examine if college outcomes differed by high school origination. The results indicated that outcomes did not significantly differ by high school origination; ($\chi^2=40.46, n=1,067, p=.096$).

Summary

The purpose of this study was to examine a Tech Prep Program located in Northwest Ohio and determine the degree to which college credits earned in high school through the Tech Prep and PSEO Programs predict college success and if there were any significant gender/race differences in credits earned and college success as well as high school origination. For the study there were 1,072 students who participated in the Tech Prep and PSEO Programs during the years of 2004-2008 attending 32 high schools. The data were gathered using the State of Ohio Higher Education Information System (HEI) which allows administrators to review and
calculate information via the Internet that includes college credit earned by Tech Prep and PSEO Program high school students and whether or not they are still enrolled in college.

Three research questions guided this study (see Table 7). The first question asked: Does the number of college credits earned in a Tech Prep and Post Secondary Enrollment Options Program predict college success? The results of the analysis of research question one showed that the number of college credits earned did significantly predict success; however a decreasing number of college credits earned predicted successful college outcome. The second question asked: Do credit hours earned differ by college success? The results of research question two indicated that the number of college credit hours earned by students while in high school did significantly differ by college success. However, the data indicated that the mean number of credit hours earned by the students with an unsuccessful outcome (Not in School) was higher than the students with a successful outcome (Still in School or Graduated). Research question three asked: Do credit hours earned and college success have any differences created by gender, race or high school origination? No significant gender or race differences were found in the number of credit hours earned or college success. However, high school origination significantly generated differences in the number of credit hours earned but not college success.
Table 7

*Results by Research Question*

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Results</th>
</tr>
</thead>
</table>
| 1. Does the Number of Credit Hours Earned in a Tech Prep and PSEO Program Promote College Success? | • The number of college credits earned did significantly (inversely) predict success.  
• There is a negative relationship in that a successful college outcome is predicted by lower college credits earned. |
| 2. Do Credit Hours Earned differ by College Success?                              | • The number of credit hours earned by the students did significantly differ by college success.  
• The mean number of credit hours earned by the students with an unsuccessful outcome (Not in School) was higher than the students with a successful outcome (Still in School or Graduated). |
| 3. Do Credit Hours Earned and College Success differ by gender, race or high school origination? | • No significant gender or race differences were found in the number of credit hours earned or college success.  
• High School origination significantly generated differences in the number of credit hours earned but not college success. |
CHAPTER 5: DISCUSSION, RECOMMENDATIONS AND CONCLUSIONS

The purpose of this chapter is to summarize the importance of this study, discuss the findings, examine implications, recommend directions for future research, and draw conclusions. The first section provides a summary of the study and its significance for research and practice. The second section discusses the statistical findings of this study and includes an interpretation of these findings. The third section describes the recommendations for leadership and policy considerations. Section four presents the study’s limitations, and in consideration of those limitations makes recommendations for future research. Conclusions are then drawn in the fifth and final section.

Summary of the Study’s Purpose and Importance

This study was conducted to examine whether or not the number of college credits earned in Tech Prep and PSEO Programs predict continued success after high school as defined by college enrollment or completion. Also examined was whether college credits earned differ by college success. In addition, the research examined gender/race differences in credits earned and college success. Previous studies have not shown this level of detail and results regarding Tech Prep and PSEO and how these two programs create college success for students after they leave high school with earned college credits. This study benefits leaders and educators associated with Tech Prep and PSEO by providing data and information that not only help with their decisions and management regarding the Tech Prep and PSEO Programs and student success at the college level, but also support the success and importance of the programs. The goal of
Tech Prep and PSEO is to create a fully integrated and seamless pathway between high schools and colleges.

Since 1985 when Dale Parnell, “the father of Tech Prep,” wrote *The Neglected Majority,* Tech Prep has become another important element in career and technical education’s mission to prepare a skilled workforce for America. Parnell’s concept included applied learning programs, blended secondary and postsecondary programs of study, and emphasized math, science, communications and technology. Career and technical education has diverse educational pathways for students to follow, and programs such as Tech Prep and career academies have helped to define those pathways while also helping to raise the academic achievement of career tech students (Reese, 2003).

