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The Effect of Articulated (tech prep) Credit on College Outcomes at a Stand-alone Technical College

by

Leslie A. Jernberg

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COMMITTEE APPROVAL

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Abstract

Students in Idaho high schools have the opportunity to earn postsecondary technical credit through the tech prep program. This study examines the college outcomes of retention, completion, time-to-degree, and technical skills attainment for tech prep participants, who matriculated to the partner stand-alone technical college within three-and-a-half years of high school graduation. In addition, this study investigates the applicability of the articulated credit to students' completed programs, and as a vehicle for career exploration.

Results indicate that tech prep students retained better, completed more often, and had a shorter time-to-degree than their non-tech prep peers. These differences were statistically significant. Tech prep students enrolled in second semester classes at a rate of 82% vs. 67% for non-tech prep students. Tech prep students completed programs at a rate of 57% vs. 35% for non-tech prep students. Time-to-degree for tech prep students was 114% of normal vs. 131% of normal for non-tech prep students. All students performed well on technical skills assessments regardless of their tech prep status, and no statistically significant differences were found.

Analysis of the actual effect of the articulated credits revealed that approximately 56% of the credits earned through the tech prep program applied to the students' earned degrees, and 60% were in the same career cluster.

Key Words: articulation; career curriculum; career discernment; career exploration; college completion; college retention; CTE; early college; history of career and technical education; Perkins; skills gap; tech prep; technical education; time-to-degree; vocational education

CHAPTER 1: INTRODUCTION

This study seeks to understand the effect that articulated tech prep credit has on postsecondary college outcomes such as retention, completion, time-to-degree, and technical skills attainment in Idaho postsecondary technical degree programs. While many are familiar with the notion of "college-prep" as high school classes and programs geared toward a student's accumulation of the skills and dispositions necessary to be successful in a four-year college degree, few are familiar with the Career and Technical Education (CTE) program called "tech prep."

Tech prep is a federally funded program that spans the United States and operates in every Idaho public high school under the guidance of the Idaho Division of Career and Technical Education. Through an articulation agreement with one of Idaho's six technical colleges, students who follow a technical program of study in high school can earn technical college credit that is applicable to postsecondary technical degrees at Idaho technical colleges. The tech prep program has been active in Idaho since the early 1990s, yet little is known about the efficacy of this program on postsecondary outcomes.

> Idaho is at the crossroads. The choices we make today are the foundation that will shape the future for our children and grandchildren. College access without success is an empty promise, and a missed opportunity with economic consequences. It is time to tie access to completion for the benefit of our students. The choices are not easy, but doing nothing is not an option. (Idaho State Board of Education, 2012, p. 2)

Thus begins the text of *Complete College Idaho*, which calls for striking reform of Idaho's educational systems to reduce the skills gap hampering Idaho's economic development.

In 2010, the Idaho State Board of Education and Governor C. L. “Butch” Otter called for 60% of Idahoans, age 25 to 34, to have a postsecondary degree or certificate by 2020. In 2015, only 42% of targeted Idahoans had degrees or certificates. In the high school graduating class of 2013, 8,267 (48%) did not go on to college. The 2013-14 Idaho four-year public college retention rate showed only 15.7% of those who went to college completed in four years, 41.4% graduated in six years, and 18.1% of two-year College students graduated within three years (Chronicle of Higher Education, 2013). More recently, the Idaho State Board of Education (2016a) reports a “go-on” rate of 46% in 2015, down from 52% in 2014.

“America’s ability to build a competitive workforce hinges on whether—and to what extent—educators and leaders can find innovative solutions for preparing all students for college and careers” (United States Department of Education, 2012, p. 13). In Idaho, one such innovative solution is the creation and funding of “Advanced Opportunities” (Idaho Division of Career and Technical Education, 2017a).

In current academic literature, Idaho’s “Advanced Opportunities” is referred to as credit-based transition programs. The phrase “credit-based transition program” is an umbrella term for students to earn college credit while still in high school (Bailey & Karp, 2003). “Originally, these initiatives focused on high-achieving students, but additional models have emerged that expand the benefits to lower- and middle-achieving students” (Tobolowsky & Allen, 2016, p. 1). In addition to allowing students to gain college credit, potentially saving them time and money on a postsecondary degree, credit-based transition programs appear to impact behaviors that lead to enrollment, retention, and completion of postsecondary degrees (Bailey & Karp, 2003; Tobolowsky & Allen, 2016).

In Idaho, high school students in Advanced Opportunity programs such as Advanced Placement (AP), dual credit, the International Baccalaureate program, and tech prep can earn postsecondary credit. While there is a wide body of literature on the positive effect of academic credit-based transition programs, the focus of this study is on tech prep program's effect on postsecondary student outcomes that lead to a certificate or degree in sub-baccalaureate technical programs.

Problem Statement

The problem addressed in this study was the lack of research in Idaho on the effect of the tech prep program on technical college outcomes. The stated goal of the tech prep program is to provide a credit-based transition program from secondary to postsecondary career and technical education. Benefits of the program are purported to be not only the articulated credits, which give the student a head start on earning postsecondary credit, but also the technical skills and career discernment to succeed in postsecondary education. Career discernment, in this paper, refers to the cognitive process a young person goes through to combine interests, aptitudes, and opportunities in search of a career path.

These benefits should lead to increased persistence/retention, certificate and degree production, decreased time-to-completion, and increased technical skills attainment. However, CTE has been criticized for lack of evidence that these goals are being realized (Duncan, 2011; Shaw, 2012). Indeed, Idaho has very limited data on the efficacy of the current program, yet a new program is being implemented. This study will inform policy makers of the efficacy of the current tech prep program in Idaho by examining a microcosm of the Idaho tech prep students who matriculate to Eastern Idaho Technical College (EITC).

Purpose of Study

The purpose of this study is to understand the effect of tech prep participation and associated articulated credit on EITC students, who matriculated with articulated tech prep credits from 2012 to 2016 within three-and-a-half years of high school graduation. The results will be two-fold: first, to document the effect of articulated credit on the college outcomes of retention/persistence, completion, time-to-degree, and technical skills attainment; second, to provide a baseline prior to significant changes underway in Idaho in the manner that articulated credits are generated. This study was conducted with data used with permission from Eastern Idaho Technical College (see APPENDIX A).

The timing and location of this study is relevant for three reasons: First, as Idaho's only stand-alone technical college, students who matriculate to EITC do so in pursuit of sub-baccalaureate technical degrees and certificates leading to entry-level technical jobs. This primary motivation for students to attend EITC makes it unlikely students have other motivations for enrolling in certificate and degree programs such as transfer to four-year degree programs.

Second, on May 16, 2017, voters in Bonneville County approved a taxing district, which will allow the conversion of EITC from a stand-alone technical college to a comprehensive community college, thus making students who matriculated prior to 2016 the last cohort solely pursuing technical degrees and certificates. In the future, students who enroll in technical programs may do so as a means for career exploration prior to enrolling in Associate of Arts (AA) and Associate of Science (AS) degree programs transferrable to four-year colleges.

Third, Idaho is embarking on a new program, called SkillStack, which changes how articulated credits are generated in high school. The SkillStack program will be in effect for students matriculating to EITC in the fall of 2017, thus diluting the effect of the current tech prep program.

Research Questions

The purpose of this study is to understand the effect of tech prep participation and associated articulated credit on EITC students, who matriculated with articulated tech prep credits from 2012 to 2016 within three-and-a-half years of high school graduation. Accordingly, the overarching research question is: What is the effect of tech prep participation and associated articulated credits on college outcomes?

To effectively analyze the research question, four questions were formulated to understand the differences between tech prep and non-tech prep students, and two questions were formulated to understand the effect of articulated credit with regard to the completed postsecondary program and career discernment. The six research questions are as follows:

Regarding comparison of tech prep to non-tech prep:

1. Is there a statistically significant difference in the second semester enrollment rate of tech prep and non-tech prep students?
2. Is there a statistically significant difference in the completion rate of tech prep and non-tech prep students?
3. To what extent did time-to-degree completion differ between tech prep and non-tech prep students?

4. Is there a statistically significant difference in technical skills assessment (TSA) pass rates between tech prep and non-tech prep students?

Regarding tech prep students only:

5. To what extent did the articulated credits apply to the degree the tech prep student completed?
6. To what extent did the student complete a program in the same career cluster as the articulated tech prep credits?

Definitions

Academic dual credit: Student gains credit for both high school and college in the same class. In Idaho, the term “dual credit” refers to general education courses, and technical dual credit refers to dual credit courses in career and technical programs (Idaho State Board of Education, 2016b).

Advanced Opportunities: Credit-based transition programs in Idaho: dual credit, Advanced Placement (AP), International Baccalaureate (IB), and Technical Competency Credit (formerly known as tech prep) (Idaho State Board of Education, 2016b).

Articulated credit: Technical college credit applicable to a postsecondary technical degree or certificate earned by high school juniors and seniors in tech prep programs and awarded upon matriculation to postsecondary technical programs. Also known as tech prep credit (Idaho State Board of Education, 2016b).

Articulation agreement: Formal agreement between a high school technical program and partner postsecondary institution, which outlines necessary learning outcomes and competency levels for articulated credit. Also referred to as a consortium agreement (Center for Occupational and Research Development, 1999).

Career and Technical Education (CTE): Term applied to schools, institutions, and educational programs that specialize in the skilled trades, applied sciences, modern technologies, and career preparation. CTE is the current preferred term for what has been known as vocational education, professional-technical education, technical education, occupational education, workforce education, and career curricula.

Career Cluster: Grouping of occupations and broad industries based on shared function and requiring similar core knowledge and skills. A career cluster represents all occupations from entry through management levels, including technical and professional careers (Raynor, 2000). Well-known career clusters include Health Sciences; Skilled and Technical Sciences; and Business and Management.

Career discernment: The cognitive process a young person goes through to combine interests, aptitudes, and opportunities in search of a career path.

Completer (postsecondary): A postsecondary student who has completed all the requirements for a certificate or an Associate of Applied Science (AAS) degree in a state approved career technical education program (Idaho Division of Career and Technical Education, 2017d).

Concentrator (postsecondary): A postsecondary student who has completed a substantial portion of a postsecondary technical program, but may or may not have completed the entire program (Idaho Division of Career and Technical Education, 2017d). Enrollment in a capstone class with a TSA is often an indicator of a concentrator.

Consortium: Partnership between area high schools and postsecondary institutions to create articulation agreements for tech prep credit (Center for Occupational and Research Development, 1999).

Credit-based transition program: Educational opportunities for students to earn college credit while still in high school (Bailey & Karp, 2003).

Idaho Division of Career and Technical Education: Formerly known as Idaho Division of Professional-Technical Education. The agency responsible for secondary, postsecondary, and adult career and technical education programs delivered through Idaho public schools and technical colleges (Idaho Division of Career and Technical Education, 2017b).

Non-tech prep students: For purposes of this study, an Idaho public high school graduate who matriculates without articulated credit to EITC within three-and-a-half years of high school graduation.

Program of study (POS): Structured approach for delivering academic and career and technical education to prepare high school students for postsecondary education and career success (McCage & Folkers, 2012).

Recommended credit: Technical college credit applicable to a postsecondary technical degree or certificate earned by high school juniors and seniors in tech prep programs. Recommended credit is held in "escrow" for the student for a period of time and is awarded when the student matriculates to a postsecondary institution and pays a nominal fee (Bailey & Karp, 2003).

Retention: Measurement showing how many students re-enrolled at the same institution they attended the previous term (Arnold, 1999).

Tech prep program: Educational plan that offers an alternative to the traditional college-prep program, featuring a non-duplicative sequence of career curricula beginning in high school and continuing to postsecondary technical education leading to a certificate or degree (Parnell, 1985).

Tech prep students: For purposes of this study, an Idaho public high school graduate who matriculates with articulated credit to EITC within three years of high school graduation.

Technical Competency Credit (TCC): Term for Idaho articulated credit under the Idaho SkillStack badging program. The first Technical Competency Credits will be available to high school juniors and seniors in May, 2017 to be awarded upon postsecondary matriculation (Idaho State Board of Education, 2016b).

Technical Skills Assessment (TSA) (postsecondary): A third-party exam taken by postsecondary concentrators to measure student attainment of challenging career and technical skill proficiencies that are aligned with industry-recognized standards (Idaho Division of Career and Technical Education, 2017c).

Limitations

Limitations are factors, which occur outside the researcher's control during a study. It is important to identify limitations because they identify potential weaknesses in the study (Vogt, 2007).

1. Because this study is limited to Idaho public high school graduates with articulated credit who matriculated to EITC within three-and-a-half years of high school graduation, this study should not be generalized to the entire population of tech prep participants in the State of Idaho.

2. Because this is a causal comparative study, students had to be categorized as “tech prep” or “non-tech prep.” Some participants may be categorized incorrectly, thus potentially impacting the conclusions of this study.
3. The primary source of information for this study is the Colleague database at EITC. While every effort is made to ensure accurate data entry, some data may have been incorrectly entered leading to inaccurate results.
4. Tech prep programs are in effect across Idaho. However, there is variability in the individual programs due to personnel and equipment differences resulting in programs being operated in a manner inconsistent with each other.

Delimitations

Delimitations are boundaries that the researcher sets for this study to narrow the focus. Delimitations threaten external validity (Vogt, 2007).

1. The study is delimited to students who graduated from Idaho public high schools and matriculated to EITC between FY12-FY16 as degree seeking students within three-and-a-half years of high school graduation.

Assumptions

An assumption is “presumed to be true, often only temporarily, or for a specific purpose such as building a theory” (Vogt & Johnson, 2016, p. 22). In this study, the following assumptions are present.

1. Students who matriculated to EITC and enrolled in a technical certificate or Associate of Applied Science (AAS) degree program did so because they intend to obtain the certificate or degree as a component of their career plan.

2. Students who articulated tech prep credit upon matriculation did so because the credit was relevant to the career field and degree they were pursuing at the time of matriculation.
3. Students understood the benefit and consequences of purchasing the articulated credit at the time they matriculated (i.e. receiving credit for a college class and therefore not taking said class as a first-year college student).
4. The Colleague database system at EITC provides consistent and accurate information about the categorization of tech prep students as well as other data points utilized in this research.

Significance of the Study

Career and Technical Education have seen many shifts in purpose throughout its long history, which mirrors the history of the United States. Initially, federally funded vocational programs in high schools were designed to provide entry-level workplace skills to students who would enter the workforce immediately after high school. With expanding technology and an increasing demand for the technological skills needed for work, emphasis for federally funded vocational programs has shifted to preparing students for postsecondary technical programs. The tech prep program was federally funded as a vehicle to provide a credit-based transition program aiding in that modification.

Increased accountability became a theme in education, and tech prep was no exception. Perkins IV added accountability measures to gauge the success of tech prep, including technical skill attainment; credential, certificate, degree completion; student retention or transfer; student placement; and nontraditional participation and completion.

However, education literature reveals that little evidence exists on the success or failure of tech prep in preparing students to meet these college outcomes.

On a national level, tracking the college outcomes of students who transition from secondary to postsecondary technical programs through tech prep is problematic. Student databases do not allow for the type of cross-referencing needed to trace a student through both the secondary and postsecondary data systems, and longitudinal databases are still being developed (Shaw, 2012; Valentine et al., 2009).

Students who come to EITC from Idaho secondary tech prep programs should have positive postsecondary outcomes associated with them such as increased persistence/retention, completion, and technical skills attainment. Additionally, articulated credit should be applicable to the student’s degree and have an effect on the time it takes a student to complete a certificate or degree program. This study will provide evidence of the validity of those assumptions, which can inform future policy.

Idaho is in the process of embarking on a new effort to improve CTE programs and instruction in Idaho high schools that is purported to result in better alignment of secondary and postsecondary instruction as well as increased matriculation from secondary to postsecondary CTE programs. However, very little research has been conducted nationally or in Idaho about the effectiveness of the current tech prep program and the impact either the program or the articulated credit has had on technical college enrollment, postsecondary retention, degree completion, time-to-degree, and technical skills attainment. Yet Idaho secondary and postsecondary institutions continue to develop and administer articulation agreements and, in fact, have embarked on the new SkillStack initiative to develop a high school badging system as a precursor to eligibility of postsecondary credit. Credit generated under the Idaho SkillStack program is referred to as Technical Competency Credit (TCC).

The SkillStack program has been expensive to develop and purports to be a tool to assist Idaho CTE programs in improving CTE instruction and Perkins accountability indicators. Without baseline data on the current program, improvement under the SkillStack system cannot be documented.

In Idaho, students who move from secondary to postsecondary technical programs with articulated technical credit must be identified in a report filed with the Idaho Division of Career and Technical Education, known as the 1054Y (Idaho Division of Career and Technical Education, 2017d). This identification provides a unique opportunity to track college outcomes for tech prep students and compare those students to a similar group of non-tech prep students. The results of this study will be useful to provide baseline data on the existing tech prep program prior to the implementation of the Idaho SkillStack program and to provide a model with which to assess the SkillStack program.

High school students who participate in federally funded career and technical programs and their parents will benefit from the results of this study by better understanding the risks and rewards associated with participation in these programs. High school and postsecondary technical program managers will be able to use the results of this study as a baseline to determine if time and effort going into the new program results in an appreciable benefit and effective use of resources. This study will inform policy makers of the efficacy of the current tech prep program in Idaho by examining a microcosm of tech prep students who matriculate to EITC.

CHAPTER 2: LITERATURE REVIEW

This literature review begins with a brief history of Career and Technical Education (CTE) in order to explore the shifting philosophies of CTE as an educational tradition, and its place in the framework of postsecondary education in the United States. The literature review will also address issues of career exploration, retention/persistence, completion, and time-to-degree. A retention model based on academic and social integration is presented. The review will briefly address literature related to the benefits of all types of credit-based transition programs followed by specific literature on CTE credit-based transition programs, and the current state of literature on tech prep. An analysis of EITC articulated credit follows to provide context for the students in the study.

A Brief History of Career and Technical Education

Origins of career and technical education. The roots of what we now term Career and Technical Education (CTE) lie in the apprenticeship model imported from Europe, fine-tuned to meet the circumstances of the New World. Two types of apprenticeship programs existed in early America, voluntary and involuntary (Gordon, 2014).

Voluntary apprenticeships generally followed the customs of the European model established in the Statute of Artificers in 1562. The New World version was not codified in law; however, apprentice agreements were entered into town records (Gordon, 2014).

Involuntary apprenticeships were a path to literacy and self-sufficiency for indigent and orphaned children (Barlow, 1976). In addition, apprenticeship agreements were entered into as a way to fund passage to the new world for immigrants. Indenture agreements took on a similar form to apprenticeship agreements (Gordon, 2014). Some examples of trades taught through apprentice agreements at that time include silversmithing, coppersmithing, printing, bricklaying, leatherwork, carpentry, and blacksmithing (Gordon, 2014).

Under the terms of a typical apprenticeship agreement, the individual was provided room, board, clothing, religious instruction, skills training, and experience in a trade or craft (Barlow, 1976; Gordon, 2014). Apprenticeship agreements lasted for five to ten years (Gordon, 2014). Apprenticeship programs provided education and training to youth in the American Colonies for nearly 150 years (Barlow, 1976). Despite intimations by some historians that apprenticeship programs had goals beyond the benevolent education of youth, who had few other opportunities for education and trades training, the apprenticeship program in early America "was one of the fundamental educational institutions of the time" (Barlow, 1976, p. 25).

Decline of apprenticeship in America. The Industrial Revolution in the early 1800s reduced the need for skilled labor, causing apprenticeships to decline. The factory system, characterized by machine production and division of labor, eliminated the need for skilled craftsmen in favor of quickly trained machine operators (Gordon, 2014). Skilled craftsmen continued to immigrate to America, diminishing the need for training new craftsmen (Barlow, 1976). Other factors, which contributed to the decline of the apprenticeship model, included the difficulty of enforcing indentures and runaway apprentices, low wages, and the development of free public elementary schools (Gordon, 2014).

The factory system provided less desirable, low-skilled jobs at low wages with fluctuating opportunities for steady employment (Gordon, 2014). According to Gordon

(2014), “These situations were largely due to the inability of the industrial and political leaders to recognize and meet the changing conditions of the workplace” (p. 16).

The apprenticeship programs provided education and skilled trades training to the masses for nearly 150 years. As the need for apprentices diminished, new opportunities were developed to provide both academic and trades training.

New opportunities in America. The American lyceum movement filled some of the gap in educating factory workers and farmers, both young and adult. Lyceums, mechanics’ institutes, and agricultural organizations provided informal education on the scientific advances of the time (Gordon, 2014).

However, the next major opportunities for career and technical training came through the Manual Labor Movement in the 1870s, the Morrill Land Grant Acts of 1862 and 1890, and the end of the Civil War. In each of these movements, the focus of education for common people was skills training for work. Liberal arts training was still reserved for college-preparatory students. Social stratification was prevalent during this time (Gordon, 2014).

Manual labor movement. The philosophy that a combination of physical work and learning was desirable characterized the manual training movement. Both Worcester Polytechnic Institute and the Hampton Institute opened in 1868, featuring theoretical classes combined with production work. The production work provided a way for students to pay for tuition and to gain experience without an apprenticeship (Gordon, 2014).

Worcester Polytechnic Institute symbolically built two towers. One was over the classroom building and the other over the shop. Thus, the “towers tell of the proverbial conflict between hand and mind and of the long, aching travail of the heart to reconcile the two" (Tymeson, 1965, p. iii).

The Hampton Institute began in 1868 as the Hampton Normal and Agricultural Institute for newly freed slaves. Students lived and worked on campus, often building the very structures they lived and worked in (Gordon, 2014).

> The thing to be done was clear: to train selected Negro youth who should go out and teach and lead their people first by example, by getting land and homes; to give them not a dollar that they could earn for themselves; to teach respect for labor, to replace stupid drudgery with skilled hands, and in this way to build up an industrial system for the sake not only of self-support and intelligent labor, but also for the sake of character. (Armstrong, 1986 as cited in Hampton University, 2016, para. 5)

The Hampton Institute's most distinguished graduate is Booker T. Washington, whose entrance exam consisted of sweeping the recitation room (Hampton University, 2016).

The 1876 Philadelphia Exposition included an exhibit of the Russian system of training engineers, which propelled the manual training movement into public schools. Training was hands-on with tools and a shop in which to work, and it included sequential exercises designed to increase skill and teach applied skills. Thus, manual training found its way into secondary schools, which had been dominated by college-prep liberal arts curriculum (Gordon, 2014).

Morrill Land Grant Act. Early colleges in America followed the roots of their European ancestors. College was an upper-class activity, and scholars were prepared for the clergy, law, or public life (Lucas, 2006). Following the success of institutions such as

Farmer's High School in Pennsylvania and New York State's Agricultural College, Congressman Justin Smith Morrill of Vermont introduced a bill in 1857 calling for land grant institutions to educate in the agricultural and mechanical arts (Lucas, 2006). The original bill did not pass, but in 1862 during the American Civil War, Morrill was supported by Ohio Senator Benjamin Wade, who added military training to the bill, and the land-grant institutions were born. The Morrill Land Grant Act of 1890 provided educational opportunities for Blacks in the former Confederate States (Gordon, 2014).

The original intent of the federally funded land-grant institutions was "to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life" (Act of July 2, 1862 [Morrill Act], 1862, p. 2). With the opening of the land-grant institutions, what would eventually be known as Career and Technical Education was established at postsecondary institutions.

Booker T. Washington and W.E.B. DuBois. The 1860 census held that there were 3.9 million slaves in America prior to the Civil War (United States Census Bureau, 1861). Booker T. Washington and W.E.B. DuBois took two different viewpoints on the education of newly emancipated slaves. Washington advocated for skills and trades-training because that was what was available to Blacks in the post-Civil War culture (Gordon, 2014). DuBois advocated for a liberal arts education in addition to skills training for the "Talented Tenth" with hopes that the educated would return to their home communities and help to increase the educational level of future generations (Dunn, 1993).

According to Washington, African Americans could best develop a strong economic base through the acquisition of utilitarian skills, and because he believed a vocational education was all that the larger, white-dominated society would allow:

> In a certain way, every slave plantation in the South was an industrial school. On these plantations, young colored men and women were constantly being trained not only as farmers but as carpenters, blacksmiths, wheel-wrights, brick masons, engineers, cooks, laundresses, sewing women and housekeepers. (Dunn, 1993, p. 195)

The South needed the former slaves' skilled labor during Reconstruction. Washington saw an opportunity for Blacks to gain economic freedom through the continued practice of industrial skills. In 1903, Washington made an emotional plea. "I plead for industrial education and development for the Negro not because I want to cramp him, but because I want to free him. I want to see him enter the all-powerful business and commercial world" (Washington, 1903, p. 19). Washington understood that the path to economic freedom for Blacks of the time was to work and save, and to access higher education when it became available to them.