The strengths of Tech Prep go beyond pedagogy. By its very nature, Tech Prep compels articulation between high schools and community colleges, something that was simply not there in the past. Tech Prep allows students to interact and develop skill sets that are far different from any previous education experience many of the students may have encountered. These new experiences indeed help with the transition into the workforce. According to Pedersen (1995), anyone who has seen Tech Prep Programs firsthand must be impressed by the dialogue these programs have promoted between instructors from both sectors and by the benefits that have flowed to students as a result. Tech Prep also has gained tremendous local support because it provides high school students with an attractive alternative to the aimless “general track” and the narrow college-prep track (Pedersen, 1995). Young people have witnessed the “re-
engineering” of America’s corporations and are well aware that those who complete their education without marketable skills can look forward to a minimum-wage job. They also can see that the traditional baccalaureate degree is no longer a guarantee of initial employment, much less job security (Pedersen, 1995).

According to Bragg and Layton (1995), if Tech Prep is effective in achieving the goals set out in the legislation it will decrease a student’s cost of attending a community college or university. Participants should have greater access to information on curriculum and enrollment, and they should receive transfer credits from Tech Prep courses, effectively lowering the time and monetary cost of an associate’s degree or bachelor’s degree (Cellini, 2006).

Some accelerated options also have the potential to better link secondary and postsecondary institutions and to point to better ways to integrate financing, data systems, and accountability mechanisms across K-16 (Hoffman, Vargas & Santos, 2009). Most dual-enrollment programs offer free or discounted tuition, providing savings for families who otherwise might not have the ability to afford to send their children to college. The expectation is that students will require and receive substantial academic support and that taxpayers will receive a return on this investment as more young people enter the labor market with a credential, contribute to the state’s economy, and pay taxes (Hoffman, Vargas & Santos, 2009).

**Discussion of Findings**

The data for this study were gathered using the HEI system, a secondary data source, which allows administrators to review the data and update information via the
Internet. The HEI system includes a database that is maintained and updated by the Workforce Development Council coordinator and director. The council includes business leaders throughout the community and academic deans from Terra Community College and Bowling Green State University Firelands campuses. The Workforce Development Council oversees the Tech Prep Consortium. The Consortium is a team of individuals such as deans and academic advisors who work at the colleges and high schools to help formulate new programs and pathways. Each Tech Prep Consortium is required to submit to the Ohio Board of Regents’ HEI system data for their secondary Tech Prep and PSEO students. For the study there were 1,072 students who participated in the Tech Prep and PSEO Programs during the years of 2004-2008 attending 32 high schools. Of the students studied in the survey, 916 (85.4%) were Caucasian. Of the remaining 156 students, 60 (5.6%) were Hispanic, 53 (4.9%) were African American, 39 (3.6%) students were of unknown race, and 4 (.4%) students were of Asian descent. Students were categorized as either “Caucasian” or “Other.” With regard to gender, there were 1,072 students in the study; 456 (42.5%) of whom were females and 615 (57.4%) of whom were males, with one student not listing their gender.

Three research questions guided this study. The first question asked: Does the Number of College Credits Earned in a Tech Prep and Post Secondary Enrollment Options Program Predict College Success? This is important to address since previous research does not examine the number of credit hours earned by high school students. The results of the analysis of Research Question #1 showed that the number of college credits earned did significantly predict success with a higher number of credits
predicting an unsuccessful outcome. The second question asked: Do College Credit Hours Earned Differ by College Success? The results of Research Question #2 indicated that the number of college credit hours earned by students while in high school did significantly differ by college success. The third question asked: Do Credit Hours Earned and College Success Differ by Gender, Race or High School Origination? The results of Research Question #3 indicated no significant gender or race differences were found in the number of credit hours earned in college success. There was however evidence of some high schools having the ability to generate more college credit for their high school students.

Since Research Question #1 and Research Question #2 are similar in nature they will be discussed collectively. The data indicated that the mean number of credit hours earned by the students with an unsuccessful outcome (Not in School) was higher than the students with a successful outcome (Still in School or Graduated). These results do not match the study by Sweat and Fenster (2006), which determined that a Tech Prep Program better prepared a student for success in Georgia’s technical colleges where students performed at a higher academic level, and completed their studies faster than non-Tech Prep students. The results of a study by Krile and Palmer (2002) also suggested that participation in a Tech Prep Program has a positive effect on subsequent college performance. Both studies indicate that the number of college credits earned by students do promote college success. However, these studies compared Tech Prep students to non-Tech Prep participants. In contrast, the current study examined the level of participation in Tech Prep (as measured by the number of college credits
earned) and its relationship to college success. Why the data indicated that the mean number of credit hours earned by the students with an unsuccessful outcome (Not in School) was higher than the students with a successful outcome (Still in School or Graduated) is concerning. This issue could be related to the idea that students may have already fulfilled their graduation requirements for high school and found that their senior year of high school could be used as a way to supplement and get a head start on their college career. It is also possible that a high school student could graduate from high school while also graduating with an associate degree at the same time. By taking the correct number of classes and using articulation agreements with specified pathways and attending college throughout the summer of the junior and senior year of high school, it is certainly possible. Another view is that many students could become bored with the typical curriculum while in high school. However the advanced classes with rigor, challenging labs and projects could help reenergize students (Lords, 2000).

The results that the mean number of credit hours earned by the students with an unsuccessful outcome (Not in School) was higher than the students with a successful outcome (Still in School or Graduated) are troubling, in that most Tech Prep and PSEO proponents would hypothesize that more credits earned in those programs would predict college success. One explanation could be that many of them use Tech Prep and PSEO as a way to explore different college level classes and to give them a sense of what that particular career might entail without having to pay for the credit hours earned while the students are still in high school. This exploration could help with career selection as well as helping the high school students better prepare for college
classes. Rather than taking classes at a university or community college and paying tuition for the classes, a strategy of career exploration can prove to be a much less costly alternative for the students and their families.

Another explanation could be the differing motivations to participate in Tech Prep versus PSEO. Tech Prep students tend to focus on developing a skill set at a community college through unique pathways that can lead to a certificate and or a two-year associate degree. Also, the certificate can be “stackable” towards a two-year associate degree allowing the student to use the credit hours earned in high school towards the certificate and then an associate degree. Although these certificates can lead to a degree by being “stackable,” the students that received any type of certificate for their college credits earned during high school and did not continue on to college, would be considered an unsuccessful outcome (Not in School) as part of this study. Based on the article by Krile and Parmer (2002), area high schools and vocational career centers need to create seamless career technical education programs that begin in the junior year of high school and continue through to an associate degree in college and beyond. In contrast, PSEO students are typically college bound and are focused on more of a “college prep” curriculum. According to the Ohio Association of Gifted Children website (2010), it is highly desirable to expose high school students to college courses early so that they understand that college is a much different environment than high school. In order for the students to be successful in the program, the PSEO students learn that they must be highly responsible and show a much higher level of accountability so they can be successful in a college environment. This characteristic is
one of the critical findings of the Pew Charitable Foundation Study (2001).

Unfortunately, the HEI database did not distinguish between Tech Prep or PSEO participation and it may be that the overall sample was just too heavy in Tech Prep participants.

The results of Research Question #3, which dealt with credit hours earned and college success regarding gender, race and high school origination showed no significant gender or race differences regarding the number of credit hours earned in college success. However, for this study ethnicity was grouped into two categories; Caucasians and other races because of the limited number of ethnicity within the study which may have caused race to be less significant. In addition, a successful outcome was defined as “still in school or graduated” with an unsuccessful outcome as “not in school.” These definitions could be quite different than other studies that examined student success rates within Tech Prep and PSEO. These results are in contrast to the study by Hoffman, Vargas and Santos, (2009), which found that Hispanic and African American students who took dual enrollment courses were enrolling in higher education at higher rates than whites or any other ethnic group. Dual enrollment programs are developed so that students underrepresented in postsecondary education (low income students, student of color, and first generation college students) can simultaneously earn a high school diploma and an associate degree or one to two years of credit toward bachelor’s degree tuition free (Hoffman, Vargas & Santos, 2009).