Unlike Washington, DuBois did not believe that African Americans had to accommodate White racists, accept second-class citizenship, or wait for Whites to ameliorate racial discussions. "A people whose education led them to aspire to and achieve high levels of intellectual and conceptual competence," DuBois contended, "could never be enslaved again" (as cited in Dunn, 1993, p. 215).

The Washington/DuBois debates echoed throughout history in the Prosser/Dewey debates, and continue to echo today as the purpose of education fluctuates between career preparation and intellectual development (Gordon, 2014).

Education for skills or education for knowledge. Although the Morrill Land Grant Acts of 1862 and 1890 brought vocational curricula such as agriculture and mechanical arts to the college campus, the real expansion of vocational education was taking place in the east, where the Industrial Revolution was booming. American industry required large numbers of single-skilled, trained workers (Walter, 1993).

Charles Prosser embraced a practical and economical view of an education system that would train individuals in a trade to meet the needs of the rapidly expanding industrial factories. Prosser advocated for narrow skills training for entry-level positions as a way to keep youth in school and fuel the economic engines of the Industrial Revolution (Lynch, 1997).

John Dewey espoused a contrasting viewpoint, “As a progressivist, Dewey advocated an education that prepared students in broad problem solving skills, experimentation, and full participation in democratic processes” (Lynch, 1997, p. 7). He advocated for all education to be both hands-on and experiential to allow students to not only learn the material, but also to have a broad understanding of context.

The different philosophies of the purpose of vocational education between Prosser and Dewey were echoed in the diverse philosophies on how and where vocational education should take place. Prosser, who promoted rapid and effective skills training, proposed that vocational education should take place separate and autonomous from the general education system. The needs of vocational education were vastly different from traditional education. Prosser noted, “vocational education needed to be protected against the tendency to train for culture rather than jobs” (Lynch, 1997, p. 7).

Dewey opposed the principle of separate academic and vocational education, due to duplication of administration and separation of groups of students. One set, under general education, would be trained in problem solving skills and democratic processes and the other, under vocational education, would be trained in skills only. Dewey cautioned this “could lead to conditions where students’ rights might be superseded by the needs of the economy or the state and create the undesirable condition of separating culture and the vocations” (Lynch, 1997, p. 8).

Reevaluating the educational needs of citizens. In 1905, the Douglas Commission was formed to reevaluate public education in Massachusetts. The commission found that there was widespread interest in industrial education, industrial intelligence, and that the cost of such education should be borne by the state (Barlow, 1976). On the strength of the Douglas Commission Report, legislation passed in Massachusetts in 1906 to include industrial education in the Massachusetts School System.

Riding upon the success of the Douglas Commission Report, the National Society for the Promotion of Industrial Education was formed in 1906. The inaugural statement of the society follows:

> The need for industrial education in the United States has become a social and industrial question of the first magnitude. It is not only a question that critically affects our material prosperity as a nation, but one that vitally

> concerns the well-being on the society as a whole. (National Society for the Promotion of Industrial Education as cited in Barlow, 1976, p. 52)

This statement, and the work of the society in educating the country about industrial education, went to a national level as the Society lobbied Congress to secure financial support of industrial education in public schools (Barlow, 1976).

By 1914, a presidential commission, the Commission on National Aid to Vocational Education, was formed to make recommendations regarding federal support of industrial education. Among the members was Prosser. The first federal legislation establishing vocational education, the Smith-Hughes Act, was passed in 1917. Prosser was named as director of the new Federal Board for Vocational Education, effectively settling the Dewey-Prosser debates in favor of Prosser's separate vocational programs for skills-only training that leads to direct employment. Included in the Smith-Hughes Act's provisions were ongoing grants for the promotion of agriculture, trade and industry, and home economics (Gordon, 2014).

The act provided for teacher training, partial salaries for teachers, supervisors, and directors, and provided the funding and structure for the Federal Board for Vocational Education. The funds were limited to below college-level public schools (Smith-Hughes Act of 1917, 1917). Vocational education, under the Smith-Hughes Act and its many reauthorizations, thrived for decades with federal money under state-level control for separate skills training. These additional acts expanded vocational education to include practical nursing, fisheries, and distributive education (marketing) as well as limited opportunities for evening classes through public high schools (Gordon, 2014).

The emergence of the junior college. America is seen as a land of opportunity where any citizen from any socio-economic background who is willing to put in time and effort toward education is rewarded with economic and personal success. Yet, Clark (1960) explains in The *"Cooling-Out Function" in Higher Education*, "a major problem of democratic society is the inconsistency between encouragement to achieve and the realities of limited opportunity" (p. 569).

This paradox was evident in the late 19th Century when William Rainey Harper divided the University of Chicago into two, calling the two divisions the "junior college" and the "senior college." The function of the junior college was to deliver the first two years of a college education while preserving the senior college resources for upper division, graduate instruction, and research. The associate degree was created as a terminal degree. Harper indicated he desired that the granting of a degree would discourage associate degree students from continuing their education (Brint & Karabel, 1989). Harper's concern was less about the creation of a junior college system, than in ensuring senior college students were ready for advanced studies (Ratcliff, 1986).

The first junior college, Joliet Junior College, founded in 1901, was an experimental post-graduate high school program designed to "accommodate students who desired to remain within the community yet still pursue a college education" (Joliet Junior College, 2016, para. 3). California, Illinois, Michigan, and Missouri soon followed the junior college movement with publically and privately sponsored junior colleges (Brint & Karabel, 1989). The four-year universities, focused on both liberal arts and professional occupations, hoped to be able to concentrate on "its proper functions: research and scholarship" (Brint & Karabel, 1989, p. 26).

The early function of the junior college was the transfer function to partner-universities. However, some junior colleges also provided occupational training. The transfer function was emphasized to the public:

> Administrators found that to legitimate their institutions, they had to emulate the first two years of a traditional college education. In the institutions that offered them, vocational education courses were stigmatized as “dumb-bell courses.” (Brint & Karabel, 1989, p. 31)

Very few students continued to four-year universities. Most were satisfied with the associate degree and secured lower-level occupations (Brint & Karabel, 1989). The paradox of upward mobility continued.

America’s promise of high status jobs was tempered with the reality that four-year education was financially and intellectually beyond the means of most students of the time (Brint & Karabel, 1989). The answer to the paradox was the same answer secondary schools came to when high school was opened to the masses—create vocational tracks that sorted students into “the realities of the economic division of labor” (Brint & Karabel, 1989, p. 11).

The American Association of Junior Colleges (AAJC) was formed in 1920 to discuss the dual purpose of the junior college—transfer and occupational education. Although initial meetings centered on the transfer mission, another group within the association advocated for occupational training as the primary mission of junior colleges (Brint & Karabel, 1989).

The "vocationalization" project became a focus of AAJC leaders. Students did not want to enroll in terminal vocational programs. The students aspired to the promise of upward mobility promised by the four-year degree (Brint & Karabel, 1989).

Vocational training in war time. Gordon (2014) noted the effect of war time on vocational education. World War I and World War II demanded quickly trained workers in the trades such as production workers, mechanics, technicians, welding, radio, electrical and machine skills, and riveting, further expanding the need for occupational training.

Gordon (2014) states the passage of the Smith-Hughes Act (1917) was tied to the notion of national preparedness prior to World War I. Indeed, shortly after its passage, the War Industries Board and the Federal Board of Vocational Education worked through public vocational schools to train more than 62,000 individuals for war production jobs (Gordon 2014).

World War II saw a similar increase in short-term vocational training to aid the war effort. Women, traditionally homemakers, were trained though short-term vocational programs to assist the domestic war effort. By April, 1943 nearly 750,000 women were trained in traditionally male occupations in shipyards, aircraft assembly plants, and factories (Gordon, 2014).

Perhaps the most significant long-term effect to vocational education at the postsecondary level was the passage of the Servicemen's Readjustment Act of 1944 (1944). Commonly known as the GI Bill of Rights, the funds were directed toward World War II veterans to provide training for civilian occupations. Many service members used these funds in vocational programs at two-year and technical colleges. In addition, many veterans became vocational instructors (Gordon, 2014). Subsequent legislation has continued the education and training tradition of the original GI Bill, including the most recent legislation, the Post 9/11 GI Bill (Gordon, 2014).

The Truman Commission Report, *Higher Education for American Democracy* (President's Commission on Higher Education, 1947), emphasized the power of terminal vocational education “aimed at developing a combination of social understanding and technical competence” (p. 69). Access and equity were new themes in higher education, and with vocational training came jobs. “A full 4 years of college training is not necessary…[it] is estimated that in many fields of work there are five jobs requiring 2 years of college preparation for every one that requires 4 years” (President's Commission on Higher Education, 1947, p. 69).

The Truman Commission Report popularized the terms “community college” and “peoples’ college” noting the function was to serve the educational needs of the local community. With the new emphasis on terminal vocational education, “junior college” no longer applied (Brint & Karabel, 1989).

Significant growth occurred in two-year colleges following World War II and the Korean Conflict. By 1958, two-year colleges enrolled almost one out of four new freshmen. Despite the high enrollment, vocational tracks were still largely underutilized. The bachelor’s degree and higher levels of professional education remained the symbol and the means for upward mobility. With a rapidly expanding economy, there was a strong labor market for college graduates to the detriment of vocational programs (Brint & Karabel, 1989).

Federal support, which favored vocational education, left junior colleges behind. The 1958 National Defense Education Act did not include junior colleges in the funding formula, and the Vocational Education Act of 1963 distributed monies to the states, which funded secondary and non-collegiate postsecondary institutions (Brint & Karabel, 1989).

By 1965, the tide turned for community colleges. The Kellogg Foundation substantially contributed to the AAJC for development of semi-professional and technical programs. A series of federal grants included community colleges. Between 1964 and 1966, federal funds increased to $31.4 million from $7.4 million (Brint & Karabel, 1989).

Sputnik and STEM. The National Defense Education Act of 1958 (1958) addressed the nation's concern over the Soviet Union's advanced technological feats in the Cold War period as symbolized by the successful launching of *Sputnik I*, the first human-made earth satellite. Funds from the act provided vocational education to students that led to employment as skilled workers in scientific and technical fields. Science, technology, engineering, and math (STEM) subjects, although long emphasized in national defense, took on renewed importance in all types of education, including vocational education (Gordon, 2014).

School districts were only able to provide limited vocational programming with respect to STEM education, and there was a shortage of personnel to teach STEM subjects. The National Defense Act provided funds to stimulate growth in the vocational centers at both the secondary and postsecondary levels (Walter, 1993). For the first time, vocational programs at the postsecondary level were included in federal legislation, providing growth in STEM careers (Gordon, 2014).

Interest and action in STEM education has continued on a large scale in recent years. Gaining attention has been CTE's role in STEM education. Rothwell (2013) laments the lack of attention that two-year college programs get in the STEM discussions and policies of the federal government. He notes that half of all STEM jobs require less than a bachelor's degree, and that those positions are critical to the maintenance and support of STEM operations.

Career and Technical Education provides an alternate path to STEM careers through secondary and post-secondary partnerships managed through tech prep articulation agreements. A STEM Smart brief notes:

> When secondary CTE infuses applied STEM learning into rigorous programs of study, aligns with post-secondary programs, awards credentials, and offers dual enrollment programs that provide college credits, it propels youth toward college and career goals. (Successful STEM Education, 2014).

Thus, CTE and tech prep programs can help fill the need for skilled workers in the STEM economy by providing a smooth transition from secondary to postsecondary education.

The growth of community colleges. The 1960s brought high unemployment, underemployment, and displaced workers due to technological advances and civil unrest (Walter, 1993). President John F. Kennedy commissioned a special report, *Education for a Changing World of Work* (Panel of Consultants on Vocational Education, 1963), which called for an increase in vocational education to address the needs of society.

After Kennedy's assassination, President Lyndon B. Johnson picked up the education agenda as part of the Great Society legislation. Access, affordability, and equity were major themes as federal funding flowed to public high schools and postsecondary institutions. The Higher Education Facilities Act of 1963 (1963) had significant impact on the number of two-year colleges and technical schools built during this era (Brint & Karabel, 1989).

The Vocational Education Act of 1963 (1963) and its many reauthorizations, attempted to address access, affordability, and equity by expanding access to vocational education to a broad range of individuals including "persons who have academic, socio-economic, or other handicaps that prevent them from succeeding in a regular vocational education program" (Gordon, 2014, p. 110). This legislation brought a departure from skills training for industry and focused instead on the "needs, interests, and abilities" of individuals (Gordon, 2014, p. 110).

The recessions of the 1970s decreased the demand for four-year degrees. Indeed, according to Brint and Karabel (1989), media coverage of the value of a bachelor's degree included political cartoons of graduates at the unemployment line, diplomas lining a birdcage, and a welder with a Ph.D. Changing family dynamics left many adults, often women, seeking education as a route to secure jobs. Suddenly, technical training was "a secure route to well-paid, if sometimes unglamorous, jobs" (Brint & Karabel, 1989, p. 121).

The 1980s brought forth widespread educational reform. President Reagan's National Commission on Excellence in Education (1983) published *A Nation at Risk: The Imperative for Educational Reform*, which raised alarm about the status of American education. Vocational education underwent changes because of these efforts (Gordon, 2014). The Carl D. Perkins Vocational Education Act (1984), referred to as Perkins I, increased integration and accountability of both vocational and academic.

Additional vocational education legislation through Perkins I further bolstered vocational education in postsecondary schools allowing a variety of training models, new programs, and part-time employment opportunities so students could continue training full-time. In addition, these funds provided for continued teacher training, vocational guidance training, facility upgrades, and funds to address gender bias (Gordon, 2014). The goal of the legislation was to increase educational attainment after high school and workforce preparation, thus recognizing the need for postsecondary educational attainment to meet the demands of an increasingly technological society (Ruhland, Jurgens, & Ballard, 2003).

The emergence of tech prep and dual credit. In *The Neglected Majority*, Parnell (1985) discussed the need for greater coordination between high schools and postsecondary vocational education to prepare non-college-prep students for work. Parnell asserted that high school college prep programs only influence about 35% of high school graduates. He noted “far too many high-school seniors are enrolled in unstructured and unfocused programs lacking in substance” (p. 45).

The solution, according to Parnell (1985), who at the time was the president of the American Association of Community and Junior Colleges, was to create a 2+2 program. This program would encompass the last two years of high school and two years of terminal vocational education, which would serve the students who were not in the college-prep/baccalaureate track. The program, called tech prep, would be a combination of applied academics and career education to prepare students for the skilled and technological jobs requiring less than a bachelor’s degree. Partnerships between high schools and college campuses would be created to articulate the course of study arranged around career clusters such as mechanical trades or health sciences.

The Secretary of Labor appointed the Secretary's Commission on Achieving Necessary Skills (SCANS) to address workplace competencies. The report, titled, *What Work Requires of Schools* (Secretary's Commission on Achieving Necessary Skills, 1991), identified a three-part foundation of skills for all students:

> A high-performance workplace requires workers who have a solid foundation in the basic literacy and computational skills, in the thinking skills necessary to put knowledge to work, and in the personal qualities that make workers dedicated and trustworthy. (Academic Innovation, n.d., para. 4)

Thus, general education was incorporated into vocational education, and the long separation between academic and vocational education began to break down.

Due to the unique mission of community colleges, the idea of credit-based transition programs, such as tech prep and dual credit, began to emerge as not only a cure for senioritis (Kim, 2008; Parnell, 1985), but also as a way to increase the academic proficiency of at-risk high school students. Minnesota implemented dual credit in four-year colleges when an area was not served by a community college (Kim, 2008).

Because of the reform efforts of the 1980s and 1990s, the philosophy of vocational education evolved. Lynch (1997) suggested that Prosser's essentialist philosophy and separate systems of vocational and general education have not served vocational education well. He noted "Dewey's view of 'man the problem solver' and education as the means of improving human problem solving is especially relevant in light of the recent reports that emphasize the need for workplace problem solving and work-based learning" (p. 23). The one-hundred-year-old Prosser/Dewey debate continues to be deliberated as vocational education enters the technology age.

The Carl D. Perkins Vocational and Applied Technology Education Act Amendments of 1990 (1990), commonly known as Perkins II, provided funds to integrate academic and vocational education in response to the issues raised in the SCANS report and other reform action of the time. Title III of Perkins II established tech prep. By the next reauthorization of Perkins, the Carl D. Perkins Vocational and Technical Education Act of 1998 (1998), tech prep had moved to Title II, and received separate funding from the rest of the vocational and technical programs. The legislation also included provisions for work-based learning, which required students to complete an on-site experience, connecting the program to the community, which complimented efforts in the School-to-Work Opportunities Act (1994).

Tech prep continued in Perkin's reauthorizations, most recently the Carl D. Perkins Career and Technical Education Improvement Act of 2006 (commonly known as Perkins IV). This version introduces a requirement for a program of study, making tech prep a comprehensive program, adds stronger accountability to the program, and requires program completers to obtain an industry recognized credential or certificate at the postsecondary level, referred to in the legislation as a "technical skills assessment"(TSA).

Perkins IV, originally scheduled to end in 2012, has been extended several times, and is still in place as of this writing. However, in 2011, tech prep funding was eliminated from the federal budget citing lack of outcomes for CTE programs (Duncan, 2011).

The U. S. House of Representatives' version of the Perkins reauthorization, *Strengthening Career and Technical Education for the 21st Century Act* continues with programs of study in lieu of tech prep to "strengthen alignment between Perkins-funded CTE programs and other education and training programs, including activities funded under the Workforce Innovation and Opportunity Act (WIOA)" (Kaleba, 2016, para 1). This act passed the House of Representatives in June of 2017, and has not been taken up by the U. S. Senate as of this writing.

Tech prep in Idaho. Career and Technical Education (CTE) is "responsible for helping all students acquire challenging academic, technical, and employability skills to succeed in postsecondary education and in-demand careers" (United States Department of Education, 2016, para 1). Technical education was present in Idaho high schools and postsecondary institutions through state and local school district funding formulas long before Perkins II Title IIIE funding was available.

The emergence of tech prep as a reform effort, however, took place almost immediately through the creation of six Idaho consortiums (Advanced Learning Partnerships). The six consortia are associated with the six Idaho technical colleges, and are listed in Table 1.

Table 1

Idaho's Advanced Learning Partnerships (consortia)

College	Region served
North Idaho College School of Applied Technology	I
Lewis and Clark State College Technical Programs	II
College of Western Idaho Professional-Technical Division (originally Selland College of Applied Technology at Boise State University)	III
College of Southern Idaho Professional-Technical Division	IV
Idaho State University College of Technology	V
Eastern Idaho Technical College (Idaho's stand-alone technical college)	VI

The Idaho Division of Career and Technical Education (formerly the Idaho Division of Professional-Technical Education), oversees Career and Technical Education in Idaho high schools and postsecondary institutions. Through the tech prep program, coursework is articulated through a partnership with one of the six technical colleges in Idaho. A student can enroll in tech prep classes as early as ninth grade and follow an articulated program of study, which results in recommended credits in the student's junior and senior years. Once the student has matriculated to a partner institution, the credits are added to the student's transcript for a nominal cost. Tech prep credits are also known as articulated credits and Career and Technical Education (CTE) credits.

In 2004, Idaho had 760 high school career technical education programs that served "almost every high school student in the state" (Rush, 2004, para 1). Rush's testimony before the Senate in support of Perkin's reauthorization called for support of career clusters as well as technical skills assessments. The 2006 reauthorization of Perkin's funding (commonly known as Perkin's IV) continued Title II tech prep funding, and increased rigor and accountability with implementation of the career cluster, program of study approach. It also added measurement of technical skill proficiency through technical skills assessments. States were given the option to consolidate Title I and Title II funds (Bray, Conneely, Green, & Herbertson, 2012, p. 58). Idaho immediately implemented the consolidation, preserving the six regional Advanced Learning Partnerships (Idaho Division of Professional-Technical Education, 2008).

In 2011, with Perkin's IV still in place, but overdue for reauthorization, Congress defunded tech prep (Bray et al., 2012). Keeping with Perkin's requirements, Idaho continued with the career cluster and program of study approach, which Idaho continues to refer to as "tech prep" (Idaho Division of Professional-Technical Education, 2013).

To gain a sense of the number of students involved with Idaho tech prep programs, the following data from the CATMA system is offered for 2012-13:

Table 2

Participation Head Count for Idaho Tech Prep 2015-16

Record counts	Region I	Region II	Region III	Region IV	Region V	Region VI	Totals
Tech prep enrollments	1,061	745	2,552	2,506	3,192	2,972	13,028
Tech prep head count	429	513	1,751	1,895	2,489	1,984	9,061
Students with credit recommended	342	481	1,280	1,321	1,834	1,383	6,641
Total postsecondary credits generated	1,349	1,806	4,016	4,845	5,416	3,749	21,181

Thus, one can see the significant impact career and technical education has in Idaho high schools. It is important to note that the numbers above do not necessarily translate into actual postsecondary credit. Current data shows that approximately 66% of high school CTE concentrators go on to college; however, only 8% go into postsecondary technical programs (Idaho Division of Professional-Technical Education, 2013). With an overall go-on rate of between 46% and 54% (Corbin, 2016), the higher percentage of CTE concentrators who continue to college suggests CTE curricula has an impact on college outcomes beyond the stated goal of articulation to postsecondary technical programs.

Among the key strategies outlined in *Complete College Idaho* (Idaho State Board of Education, 2012), was a plan to evaluate tech prep policies and procedures and make recommendations based on the evaluation. The PTE Advanced Learning Task Force began work in 2012 and made the following recommendations in May, 2013:

1. Recognize that one of the purposes of professional-technical secondary education is to move students onto postsecondary and be better prepared for any postsecondary program.
2. Improve alignment between secondary and postsecondary professional-technical credit.
3. Create a consistent and well-defined statewide system that serves the students.
4. Improve communication and promotion of the PTE advanced opportunity. (Idaho Division of Professional-Technical Education, 2013)

Because of the recommendations contained in the *PTE Advanced Learning Task Force Final Report* (Idaho Division of Professional-Technical Education, 2013), work began to align first semester courses with industry-validated workplace readiness skills across the state's six technical colleges and articulation of those classes from Idaho high schools to Idaho postsecondary technical colleges.

The goal of the revised program is closer alignment of career and technical education programs with opportunities for students to achieve Technical Competency Credit (TCC) through the Idaho SkillStack program. Idaho SkillStack is a badging program where high school students can meet industry competencies through several high school classes rather than having to be enrolled in a specific course. Once a student accumulates the necessary badges, TCC credit is recommended and can be purchased when the student matriculates to a postsecondary institution in the same manner that tech prep has operated.

The TCC/SkillStack program will result in programs of study and articulated credit, and will continue to meet the eligibility requirements for Perkin's funding. The articulated credit may reduce the amount of time the student needs at the postsecondary institution to complete a certificate or degree program—resulting in shorter time-to-degree and less out-of-pocket tuition and related living expenses. The first TCC credits will be recommended for eligible high school juniors and seniors in the 2016-17 academic year.

Career Exploration

Career exploration is pertinent to this discussion because of the effect it has on student engagement. According to Perry, Wallace, and McCormick (2016), when students understand the connection between what they learn in the classroom and how it applies to real-world work, they become increasingly invested in their education as a vehicle for autonomy.

"Developing a career is a process, not just a destination (Kosine & Lewis, 2008, p. 227). Super's (1963) seminal theory of vocational choice identifies phases of career exploration. "It is through the exploration process that the individual *crystallizes* his or her career interests by narrowing choices, *specifies* a vocational choice, and then *implements* the choice by making it a reality via training, education, and work" (Kosine & Lewis, 2008, p. 231).

The exploration process, encompassing all three phases, is referred to as career discernment in this paper. Career discernment is the cognitive process a young person goes through to combine interests, aptitudes, and opportunities in search of a career role. The natural outcome for career exploration is for a student to develop an interest in a career cluster, and further refine that interest into action. This self-knowledge, coupled with effective career counseling, provides a foundation for determining what type of credit-based transition program, if any, will be most beneficial for the student to realize his or her career goal.