Based on the data from this study, there were no significant differences found in the number of credit hours earned while students were in high school related to gender.
This is in contrast to the study by Boudria (2002) concerning the development of a support network of individuals from the Massachusetts Department of Education, Bristol Community College, area businesses, and local high schools. This support network was established to recruit women to programs and careers that were not typically considered female career choices. In this program, women were encouraged to explore technical careers, participate in field trips to colleges and businesses, and attend leadership and team building skills workshops. The results of the Boudria study showed that by establishing exposure to different programs and career options not normally of interest for women helped with enrollment in several technology programs such as engineering and computer technology.

According to Hoffman, Vargas and Santos (2009), dual enrollment can help promote underrepresented enrollment and prepare high school students for college and give them momentum in completing a degree or credential. In addition, dual enrollment can help with making college courses more accessible to low income areas where advanced courses may not be available to high school students. It is this access and momentum that are most closely connected to students’ future success in college. The spread of dual enrollment programs is, to some degree, the result of the rising cost of college. As many dual enrollment programs are free to participating students, they serve as an inexpensive way for young people to earn college credit, thus lowering the long term cost of a college degree (Orr, 2002). This strategy of taking classes and then earning college credit is the focus of a number of students who have taken a variety of classes while in Tech Prep and PSEO in order to explore where their interests may lie as
opposed to waiting until attending college. Switching majors while in college can be extremely costly for the students and or their families and could cause the four-year degree to turn into a five or six year degree.

Research Question #3 also explored differences in college credits earned and college success by high school origination. The results indicate that some high schools are more successful at producing students who earn more college credits and subsequently have a successful college outcome. This higher success rate for some high schools may be due to numerous factors. According to a report issued by ACT (2006), research has shown that high schools that have a rigorous course load tend to generate more college bound graduates that are better prepared for college. Orr (2002) also suggests that the relationship found between a rigorous high school course load and success in postsecondary education serves to encourage the spread of dual enrollment for middle and low achieving high school students. This rigor and college level curriculum serves as a way to help give the students, while in high school, a head start regarding the academic adjustment that will be needed for college success and also helps to establish a sense of confidence.

While this ability to offer additional choices of college classes seems to help with the exploration of different pathways and classes for the high school students, it can be very expensive for the high school to provide the college courses. Additional teachers will be needed and they must have the proper credentials to teach college level classes. Finding instructors with the exact credentials can be very time consuming and expensive. In order to retain the true high school experience, high schools need to have
the universities and colleges do the teaching either at the high school or at the college. The preferred method is to have the students bussed to the college or have the students report to the classroom at the college on their own so they can experience the college environment. However, in these times of declining budgets at the state and local levels, this may be a real concern for the future of such programs.

Community colleges and some universities seem ready to take full advantage of the Tech Prep and PSEO programs. If the high schools happen to have teachers on their staff with the proper credentials, then they can hire the high school teacher to teach the college level class at adjunct pay levels. This creates all kinds of “double dipping” issues that must be defined in the articulation agreements to help prevent any concerns regarding pay. This issue would be a concern as it goes against the Pew Charitable Foundation Study (2001) that found that the benefits of the PSEO programs include a savings in both cost and time, efficiency of learning enhanced admission and retention rates in college. Also, the articulation agreements must provide benefits to students, institutions, and the community (Zinser & Hanssen, 2006). The hiring of the high school teachers to teach college level classes at the high school also causes issues in the classroom. Some students and teachers cannot divorce themselves from the fact that they now teach and are attending a class for college credit. The concern about the quality of the teaching is also up for debate. Do the high school teachers have the proper credentials to teach and the necessary experience to help students learn the necessary curriculum? It is critical that teachers help develop and formulate the curriculum that is being taught to the students. This development and formulation may
not always happen when a high school teacher uses curriculum that was established by the colleges and universities. In addition, some college professors may have concerns about the level of rigor and quality regarding their curriculum being taught by someone outside of the university. In other words, are they really college level classes? For students to be successful in the learning environment it is critical to have rigor established within these programs. According to Cantor (1999) there has been a significant improvement in the levels of cooperation and communication between secondary school teachers and our community college faculty. These collaborations must continue to show progress to try and help promote partnerships with the high schools and colleges.