Career Clusters

Career clusters provide a useful framework to organize related industries and occupations. As detailed in Table 3, the United States Department of Education has identified 16 career clusters. Each cluster contains the related industry and occupations associated with it from entry-level through professional (Raynor, 2000). Idaho has identified six "super clusters," which provide organization to the program areas supported by the Idaho Division of Career and Technical Education at both the secondary and postsecondary levels (Idaho Division of Career and Technical Education, 2016). APPENDIX B details certificate and degree programs at EITC and their associated career cluster.

Table 3

Comparison of Career Clusters and Idaho's "Super Clusters"

United States Department of Education 16 Career Clusters	Idaho Division of Career and Technical Education 6 "Super Clusters"
Arts	Agriculture & Natural Resources
Audio Video Technology & Communications	Business & Management
Hospitality & Tourism	Engineering & Technology
Business & Administrative Services	Family & Consumer Sciences
Information Technology	Health Sciences
Legal & Protective Services	Skilled & Technical Sciences
Transportation, Distribution & Logistics	
Public Administration/Government Services	
Financial Services	
Agriculture & Natural Resources	
Health Sciences	
Human Services	
Construction	
Manufacturing, Education & Training Services	
Wholesale/Retail Sales & Services	
Scientific Research, Engineering & Technical Services	

Career clusters are further broken down into Career Pathways, which provide specific programs of study based on students' interest and aptitude as well as educational opportunities. This developmental career-counseling framework is supported by Perkin's legislation and encouraged as an "integral component of [programs of study]" (Harris-Bowlsbey & McPherson, 2012, p. 270).

Tech prep in Idaho is arranged around the six "super clusters," which support programs of study for articulated credit. A student completes a program of study in high school, which articulates to earned technical credit when the student matriculates to an Idaho postsecondary technical program. Career counseling that utilizes career clusters should be progressive and span pre-K to adult (Harris-Bowlsbey & McPherson, 2012).

College Outcomes

Retention, persistence, and time-to-degree. Retention is a "percentage measurement showing how many students re-enrolled at an institution that they attended the previous year" (Arnold, 1999, p. 5). The term *retention* should not be confused with the term *persistence*, which is defined as "a student's postsecondary education continuation behavior that leads to graduation" (Arnold, 1999, p. 5). Hagedorn (2005) aptly noted, "Institutions retain and students persist" (p. 6). Time-to-degree and completion rates are affected by both retention and persistence, making the responsibility of a successful college education both a student and an institution issue.

Tinto (1975) developed the seminal model for retention, which asserts that failure to integrate academically or socially leads to students withdrawing from college. Tinto likens college withdrawal to withdrawing from society—in effect committing suicide. Academic integration involves student perception of college, such as the student enjoying the subject studied, getting good grades, having a positive self-evaluation of one's work, and identifying with self as a student. Social integration has to do with enjoying a group of peers and positive interaction with faculty and staff (Tinto, 1975).

Bean (1990) looked at persistence and noted, "Retention rates depict a complex interaction between the characteristics of the school *and* the students attending the school" (p. 171). Student retention and persistence are positively affected by interactions between students and college personnel (Nutt, 2003).

In an article in *University Business,* Scannell (2011) asserts, "Costs and affordability are likely a proxy for more personal reasons for withdrawing" (p. 21). Scannell indicates that, although financial reasons are stated as the reason for withdrawal, "it's the internal variables such as relationships, connections, and involvement that are the real influences" (Collette, as cited in Scannell, 2011, p. 22). Thus, the need for academic and social integration is reinforced.

In summary, retention is a statistical number describing student persistence toward degree attainment. Persistence is influenced by the personal interaction between a student and college personnel that leads to both academic and social integration. Credit-based transition programs, such as tech prep, allow students to earn technical college credit prior to matriculation, thus potentially reducing time-to-degree completion. The nature of career curriculum and smaller class size associated with the technical side of community colleges and stand-alone technical colleges provides scaffolding to assist students with academic and social integration leading to degree attainment.

Technical Skills Assessment (TSA). Uy and Green (2009) note that the Career and Technical Education (CTE) community has long recognized the importance of industry recognized credentials as students enter the workplace, but they note that the TSA requirement in Perkins IV presents a "vexing issue" (p. 25) on how best to measure technical skill attainment. Dortch (2012) observes that "the methods employed to measure career and technical skill attainments vary across states and types of skills (p. 6). While some third-party exams have a close relationship to industry qualifications, such as state licensing exams for health care workers, others have less relevance, or are overly narrow for an industry. An example of the latter is the Microsoft Word exam for an administrative assistant. While it is admirable to achieve the level of proficiency necessary to pass the exam, it is only one skill of many needed for successful employment. A listing of Idaho postsecondary Technical Skills Assessments can be found in APPENDIX C.

Nevertheless, Perkins IV has an accountability requirement for technical skills attainment, which is measured by the number of CTE concentrators who took and passed a TSA. This measure is reported annually and postsecondary providers must meet a minimum threshold or create an improvement plan. The current threshold for Idaho is approximately 70 percent (Idaho Division of Career and Technical Education, 2016).

Credit-Based Transition Programs

Credit-based transition programs refer to educational opportunities for students to earn college credit while still in high school. Well known credit-based transition programs include Advanced Placement, dual credit, and International Baccalaureate programs. Credit-based transition programs provide a method for academic and social integration before the student enters college. Such programs may have an effect on the student’s choice to go to college and which college to attend.

Credit-based transition programs provide both academic and social benefits to students who participate in them. These benefits may positively influence the student’s academic and social integration when he or she matriculates to a college campus.

There is a wide body of literature in support of credit-based transition programs and the positive effect they have on students’ academic and social integration leading not only to high school graduation, but also to college matriculation and achievement of favorable college outcomes (An & Taylor, 2015; Chajewski, Mattern & Shaw, 2011; Columbia University, 2012; Dougherty, Mellor, & Jian, 2006; Foust, Hertberg-Davis, & Callahan, 2009; Kim & Bragg, 2008; Kyburg, Hertberg-Davis, & Callahan, 2007; Mattern, Marini, & Shaw, 2013; Taylor, 2015).

Tech prep

Tech prep was first introduced by Dale Parnell in his book, *The Neglected Majority* (Parnell, 1985), which promoted a 2+2 program encompassing two years of high school and two years of postsecondary instruction aimed at the middle two quadrants of high school students. Tech prep received its first federal funding through Title IIIE of the Carl D. Perkins Vocational and Applied Technology Act of 1990 (1990), commonly referred to as Perkins II). Through the original Title IIIE funding, over 1,000 local consortia were formed in the United States, which impacted 70% of all school districts and 90% of all high school students (Hershey, Silverberg, Owens, & Hulsey, 1998).

Tech prep moved into Title II of the Carl D. Perkins Vocational and Applied Technology Acts of 1998 (1998), referred to as Perkins III, as an educational reform effort to provide seamless transition from high school to sub-baccalaureate technical programs that lead to a degree, certificate, or further education. The program was further expanded to reach down into middle school for career exploration and up into four-year colleges, acknowledging the increasingly technical nature of bachelor's programs. The current version of the Perkins Act (Perkins IV) requires a non-duplicated sequence of courses (program of study) and the attainment of a portable technical credential referred to as a Technical Skills Assessment (TSA) for postsecondary completers.

Tech prep has been described as a partnership, a process of teaching and learning, and a curriculum structure (Center for Occupational and Research Development, 1999). A postsecondary institution and area high schools form a partnership called a consortium. Through articulation agreements within the consortium, a curriculum structure for technical and academic content is created and taught at the high school level. Those credits transfer to the college as postsecondary articulated credit upon the student's matriculation, thus reducing the credits a student must take at college. As a process of teaching and learning, career and technical education "is inherently contextualized and can reach many students for whom the abstract nature of the typical academic classroom can be simultaneously intimidating and boring" (Lewis, Kosine, & Overman, 2008, p. 53).

The Miami Valley Tech Prep Consortium (MVTCP) provides a useful example of a well-defined tech prep program. Draeger (2006) describes the partnership between the area high schools and Sinclair Community College, which make up the consortium. Designed to provide a link between secondary and postsecondary education, the program has not only benefitted students, but also provides ongoing professional development for instructors and guidance counselors.

The MVTPC program begins in ninth and tenth grade, and provides students with career exploration activities tied to career clusters. A career cluster "represents a grouping of occupations and broad industries based on commonalities" (McCage & Folkers, 2012, p. 161). An example of a career cluster is Health Science, which represents health-related occupations along a vast educational and skill continuum from phlebologist to surgeon.

Guidance counselors follow up with students to create a plan based on early academic testing and the student's career cluster choice. Students are guided into remediation if needed. The counselors suggest eleventh and twelfth-grade classes that are advantageous to college success for the particular student.

Students in the MVTPC program visit the college campus regularly for tours, interaction with faculty and admissions counselors, postsecondary students, student-led, hands-on demonstrations, and academic competitions for area high schools. Benefits from this partnership expand to the community as interested industry representatives serve as judges for the competitions and assist as trainers and advisory board members to support instructors with curricula that meet current industry standards (Draeger, 2006).

Through the MVTPC, joint professional development opportunities are available for high school and college instructors, which result in integrated curricula that meet tech prep standards. Joint professional development for guidance counselors provides networking opportunities for the area high school counselors as well as clear instruction on tech prep articulation agreements and dual enrollment procedures (Draeger, 2006).

Because of MVTPC efforts, high school students gain multiple opportunities to learn about the field of study in which they are interested. They are able to gain knowledge about the most appropriate level of college and career choice for their particular circumstances (Draeger, 2006).

Current literature on tech prep. Tech prep is a credit-based transition program aimed at the middle two quadrants of high school students, providing a seamless path to technical postsecondary education, rather than four-year colleges (Bailey & Karp, 2003; Krile & Parmer, 2002). Tech prep is not designed to serve the academically proficient students who qualify to participate in other credit-based transition programs, such as Advanced Placement and dual credit (Parnell, 1985; Tobolowsky & Allen, 2016).

Early research on tech prep focused on high school outcomes and initial transition to college. A large New York study (Brodsky, Newman, Arroyo, & Fabozzi, 1997), with both qualitative and quantitative components, found that tech prep was beneficial to students' academic, career, and social development. Qualitative results from student interviews indicate high school students found the "classes are interesting, have improved their thinking skills and have increased their motivation for learning" (Brodsky et al., 1997, p. xv). The authors also found the tech prep program was beneficial to the staff, schools, and the community by engaging students, teaching marketable skills, and preparing students for postsecondary employment. High school tech prep students earned higher grades, had better school attendance, higher graduation rates, and better scores on competency tests (Brodsky et al., 1997).

The follow-up to the New York study (Brodsky & Arroyo, 1999) moved the research to the college setting. The college pairs study followed students in 14 tech prep consortia (n = 391) and compared college outcomes for tech prep and non-tech prep participants. After four semesters, the tech prep participants were more likely to persist, that is, continue in college, and less likely to drop out. In addition, tech prep students tended to enroll in career curricula and often completed a college course of study that was similar to their area of interest in high school.

Brodsky and Arroyo (1999) also found that tech prep students persisted at a higher rate, had higher first-semester grade point averages, and were more likely to enroll in career-college curricula. Tech prep students who enrolled in postsecondary career curricula gravitated more toward academically rigorous programs in engineering-related and health-related programs than did their non-tech prep peers.

The United States Department of Education Office of Vocational and Adult Education sponsored a large, multi-part investigation involving eight tech prep consortia located across the country (Bragg et al., 1999). The sample included 4,572 graduates from 62 high schools, drawn from 168 high schools and more than 32,000 students. The graduates were in the graduating classes of 1995, 1996, and 1997. Approximately half the graduates were involved in tech prep in high school and the other half were non-tech prep students.

Generally, tech prep students exceeded their non-tech prep peers in college enrollment. Pooling all sites, the total was 54% tech prep students went on to college compared to 47% non-tech prep (Bragg et al., 1999).

Transcripts of the college enrollees revealed both tech prep and non-tech prep college students earned degrees in small numbers. “In all consortia, the proportions of the participants and non-participants in each of those categories [persistence and program completion] were quite similar, and none of the distributions differed significantly” (Bragg et al., 1999, p. 74).

Krile and Parmer (2002) used a quantitative analysis to determine whether tech prep and non-tech prep students had differences in their first quarter to second quarter (fall-to-winter) and first quarter to second year (fall-to-fall) retention rates. The study was conducted at Sinclair Community College (SCC) in Ohio, and involved 2,265 students who entered the college between 1997 and 2001 in career-technical programs. Of those, 2,265 students, 291 of them transferred credit from a partner high school through tech prep. The control group (n = 2,074) was limited to students who entered SCC within two years of high school graduation and had no previous college in order to be demographically and academically similar to the tech prep group.

The retention analysis of the Sinclair study (Krile & Parmer, 2002) was further limited to students who entered the college in the fall. Results indicated that there was no statistically significant difference in retention rates between tech prep and non-tech prep students for fall to winter retention. However, there was a statistically significant difference between fall-to-fall retention, leading the authors to suggest that tech prep students persist with college studies at higher rates than did their non-tech prep peers. However, Krile and Parmer (2002) noted that additional study is needed to determine if these results can be attributed to tech prep.

Sweat and Fenster (2006) used archival data from the Georgia Department of Technical and Adult Education's (GDTAE) computerized Banner Data System to learn how articulated credit affected time-to-degree for tech prep students. They found that both tech prep and non-tech prep students did not complete degrees in the standard amount of time allocated for the degree. However, tech prep students did complete .5 quarter faster on average than non-tech prep students.

Torres (2008) studied tech prep and non-tech prep students in two-year postsecondary institutions in Texas. Among the research questions were two relevant to the current study: time-to-degree and completion. From the general population of three two-year postsecondary colleges, Torres identified tech prep students who matriculated to partner colleges and compiled a control group of students from those colleges who did not participate in tech prep while in high school.

Torres (2008) noted that the graduation rate for tech prep students was nearly double that of non-tech prep students. She attributed the difference to student engagement. That is, students were able to conduct extensive career exploration in high school through the tech prep program rather than in college, thus saving the time and money associated with changing career paths in college.

In the same study, Torres (2008) concluded there was a statistically significant difference in time-to-degree between tech prep and non-tech prep students in the selected south Texas postsecondary institutions, with an effect size that was educationally meaningful. Tech prep students graduated in less time than their non-tech prep peers did presumably because of the articulated credits, which assisted "students in making a smooth transition from one level of education to another without experiencing delays or duplication in leaning" (Torres, 2008, p. 45).

Shaw (2012), tested college outcomes including retention and completion rates in a large Massachusetts study. The analysis included nearly 11,000 records from vocational-technical high schools. Using a multi-variant analysis, Shaw first calculated the contribution that seven control variables made to enrollment in college after one year of postsecondary education then added the tech prep variable to the analysis and found that "students who participated in tech prep during high school were 1.390 times more likely to be retained in college one year after enrollment than students who did not participate in tech prep during high school" (Shaw, 2012, p. 165).

Utilizing a similar process, Shaw (2012) found that students enrolled in tech prep in "high school were 1.522 times more likely to graduate from college than students who did not participate in tech prep during high school" (p. 167). Participation in tech prep programs in high school "increased the likelihood of graduating from a college program of study by 7.3%" (p. 168).

Of note in the Shaw (2012) study, is that the dataset came from CTE high schools with participants matriculating into CTE postsecondary programs. This model is similar to Parnell's (1985) 2+2 tech prep model, and provides the strongest pathway from high school technical programs into postsecondary technical programs. The Shaw study had consistent data, which provided a structured path between high school data and college data.

The difficulty of tracing students from high school to college has been an obstacle for many researchers as the datasets often do not overlap, and longitudinal data systems are still being developed (Shaw, 2012; Valentine et al., 2009). In addition, Shaw (2012) notes that “the flexibility and ambiguity within the [Perkins] statute contribute[s] to the issues of inconsistent implementation and thus impacted the ability to comprehensively evaluate the policy’s effectiveness” (p. 58).

In Idaho, aggregate data is gathered at the secondary and postsecondary levels through the Division of Career and Technical Education in compliance with Perkin’s reporting requirements. However, there is no data pathway to trace a student through both systems. The secondary database ends when a student is eligible for articulated credit, and the postsecondary databases are not tied to a central database. Idaho college transcripts reflect articulated credit at the institution level when the credit is received rather than at the state level.

Discussion. High school outcomes associated with tech prep were the subject of early analysis when tech prep programs were initially developed. Tech prep is beneficial to high school students’ academic, career, and social development (Brodsky, et. al., 1997). Tech prep students continue to postsecondary education in higher numbers, and tech prep students are more likely to work after high school, regardless of postsecondary enrollment (Bragg et al., 2002; Bragg, Kirby & Zhu, 2006). Cellini (2006) asserted that tech prep “helps participants complete high school and encourages enrollment in two-year programs" (p. 394) after a fixed effects approach study involving more than 7,000 students.

DeLuca, Plank, and Estacion (2006) found that while high school career curricula increased the odds of a student enrolling in postsecondary education, tech prep programs were negatively related to any college enrollment, which suggests that the job skills taught in high school programs may be sufficient for students to gain employment without an additional postsecondary credential.

College outcomes associated with tech prep include postsecondary retention, completion, and time-to-degree—a function of both career exploration and articulated credits. While Krile and Parmer (2002) asserted, "Tech prep has a positive effect on subsequent college performance" (p. 9), other studies detailed above have had mixed results when considering college outcomes such as retention, graduation, and time-to-degree. Brodsky and Arroyo (1999) found that tech prep students persisted better and completed postsecondary technical programs at a higher rate than non-tech prep students. In addition, Brodsky and Arroyo found evidence that tech prep students stayed with their original college curriculum choice, which matched the high school tech prep curriculum, reinforcing the value of career exploration in high school.

The seven-consortium longitudinal study of the "most promising tech prep programs" (Bragg et al., 2002, p. 74) concluded that there were little to no differences between the tech prep and non-tech prep college outcomes of persistence and completion. Krile and Parmer's (2002) Sinclair study found no difference between first quarter to second quarter retention, and a statistically significant favorable difference in first quarter to second year retention for tech prep students.

Sweat and Fenster (2006) found little difference in time-to-degree between tech prep and non-tech prep students. However, Torres (2008) found a statistically significant difference in time-to-degree in favor of tech prep students. Torres also found that south Texas students who completed high school tech prep programs graduated at nearly double the rate as their non-tech prep peers.

The most robust of the studies, Shaw's (2012) longitudinal study of CTE high school students that matriculated to CTE programs, found positive effects of tech prep college outcomes in retention and graduation. However, the high school students in the study were from CTE high schools with strong ties to partner-institutions.

Eastern Idaho Technical College (EITC). Eastern Idaho Technical College (EITC) was founded in 1969 as Eastern Idaho Vocational Technical School. EITC is Idaho's only stand-alone technical college. As a technical college, EITC is funded primarily through the Idaho Division of Career and Technical Education rather than through the legislative process (Eastern Idaho Technical College [EITC], 2016).

The terminal degree that EITC offers is an Associate of Applied Science (AAS), which is a sub-baccalaureate two-year degree that leads directly to entry-level skilled labor careers, rather than transfer to a four-year institution (EITC, 2016). Students who receive federal financial aid can only take courses that are listed in the career program's scope and sequence. In other words, financial aid does not cover the cost of tuition for elective courses or courses a student may want to take for personal or professional enjoyment. There are no electives in technical programs at EITC. The scope and sequence for a career program is defined and approved through the Idaho Division of Career and Technical Education (EITC, 2016).

Transferability of credits from EITC to four-year colleges. Credits from a technical degree do not readily transfer to four-year college-degree programs. At EITC, credits are characterized as technical credits or general education credits. Articulated tech prep credits are technical credits.

By state policy, 15 credits of an AAS's minimum of 60 credits must be transferable general education (Idaho State Board of Education, 2016b, III.E.1b). Beyond those 15 credits, if a student transfers to a four-year institution, he or she would need to petition for technical credits to fulfill program credit requirements. This type of decision is made on a case-by-case basis at most institutions. Efforts to mitigate the transfer of an AAS degree to a bachelor's degree have been successful through the Bachelor of Applied Science, Bachelor of Applied Technology, and other four-year degrees that grant credit for professional experience, prior learning, or sub-baccalaureate degrees.

Discussion. An understanding of the limitations of technical degrees and technical credits is pertinent to the discussion because many high school students find that articulated tech prep credits do not transfer to four-year degree programs nor to all technical degree programs. Unless the technical credit earned in high school is required in the particular program the student enrolls in, the credits will be on the student's transcript, but not applied to the degree program. This concept is amplified when the student attempts to articulate tech prep credit to a four-year college in pursuit of a bachelor's degree.

The lack of transferability is a growing concern with all types of credit-based transition programs. Gewertz, Harwin, Sparks, and Lewandowski (2016) reported that students lose an average of 13% of pre-college credits when they enroll in college. A study funded by the Greater Texas Foundation (Appleby et al., 2011) noted that with 226 students with dual credit, all the credits were accepted by Texas colleges. However, only 73% were accepted toward a degree. Florida requires its department of education to develop and circulate a statement that tells students and parents that dual credits might transfer only for general education or elective credit (Gewertz et al., 2016).

The implicit promise made to students is that if he or she earns college credit, then colleges should accept that credit. Credit transfer is a complex topic that falls outside the scope of this research. However, it is a theme to keep in mind through the following analysis of tech prep credit that was articulated through EITC consortium agreements.

An examination of tech prep credits articulated through EITC. To provide context for the students in the sample used for this study, an analysis of credits purchased through the EITC tech prep program has been conducted. Tech prep credits that are purchased and transcribed to a postsecondary institution are referred to as "articulated credit." Credits that are earned in high school, but not yet purchased and transcribed, are referred to as "recommended credit." At EITC, a student must fill out an application to purchase credits and have the credits sent to a postsecondary institution for inclusion on his or her transcript within three years of high school graduation.

The source for this analysis is the EITC Advanced Opportunities database (Eastern Idaho Technical College [EITC], 2017), which is maintained by the Advanced Opportunities coordinator housed at the college. This analysis provides insight into the origin of students identified as tech prep students in the postsecondary database used for this study. A list of high schools that participate in consortium agreements with EITC is presented in APPENDIX D.

The purpose of this study is to understand the effect the tech prep program has on college outcomes by analyzing outcomes for a microcosm of students that matriculate to EITC with articulated credit from the tech prep program. Placing that microcosm of students into a larger context of state and institutional statistics will add greater understanding of the effect of the tech prep program.

Credits generated versus credits articulated to partner institution. A review of the tech prep credits articulated through EITC reveals some interesting information about the difference between the postsecondary credits generated in the high schools (recommended credits) and the postsecondary credits actually articulated to various colleges including EITC. The articulated credits are presented in Table 4.

Table 4

Credits Articulated Through EITC – FY13-17 (all colleges)

Year	Student headcount	Credits
12-13	270	1,341
13-14	235	1,180
14-15	156	728
15-16	259	1,103
16-17	177	745
Total	1,097	5,097

Source. Eastern Idaho Technical College Advanced Opportunities Database, 2017

In the academic years FY13 through FY17, 1,097 students articulated 5,097 credits through EITC. This is a substantially smaller number than the recommended credits generated in EITC's region (Region VI).

Further, an examination of the articulated credits provides insight into the actual efficacy of the tech prep program as a vehicle for transitioning students into the partner institution. Consider Table 5, which summarizes the students with credits that were articulated to EITC, the partner institution.

Table 5

Credits Articulated to EITC – FY13-17 by Cohort

Cohort	Student headcount	Credits
12-13	23	164
13-14	19	146
14-15	11	52
15-16	12	57
16-17	14	74
Total	79	493

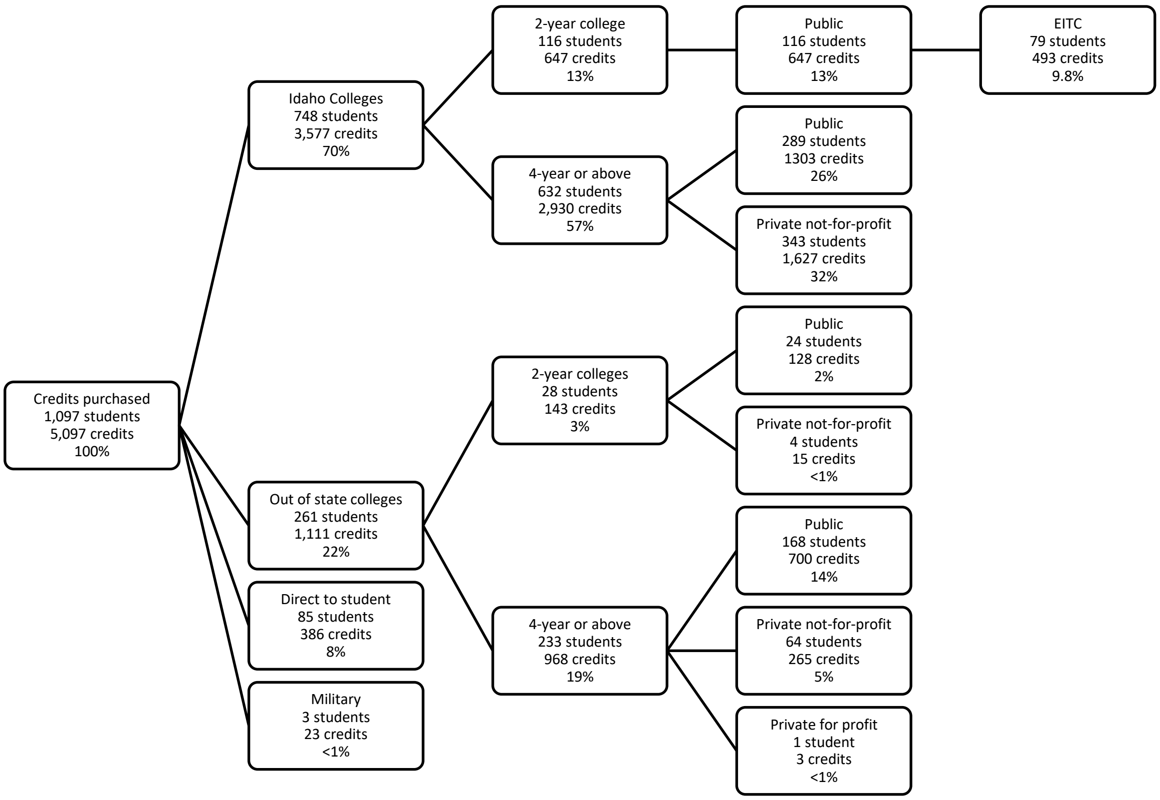
Source: Eastern Idaho Technical College Advanced Opportunities Database, 2017

In the five-year time period that binds this study, only 79 high school tech prep students had 493 credits articulated to EITC. This accounts for only 7% of the students and 9.8% of the credits generated by EITC articulation agreements.

The obvious question that follows is: If not EITC, then where are the credits going? The EITC Advanced Opportunities database has records of all articulated credits and where the credits were sent for inclusion onto the student’s postsecondary transcript. These data are displayed in Figure 1.

Figure 1

Credits Articulated Through EITC – FY13-17



Analysis reveals that 70% of the articulated credits stay in Idaho, but only 13% are articulated to Idaho 2-year public institutions and 3% to out-of-state two-year colleges. It is worth noting that the 13% figure may be somewhat misleading because the institutions designated as Idaho two-year public colleges include three community colleges and the stand-alone technical college. Therefore, students who matriculated into the technical colleges housed at Idaho State University and Lewis & Clark State College are not reflected in the 13%.

Idaho State University (ISU), a 4-year or above Idaho public college located 45 miles south of EITC, received nearly 21% of the articulated credit that was generated through EITC articulation agreements. Some of those credits could have gone to ISU's technical college, thus partially fulfilling the tech prep goal of transitioning students to postsecondary technical education even though it was not a partner institution. Conversely, due to the proximity of the two colleges, it is likely that credits generated by Idaho State University consortium agreements are articulated to EITC.

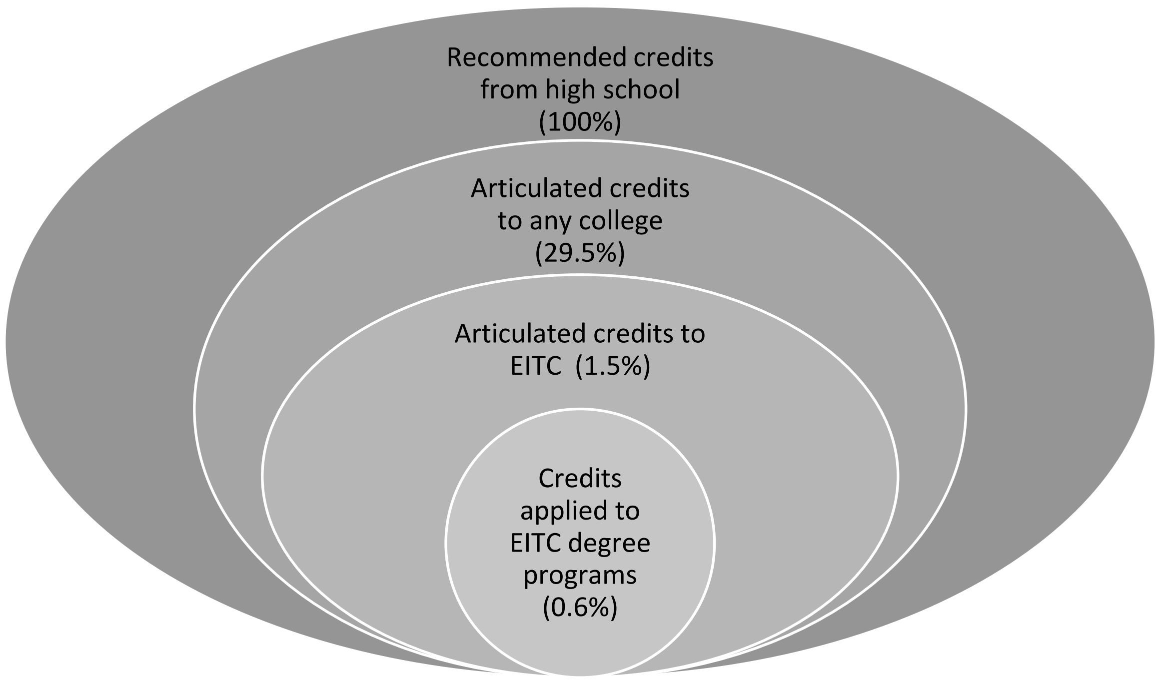
There has been growing concern that credits generated through Idaho high school credit-based transition programs, especially dual credit, are less transferable than some high school students and parents anticipated (see for example, Roberts, 2017). A complete list of colleges that received articulated credit through EITC appears in APPENDIX E.

To review the salient point of this part of the analysis, Career and Technical Education students in Idaho are producing a very large number of recommended credits earned through articulation agreements in Idaho. For example, Table 2 shows 3,749 credits recommended for 1,383 students in EITC's region (Region VI) in 2015-16. Fewer students actually articulated those credits and had the credits sent to colleges, as demonstrated in Table 4 for 2015-16 (259 students and 1,105 credits). Fewer still apply those credits to the partner institution (12 students and 57 credits).

While the numbers fluctuate through the years, the concept remains constant. Small numbers of students are using the articulated credits in the manner the credits were intended to be used—to transfer as non-duplicative coursework at a partner postsecondary technical institution. The fourth part to this process, having the credits actually apply to the postsecondary degree, is part of the research that this study addresses. The finding, from research question #5 completes the picture. In the five years binding this study, only 30 tech prep students completed degrees. One-hundred and nine credits applied to the degrees. A conceptual illustration of the relationship between recommended credit and articulated credit to a partner institution is presented in Figure 2.

Figure 2

Relationship between Recommended Credit and Articulated Credit



Although not to scale, the figure demonstrated the diminishing effect of the recommended credits verses the articulated credits that come over to EITC as students matriculate into partner postsecondary technical programs.

Nature of articulated credits. While examining recommended credits versus articulated credits demonstrates a diminishing effect, the nature of the articulated credits is another area that is worth exploring. To provide some context, the following observations are offered. APPENDIX F provides a complete listing of articulated credits and their associated career cluster. It is informative to understand the types of classes taught at the high school for technical credit through articulation agreements. In this analysis, the term “times articulated” is used rather than a quantitative value such as credits. Because courses have a credit value between 1 and 5 credits, using the term “times articulated” takes out the variable credit and refers only to the number of times a particular course is articulated.

The most frequently articulated course was Economic Issues/Applied Economics, a basic economics course in the Business and Management career cluster. The next most articulated course was Introduction to Health Professions followed by Medical Terminology and Certified Nursing Assistant (CNA) in the Health Sciences career cluster.

A similar pattern was noted in the articulated credits for students who actually matriculated to EITC. As displayed in Table 6, Economic Issues/Applied Economics and the three courses in the Health Sciences career cluster were the most often articulated courses.

Table 6

Courses Articulated to EITC – FY13-17

Career cluster	Course	Credits	Times articulated	Credits generated
Business & Management				
	Economic Issues/Applied Econ	3	31	93
	Computer Info Syst	3	9	27
	Accounting I	3	4	12
	Occupational Relations	3	3	9
	Leadership	1	2	2
	Intro to Marketing	3	2	6
	Keyboarding	3	1	3
	Desktop Publishing	3	1	3
Engineering & Technology				
	Computer Assisted Graphics	3	1	3
	Web Development Tools	3	1	3
	Microcomputer Concepts	4	1	4
Health Sciences				
	Intro to Health Prof.	2	32	64
	Medical Terminology	2	31	62
	Certified Nursing Assistant (C.N.A.)	4	20	80
	Anatomy & Physiology	4	6	24
Skilled and Technical Sciences				
	Industrial Safety	3	8	24
	Auto Brake Syst	2	6	12
	Oxy-Acetylene	2	6	12
	Basic Arc Welding	2	6	12
	Ignition Syst	2	5	10
	Auto Syst & Steering	3	2	6
	Intro to Auto Elect.	5	2	10
	Basic Heat & Cool	3	2	6
	Basic Arc Welding II	2	2	4
	Basic Comp. Contr. Eng. Syst.	2	1	2
Total			185	493

Source. Eastern Idaho Technical College Advanced Opportunities Database, 2017

The nature of these frequently articulated courses goes to the heart of the benefit of career curricula and career exploration. Economics is a foundational course for all business careers. The Health Science courses contain the type of material that one needs to know, and would be interested in, whether pursuing a career as a CNA, or going on to become a surgeon. The opportunity to explore, gain information, and apply skills is present in CTE courses with or without the opportunity for technical college credit.

Relationship between articulated credits and matriculation into EITC. Another observation noted in the analysis of the EITC Advanced Opportunities database (2017) has to do with the relationship between articulated courses and students who actually matriculate to EITC. Table 7 shows frequently articulated courses, the associated career cluster, number of times the course was articulated, and how many times that articulated course came to EITC. An accompanying percentage and data bar graphically summarizes the data.

The pattern demonstrated earlier of frequently articulated credits is disrupted. As previously described, Economics and the three Health Science courses were the most often articulated to any college as well as the most frequently articulated to EITC. However, as demonstrated in Table 7, the credits produced through EITC articulation agreements in the Skilled and Technical Sciences area, while smaller in number, produced the highest percentage of students who matriculated to EITC, the partner institution. Programs associated with this career cluster include welding, auto, and diesel technologies.

Table 7

Comparison of Articulated Courses to EITC and Matriculation EITC FY13-17

Career cluster	Course	Times articulated	Came to EITC	Came to EITC %
Business and Management				
	Economic Issues/Applied Econ	658	31	5%
	Computer Info Syst	69	9	13%
	Accounting I	46	4	9%
	Keyboarding	34	3	9%
	Leadership	24	2	8%
	Principles of Management	20	0	0%
	Desktop Publishing	19	1	5%
	Intro to Marketing	19	2	11%
	Occupational Relations	11	3	27%
	Business Spreadsheets	5	0	0%
Engineering and Industrial Systems				
	Web Development Tools	6	1	17%
	Computer Assisted Graphics	5	1	20%
Health Sciences				
	Intro to Health Prof.	311	32	10%
	Medical Terminology	255	31	12%
	C.N.A.	174	20	11%
	A & P	54	6	11%
Skilled and Technical Sciences				
	Oxy-Acetylene	27	6	22%
	Basic Arc Welding	26	6	23%
	Industrial Safety	23	8	35%
	Auto Brake Syst	19	6	32%
	Basic Arc Welding II	11	2	18%
	Ignition Syst	10	5	50%

Source. Eastern Idaho Technical College Advanced Opportunities Database, 2017

Although the number of times the courses are articulated is relatively low compared to the numbers associated with Economics and the Health Science courses, the effect on matriculation to the partner institution is worth noting. This relationship suggests a closer alignment between the high schools and the partner institution, which bears fruit in recruiting efforts and influences college enrollment behaviors to the partner institution.

Impact of articulated credits on the postsecondary institution. The final point on the analysis of EITC's Advanced Opportunities database is the impact the articulated credits have on courses and sections offered at the college. Tech prep is a credit-based transition program. The advantage to the student who is articulating credits is that the student has taken classes and received credit for classes that he or she would normally take at a postsecondary institution, thus saving time and money on required coursework.

The advantage to the institution, in addition to a recruiting tool, lies in the number of students that need to be served in first-semester courses. If large numbers of students are articulating courses and matriculating to the partner institution, it follows that fewer sections of those classes need to be offered, thus saving the college the cost of offering those sections. The disadvantage is the reduced tuition and fee revenue, as well as reduced credits generated, which often feed into funding formulas.

The analysis of the EITC Advanced Opportunities database reveals that students with articulated credit are matriculating in very small numbers. As a result, there is a smaller chance that any appreciable cost savings is being realized by EITC as a result of articulated credit. This concept is further compounded by the cohort approach of most EITC programs of study.

As a small technical college, most programs are run on a cohort model, meaning that a set number of students are accepted into a program each fall, and those students move through the program together taking specific classes each semester. Cohort enrollment can be limited by equipment, such as number of stations in hands-on laboratories, or by specialized accreditation, which requires a specific instructor-to-student ratio.

If, for example, a program takes 20 students into the fall cohort, and one of those students has articulated credit for a first semester class, there is no change in the number of sections that need to be offered of that particular class. Indeed, all the first semester sections would be offered with a maximum enrollment of 20, but one section would only enroll 19 because the student with articulated credit would not need to take that class. Further, there may be financial aid implications for the student if that student's credits fall below full-time status for financial aid purposes.

Idaho has set a goal that 60% of 25 to 34 year-olds will attain a postsecondary certificate or degree by 2020. Idaho is not in a position to realize that goal (Richert, 2016). Without higher education attainment, Idaho will not have the ability to "fuel innovation and economic competitiveness" (Idaho State Board of Education, 2012, p. 2). Action must be taken to increase Idaho's go-on [to college] rate, increasing the college pipeline with college-ready students who will be retained and able to complete degrees in a timely manner. Understanding the benefits and risks associated with tech prep programs and the effect the program has on college outcome attainment in Idaho is an important step toward justifying the expense of the program.

CHAPTER 3: METHODOLOGY

This chapter provides the methodology for this study. Included is the description of the participants, the data collection means, and the research procedures. This is a case study, which focuses on students who matriculated to EITC from 2012 to 2016 with articulated credits earned in an Idaho high school through the tech prep program. The study utilizes archival data. Some data will be appropriate for statistical analysis; other data will be descriptive in nature.

Purpose Statement

The goal of the tech prep program is to provide a credit-based transition program from secondary to postsecondary career and technical education. Benefits of the program include articulated credits, which give the student a head start on earning postsecondary credit, and exposure to college-level career curricula. Another benefit is the technical skills and career discernment to succeed in postsecondary education. Combined, these benefits may lead to increased persistence/retention, certificate and degree production, decreased time-to-completion, and increased technical skills attainment. The purpose of this study is to determine the effect of tech prep participation and associated articulated credits on students' college outcomes for students that matriculated to EITC in 2012 through 2016.

Research Questions

The purpose of this study is to understand the effect of tech prep participation and associated articulated credit on EITC students, who matriculated with articulated tech prep credits from 2012 to 2016 within three-and-a-half years of high school graduation.

Accordingly, the overarching research question is: What is the effect of tech prep participation and associated articulated credits on college outcomes?

To effectively analyze the research question, four questions were formulated to understand the differences between tech prep and non-tech prep students, and two questions were formulated to understand the effect of articulated credit with regard to the completed postsecondary program and career discernment. The six research questions are as follows:

Regarding comparison of tech prep to non-tech prep:

Appendix A Is there a statistically significant difference in the second semester enrollment rate of tech prep and non-tech prep students?

2. Is there a statistically significant difference in the completion rate of tech prep and non-tech prep students?
3. To what extent did time-to-degree completion differ between tech prep and non-tech prep students?
4. Is there a statistically significant difference in technical skills assessment (TSA) pass rates between tech prep and non-tech prep students?

Regarding tech prep students only:

5. To what extent did the articulated credits apply to the degree the tech prep student completed?
6. To what extent did the student complete a program in the same career cluster as the articulated tech prep credits?

Methodology (Research and Process Procedures)

The research design employed for this study is quantitative, utilizing archival data from EITC's Colleague database. This method was chosen because the accountability measures specified in Perkin's legislation, most recently in Perkins IV (Carl D. Perkins Career and Technical Education Improvement Act of 2006, 2006), are quantitative in nature and are most appropriate to measure the first set of research questions related to college outcomes of retention/persistence, completion, and technical skills attainment. In addition, the literature review has revealed that outcomes analysis are most often performed using quantitative methods, predominantly causal comparative, quasi-experimental, post hoc analysis of outcomes for tech prep and non-tech prep students. In this chapter the following elements of the study are explained: participants/sampling, instrumentation, human subjects committee, and procedures.

Participants/Sampling. The study's population consists of degree-seeking students, who graduated from an Idaho high school and matriculated to EITC within three-and-a-half years of high school graduation. The study is bound by students who matriculated between summer 2012 and fall 2016. The population is not representative of the general population of EITC students.

EITC was chosen as the location for the proposed study because it is Idaho's only stand-alone technical college. As such, students who matriculate to EITC do so in pursuit of sub-baccalaureate technical degrees and certificates leading to entry-level technical jobs. This primary motivation for students to attend EITC makes it unlikely students have other motivations for enrolling in certificate and degree programs such as transfer to four-year degree programs, which may confound the findings. The years 2012-2016 were chosen as the five most recent years where students will be far enough along in their programs to have meaningful outcomes data.

Instrumentation. The data set was derived from the EITC Colleague database. Colleague is the official record keeping database for EITC. The data set includes a record of all students who matriculated to EITC from summer 2012 and fall 2016. The following fields were requested by the researcher and make up the records for the dataset that this study is based on:

Table 8

Dataset Fields from Colleague Database

Field	Description
Reference ID	Unique identifier to distinguish records and disguise the student ID number
Start term	Semester reference for student enrolled in credit bearing class(es) at EITC
Start term date	First calendar date of start term
Cohort	EITC cohort year (example: students whose first EITC term is su12, f12, or s13 are in the 12-13 cohort.
HS/GE	HS=high school graduate; GE=GED graduate; blank=not listed
School name	Name of high school student graduated from
HS state	State of high school (i.e. ID=Idaho)
High school or GE grad date	Date of high school graduation/GED completion
Age upon start	Attained age at EITC matriculation
Start program	Program designation for initial enrollment
Program name	Program name for initial enrollment
Next term return (spring start-came back fall term; summer or fall start-came back spring term)	Retention measure for student return for second semester (1=second semester retained; 0=second semester not retained)
Last term	Semester reference for student's last term enrolled in credit bearing class(es) at EITC
Last term end date	Calendar date of last term

Field	Description
Still active	Convenience field to distinguish active students from students who have dropped out without completing (1=active fall 2017; 0=not active fall 2017)
Graduate	Student graduated from EITC with degree or certificate (1 = yes; blank = no)
Degree/Certificate	Program designation for completed degree or certificate
Graduate term	Term degree or certificate conferred
Graduate date	Last day of instruction for graduation term
Time as student	Calculated field: last term end date less start term date expressed in months
Time to degree	Calculated field: graduation date less start term date expressed as a percentage of normal time-to-degree
TSA P/F	Technical Skills Attainment (TSA) measure P = passed TSA; F = failed TSA
Gender	Demographic descriptor: m = male; f = female
White	Demographic descriptor-ethnicity: 1 = yes
Hispanic	Demographic descriptor-ethnicity: 1 = yes
Native American or Alaska Native	Demographic descriptor-ethnicity: 1 = yes
Asian	Demographic descriptor-ethnicity: 1 = yes
Native Hawaiian or Pacific Islander	Demographic descriptor-ethnicity: 1 = yes
African American or Black	Demographic descriptor-ethnicity: 1 = yes
Two or more	Demographic descriptor-ethnicity: 1 = yes
Unknown	Demographic descriptor-ethnicity (note: students not required to declare ethnicity): 1 = yes
Individual ADA	Special population: Student who qualifies under Americans with Disabilities Act: 1 = yes
Limited English	Special population: Student with limited English proficiency: 1 = yes
Economically disadvantaged	Special population: Student who is economically disadvantaged: 1 = yes
Displaced homemaker	Special population: Student who qualifies as a displaced homemaker: 1 = yes
Single parent	Special population: Student who qualifies as a single parent: 1 = yes
Tech prep	Convenience field to count students who matriculated to EITC with articulated (tech prep) credit: 1 = yes
1 Tech prep prefix and number	Course prefix and number for articulated credit
1 Tech prep course name	Course title for articulated credit

Field	Description
2 Tech prep prefix and number	Course prefix and number for articulated credit
2 Tech prep course name	Course title for articulated credit
3 Tech prep prefix and number	Course prefix and number for articulated credit
3 Tech prep course name	Course title for articulated credit
4 Tech prep prefix and number	Course prefix and number for articulated credit
4 Tech prep course name	Course title for articulated credit

Human Subjects Committee. The researcher had permission from the president of Eastern Idaho Technical College (EITC) to conduct the study using records from the Colleague database at the college. Because EITC does not have an Institutional Review Board, permission to use college data for outside research rests solely with the president. Since the study utilized existing, archival data with no personally identifiable information, the researcher applied for, and was granted, an exemption from the Human Subjects Committee at Idaho State University (ISU). In addition, ISU requires student researchers to complete training through Collaborative Institutional Training Initiative (CITI). The researcher in this study completed the CITI training prior to applying for permission to complete the study. The permission letter from EITC and the notification of exemption from ISU can be found in APPENDIX A.

Procedures. This study employed a quantitative research methodology. Specifically, the first four research questions were examined using an ex-post facto causal-comparative research design. Ex-post facto (Latin for *operating retroactively*) refers to the notion that the researcher did not assign or influence student participation in tech prep. Rather, the presence or absence of articulated tech prep credits, allow for categorization of postsecondary students after the fact.

> Causal-comparative research is a type of non-experimental investigation in which researchers seek to identify cause-and-effect relationships by forming groups of individuals in whom the independent variable in present or absent—or present at several levels—and then determining whether the groups differ on the dependent variable. (Gall, Gall, & Borg, 2007, p. 306).

For this study in the first four research questions, the independent variable is tech prep or non-tech prep status. The dependent variables are the college outcomes of retention, completion, time-to-degree, and pass rate on technical skills assessments as described more thoroughly below.

Research questions 5 and 6 are descriptive in nature. Descriptive research "is a type of quantitative research that involves making careful descriptions of educational phenomena" (Gall, Gall, & Borg, 2007, p. 300). While the first four research questions essentially consider tech prep as a treatment, research questions 5 and 6 will describe the actual effect that specific tech prep credits had on degree attainment.

Research question #1. Is there a statistically significant difference in the second semester enrollment rate of tech prep and non-tech prep students? This question seeks to understand retention differences between tech prep and non-tech prep students.

The retention measure utilized in this study considers initial enrollment and determines if the student came back to school the next semester. Data was analyzed using the chi-square test for independence.

> The chi-square test for independence uses the frequency data from a sample to evaluate the relationship between two variables in the population. Each individual in the sample is calculated on both of the two

> variables in the population, creating a two-dimensional frequency-distribution matrix. The frequency distribution for the sample is then used to test hypothesis about the corresponding frequency distribution for the population. (Gravetter and Wallnau, 2013, p. 605)

The chi-square test for independence allows hypothesis testing for a 2 x 2 matrix of success and failure. Chi-square analysis was chosen because the data were categorical frequency counts, which do not meet the assumptions for a parametric statistical test (Gravetter & Wallnau, 2013).

The assumptions for a chi-square test for independence are that the observations are independent, and that the expected frequencies are not below five for any cell (Gravetter & Wallnau, 2013). Independence of observation “is present when the selection of one observation is unrelated to the selection of another observation” (Vogt & Johnson, 2016, p. 200). It is achieved when each observation is generated by a different record (Gravetter & Wallnau, 2013). Expected frequencies are calculated by multiplying the row marginal and the column marginal then dividing by the sample size. According to Gravetter and Wallnau (2013), the chi-square statistic is distorted when expected frequencies are too small. If the expected frequency in any cell is below five, then the chi-square statistic should be replaced by Fisher’s Exact Test (Vogt & Johnson, 2016).