**Recommendations for Leadership and Policy**

An emerging body of research and practice suggests that providing college level work in high school is one promising way to better prepare a wide range of young people for college success, including those who do not envision themselves as college material (Hoffman, Vargas & Santos, 2009).

Tech Prep and PSEO are very successful programs that provide college credits for students while attending high school. Effective articulation agreements, policies and procedures, and extensive collaboration between high schools, community colleges, four-year institutions, and state higher education agencies will all contribute to the continued success of the Tech Prep and PSEO programs. As learning workforce skill sets and technology continue to change, the leadership of these programs that includes faculty, business and community leaders
must continue to seek out inventive ways of creating pathways and courses for the students. Experienced educators should find ways to develop entirely new courses, modify existing ones or identify present courses that address the development of the competencies identified (Gilli & Gilli, 1994). According to Dare (2006), colleges and universities must learn to meet students’ needs and demands while they are in high school and help them transition into college and the workforce.

Financial resources must continue to be a major part of any program. At the local level, the Workforce Development Council or the organization responsible for accountability must monitor the results more closely and not just focus on the total number of credit hours earned by all students. Students that earned a certificate during their high school years while in a Tech Prep program should be monitored for progress towards a degree. It is also important to have accurate data collection regarding different programs at the state and local levels that includes using and developing separate data for each program such as Tech Prep and PSEO. This separation of the data is crucial to determine the success of the programs and the students taking the college credits. Leadership that includes knowledge of how programs are developed, monitored and improved is crucial to the success of Tech Prep and PSEO programs. It is also critical that partnerships and pathways continue to be built and updated so that students have the ability to transfer to a different college or university and not lose the college credits that were earned while in high school.

States need to continue to play a more active role in Tech Prep and PSEO programs to make sure they are effective for years to come. The policies for these
programs must have clear definitions, goals, and expectations for the high schools, colleges and universities that work with each other through articulation agreements. Successful programs across the country should be benchmarked for unique ideas and implementations. Certainly local program evaluation is best conceptualized within this context. A demonstration of shared approaches at the highest level of leadership would serve as an outstanding example of collaborative practice. State supported pre-service and in-service training for educators can help to promote awareness, increase collaboration, and develop new leadership to ensure the long term future of Tech Prep (McDavid, Boggs & Stumpf, 2005). Federal and state governments, high schools, community colleges and universities must continue to work together to promote successful programs that ultimately create opportunities for students, which in turn creates options for them in the future.

**Recommendations for Future Research**

Although Tech Prep and PSEO use different funding models, the data from both programs were not separated within the HEI information supplied from the Tech Prep Workforce Council and, therefore, this study examines strictly participation of these two programs. In the future it would be interesting to analyze the data that distinguishes the two programs. The study could include the results of students that attended PSEO, which would be described as “college prep” program, and whether the students had a better success rate in college as opposed to the Tech Prep Program students who may need to be more focused on technical programs.
This study also used regional data from Northwest Ohio rather than state or national data. Since these programs are typically state driven and state funded, a state by state comparison might prove beneficial and discover potential models that may work better than others. College success was defined as either having graduated from a four-year university/two-year college or still in college. It would be of interest to discover through additional research what the actual breakdown would be for the information regarding graduation rates from a two-year and or four-year institution of the students who participated in Tech Prep and PSEO Programs. Future studies might also include analyzing the data to determine if the two-year college graduates eventually went on to attend a four-year institution and if they achieve success through graduation with a bachelor’s degree. Also, do these students require any less remediation when it comes to Math, English and Science when they finally attend college?

Another limitation of this study was that students could stop attending college for personal or financial reasons and, therefore, be categorized as unsuccessful, regardless of the number of college credits earned in the Tech Prep or PSEO Program. These students could have gained employment and be working and earning a significant wage. Also, they may at a future date enroll back in school. It would be critical to understand where they went in relationship to their careers. Interviewing the students and capturing the information would be a good way to determine what impact their current careers will have on their future college plans and if indeed they will ever
finish college. These interviews could help develop insight into future programs, transitional pathways and career advising.