The result allows an inference to be made of the samples with regard to the following hypothesis:

H_o: There is no difference in the second semester retention rates for the tech prep students vs. non-tech prep students.

H_1: There is a difference in the second semester retention rates for the tech prep students vs. non-tech prep students.

Five tests of independence (either chi-square test for independence or Fisher's Exact Test) were run. The first was an aggregate compilation of the study sample. The next four were disaggregated by career cluster to determine if there were differences by discipline. As with the Krile and Parmer (2002) study, the hypothesis was tested with an alpha of .05, which is appropriate for social science inquiry. The alpha level indicates the chance a researcher is willing to take of committing a Type I error. That is, rejecting the null hypothesis when it is actually true (Vogt & Johnson, 2016).

When results of the analysis provided evidence that there is a statistically significant difference between the tech prep and non-tech prep groups, an effect size was calculated. "Because a significant effect does not necessarily mean a large effect, it is generally recommended that the outcome of a hypothesis test be accompanied by a measure of the effect size" (Gravetter & Wallnau, 2013, p. 613). The appropriate effect size statistic for a chi-square test for independence is a phi-coefficient.

Research question #2. Is there a statistically significant difference in the completion rate of tech prep and non-tech prep students? This question seeks to understand the difference in completion rates (earned technical certificate or AAS) between tech prep and non-tech prep students.

Because students who matriculated to EITC in the 16-17 cohort as AAS students have not been in school long enough to complete degrees, records for students with a start program of AAS from the 16-17 cohort were eliminated before analysis. Specifically, the only records from the 16-17 cohort that were included are those where the start program was an intermediate technical certificate. As with research question #1, the data were frequency counts. However, in the aggregate computation, as well as each disaggregated computation, expected frequencies were below five in at least one cell. Therefore Fisher's Exact Test was employed with regard to the following hypothesis:

H_o: There is no difference in the completion rates for the tech prep students vs. non-tech prep students.

H_1: There is a difference in the completion rates for the tech prep students vs. non-tech prep students.

Fisher Exact Test was run on the entire study group as well as individual career clusters. As with the Torres (2008) study, the hypothesis was tested with an alpha of .05.

Research question #3. To what extent is there a statistically significant difference in time-to-degree completion between tech prep and non-tech prep students? This question seeks to understand time-to-degree for tech prep and non-tech prep students. Time-to-degree is the time lapse between initial enrollment and graduation. Because tech prep students matriculate with articulated credits, time-to-degree should be faster for tech prep students.

The statistic for this analysis is an independent-measures t-test, "which is a hypothesis test that uses two samples to evaluate the mean difference between two treatment conditions between two different populations" (Gravetter & Wallnau, 2013, p. 316). Because the two groups, tech prep and non-tech prep, are separate groups, this is a between-subjects research design (Gravetter & Wallnau, 2013). Assumptions for an independent-measures t-test are that the observations are independent, the two populations from which the samples are selected have a normal distribution and, the two samples have equal variances (Gravetter & Wallnau, 2013).

The first two assumptions were met based on the nature and number of student records examined. The third assumption, the equal variance assumption, was tested using Levene's Test prior to conducting the test.

For this study, the two groups (independent variable) are tech prep and non-tech prep students. The dependent variable is time-to-degree expressed as the percentage of the normal time it takes to complete the particular program. The independent measures t-test was used for the entire study group, as well as for individual career clusters. As with the Torres (2008) study, the hypothesis was tested two-tailed with an alpha of .05, with regard to the following hypothesis:

H_0: There is no difference in time-to-degree between tech prep and non-tech prep students.

H_1: There is a difference in time-to-degree between tech prep and non-tech prep students.

When a statistically significant difference was found, Cohen's *d* was used to compute effect size. "A measure of effect size is intended to provide a measurement of the absolute magnitude of a treatment effect, independent of the sample" (Gravetter & Wallnau, 2013, p. 262).

Research question #4. Is there a statistically significant difference in technical skills assessment (TSA) pass rates between tech prep and non-tech prep students?

This question seeks to understand differences between tech prep and non-tech prep students' technical skills attainment. Due to expected frequencies that were below five in at least one cell per table, Fisher's Exact Test was employed for the entire study group as well as individual career clusters with regard to the following hypothesis:

> H_o: There is no difference in technical skills attainment (TSA) pass rates for tech prep vs. non-tech prep students.
>
> H_1: There is a difference in technical skills attainment (TSA) pass rates for tech prep vs. non-tech prep students.

When statistically significant differences were found, the effect size was calculated using the phi-coefficient. There are no previous studies on TSA pass/fail rates, so the hypothesis was tested with an alpha of .05 to match research questions #1 and #2.

Research question #5. To what extent did the articulated credits apply to the degree the tech prep student completed? This question seeks to determine whether articulated credits actually were applied to the degree that the student earned.

To measure this question, the researcher started with a list of tech prep graduates (e.g., earned a technical certificate or AAS from EITC) and looked back to the articulated coursework. By comparing the articulated coursework to the necessary coursework for the degree, applicable articulated coursework was identified. Three areas were looked at in aggregate and by career cluster:

Appendix A At least one credit was applied to the degree

Appendix B Number of courses that applied to the degree vs. number of courses that did not apply to the degree

Appendix C Number of credits that applied to the degree vs. number of credits that did not apply to the degree

There is no statistical analysis for this research question. It is descriptive in nature.

Research question #6. To what extent did the student complete a program in the same career cluster as the tech prep credits? This question seeks to understand the effect participation in tech prep may have had on a student's motivation to pursue a course of study associated with a particular career cluster. For example, if a student articulated credits in welding, did he or she complete a degree in automotive technology (both are in the same career cluster), or in nursing (a different career cluster). This question may illuminate the effect of tech prep and career curricula on career discernment.

To analyze this data, the researcher first identified the career cluster associated with each articulated course and compared it to the career cluster associated with the student's degree. Three categories were possible: no match, partial match, and match (Brodsky & Arroyo, 1999).

No match refers to articulated credits and courses that were not applicable to the student's degree and not in the same career cluster. Partial match refers to articulated credits and courses that are not applicable to the student's degree, but are in the same career cluster. Match refers to articulated credits that apply to the student's degree and are in the same career cluster. There is no statistical analysis for this research question. It is descriptive in nature.

Summary

The purpose of this study is to understand the effect of tech prep participation and associated articulated credit on EITC students, who matriculated with articulated tech prep credits from 2012 to 2016. This chapter presented the research questions and provides a discussion on the participants/sampling, instrumentation, human subjects committee, procedures, and design

This study analyzes retention, completion, time-to-degree, and technical skills attainment data for tech prep students and their non-tech prep peers to see if differences exist. In addition, descriptive information is presented and analyzed to determine the applicability, if any, that the articulated credits have on students' degree programs. The results of the study are presented in Chapter 4.

CHAPTER 4: ANALYSIS

The purpose of this study was to determine the effect of tech prep participation and associated articulated credits on students' college outcomes. Students' accomplishments with regard to retention, completion, time-to-degree, and technical skills attainment were compared for tech prep and non-tech prep students that matriculated to EITC in 2012 through 2016 within three-and-a-half years of high school graduation. Analysis was conducted using JMP Pro 13 (version 13.1.0). The study employed both inferential and descriptive statistics.

The overarching research question that guided this study was: What is the effect of tech prep participation and associated articulated credits on students' college outcomes? Specific questions analyzed were:

Regarding comparison of tech prep to non-tech prep:

Appendix A Is there a statistically significant difference in the second semester enrollment rate of tech prep and non-tech prep students?

7. Is there a statistically significant difference in the completion rate of tech prep and non-tech prep students?
8. To what extent did time-to-degree completion differ between tech prep and non-tech prep students?
9. Is there a statistically significant difference in technical skills assessment (TSA) pass rates between tech prep and non-tech prep students?

Regarding tech prep students only:

10. To what extent did the articulated credits apply to the degree the tech prep student completed?

11. To what extent did the student complete a program in the same career cluster as the articulated tech prep credits?

The dataset provided to the researcher by the EITC Office of Institutional Research contained 2,190 records. Each record for was a student who had attended EITC in credit bearing classes between summer 2012 and fall 2016. Several records were eliminated through the following process:

Appendix A Identify records where the original start program was non-degree seeking (NP). Filtering the data field "start program" for "contains .NP" eliminated 962 records.

Appendix B Identify records where the start program was a Postsecondary Technical Certificate (PSTC). Postsecondary technical certificates do not meet the definition of a Perkin's eligible degree due to the lack of general education courses needed for completion. Filtering the data field "start program" for "contains .PSTC" eliminated 12 records.

The remaining records (n = 1,216) represent degree seeking students that matriculated to EITC between summer 2012 and fall 2016. This study was further delimited to students who graduated from an Idaho high school and matriculated within three-and-a-half years of high school graduation. The following process was employed to identify records that met the criteria:

Appendix A Check records for completeness. Ten records had no high school information. Therefore, the researcher eliminated the records for non-completeness. This process eliminated 10 records.

Appendix B Using the field “HS/GE,” the researcher applied a filter to eliminate records where the student obtained a General Equivalency Diploma (GED). This process eliminated 180 records.

Appendix C Using the data field “HS state,” the researcher eliminated records where the student did not graduate from an Idaho high school. This process eliminated 210 records.

Appendix D Create a calculated field to determine the time between high school graduation and matriculation into EITC (“Start term date” minus “high school grad date”, expressed in years). When a high school graduation date was not available, the researcher inferred the date using the “age upon matriculation” field. High school graduation dates were inferred on 72 records. Using the calculated field, the researcher applied a filter to eliminate records where the years out of high school was greater than 3.5 years. This process eliminated 418 records.

The remaining records (n = 398) comprise the dataset to be used in this study. The records were those of degree seeking students who matriculated to EITC between summer 2012 and fall 2016, and graduated from an Idaho high school within three-and-a-half-years of matriculation to EITC.

Next, the data set was filtered for students who have transcribed articulated credit. This group was established as the “tech prep” group. The remaining records formed the “non-tech prep” or control group for this study. In this manner, two groups were identified: tech prep (n = 68) and non-tech prep (n = 330). Each student in the two groups graduated from an Idaho high school who matriculated to EITC as a degree seeking student within three-and-a-half years of high school graduation. The difference between the groups was the presence or absence of articulated credit upon matriculation.

Demographic Analysis

Table 9 provides a demographic comparison between degree seeking students, and the tech prep and non-tech prep students, who were the focus of this study.

Table 9

Selected Demographic Information from Colleague Database

Characteristic		Degree seeking	Tech prep	Non-tech prep
Count		N = 1,216	n = 68	n = 330
Age				
	Age range at start of college	17-66	18-22	18-25
	Average age	26.4	19.6	19.7
Gender				
	Male	569 (47%)	31 (46%)	157 (58%)
	Female	647 (53%)	37 (54%)	113 (42%)
Ethnicity				
	White	490 (66%)	53 (78%)	232 (70%)
	Hispanic	162 (22%)	12 (18%)	77 (23%)
	Native American or Alaska Native	9 (1%)	0 (0%)	2 (1%)
	Asian	6 (1%)	0 (0%)	1 (0%)
	Native Hawaiian or Pacific Islander	7 (1%)	0 (0%)	0 (0%)
	African American or Black	8 (1%)	0 (0%)	1 (0%)
	Two or More	47 (6%)	3 (4%)	15 (5%)
	Unknown	15 (2%)	0 (0%)	2 (1%)
Special population				
	Individual ADA	72 (8%)	5 (24%)	17 (11%)
	Limited English	5 (1%)	0 (0%)	2 (1%)
	Economically Disadvantaged	482 (57%)	11 (52%)	95 (60%)
	Displaced Homemaker	96 (11%)	2 (10%)	13 (8%)
	Single Parent	198 (23%)	3 (14%)	31 (20%)

As seen in Table 9, the age range and average age for the tech prep and non-tech prep groups were similar and appropriate for students who were less than three-and-a-half years out of high school. The tech prep group was comprised of 46% males and 54% females. The non-tech prep group consisted of 58% males and 42% females.

The predominant ethnicity for both groups was White (78% for tech prep and 70% for non-tech prep), although the difference between the two was 8% greater for the tech prep group. Special population information shows a higher percentage of students with ADA status in the tech prep group (24% vs 11%). The non-tech prep group showed a higher percentage of economically disadvantaged students (60% vs 52%) and single parents (20% vs. 14%).

Analysis of Research Question #1

Research question #1 asked if there was a statistically significant difference in second semester enrollment between tech prep and non-tech prep students. The data were analyzed in aggregate and disaggregated by career cluster with regard to the following hypothesis:

H_o: There is no difference in the second semester retention rates for the tech prep students vs. non-tech prep students.

H_1: There is a difference in the second semester retention rates for the tech prep students vs. non-tech prep students.

The chi-square statistic was used for the aggregate computation. The independent variable was tech prep status and the dependent variable was a frequency count of success or failure. The computation was made using a .05 significance level. Table 10 displays the frequency counts and percentages of aggregate student retention.

Table 10

Comparison of Retention for All Students

Tech prep status	n	Retained	n	Not retained
Tech prep	56	82.35%	12	17.65%
Non-tech prep	220	66.67%	110	33.33%

Note. $\chi^2(1, n = 398) = 6.526$, $p = .0106$, $\Phi = .128$

The data in the aggregate computation produced a chi-square statistic of 6.526. With 1 degree of freedom, the critical range begins at 3.84. Therefore, the null hypothesis is rejected, indicating there was a statistically significant difference between the tech prep and non-tech prep groups. The effect size, calculated with the phi-coefficient, was .128, which is considered to be a small effect size. (Gravetter & Wallnau, 2013).

With regard to the disaggregated computations, three of the four career clusters contained expected frequencies that were below five. This violates assumptions of the chi-square statistic, so Fisher's Exact Test was employed for the analysis in those cases.

Business and Management. Table 11 displays the frequency counts and associated percentages for Business and Management students. Approximately 89% of the tech prep group persisted to second semester compared to a 61.76% of the non-tech prep students.

Table 11

Comparison of Retention for Business and Management Students

Tech prep status	n	Retained	n	Not retained
Tech prep	8	88.89%	1	11.11%
Non-tech prep	42	61.76%	26	38.24%

Note. $p(1, n = 77) = .1488$

Because expected frequencies were below five in one cell, Fisher's Exact Test was used to test the relationship. The resultant statistic ($p = .1488$) was insufficient to reject the null hypothesis, indicating there was no statistically significant difference in the second semester retention rates for the tech prep students vs. non-tech prep students.

Engineering and Technology. Within the Engineering and Technology students, 80% of the tech prep group retained to second semester compared to 65.63% of the non-tech prep students. Table 12 presents the frequency counts and associated percentages.

Table 12

Comparison of Retention for Engineering and Technology Students

Tech prep status	n	Retained	n	Not retained
Tech prep	4	80.00%	1	20.00%
Non-tech prep	21	65.63%	11	34.38%

Note. p(1, n = 37) = .35

Because expected frequencies were below five in two cells, Fisher's Exact Test was employed for the analysis. The resultant statistic (p = .35) was insufficient to reject the null hypothesis, indicating there was no statistically significant difference in the second semester retention rates for the tech prep students vs. non-tech prep students.

Health Science. The frequency counts and associated percentages for Health Science students are presented in Table 13. The tech prep group had a 74.29% retention rate compared to a 62.22% retention rate for the non-tech prep students.

Table 13

Comparison of Retention for Health Science Students

Tech prep status	n	Retained	n	Not retained
Tech prep	26	74.29%	9	25.71%
Non-tech prep	84	62.22%	51	37.78%

Note. X^2(1, n = 170) = 1.771, p = .1832

Expected frequencies were sufficient for a chi-square test. The data produced a chi-square statistic of 1.771. With 1 degree of freedom, the critical range begins at 3.84. Therefore, the null hypothesis was not rejected, indicating there was not a statistically significant difference between the tech prep and non-tech prep groups.

Skilled and Technical Science. Within Skilled and Technical Science students, the tech prep group had a 94.74% retention rate compared to a 76.84% retention rate for the non-tech prep students. The frequency counts and associated percentages are presented in Table 14. Because expected frequencies were below five in one cell, Fisher's Exact Test was employed.

Table 14

Comparison of Retention for Skilled and Technical Science Students

Tech prep status	n	Retained	n	Not retained
Tech prep	18	94.74%	1	5.26%
Non-tech prep	73	76.84%	22	23.16%

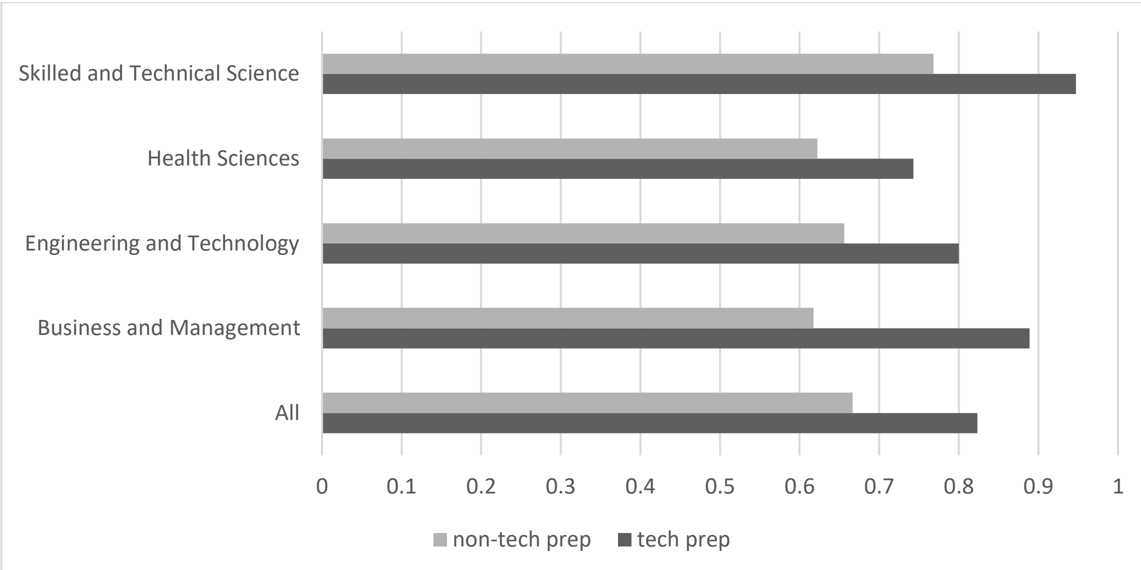
Note. $p(1, n = 114) = .1154$

The resultant statistic (p = .1154) was insufficient to reject the null hypothesis, indicating there was no statistically significant difference in the second semester retention rates for the tech prep students vs. non-tech prep students in Skilled and Technical Science.

Summary of Research Question #1. Figure 3 provides a graphical representation of research question #1. Each series shows the percentage of students who came back to EITC for second semester classes in aggregate as well as disaggregated by career cluster.

Figure 3

Second Semester Retention for Tech Prep vs. Non-tech Prep Students



In all cases, the tech prep students retained better than the non-tech prep students. However, only the aggregate students showed a difference that was statistically significant.

Analysis of Research Question #2

Research question #2 asked if there was a statistically significant difference in completion rates between tech prep and non-tech prep students. The data were analyzed in aggregate, and disaggregated by career cluster. Because students who matriculated to EITC in the 2016-2017 cohort with a start program of an AAS degree have not been in school long enough to complete degrees, records for AAS students from the 2016-2017 cohort were eliminated before analysis.

The statistic employed was the chi-square statistic. The independent variable was tech prep status and the dependent variable was a frequency count of success, failure, and still active. The computation was made using a .05 significance level with regard to the following hypothesis:

H_o: There is no difference in the completion rates for the tech prep students vs. non-tech prep students.

H_1: There is a difference in the completion rates for the tech prep students vs. non-tech prep students.

Table 15 lists the frequency counts and associated percentages of aggregate completion rates. Because expected frequencies were below five in the aggregate distribution, Fisher's Exact Test was used for the aggregate computation.

Table 15

Comparison of Completion Rates for All Students

Tech prep status	n	Completed	n	Not completed	n	Still active
Tech prep	30	56.60%	21	39.62%	2	3.77%
Non-tech prep	92	34.85%	145	54.92%	27	10.23%

Note. $p(2, n = 317) = .0121$, $V = .172$

In the aggregate compilation, the completion rate of tech prep students was 56.60% compared to non-tech prep students at 34.85%. The resultant statistic ($p = .0121$) was sufficient to reject the null hypothesis and conclude there was a statistically significant difference between the tech prep and non-tech prep groups. The effect size, using Cramer's *V*, was .172 indicating a small effect size.

Business and Management. Within the Business and Management students, the tech prep group had a 77.78% completion rate compared to a 35.59% completion rate for the non-tech prep students. The frequency counts and associated percentages are presented in Table 16. The resultant statistic, using Fisher's Exact Test ($p = .0704$), was insufficient to reject the null hypothesis. There was not a statistically significant difference between the tech prep and non-tech prep groups in the Business and Management career cluster.

Table 16

Comparison of Completion Rates for Business and Management Students

Tech prep status	n	Completed	n	Not completed	n	Still active
Tech prep	7	77.78%	2	22.22%	0	0.00%
Non-tech prep	21	35.59%	31	52.54%	7	11.86%

Note. $p(2, n = 68) = .0704$

Engineering and Technology. The frequency counts and associated percentages are presented in Table 17 for Engineering and Technology students. The tech prep group had a 60.00% completion rate compared to a 26.63% completion rate for the non-tech prep students. The resultant statistic, using Fisher's Exact Test ($p = .5236$), was insufficient to reject the null hypothesis. There was not a statistically significant difference between the tech prep and non-tech prep groups in the Engineering and Technology career cluster.

Table 17

Comparison of Completion Rates for Engineering and Technology Students

Tech prep status	n	Completed	n	Not completed	n	Still active
Tech prep	3	60.00%	2	40.00%	0	0.00%
Non-tech prep	8	29.63%	17	62.96%	2	7.41%

Note. $p(2, n = 32) = .5236$

Health Science. Within the Health Science students, the tech prep group had a 38.56% completion rate compared to a 28.70% completion rate for the non-tech prep students. The frequency counts and associated percentages are presented in Table 18. The resultant statistic, using Fisher's Exact Test (p = .5726), was insufficient to reject the null hypothesis. There was not a statistically significant difference between the tech prep and non-tech prep groups in the Health Science career cluster.

Table 18

Comparison of Completion Rates for Health Science Students

Tech prep status	n	Completed	n	Not completed	n	Still active
Tech prep	10	38.56%	15	57.69%	1	3.85%
Non-tech prep	31	28.70%	68	62.96%	9	8.33%

Note. p(2, n = 134) = .5726

Skilled and Technical Science. The frequency counts and associated percentages are presented in Table 19 for Skilled and Technical Science students. The tech prep group had a 76.92% completion rate compared to a 45.71% completion rate for the non-tech prep students. The resultant statistic, using Fisher's Exact Test (p = .1396), was insufficient to reject the null hypothesis. There was not a statistically significant difference between the tech prep and non-tech prep groups in the Skilled and Technical Science career cluster.