Students that earned a certificate during their high school years while in a Tech Prep program should be monitored for progress towards a degree. These certificates can lead to a degree by being “stacked,” but for this study the students were considered an unsuccessful outcome (Not in School). These students could go back to school within a specified time and pursue either a two-year or four-year degree. Students who earned these certificates should be identified as potential college students by being the focus of programs that help with the transition to college. Many may already be working and will need help with accommodating the college curriculum and time management aspect required to be successful in college.

Since this study represented only five years of data, additional studies could review the graduation rates of students who participated in the Tech Prep and PSEO programs and the period of time from high school graduation to college graduation. High school origination significantly generated differences in the number of credit hours earned but not college success. So even though some high schools had a tendency to generate additional college credits for their students, the number of college credit hours earned did not necessarily lead to a successful outcome. This may indicate the need for high schools, universities and community colleges to study and examine the current established pathways for the students and track their actual progress more closely towards degree attainment.
Further research also needs to be conducted that examines the reasons why the data indicated the mean number of credit hours earned by the students with an unsuccessful outcome (Not in School) was higher than the students with a successful outcome (Still in School or Graduated). Reviewing the Tech Prep and PSEO programs and the number of credit hours earned should include: reviewing recruitment policies, measuring retention, establishing check sheets that monitor student progress and advising of the students regarding the number of college credit hours students are earning while in high school. Also of interest would be comparing students in a Tech Prep and PSEO program to high school students who did not participate at all in these types of programs and then determining whether the students were successful or unsuccessful. Regardless, it is critical that partnerships and pathways continue to be built and updated so that students can ultimately be successful in earning college credit while they are still in high school.

Conclusions

The United States currently ranks 15th of 29 developed nations in terms of degrees granted; for every 100 students enrolled, countries such as Switzerland, Japan, and Australia award 26 degrees, compared to 18 in the United States. In fact, nearly half of American students at four-year colleges do not finish within six years (Measuring Up Report, 2008). This needs improvement, and Tech Prep and PSEO can help with improving these numbers.

Tech Prep and PSEO Programs will continue to blur the lines between college and high school as long as the college level classes taken in high school are
representative of the rigor and quality seen in college. Based on the article by Bragg, Reger, Brown, Orr & Dare (2002), Tech Prep has accomplished these goals through articulating courses, curriculum development, professional development, collaboration with business and industry, work based learning, and career and educational planning. These programs can fundamentally change the content of the high school curriculum and at the same time promote a more focused and perhaps coherent role for postsecondary institutions by creating pathways for students and ultimately addressing the goal of a college degree.

Tech Prep and PSEO have become important elements in technical education and career development for many high school students. The results of this study indicate that programs such as Tech Prep and PSEO may promote college success and help create numerous opportunities for the “Neglected Majority” to attend college. However, it appears then the “Neglected Majority” is still very much present, but by allowing students to participate in programs such as Tech Prep and PSEO it is no longer being ignored. It is important to understand however that Tech Prep and PSEO programs must be evaluated and continually researched for overall effectiveness.

In order for Tech Prep and PSEO Programs to be successful, the support and implementation of new pathways and programs must be supported by all levels of government, including federal, state, and local. High schools, community colleges and universities must continue to work together to promote successful programs that ultimately create opportunities for students which in turn creates options for them in the future.
REFERENCES


presented at the annual forum for the Association for Institutional Research, Toronto, Canada.


June 22, 2011

TO:        Bruce Meyer  
            Campus Operations

FROM:      Hillary Harms, Ph.D.  
            HSRB Administrator

RE:        Human Subjects Review Board Project No.: H11D291GX4

TITLE:     Does the Number of College Credits Earned in a Tech Prep and Post 
            Secondary Enrollment Options Program Predict College Success?

The BGSU Human Subjects Review Board (HSRB) has completed its review of 
your project involving research with human subjects.

Your project has been approved as submitted. **This approval is effective June 
22, 2011 and expires on June 21, 2012.**

If you seek to make any changes in your project activities or procedures, send a 
request for modifications to the HSRB via this office. Those changes must be 
approved by the HSRB prior to their implementation.

If you have any questions, please contact the Chair of the HSRB or me at 
372-7716.

Good luck with your research project. If you have any questions you can contact 
me at 419-372-7716.

COMMENTS:

C: Drs. Patrick Pauken and Rachel Reinhart

RESEARCH CATEGORY: EXEMPT #4