Table 19

Comparison of Completion Rates for Skilled and Technical Sciences Students

Tech prep status	n	Completed	n	Not completed	n	Still active
Tech prep	10	76.92%	2	15.38%	1	7.69%
Non-tech prep	32	45.71%	29	41.43%	9	12.86%

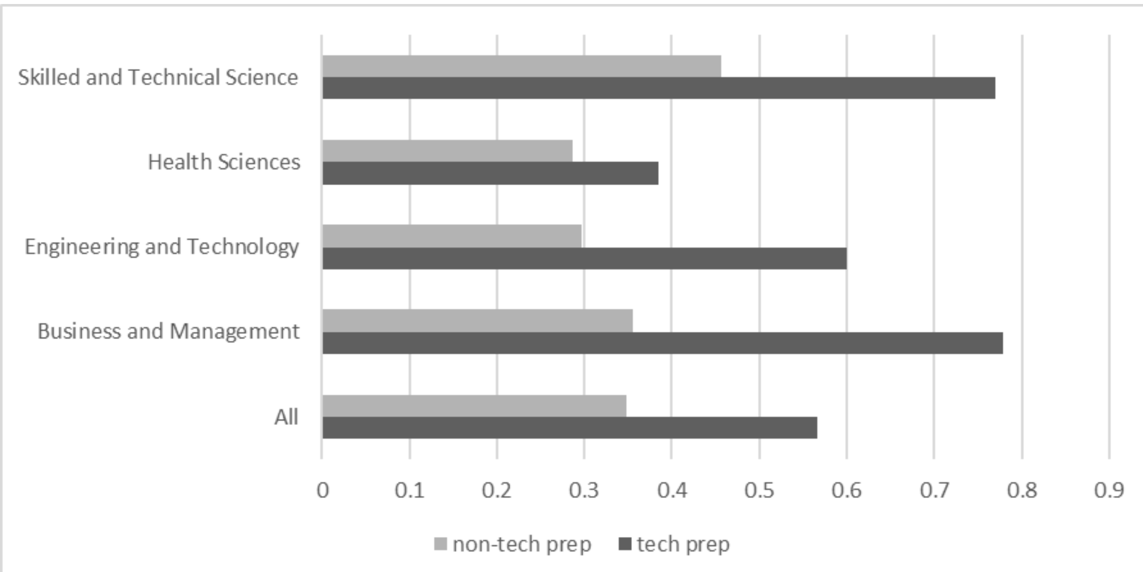
Note. p(2, n = 83 = .1396

Summary of Research Question #2. Figure 4 provides a graphical representation of the completion rates of tech prep vs non-tech prep students. Each series represents the percentage of students in this study that completed a technical certificate or Associate of Applied Science (AAS) degree. The data are presented in aggregate for all students and disaggregated by career cluster.

Only the aggregate computation produced a statistically significant difference. However, visual inspection indicates that tech prep students complete programs at a higher rate than non-tech prep students in every career cluster.

Figure 4

Completion Rates for Tech Prep vs. Non-Tech Prep Students



Analysis of Research Question #3

Research question #3 asked to what extent time-to-degree differed between tech prep and non-tech prep students. Time-to-degree is a numeric measurement, which quantifies the time between a student's matriculation and graduation expressed as a percentage of the time it would take a full-time student to complete the program. The data were analyzed, using an independent measures t-test, in aggregate as well as disaggregated by career cluster with regard to the following hypothesis:

H_0: There is no difference in time-to-degree between tech prep and non-tech prep students.

H_1: There is a difference in time-to-degree between tech prep and non-tech prep students.

The independent-measures t-test had an assumption that the variances are equal. This assumption was especially important when there is a large discrepancy in the sample sizes (Gravetter & Wallnau, 2013). To determine if the homogeneity of variances assumption was met, the assumption was tested with the Levene Test.

For the comparison of time-to-degree for all students, the Levene Test provided evidence (p = .0057) that the homogeneity of variances assumption was not met. Therefore, the t-test for independent samples was run assuming unequal variances. The results are displayed in Table 20.

There was a statistically significant difference in time-to-degree for tech prep (M = 1.14, SD = .23) and non-tech prep (M = 1.31, SD = .54) students; t(112.22) = -2.47, p = .0151. The effect size, calculated with Cohen's d, was .41 indicating a small effect size (Gravetter & Wallnau, 2013). These results suggest there was a statistically significant difference between time-to-degree for tech prep and non-tech prep students.

Table 20

Comparison of Time-to-Degree for All Completers

Tech prep status	n	Mean	SD	Lower 95%	Upper 95%
Tech prep	30	1.14	.23	1.05	1.23
Non-tech prep	92	1.31	.54	1.20	1.43

Note. t(112.22) = -2.47, p = .0151 (two-tailed)

Business and Management. For the comparison of time-to-degree for Business and Management students, the Levene Test provided evidence (p = .0682) that the homogeneity of variances assumption was met. Therefore, the t-test for independent samples was conducted assuming equal variances. The results are displayed in Table 21.

There was not a statistically significant difference in time-to-degree for tech prep (M = 1.29, SD = .31) and non-tech prep (M = 1.62, SD = .79) students; $t(29) = -1.29$, p = .2876. These results suggest there was not a statistically significant difference between time-to-degree for tech prep and non-tech prep students in the Business and Management career cluster.

Table 21

Comparison of Time-to-Degree for Business and Management Completers

Tech prep status	n	Mean	SD	Lower 95%	Upper 95%
Tech prep	7	1.29	.31	1.00	1.57
Non-tech prep	24	1.62	.79	1.29	1.95

Note. $t(29) = -1.08$, $p = .2876$ (two-tailed)

Engineering and Technology. For the comparison of time-to-degree for Engineering and Technology students, the Levene Test provided evidence (p = .8425) that the homogeneity of variances assumption was met. Therefore, the t-test for independent samples was run assuming equal variances. The results are displayed in Table 22. There was not a statistically significant difference in time-to-degree for tech prep (M = 1.19, SD = .33) and non-tech prep (M = 1.21, SD = .27) students; $t(8) = -0.10$, p = .4612. These results suggest there was not a statistically significant difference between time-to-degree for tech prep and non-tech prep students in the Engineering and Technology career cluster.

Table 22

Comparison of Time-to-Degree for Engineering and Technology Completers

Tech prep status	n	Mean	SD	Lower 95%	Upper 95%
Tech prep	3	1.19	.33	0.37	2.00
Non-tech prep	7	1.21	.27	0.96	1.46

Note. $t(8) = -0.10$, p = .4612 (two-tailed)

Health Science. For the comparison of time-to-degree for Health Science students, the Levene Test provided evidence ($p = .0554$) that the homogeneity of variances assumption was met. Therefore, the t-test for independent samples was run assuming equal variances. The results are displayed in Table 23.

There was not a statistically significant difference in time-to-degree for tech prep (M = 1.15, SD = .20) and non-tech prep (M = 1.27, SD = .45) students; $t(38) = -0.83$, $p = .2056$ for Health Science students. These results suggest there was not a statistically significant difference between time-to-degree for tech prep and non-tech prep students in the Health Sciences career cluster.

Table 23

Comparison of Time-to-Degree for Health Science Completers

Tech prep status	n	Mean	SD	Lower 95%	Upper 95%
Tech prep	10	1.15	.20	1.00	1.29
Non-tech prep	30	1.27	.45	1.10	1.44

Note. $t(38) = -0.83$, $p = .2056$ (two-tailed)

Skilled and Technical Science. For the comparison of time-to-degree for Skilled and Technical Science students, the Levene Test provided evidence ($p = .0212$) that the homogeneity of variances assumption was not met. Therefore, the t-test for independent samples was run assuming unequal variances. The results are displayed in Table 24.

There was a statistically significant difference in time-to-degree for tech prep (M = 1.01, SD = .08) and non-tech prep (M = 1.14, SD = 30) students; $t(38.38) = -2.14$, $p = .0388$. The effect size, calculated with Cohen's *d*, was .59, indicating a medium effect (Gravetter & Wallnau, 2013). These results suggest there was a statistically significant difference between time-to-degree for tech prep and non-tech prep students in the Skilled and Technical Science career cluster.

Table 24

Comparison of Time-to-Degree for Skilled and Technical Science Completers

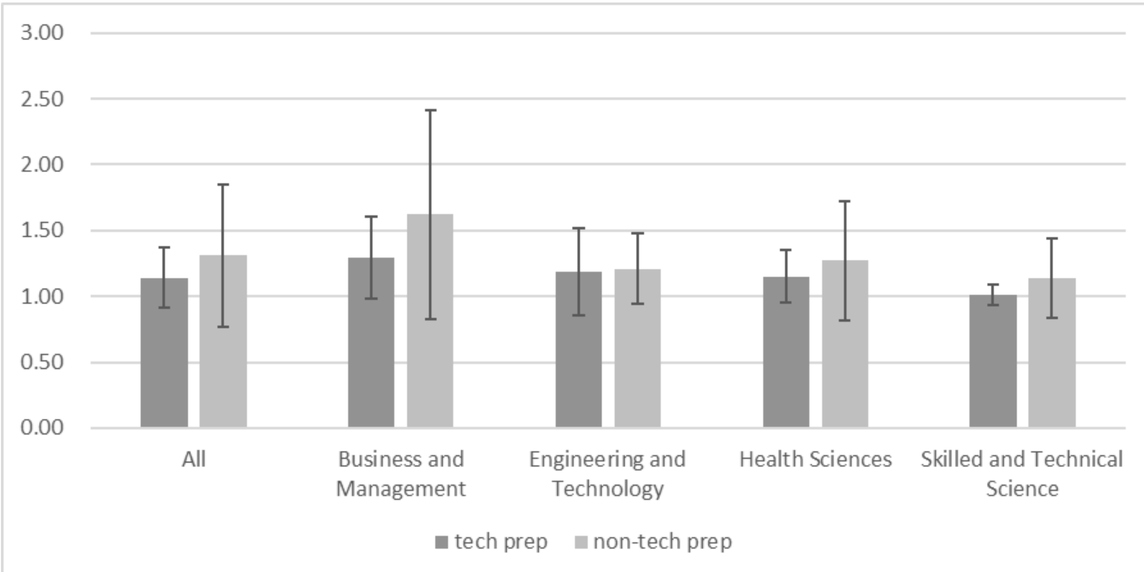
Tech prep status	n	Mean	SD	Lower 95%	Upper 95%
Tech prep	10	1.01	.08	0.96	1.07
Non-tech prep	31	1.14	.30	1.03	1.25

Note. $t(38.38) = -2.14$, $p = .0388$ (two-tailed)

Summary of Research Question #3. Figure 5 provides a graphical representation of research question #3. Each series represents average time-to-degree for students in this study that completed a technical certificate or AAS. The error bars represent one standard deviation above and below the mean for time-to-degree. In a normal distribution, 68% of the data fall within the range depicted by this interval. The data are presented in aggregate for all students and disaggregated by career cluster.

Figure 5

Comparison of Time-to-Degree for Tech Prep vs. Non-Tech Prep Students



In all cases, tech prep students had a shorter time-to-degree than their non-tech prep peers. A visual inspection also shows that the aggregate standard deviation interval was much tighter for the tech prep group than the non-tech prep group. This was the case in three of the four career clusters as well. However, only the aggregate computation and the disaggregated computation for Skilled and Technical Science were statistically significant.

Analysis of Research Question #4

Research question #4 asked if there was a statistically significant difference in technical skills assessment (TSA) pass rates between tech prep and non-tech prep students. The data were analyzed in aggregate and disaggregated by career cluster with regard to the following hypothesis:

H_o: There is no difference in technical skills attainment (TSA) pass rates for tech prep vs. non-tech prep students.

H_1: There is a difference in technical skills attainment (TSA) pass rates for tech prep vs. non-tech prep students.

Fisher's Exact Test was used for the aggregate computation due to the low expected frequency counts. The independent variable was tech prep status and the dependent variable was a frequency count of success or failure. Success indicated the student passed the TSA. Each computation was made using a .05 significance level. Table 25 lists the frequency counts and associated percentages of aggregate pass rates for all students in the study group.

Table 25

Comparison of TSA Pass Rates for All Students

Tech prep status	n	Passed	n	Failed
Tech prep	28	90.32%	3	9.68%
Non-tech prep	76	87.36%	11	12.64%

Note. $p(1, n = 118) = .999$

The tech prep group had a 90.32% pass rate and the non-tech group had an 87.36% pass rate. The resultant statistic (p = .999) was insufficient to reject the null hypothesis, indicating there was not a statistically significant difference between the two groups.

Business and Management. Table 26 lists the frequency counts and associated percentages of pass rates for Business and Management students. The tech prep group had an 80.00% pass rate and the non-tech group had an 88.24% pass rate.

Table 26

Comparison of TSA Pass Rates for Business and Management Students

Tech prep status	n	Passed	n	Failed
Tech prep	4	80.00%	1	20.00%
Non-tech prep	15	88.24%	2	11.76%

Note. $p(1, n = 22) = .999$

Fisher's Exact Test was employed for the computation. The resultant statistic (p = .999) was insufficient to reject the null hypothesis, indicating there was not a statistically significant difference between the two groups in the Business and Management career cluster.

Engineering and Technology. Table 27 lists the frequency counts and associated percentages of pass rates for Engineering and Technology students. The tech prep group had a 66.67% pass rate and the non-tech group had a 57.14% pass rate.

Table 27

Comparison of TSA Pass Rates for Engineering and Technology Students

Tech prep status	n	Passed	n	Failed
Tech prep	2	66.67%	1	33.33%
Non-tech prep	4	57.14%	3	42.86%

Note. $p(1, n = 10) = .999$

Fischer's Exact Test was used for the computation. The resultant statistic (p = .999) was insufficient to reject the null hypothesis, indicating there was not a statistically significant difference between the two groups in the Engineering and Technology career cluster.

Health Science. The frequency counts and associated percentages of pass rates for Health Science students are displayed in Table 28. The tech prep group had an 88.89% pass rate and the non-tech group had an 82.14% pass rate.

Table 28

Comparison of TSA Pass Rates for Health Science Students

Tech prep status	n	Passed	n	Failed
Tech prep	8	88.89%	1	11.11%
Non-tech prep	23	82.14%	5	17.86%

Note. $p(1, n = 37) = .999$

Fisher's Exact Test was used for the computation. The resultant statistic (p = .999) was insufficient to reject the null hypothesis, indicating there was not a statistically significant difference between the two groups in Health Sciences.

Skilled and Technical Science. Table 29 lists the frequency counts and associated percentages of pass rates for Skilled and Technical Science students. The tech prep group had a 100% pass rate and the non-tech group had a 97.14% pass rate.

Table 29

Comparison of TSA Pass Rates for Skilled and Technical Sciences Students

Tech prep status	n	Passed	n	Failed
Tech prep	14	100.00%	0	0.00%
Non-tech prep	34	97.14%	1	2.86%

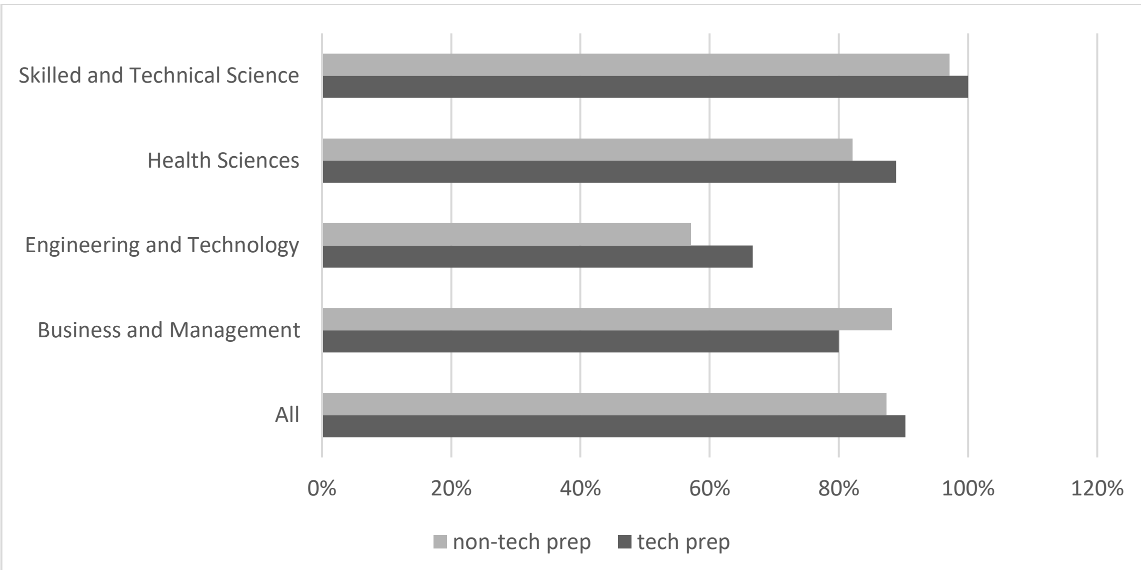
Note. $p(1, n = 49) = .999$

Fisher's Exact Test was used for the computation. The resultant statistic (p = .999) was insufficient to reject the null hypothesis, indicating there was not a statistically significant difference between the two groups.

Summary of Research Question #4. In all cases, the students performed well on Technical Skills Assessments (TSAs). Figure 6 provides a graphical representation of TSA pass rates in aggregate and disaggregated by career cluster.

Figure 6

Comparison of TSA Pass Rates for Tech Prep vs. Non-tech Prep Students



The series represent the percentages of students who passed TSAs. A visual inspection confirms the results of the statistical analysis. Although in most cases tech prep students performed better than non-tech prep students, the differences were minimal, and none were statistically significant.

Analysis of Research Question #5

Research question #5 seeks to understand whether the articulated credits actually were applied to the degree that the student earned. This question was analyzed using three different criteria.

Appendix A At least one credit was applied to the degree

Appendix B Number of courses that applied to the degree vs. number of courses that did not apply to the degree

Appendix C Number of credits that applied to the degree vs. number of credits that did not apply to the degree

The three criteria were chosen to display the various ways that articulated credit can be considered. Generally, when a student requests that credit gets articulated, it is an all or nothing proposition. All articulated credit that the student was eligible for goes on the transcript whether it does or does not appear to be applicable to the student's program.

The number of courses that are articulated was the most neutral way to consider applicability. Because courses have varying credits, the impact of articulated credit can be confounded by comparing credits to credits when considering the coursework the student completed prior to matriculation. However, the total credits earned was a useful measure when considering the overall impact on the student's program completion prior to matriculation. Each of the following tables contain three measures of applicability of articulated credits: at least one credit articulated, number of courses articulated, and number of credits articulated. The data are displayed in aggregate for all completers, and disaggregated by career cluster.

Table 30

Articulated Credits That Applied to a Degree for All Completers

Credits Applied	At least one	%	Courses	%	Credits	%
Yes	19	63.3%	40	55.6%	109	55.6%
No	11	36.7%	32	44.4%	87	44.4%
Total	30		72		196	

Of the 30 tech prep students who completed an EITC degree, 19 had at least one class that was applied to his or her program. Seventy-two courses were articulated with a value of 196 credits. Of those, 40 courses, worth 109 credits, were applicable to the degrees the students earned. Table 30 displays the aggregate data.

Gewertz et al. (2016) reported that students lose an average of 13% of pre-college credits when they enroll in college. Students in this study, who persevered to degree completion, lost 44.4% of their pre-college credits.

Business and Management. The data for the Business and Management career cluster is displayed in Table 31. Classes that articulated include Economic Issues/Applied Economics, Accounting, and Computer Information Systems.

Table 31

Articulated Credits That Applied to a Degree for Business and Management completers

Credits Applied	At least one	%	Courses	%	Credits	%
Yes	5	71.4%	8	80.0%	16	76.2%
No	2	28.6%	2	20.0%	5	23.8%
Total	7		10		21	

Within the Business and Management career cluster, five of seven students had at least one articulated course that applied to the degree the student earned. Eight of ten courses, and 16 of 21 credits applied to the degrees the students earned.

Engineering and Technology. As displayed in Table 32, the Engineering and Technology career cluster, no articulated credits applied to the three students’ eventual degrees.

Table 32

Articulated Credits That Applied to a Degree for Engineering and Technology Completers

Credits Applied	At least one	%	Courses	%	Credits	%
Yes	0	0.0%	0	0.0%	0	0.0%
No	3	100%	7	100%	21	100%
Total	3		7		21	

All three students in this field articulated the Economic Issues/Applied Economics course, which did not apply to the earned degree. Classes that would articulate and be able to be applied to the degree programs within Engineering and Technology include Computer Repair, Web Development, and Engineering Technology.

Health Science. In the Health Sciences career cluster, seven of ten students had at least one articulated course apply to the earned degree. The data for health sciences is displayed in Table 33.

Table 33

Articulated Credits That Applied to a Degree for Health Science Completers

Credits Applied	At least one	%	Courses	%	Credits	%
Yes	7	70.0%	15	50.0%	56	60.2%
No	3	30.0%	15	50.0%	37	39.8%
Total	10		30		93	

Of 30 courses, worth 93 credits, 15 courses worth 56 credits applied to the students' degrees. Most of the articulated credits that applied to degrees came from the basic health care classes of CNA, Introduction to Health Professions, and Medical Terminology.

Skilled and Technical Science. Data for Skilled and Technical Science completers are displayed in Table 34. Within the Skilled and Technical Science career cluster, seven of ten students had at least one credit count toward their degree.

Table 34

Articulated Credits That Applied to a Degree for Skilled and Technical Science Completers

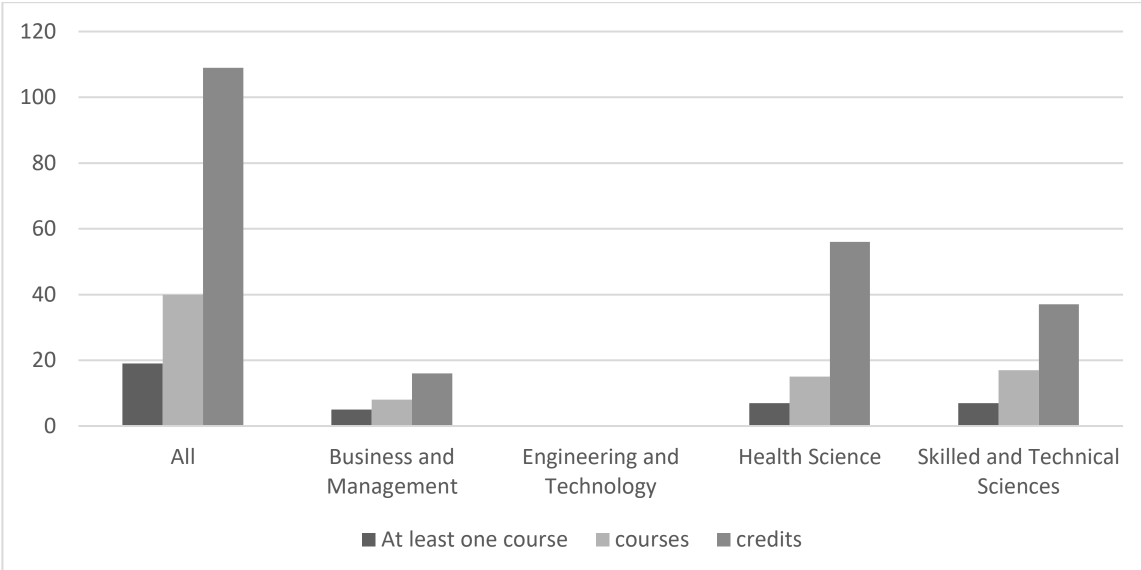
Credits Applied	At least one	%	Courses	%	Credits	%
Yes	7	70%	17	68.0%	37	60.7%
No	3	30%	8	32.0%	24	39.3%
Total	10		25		61	

Of 25 courses, worth 61 credits, that were articulated, 17 courses, worth 37 credits, were applicable to the degrees earned. Typical classes that were articulated and applied to the degree program were welding classes and basic car repair classes.

Summary of Research Question #5. Figure 7 provides a graphical display of research question #5. Three series are displayed corresponding with the three criteria used to describe the applied articulated credits in both aggregate form and disaggregated by career cluster. Through this visual analysis, it is evident that Health Science and Skilled and Technical Science classes contribute more applicable courses and credits per student than the other two career clusters.

Figure 7

Articulated Coursework That Applied to Earned Degrees



Analysis of Research Question #6

To what extent did the student complete a program in the same career cluster as the tech prep credits? This question seeks to understand the effect participation in tech prep may have had on a student's motivation to pursue a course of study associated with a particular career cluster. For example, if a student articulated credits in welding, did he or she complete a degree in automotive technology (both are in the same career cluster), or in nursing (a different career cluster). Articulated credits and courses were coded into three categories: match, partial match, and no match (Brodsky & Arroyo, 1999). The data is displayed in Table 35.

Match referred to an articulated course that applied to the student's degree, thereby saving the student from taking the course at the postsecondary level. Partial match indicated an articulated course that was in the same career cluster as the student's degree, but not applicable to the degree. No match referred to an articulated course that was in a different career cluster than the student's degree.

Table 35

Articulated Credits in Relationship to Students' Earned Degrees

Match to graduation career cluster	Articulated courses	%	Articulated credits	%
Match	40	55.6%	109	55.6%
Partial match	3	4.2%	9	4.6%
No match	29	40.3%	78	39.8%

The 40 courses and 109 credits in Table 35 are the same courses and credits described in research question #5. The new information, partial match, describes articulated courses and credits that were in the same career cluster as the student's degree, but were not applicable to the degree. This number is small—three courses and nine credits. This may be attributed to the introductory nature of courses available for articulation, or to the career discernment of the student prior to enrolling in the technical college.

Analysis of student records showed two situations where articulated credits were in the same career cluster as the degree, yet no credits applied to the degree. In one case, the student articulated credits in basic computers and web development, which are in the Engineering and Technology career cluster. The student earned a degree in Computer Networking Technologies (CNT), which is also in the Engineering and Technology career cluster. None of the articulated credits applied to the degree. However, the student's interest in computers, which led to the CNT degree, may have started with the exposure in high school.

In the other case, the student earned articulated credit in Economic Issues/Applied Economics from the Business and Management career cluster. The student completed an Intermediate Technical Certificate in Applied Accounting, also in the Business Management career cluster. However, the credits did not apply, because Economic Issues/Applied Economics is a second-year class for accounting students, and this student only completed one year. Again, the student's interest in accounting may have started with the articulated course in the Business Management career cluster.

Summary of Research Question #6. Of the 30 students who earned a degree from EITC, 21 came to EITC with articulated credit in the same career cluster as the earned degree. This can be compared to the 19 students who came to EITC with articulated credit that applied to the degree discussed in research question #5.

The second part of this question considers articulated credits that were not applied to a degree or certificate, nor in the same career cluster as the student's eventual degree. There were nine students that fell into this category. In each case, the student had credit articulated to EITC, but was unable to use them in any fashion.

Summary

Analysis found statistically significant relationships between tech prep and non-tech prep students related to the college outcomes of retention, completion, and time-to-degree when considered in the aggregate. When broken into career clusters, the differences were not statistically significant in any group except time-to-degree for Skilled and Technical Science students. Both tech prep and non-tech prep students passed technical skills assessments at equally high rates. There was no statistical significance between TSA pass rates with either the aggregate test or the disaggregated by career cluster tests.

Analysis of the applicability of articulated credit revealed that most students had at least one tech prep credit applied to the degree earned, and of the students who completed degrees, more than half of the tech prep credits earned in high school applied to the earned degree. Analysis of articulated credit related to career clusters showed that most students completed programs in the same career cluster in which they earned tech prep credit.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

Introduction

The Center on Education and the Workforce (Carnevale, Smith, & Strohl, 2013) reported that there will be 55 million job openings in the United States economy through 2020. Of those, 24 million will be newly created jobs and 31 million will replace baby boomer retirements. Thirty percent of the job openings will require less than a bachelor's degree level of education, which aligns with most career technical programs.

Idaho is facing a skills gap. A skills gap represents the difference between the number of individuals in the workforce compared to the number of projected jobs. Idaho "faces a critical shortage of tens of thousands of skilled, qualified workers by 2024 putting statewide economic growth at risk" (Hill & Whitlock, 2017, p. 7). In addition, Idaho has a low "go-on" [to college] rate that currently hovers around 48% (Corbin, 2016).

Career and Technical Education has a long history of evolving to meet the needs of industry through short-term training, certificate programs, and Associate of Applied Science (AAS) degrees within the context of national economic and workforce needs (Association for Career and Technical Education, 2018). Once such evolution has been the creation of the tech prep program to provide seamless transition from high school to postsecondary technical education. The tech prep program was originally conceived by Dale Parnell in his book, *The Neglected Majority* (1985).

Tech prep in Idaho was a credit-based transition program, which provided students with the opportunity to earn postsecondary technical credit. The credit could be articulated to Idaho technical colleges. Benefits of participation included, not only the opportunity to earn low-cost technical credit while still in high school, but also exposure to college-level career curricula, and the ability to gain technical skills and career discernment, which may help students to not only go to college, but also to succeed in college.

The purpose of this study was to examine the effect of articulated tech prep credits on college outcomes for students who matriculate to a technical college within three-and-a-half years of high school graduation. The outcomes explored were retention, degree completion, time-to-degree, and technical skills assessment pass rates. In addition, this research addressed the actual effect that the articulated tech prep credits had on degree completion and career discernment. Specifically, this study addressed the primary question of, what is the effect of tech prep participation and associated articulated credits on college outcomes?

To effectively analyze the primary question, four research questions were formulated to understand the differences between tech prep and non-tech prep students, and two research questions were formulated to understand the effect of articulated credit with regard to the completed postsecondary program and career discernment. The six research questions are as follows:

Regarding comparison of tech prep to non-tech prep:

Appendix A Is there a statistically significant difference in the second semester enrollment rate of tech prep and non-tech prep students?

12. Is there a statistically significant difference in the completion rate of tech prep and non-tech prep students?
13. To what extent did time-to-degree completion differ between tech prep and non-tech prep students?

14. Is there a statistically significant difference in technical skills assessment (TSA) pass rates between tech prep and non-tech prep students?

Regarding tech prep students only:

15. To what extent did the articulated credits apply to the degree the tech prep student completed?
16. To what extent did the student complete a program in the same career cluster as the articulated tech prep credits?

Data were obtained from the Eastern Idaho Technical College Office of Institutional Research. Records of students who graduated from an Idaho high school and matriculated to EITC within three-and-a-half years of high school graduation were used for the analysis. Of the 398 records that met the criteria, 68 formed the tech prep group and 330 formed the non-tech prep group.

Findings and Conclusions

Research question #1. Is there a statistically significant difference in the second semester enrollment rate of tech prep and non-tech prep students? This question sought to understand retention differences between tech prep and non-tech prep students.

The retention measure utilized in this study was second semester enrollment. As described in the methodology section, data were analyzed using the chi-square test for independence for a 2 x 2 matrix of success and failure. When expected frequencies dropped below five for any cell, Fisher's exact test was employed.

Results indicated that tech prep students enrolled in second semester classes at a higher rate than non-tech prep students. Tech prep students enrolled in second semester classes at a rate of 82.35% as compared to 66.67% for non-tech prep students. The difference was statistically significant with a small effect size.

This finding confirms the results described in Brodsky and Arroyo's (1999) and Shaw's (2012) studies. However, it contradicts the findings of Bragg et al. (2002) and Krile and Parmer (2002) that indicated no statistically significant differences were found. The positive results in the current study may be due to the career discernment opportunity for tech prep students, or because tech prep students have exposure to the rigor of college-level technical courses while still in high school.

When records were categorized into career clusters, expected frequencies within the 2 x 2 matrix of success and failure fell below five due to small sample sizes. Therefore, Fisher's Exact Test was used for the analysis. In the four tests for each career cluster, no statistically significant differences were detected.

For research question #1, the researcher concludes that there were statistically significant differences between tech prep and non-tech prep students in second semester retention rate when considered in aggregate. However, larger sample sizes are needed to confirm these results within career clusters.

Research question #2. Is there a statistically significant difference in the completion rate of tech prep and non-tech prep students? This question seeks to understand the difference in completion rates (earned technical certificate or AAS) between tech prep and non-tech prep students.

As described in the methodology section, records for students who have not had time to complete their stated degree program were eliminated before analysis. The data were analyzed using the chi-square statistic, or when expected frequencies fell to below five in any cell, Fisher's Exact Test was used. Tests were performed with the aggregate data and disaggregated by career cluster. The effect size was calculated using Cramer's *V*.

In this study, tech prep students completed technical certificates and AAS degrees 56.66% more often than did non-tech prep students (34.85%). The difference was statistically significant with a small effect size ($V = .172$).

This finding may be attributable to both early career discernment and the rigor of college-level curriculum while still in high school. Both Torres (2008) and Shaw (2012) found that tech prep students completed programs at higher rates than their non-tech prep peers. However, Bragg, et al. (1999) detected no difference in completion rates between tech prep and non-tech prep students.

When records were categorized into career clusters, expected frequencies within the 2 x 3 matrix fell below five due to small sample sizes. Therefore, Fisher's Exact Test was used for the analysis. In the four tests for each career cluster, no statistically significant differences were detected.

For research question #2, the researcher concluded that there were statistically significant differences between tech prep and non-tech prep students in completion rates when considered in aggregate. However, larger sample sizes were needed to confirm this result within career clusters.

Research question #3. To what extent is there a statistically significant difference in time-to-degree completion between tech prep and non-tech prep students? This question seeks to understand time-to-degree for tech prep and non-tech prep students. Time-to-degree is the time lapse between initial enrollment and graduation expressed as a percentage. Because tech prep students matriculate with articulated credits, time-to-degree should be faster for tech prep students.

The tech prep program allows students to earn postsecondary technical credit while still in high school, thus reducing the credits the student would have to take at the postsecondary technical school. Sweat and Fenster (2006) noted that when students earn credits before matriculating to college, the time-to-degree should be reduced.

This study found, that while no students graduated early, tech prep students graduated at average of 114% of normal time-to-degree, while non-tech prep students graduated an average of 131% of normal time-to-degree. These findings were statistically significant with a small effect size.

Literature supports the findings of the current study related to time-to-degree. Sweat and Fenster (2006) and Torres (2008) each found that tech prep students had a faster time-to-degree than non-tech prep students. This finding may be due to articulated credits, which allowed students to sequence college courses more effectively, or due to the commitment of the student to the career path.

When considering time-to-degree within career clusters, the only statistically significant finding was in the Skilled and Technical Science career cluster. Tech prep students graduated within an average of 101% of normal time-to-degree, while non-tech prep students graduated in an average of 114% of normal time-to-degree. This finding was statistically significant with a small effect size.

For research question #3, the researcher concluded that there was a statistically significant difference between tech prep and non-tech prep students both in aggregate and within the Skilled and Technical Science career cluster. Tech prep students graduate faster than their non-tech prep peers in all career clusters.

Research question #4. Is there a statistically significant difference in technical skills assessment (TSA) pass rates between tech prep and non-tech prep students? This question sought to understand differences between tech prep and non-tech prep students' technical skills attainment. The original methodology called for using chi-square analysis for a 2 x 2 matrix of success and failure. However, expected frequencies fell below five in at least one cell per table, so Fisher's Exact Test was employed.

Technical Skills Assessments (TSAs) are given toward the end of a postsecondary student's program, typically in a capstone class. This study found no difference in TSA pass rates between tech prep and non-tech prep students. Both groups performed well on the exams with minimal differences.

For research question #4, the researcher concluded that by the end of a successful (i.e., graduating) student's program, differences between tech prep and non-tech prep students were negligible. Although TSAs have been mandated by Perkin's legislation since 2006, there have been no studies on pass rates between tech prep and non-tech prep students at the postsecondary level. This study helps to fill that gap.

Research question #5. To what extent did the articulated credits apply to the degree the tech prep student completed? This question seeks to determine whether the articulated credits actually were applied to the degree that the student earned.

This question employed a descriptive method of categorizing the articulated credits and their utility toward a postsecondary degree using three criteria for each record: at least one credit applied, number of courses that applied, number of credits that applied.

Of the 30 students who completed postsecondary degrees, 19 were able to use 40 courses worth 109 credits. Only 55.6% of the credits articulated by EITC completers were applicable to the degree the students earned. Some of that finding may be confounded because when students articulate any credits, all earned credits are recorded on the student's transcript, whether or not the credit will apply to the student's initial program. Nevertheless, there were nine students who articulated credits that were unable to use any of the credits in their program. This finding suggests that the students had an imperfect understanding of the EITC program requirements, received inaccurate advice from an admissions counselor, or thought the credits may be useful in a future degree program.

Exploring the articulated credits of postsecondary completers yielded two interesting discoveries: First, not all students who articulated credit were able to use that credit toward their program. Second, credits generated through the Health Science and Skilled and Technical Sciences went further toward a postsecondary degree than the other two career clusters.

These findings may be due to the introductory nature of CTE classes available in the high schools. Introductory classes, such as Introduction to Health Professions and Medical Terminology, are foundational courses in all the health-related programs at EITC. In the same manner, basic welding and shop safety courses are foundational to several programs in all the mechanical trades programs at EITC.

For research question #5, the researcher reached two conclusions. First, the applicability of the actual credit articulated was minimal for postsecondary completers. Second, the courses that most readily applied to degrees were basic, introductory courses that apply to many programs within a career cluster.

Research question #6. To what extent did the student complete a program in the same career cluster as the articulated tech prep credits? This question sought to understand the effect participation in tech prep may have had on a student's motivation to pursue a course of study associated with a particular career cluster. This question may illuminate the effect of tech prep and career curricula on career discernment.

The methodology for this question utilized a descriptive technique from Brodsky and Arroyo's (1999) study on tech prep. Articulated credits were compared to each student's program of study by career cluster. Three possibilities were possible: no match, partial match, and match.

Only a small number of courses (3 courses worth 9 credits) that were articulated to EITC were in the same career cluster as the students' degrees, but not applicable to the degree. Of the 30 students who earned a degree from EITC, 21 (70%) came to EITC with articulated credit in the same career cluster as the earned degree. This finding supports the results of Brodsky and Arroyo (1999), who found that 63% of students completed a program of study in the same interest area as the articulated credits.

This finding may be due to the introductory nature of articulated courses, or because students, who earned recommended credit in a career cluster they did not want to pursue, simply did not have the credits articulated. Career exploration leading to career discernment is a benefit of career technical coursework in high school.

By taking CTE courses in high school, a student can learn what he or she enjoys and has an aptitude for, thereby moving toward career discernment. Conversely, a student can also learn what he or she does not enjoy. Hanford (2014) noted, "One goal of vocational education is to help kids figure out what they *don't* want to do" (p. 3).

For research question #6, the researcher concluded that exposure to career curricula in high school may have had an effect on students' motivation to pursue a particular career cluster in college.

Summary

The purpose of this study was to examine the effect of articulated tech prep credits on college outcomes for students who matriculate to a technical college after high school. The study was limited to Idaho high school graduates who articulated tech prep credit and matriculated to EITC within three-and-a-half years of high school graduation. In this study, tech prep students had higher retention, better rates of program completion, and shorter time-to-degree than their non-tech prep peers. The results for retention, completion, and time-to-degree were statistically significant. Both tech prep and non-tech prep students passed technical skills assessments equally well, and no statistically significant differences were found.

The applicability of articulated credit applicable to degrees was minimal. Of the 30 students who had articulated credit and completed postsecondary degrees, only 19 of them had articulated credit that applied to the degree the student eventually earned. The 19 students completed 40 courses, worth 109 credits, that were applicable to the earned degree.

The finding does not substantially change when relaxing the definition to include articulated course work that is in the same career cluster as the students' earned degrees. The looser definition contributed only three additional courses and nine additional credits for two students. There was not enough information to determine if exposure to a career field in high school played a part in the student's career decision.

Policy Implications

The Idaho Division of Career and Technical Education (2017b) states: “We prepare Idaho’s youth and adults for high-skill, in-demand careers” (para. 1). Tech prep, with its emphasis on articulated credits and seamless transition to postsecondary technical programs, certainly qualifies as preparing youth for high-skill, in-demand jobs. But, as with the Prosser/Dewey debates, CTE leaders should also consider the implications of narrow skills training.

Dewey advocated vocational education as a means to experimentation, problem solving skills, and democratic processes (Lynch, 1997). Career exploration leading to career discernment should be as much a valid goal for CTE as the career training itself. Only as a result of a student’s understanding of career roles in relationship to his or her aptitudes and opportunities will that student be successful in preparing for high-skill, in-demand careers regardless of whether the training takes place at a technical college or a four-year college.

According to the Idaho State Board of Education (2017) website, “The State Board of Education envisions an accessible, seamless public education system that results in a highly educated citizenry” (para. 1). The term seamless refers to smooth transitions between secondary and postsecondary education, a function of both credit-based transition programs and career discernment, which motivate students to continue their education in pursuit of a career, whether through a postsecondary career program or a four-year degree.

The State Board of Education is committed to the Advanced Opportunities program, which provides credit-based transition programs through advanced placement, dual credit, and tech prep (Idaho State Board of Education, 2018). Yet, Idaho has a low "go-on" [to college] rate, and evidence from this study does not support the focus on articulated credit as an indicator for success. Overall, a very small portion of tech prep students continue to postsecondary technical education.

Despite the negligible value of the actual articulated credits, this study concluded that tech prep students retained better and completed degrees more often and faster than their non-tech prep peers. Offering opportunities to students in career and technical education to explore real-world opportunities that lead to any postsecondary education is of vital importance to Idaho's economic well-being.

Results from this study have implications for educational policy and program support. The focus of the tech prep program and its successor, Idaho SkillStack, is on generating articulated credits. However, this study concludes that the usefulness of the actual articulated credits was minimal slight. The benefit of the tech prep program was successful college outcomes of increased retention, increased completion, and shorter time-to-degree. There was not enough information in this study to conclude whether the success was attributable to early exposure to college-level curricula, or the development of career discernment, which increased the students' abilities and motivation to pursue a particular career role.

Educational leaders should strive to understand the importance of career and technical education in assisting students in making career decisions and embarking on a path to effective training. The ability to explore career roles, try them out on real equipment, and gain access to opportunities within those roles, is a benefit of career and technical education and necessary components of career discernment. Therefore, educational leaders should consider the impact of CTE beyond transitioning from secondary schools to postsecondary technical programs.

Career counseling is key to career exploration. Career counselors in secondary schools must understand the importance of balancing the students' career aspirations with educational opportunities that are a good match, both academically and financially, to the student's particular circumstances. Postsecondary technical education is a shorter, often less expensive, route to a secure career. This study provided evidence that tech prep students have better technical college outcomes than their non-tech prep peers, yet participation was low. CTE teachers in both secondary and postsecondary institutions, as well as career counselors, should strive to provide the necessary linkage to increase the number of students transitioning to postsecondary technical education, especially among those students who fail to "go-on" [to college] at all.

Career Technical Education encompasses many career clusters. Yet, funding for CTE programs is often limited, especially in the smaller school districts. Increases in funding for secondary CTE education may allow schools to develop CTE programs in a variety of career clusters to better serve students and provide more opportunity to explore career roles.

Recommendations for Further Research

Appendix B Although results from this study indicate that tech prep students outperform non-tech prep students in retention, completion, and time-to-degree, additional study is needed that encompasses all tech prep students in Idaho who matriculate to postsecondary technical programs with articulated credits to determine if there are similar findings.

Appendix C Further study is also needed with regard to career clusters. This study produced no statistically significant findings when data was disaggregated by career clusters even though the aggregate data produced a statistically significant difference. Larger sample sizes within career clusters will help mitigate the difference and provide evidence of exemplary tech prep programs within disciplines.

Appendix D Once exemplary programs are identified, further research into the success of those programs is in order to duplicate the success in other high schools and partner institutions. This research should be qualitative in nature and include the viewpoints of instructors, students, and advisory committee members.

Appendix E Career discernment was of interest in this study. A similar study tracing the articulated credits to non-technical programs and determining their effect on college outcomes would help stakeholders understand the effect of career curricula on students' postsecondary career choices and college outcomes.

Appendix F The topic of career discernment would also benefit from qualitative analysis to learn the effect of career curricula and the tech prep program on student's career decisions. Possible outcomes would be to learn if high school career curricula helped students to develop passion in a field, made the student realize that a particular course of study was not a good match, or that skills learned in career curricula were of use to the student outside the realm of education and career roles.

Appendix G Idaho is embarking on a new system for articulated credits, the SkillStack program. A research model, well-defined and consistently applied across the state, is recommended to determine the effect of articulated credit on college outcomes including retention, completion, time-to-degree, and career discernment in both technical colleges and four-year colleges.

Career and Technical Education is of great importance to Idaho to address the projected skills gap. Idaho's projected skills gap of approximately 46,000 jobs by 2024 must be filled with an educated workforce. Many of those jobs require less than a bachelor's degree of education, which aligns with career and technical programs available in Idaho high schools and provides a path to postsecondary technical education.

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APPENDIX A

Authorization for Use of Data

Eastern Idaho Technical College

June 30, 2017

This letter provides authorization for Leslie Jernberg to utilize data from Eastern Idaho Technical College's Colleague database and the EITC Advanced Opportunities database relative to her dissertation titled "The Effect of Articulated (tech prep) Credit on College Outcomes at a Stand-alone Technical College." At Eastern Idaho Technical College, in the absence of an Institutional Review Board, authority for utilization of data for outside research rests with the President of the College.

The data is archival, and poses no risk to human subjects.

Data will be compiled by Eastern Idaho Technical College's Department of Institutional Research, and will be provided on an Excel spreadsheet after all personally identifiable information has been removed.

Data reported in Ms. Jernberg's dissertation will be aggregate.

Eastern Idaho Technical College is in the process of converting to the College of Eastern Idaho. This letter also provides my support should data need to be updated after the conversion date. Ms. Jernberg may have to seek permission from the new administration for data collected after the conversion date.

Sincerely,

Rick Aman, PhD
President

1600 S. 25TH E. • IDAHO FALLS, IDAHO • 83404-5788 • 208.524.3000 • 800.662.0261 • www.eitc.edu

Idaho State
UNIVERSITY

Office for Research - Research Outreach & Compliance
921 S. 8th Avenue, Stop 8046 • Pocatello, Idaho 83209-8046

Jan 11, 2018

Leslie Jernberg
UBO- Education
MS 8059

RE: regarding study number IRB-FY2018-188: The Effect of Articulated (tech prep) Credit on College Outcomes at a Stand-alone Technical College

Dear Ms. Jernberg:

I agree that this study qualifies as exempt from review under the following guideline: Category 4. Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.
This letter is your approval, please, keep this document in a safe place.

Notify the HSC of any adverse events. Serious, unexpected adverse events must be reported in writing within 10 business days.

You are granted permission to conduct your study effective immediately. The study is not subject to renewal.

Please note that any changes to the study as approved must be promptly reported and approved. Some changes may be approved by expedited review; others require full board review. Contact Tom Bailey (208-282-2179; fax 208-282-4723; email: humsubj@isu.edu) if you have any questions or require further information.

Sincerely,

Ralph Baergen, PhD, MPH, CIP
Human Subjects Chair

APPENDIX B

Certificate and Degree Programs at Eastern Idaho Technical College

Career cluster	Degree code	Program	Degree or certificate type
Business & Management			
	AAC.TC	Accounting	TC
	AAC.ITC	Accounting	ITC
	ACP.AAS	Accounting	AAS
	BT.TC	Business Technology	TC
	BT.ITC	Business Technology	ITC
	LGL.AAS	Legal Technologies	AAS
	LGL.TC	Legal Technologies	TC
	LGL.ITC	Legal Technologies	ITC
	MAM.AAS	Marketing and Management	AAS
	MAM.ATC	Marketing and Management	ATC
	OFP.AAS	Office Professional	AAS
	OFS.TC	Office Specialist	TC
	OFS.ITC	Office Specialist	ITC
Engineering & Technology			
	CNT.AAS	Computer Networking Technology	AAS
	CNT.ITC	Computer Networking Technology	ITC
	WDS.AAS	Web Development Specialist	AAS
	WDS.ATC	Web Development Specialist	ATC
	WDS.ITC	Web Development Specialist	ITC
Health Sciences			
	MA.AAS	Medical Assisting	AAS
	PN.ATC	Practical Nursing	ATC
	PN.ITC	Practical Nursing	ITC
	RDS.ITC	Radiation Safety	ITC
	RDS.TC	Radiation Safety	TC
	RN.AAS	Registered Nursing	AAS
	SRT.AAS	Surgical Technology	AAS
Skilled & Technical Sciences			
	AT.AAS	Automotive Technology	AAS
	AT.ATC	Automotive Technology	ATC
	AT.TC	Automotive Technology	TC
	DT.AAS	Diesel Technologies	AAS
	DT.ATC	Diesel Technologies	ATC
	DTL.TC	Diesel Technologies	TC
	DTL.ITC	Diesel Technologies	ITC
	ESTEC.TC	Energy Systems	TC
	ESTEC.ITC	Energy Systems	ITC
	MTT.AAS	Machine Tool Technologies	AAS
	WLD.AAS	Welding	AAS
	WLD.ATC	Welding	ATC

AAS: Associate of Applied Science (minimum of 60 semester credits with 15 credits of transferable general education including identifiable learning outcomes associated with communication, computation, and human relations)

ATC: Advanced Technical Certificate (minimum of 52 semester credits with identifiable learning outcomes associated with communication, computation, and human relations)

ITC: Intermediate Technical Certificate (minimum of 30 semester credits with identifiable learning outcomes associated with communication, computation, and human relations)

TC: Technical Certificate (same definition as ITC). Intermediate Technical Certificate reflects updated language made by the Idaho Division of Professional-Technical Education

APPENDIX C

Idaho Postsecondary Technical Skills Assessments

Postsecondary Technical Skills Assessments

Program	CIP Code	Source of Assessment	Assessment Name
Accounting/Bookkeeping	52.0302	NOCTI	Accounting Basic #4000
Accounting/Bookkeeping	52.0302	NOCTI	Accounting Advanced #4900
Accounting/Bookkeeping	52.0302	The American Institute of Professional Bookkeepers	Certified Bookkeeper
Administrative Assistant	52.0401	NOCTI	Administrative Assisting#4101
Administrative Assistant	52.0401	Certiport	Microsoft Office Specialist (MOS) Certification MOS: Microsoft Office 2010 Word, Excel, Pp., Access, and Outlook
Administrative Assistant	52.0401	Office Proficiency Assessment & Certification (OPAC)	Office Skills, Clerical Skills& Software Skills Testing
Administrative Specialist	52.0401	International Association of Administrative Professionals (IAAP)	IAAP Certification
Agriculture Floriculture/Greenhouse	1.0608	NOCTI	Floriculture/Greenhouse #4949
Agriculture Horticulture Technology	1.0601	Idaho Nursery and Landscape Association	Certified Nursery Professional Exam
Agriculture Horticulture: Floriculture/Greenhouse	1.0608	NOCTI	Floriculture/Greenhouse #4949
Agriculture Horticulture: Landscaping	1.0605	NOCTI	Horticulture/Landscaping Option #4149

Program	CIP Code	Source of Assessment	Assessment Name
Agriculture Livestock Technician	1.0302	Idaho Department of Agriculture	Artificial Insemination State Licensure Test
Agriculture Production	1.0301	NOCTI	Production Agriculture #3063
Agriculture Veterinary Technician	51.0808	American Association of Veterinary State Boards (AAVSB)	Veterinary Technician National Examination (VTNE)
Agriculture & Natural Resources	1.0901	Animal Care Technologies	Veterinary Assistant ICertification Exam
Animal Science	1.0901	Oklahoma Career Tech Testing Center	Animal Science: Animal Production Assistant #46101
Animal Science	1.0101	NOCTI	Animal Systems #1227
Auto Body/Collision Repair	47.0603	I/CAR	I/CAR Qualification Tests
Auto Body/Collision Repair	47.0603	NOCTI	Collision Repair Technology #4006 Collision Repair Refinishing Technology #3083
Auto Body/Collision Repair	47.0603	ASE / NA3SA www.NA3SA.com	Collision Repair and Refinish Test Series
Auto Body/Collision Repair	47.0603	National Automotive Student Skills Standards Assessment (NA3SA)	Automotive Refinishing
Auto Body/Collision Repair	47.0603	National Automotive Student Skills Standards Assessment (NA3SA)	Collision Repair Technology
Automation Engineering Technology	15.0406	NOCTI	Industrial Electronics # 2051

Program	CIP Code	Source of Assessment	Assessment Name
Automotive Technology	47.0604	National Automotive Technicians Educational Foundation (NATEF)	ASE Automobile/Light Truck Certification Test Series
Automotive Technology	47.0604	National Automotive Student Skills Standards Assessment (NA3SA)	Automotive Service Technology
Automotive Technology Advanced	47.0604	NOCTI	Automotive Technician Advanced #4008
Building Construction (Residential Carpentry)	46.0201	NOCTI	Carpentry #4015
Business Management/Entrepreneurship	52.0201	NOCTI	General Management #1103
Cabinetmaking	48.0703	SkillsUSA Work Force Ready System	Cabinetmaking
Cabinetmaking	48.0703	NOCTI	Cabinetmaking #3014
Computer Applications/Data Entry	11.0601	Microsoft Certified Apps Specialist (MCAS)	Minimum of one exam required 77-601: Using Microsoft Word 77-602: Using Microsoft Excel 77-605: Using Microsoft Access 77-607: Using Microsoft PowerPoint 2007
Computer Applications/Data Entry	11.0601	Certiport IC3 Certification	Microsoft Office Specialist Certification
Computer Network Support Technician	11.0901	Microsoft Certified Professional - Microsoft Certified Technology Specialist	Minimum of one (1) exam required from the server technologies certifications
Computer Network Support Technician	11.0901	Cisco	Minimum of one (1) exam required from the CCENT and/or CCNA certifications

Program	CIP Code	Source of Assessment	Assessment Name
Computer Network Support Technician	11.0901	CompTIA	Minimum of one (1) exam Linux+ Certification required: Network+ and
Computer Network Support Technician	11.0901	NOCTI	Computer Networking Fundamentals #4414
Computer Programming and Software Development	11.0201	CTECS	Idaho Programming & Software Development
Computer Service Technology	47.0104	SkillsUSA Work Force Ready System	Computer Maintenance Technology
Computer Service Technology	47.0104	NOCTI	Computer Repair Technology #4415
Computer Service Technology	47.0104	CompTIA	CompTIA A+ certification
Computer Service Technology	47.0104	Test Out Corp	PC Pro
Construction Trades	46.9999	SkillsUSA Work Force Ready System	Carpentry Blueprint
Cosmetology	12.0401	Idaho State Board of Cosmetology	Cosmetologist License Exam www.ibol.idaho.gov/cos.ht m
Culinary Arts - Baking/Pastry	12.0501	NOCTI	Retail Commercial Baking #4010
Culinary Arts - Commercial Baking	12.0501	SkillsUSA Work Force Ready System	Commercial Baking
Culinary Arts Technology	12.0508	NOCTI	Culinary Arts Prep Cook Level 1 # 4236 and Culinary Arts Cook Level 2 #4336
Culinary Arts Technology	12.0508	The National Restaurant Assn. Educational Foundation	ServSafe Food Protection Manager Certification Exam
Culinary Arts Technology	12.0508	The National Restaurant Assn. Educational Foundation	Foodservice Management Professional (FMP) certification

Program	CIP Code	Source of Assessment	Assessment Name
Culinary Arts Technology	12.0508	American Culinary Federation	Certified Culinary Certificate
Dental Assisting	51.0601	Dental Assisting National Board (DANB)	DANB Certified Dental Assistant (CDA) exam
Dental Assisting	51.0601	NOCTI	Dental Assisting #4026
Diesel Technology	47.0605	National Automotive Technicians Educational Foundation (NATEF)	Automotive Service Excellence (ASE), ASE Medium/Heavy Truck Test Series
Diesel Technology	47.0605	NOCTI	Diesel Engine Technology #4027
Diesel Technology	47.0605	ASE NA3SA www.NA3SA.com	Diesel Equipment Technology
Drafting Technology	15.1302	NOCTI	Mechanical Drafting & Design #4038, CAD #4973, CAD/CAM #3073, or Technical Drafting #4054
Drafting Technology	15.1302	Autodesk	AutoCAD Certified Associate Exam
Drafting Technology	15.1302	SolidWorks	Certified SolidWorks Associate Exam
Drafting Technology - Architectural	15.1303	NOCTI	Architectural Drafting #4004
Drafting Technology - Architectural	15.1303	SkillsUSA Work Force Ready System	Architectural Drafting
Early Childhood Development	19.0708	NOCTI	Early Childhood Care and Education/Adv. #4017
Early Childhood Development	19.0708	Council for Professional Recognition	Child Development Associate (CDA)
Education Assistant	13.121	ETS Praxis Series	ParaPro Assessment
Electronics Technology	47.0105	NOCTI	Electronics Technology #4035 or Electronics #2034
Electronics Technology	47.0105	SkillsUSA Work Force Ready System	Electronics Application & Technology

Program	CIP Code	Source of Assessment	Assessment Name
Electronics Technology	47.0105	International Society of Certified Electronics Technicians	Certified Electronics Technician
Electronics Technology	47.0105	Electronics Technicians Association (ETA)	Student Certified Electronics Technician (sCET)
Emergency Medical Technician	51.0904	FISDAP	EMT Comprehensive Exam
Emergency Medical Technician	51.0904	National Registry of Emergency Medical Technicians	EMT/Basic
Entrepreneurship	52.0701	A*S*K Business Institute (MarkEd & DECA Joint Initiative)	Concepts of Entrepreneurship & Management
Environmental Technology	15.0507	NOCTI	Industrial Electricity #2050
Fire Service Technology	43.0203	US Fire Administration	Firefighter I or subsequent assessment
Graphic Communications	10.0304	SkillsUSA Work Force Ready System	3D Visualization & Animation
Graphic Communications	9.0702	NOCTI	Visual Communications and Multimedia Design #2425
Graphic Communications	10.0301	SkillsUSA Work Force Ready System	Graphic Communications
Graphic Communications	10.0301	SkillsUSA Work Force Ready System	Advertising & Design
Health Information Technology	51.0707	National Health Career Association (NHA)	Certified Medical Administrative Assistant (CMAA)
Health Information/Medical Records Technology	51.0707	Delmar Cengage	Capstone Assessment Test (CAT): Professional Review Guide for RHIT Credential

Program	CIP Code	Source of Assessment	Assessment Name
Health Information/Medical Records Technology	51.0707	Delmar Cengage	Capstone Assessment Test (CAT): Professional Review Guide for the CCS/CCSP Credential
Hospitality Management	52.0901	NOCTI	Hospitality Mgmt Food & Beverage #3079 and Hospitality Mgmt Lodging #3080
Hospitality Management	52.0901	American Hotel and Lodging Association Educational Institute	Lodging Management Program 1
Human Services	44	Center for Credentialing and Education	Human Services-Board Certified Practitioner (HS/BCP)
HVAC Technician	47.0201	National Center for Construction Education & Research (NCCER)	HVAC Technician
HVAC Technician	47.0201	HVAC Excellence	Employment Ready Certification: Air Conditioning
HVAC Technician	47.0201	NOCTI	HVAC #3045
HVAC Technician	47.0201	The Air-Conditioning, Heating, and Refrigeration Institute (AHRI)	Industry Competency Exam (ICE) for HVAC Technician
HVAC/R Technician	47.0201	NOCTI	HVAC & Refrigeration #3064
Industrial Mechanics	47.0303	NOCTI	Industrial Maintenance Mechanics #2074
Information Technology - Digital Media	9.0702	NOCTI	Visual Communications and Multimedia Design #2425
IT Dev and Security	11.0901	CompTIA	CompTIA Security+ certification
IT Dev and Security	11.0901	TestOut	TestOut Security Pro Certification
Law Enforcement	43.0107	NOCTI	Criminal Justice #4081

Program	CIP Code	Source of Assessment	Assessment Name
Law Enforcement	43.0107	State of Idaho, Peace Officer Standards and Training Council	Peace Officer Standards and Training (POST) Basic Certification
Legal Office Technology/Legal Assistant	22.0302	National Association of Legal Secretaries	Accredited Legal Secretary Certification
Legal Office Technology/Paralegal	22.0302	Office Proficiency Assessment & Certification (OPAC)	
Machine Tool Technology	48.0501	Skills USA	CNC Milling and Turning Technology
Manufacturing Technology/Automated Manufacturing	15.0613	NOCTI	Manufacturing Technology #2084 or Precision Machining #4052
Marketing and Management	52.1401	A*S*K Business Institute (MarkEd & DECA Joint Initiative)	Minimum of One (1) Exam Required: Fundamental Marketing Concepts, Fundamental Business Concepts, Concepts of Finance, Concepts of Entrepreneurship & Management
Masonry	46.0101	National Center for Construction Education & Research (NCCER)	Masonry Level One
Medical Administrative Assistant	51.0716	National Health Career Association	Medical Administrative Assistant Certification (CMAA)
Medical Administrative Assistant	51.0701	Office Proficiency Assessment & Certification (OPAC)	Office Skills, Clerical Skills& Software Skills Testing

Program	CIP Code	Source of Assessment	Assessment Name
Medical Assistant	51.0801	American Association of Medical Assistants (AAMA)	CMA (AAMA) National Certification Exam
Medical Assistant	51.0801	NOCTI	Medical Assisting #3055
Medical Assistant	51.0801	American Medical Technologists (AMT)	Registered Medical Assistant
Medical Coding	51.0713	American Academy of Professional Coders (AAPC)	Certified Professional Coder
Medical Coding	51.0713	American Health Information Management Association	Certified Coding Associate
Mental Health Services Technician (Addiction Studies)	51.1502	Idaho Board of Alcohol and Drug Counselor Certification, Inc.	Idaho Student of Addiction Studies (ISAS)
Network Administration	11.1001	Certiport	Microsoft Technology Associate Server Administrator
Network Administration	11.1001	Microsoft	Microsoft Technology Associate Server Administrator
Nurse Assistant	51.1614	Prometric	Idaho Certified Nurse Assistant (CNA) Exam
Paramedic	51.0904	National Registry of Emergency Medical Technicians	Paramedic Certification
Pharmacy Technician	51.0805	PassAssured, LLC	PTCB Exam
Pharmacy Technician	51.0805	Institute for the Certification of Pharmacy Technicians	ExCPT exam

Program	CIP Code	Source of Assessment	Assessment Name
Practical Nurse (LPN)	51.1613	National Council of State Boards of Nursing (NCSBN)	Licensed Practical Nurse (NCLEX/PN)
Professional Truck Driver Training Program	49.0205	State of Idaho, Department of Motor Vehicles	Class A Commercial Drivers' License (CDL) Test
Radiation Safety	41.0299	Department of Energy	CORE Exam
Radiologic Technology	51.0907	American Registry of Radiologic Technologists (ARRT)	Radiography Exam
Registered Nurse (RN)	51.1601	National Council of State Boards of Nursing (NCSBN)	Registered Nurse (NCLEX/RN)
Small Engine Mechanic/Technician	47.0606	Equipment & Engine Training Council (EETC)	EETC Technician Certificate (1) test required
Surgical First Assistant	51.0909	National Board of Surgical Technology & Surgical Assisting	NBSTSA National Certification Exam
System Administration	11.1001	Skills USA	Computer Maintenance Technology
Water Resource Management	15.0506	Brown Environmental, Inc.	Water Wastewater Laboratory Competency Exam
Water Resource Management	15.0506	Idaho Board of Water and Wastewater Professionals	Drinking Water or Wastewater Licensure: Operator in Training
Web Applications Development	11.0801	Adobe	Adobe Certified Associate
Web Applications Development	11.0801	Adobe	Adobe Certified Expert

Program	CIP Code	Source of Assessment	Assessment Name
Web Applications Development	11.0801	World Organization of Webmasters (WOW)	Apprentice, Associate, and Professional Level Certifications Available
Web Applications Development	11.0801	NOCTI	Visual Communications and Multimedia Design #2425
Web Applications Development	11.0801	Expert Rating	HTML 4.01
Web Applications Development	11.0801	NOCTI	Web Design #2750
Web Applications Development	11.0801	Microsoft	Microsoft Technology Associate certification no. 98-375 (HTML 5: App Development Fundamentals)
Welding Technology	48.0508	American Welding Society	AWS QC10, A WS EG2.0, Level I-Entry Welder
Wind Energy Technology	15.0503	NOCTI	Wind Turbine Technician #2150
Wind Energy Technology	15.0503	Syntech Safety Solutions	Fall Protection and Rescue Written Assessment; technical skills proficiency exam

APPENDIX D

Idaho High Schools Participating in EITC Consortium Agreements

High school	District	City
Bear Lake High School	#33	Montpelier
Aberdeen High School	#58	Aberdeen
Firth High School	#59	Firth
Shelley High School	#60	Shelley
Compass Academy	#91	Idaho Falls
Eastern Idaho Professional Technical High School	#91	Idaho Falls
Emerson Alternative High School	#91	Idaho Falls
Idaho Falls High School	#91	Idaho Falls
Skyline High School	#91	Idaho Falls
Bonneville High School	#93	Idaho Falls
Hillcrest High School	#93	Idaho Falls
Technical Careers High School	#93	Idaho Falls
Butte High School	#111	Arco
Grace High School	#148	Grace
Clark County Junior/Senior High School	#161	Dubois
Challis Junior/Senior High School	#181	Challis
Mackay Junior/Senior High School	#182	Mackay
North Fremont Junior/Senior High School	#215	Ashton
South Fremont High School	#215	St. Anthony
Jefferson Alternative High School	#251	Menan
Rigby High School	#251	Rigby
Ririe High School	#252	Ririe
West Jefferson High School	#253	Terreton
Valley High School	#262	Hazelton
Salmon High School	#291	Salmon
Leadore High School	#292	Leadore
Highland High School	#305	Craigmont
Madison High School	#321	Rexburg
Sugar-Salem High School	#322	Sugar City
Rockland High School	#382	Salmon
Teton High School	#401	Driggs

APPENDIX E

Colleges Where EITC Articulated Credit Was Sent – FY13-17

				headcount	headcount %	credits	credits %
Idaho 2-year Public							
	College of Southern Idaho	Twin Falls	ID	31	2.8%	128	2.5%
	College of Western Idaho	Nampa	ID	3	0.3%	12	0.2%
	EITC	Idaho Falls	ID	79	7.2%	493	9.7%
	North Idaho College	Coeur d'Alene	ID	3	0.3%	14	0.3%
Idaho 4-year and above Private not-for-profit							
	BYU-Idaho	Rexburg	ID	337	30.7%	1,606	31.5%
	College of Idaho	Caldwell	ID	5	0.5%	18	0.4%
	Northwest Nazarene	Nampa	ID	1	0.1%	3	0.1%
Idaho 4-year and above Public							
	Boise State University	Boise	ID	34	3.1%	135	2.6%
	Idaho State University	Pocatello	ID	209	19.1%	963	18.9%
	Lewis & Clark State College	Lewiston	ID	2	0.2%	14	0.3%
	University of Idaho	Moscow	ID	44	4.0%	191	3.7%
Out of State 2-year Private not-for-profit							
	LDS Business College	Salt Lake City	UT	4	0.4%	15	0.3%
Out of State 2-year Public							
	Big Bend Community College	Moses Lake	WA	3	0.3%	9	0.2%
	Blue Mountain Community College	Pendleton	OR	2	0.2%	17	0.3%
	Coastal Carolina Community	Jacksonville	NC	1	0.1%	3	0.1%
	Coffeyville Community College	Coffeyvillw	KS	1	0.1%	3	0.1%
	Colby Community College	Colby	KS	1	0.1%	4	0.1%
	Iowa Western Community College	Council Bluffs	IA	1	0.1%	3	0.1%
	Jackson Community College	Jackson	MI	1	0.1%	4	0.1%
	Laramie County Community College	Cheyenne	WY	1	0.1%	3	0.1%
	Miles City Community College	Miles City	MT	1	0.1%	3	0.1%
	Otero Junior College	La Junta	CO	1	0.1%	4	0.1%
	Paradise Valley Community College	Phoenix	AZ	2	0.2%	11	0.2%
	Salt Lake Community College	Salt Lake City	UT	1	0.1%	11	0.2%
	St. Philips College	San Antonia	TX	1	0.1%	15	0.3%
	Treasure Valley Community College	Ontario	OR	4	0.4%	24	0.5%
	Walla Walla Community College	Walla Walla	WA	1	0.1%	3	0.1%
	Western Wyoming Community College	Rock Springs	WY	2	0.2%	11	0.2%
Out of State 4-year and above Private for-profit							
	Neumont University	Salt Lake City	UT	1	0.1%	3	0.1%
Out of State 4-year and above Private not-for-profit							
	Arizona Christian University	Pheonix	AZ	1	0.1%	3	0.1%
	Art Institute of Las Vegas	Las Vegas	AZ	1	0.1%	6	0.1%
	Baylor University	Waaco	TX	1	0.1%	3	0.1%
	BYU-Hawaii	Laie	HI	3	0.3%	14	0.3%
	BYU	Provo	UT	39	3.6%	160	3.1%
	Carroll College	Helena	MT	1	0.1%	4	0.1%
	Dakota Wesleyan University	Mitchell	SD	1	0.1%	3	0.1%
	Dordt College	Sioux Center	IA	1	0.1%	3	0.1%
	George Fox University	Newberg	OR	1	0.1%	9	0.2%
	Georgetown College	Georgetown	KY	1	0.1%	4	0.1%
	Hawaii Pacific University	Honolulu	HI	1	0.1%	3	0.1%
	Lindenwood University	St. Charles	MO	1	0.1%	4	0.1%

	Pacific Lutheran University	Tacoma	WA	1	0.1%	2	0.0%
	Southern Virginia University	Buena Vista	VA	3	0.3%	9	0.2%
	Stevens Henager College	Murray	UT	2	0.2%	6	0.1%
	University of Jamestown	Jamestown	ND	1	0.1%	4	0.1%
	University of Portland	Portland	OR	1	0.1%	3	0.1%
	University of San Diego	San Diego	CA	1	0.1%	3	0.1%
	Westminster College	Salt Lake City	UT	3	0.3%	22	0.4%
Out of State 4-year and above Public							
	Adams State University	Alamosa	CO	1	0.1%	3	0.1%
	California State University	Los Angelos	CA	1	0.1%	6	0.1%
	Colorado State University	Fort Collins	CO	2	0.2%	6	0.1%
	Dixie State College	St. George	UT	7	0.6%	27	0.5%
	Eastern Oregon University	Grande	OR	1	0.1%	3	0.1%
	Georgia State University	Atlanta	GA	1	0.1%	3	0.1%
	John Jay School of Criminal Justice	Manhattan	NY	2	0.2%	6	0.1%
	Montana State University	Bozeman	MT	12	1.1%	40	0.8%
	Montana Tech	Butte	MT	1	0.1%	6	0.1%
	New Mexico State University	Las Cruces	NM	1	0.1%	3	0.1%
	Purdue University	West Lafayette	IN	1	0.1%	3	0.1%
	San Diego State University	San Diego	CA	2	0.2%	9	0.2%
	Snow College	Ephraim	UT	3	0.3%	9	0.2%
	University of Anchorage Alaska	Anchorage	AK	1	0.1%	12	0.2%
	University of Colorado	Boulder	CO	1	0.1%	6	0.1%
	University of Florida	Gainesville	FL	1	0.1%	4	0.1%
	University of Hawaii-Manoa	Honolulu	HI	1	0.1%	5	0.1%
	University of Mississippi	Oxford	MS	1	0.1%	9	0.2%
	University of Montana	Missoula	MT	2	0.2%	3	0.1%
	University of Nevada	Reno	NV	1	0.1%	6	0.1%
	University of New Mexico	Albuquerque	NM	2	0.2%	3	0.1%
	University of Oklahoma	Norman	OK	1	0.1%	4	0.1%
	University of Oregon	Eugene	OR	1	0.1%	6	0.1%
	University of Utah	Salt Lake City	UT	26	2.4%	128	2.5%
	University of Wyoming	Laramie	WY	2	0.2%	10	0.2%
	Utah State University	Logan	UT	63	5.7%	255	5.0%
	Utah Valley University	Orem	UT	5	0.5%	20	0.4%
	Washington State University	Pullman	WA	2	0.2%	6	0.1%
	Weber State University	Ogden	UT	16	1.5%	71	1.4%
	Western Washington University	Bellingham	WA	1	0.1%	6	0.1%
Military				3	0.3%	23	0.5%
Self only				85	7.7%	386	7.6%
LDS Church Educational Ststem				6	0.5%	22	0.4%
Totals				1,097		5,097	

Source. Eastern Idaho Technical College Advanced Opportunities Database, 2017

APPENDIX F

Courses Articulated Through EITC – FY13-17

Career cluster	Course	Credits	Times articulated	Credits generated
Business and Management				
	Economic Issues/Applied Economics	3	658	1,974
	Computer Info Syst	3	69	207
	Accounting I	3	46	138
	Keyboarding	3	34	102
	Leadership	1	24	24
	Principles of Management	3	20	60
	Desktop Publishing	3	19	57
	Intro to Marketing	3	19	57
	Occupational Relations	3	11	33
	Business Spreadsheets	3	5	15
	Word Processing	3	4	12
	Business Law	3	3	9
Engineering & Technology				
	Web Development Tools	3	6	18
	Computer Assisted Graphics	3	5	15
	Microcomputer Concepts	4	4	16
	Desktop/Client Computer	4	2	8
	Intro to Computer Programming	3	2	6
	Web Page Design	3	1	3
	Engineering Technology	1	1	1
Health Sciences				
	Intro to Health Prof.	2	311	622
	Medical Terminology	2	255	510
	C.N.A.	4	174	696
	A & P	4	54	216
Skilled and Technical Sciences				
	Oxy-Acetylene	2	27	54
	Basic Arc Welding	2	26	52
	Industrial Safety	3	23	69
	Auto Brake System	2	19	38
	Basic Arc Welding II	2	11	22
	Ignition System	2	10	20
	Intro to Auto Elect.	5	4	20
	Auto System & Steering	3	3	9
	Basic Heat & Cool	3	2	6
	Basic Comp. Contr. Eng. Syst.	2	2	4
	Basic Ignition Systems & Tune up	2	2	4
Total			1,856	5,097

Source. Eastern Idaho Technical College Advanced Opportunities Database, 2017