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Title: ***Key Influences and Perceptions of Welding Dual Credit Earners at a Wisconsin Technical College***

The accompanying research report is submitted to the **University of Wisconsin-Stout**, **Graduate School** in partial completion of the requirements for the

Graduate Degree/ Major: MS in Career and Technical Education

Research Advisor: Urs Haltinner, Ph.D.

Submission Term/Year: Fall 2020

Number of Pages: 80

Style Manual Used: American Psychological Association, 7th edition

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Kaminski, Garrett R. ***Key Influences and Perceptions of Welding Dual Credit Earners at a Wisconsin Technical College***

Abstract

Manufacturing in the United States faces a shortage of skilled labor as talented men and women retire. High school students often miss opportunities to pursue rewarding careers in the skilled trades due to a lack of awareness, a lack of knowledge, or both. Articulation agreements between high schools and technical colleges can facilitate the offering of dual credit course that expose high school students to a variety of skilled labor careers such as welding. The purpose of this nonexperimental, descriptive, mixed-method case study was to examine in greater detail both student perceptions of the Fox Valley Technical College (FVTC) welding program and the influences that guide students to participate in dual credit welding courses offered through FVTC. Participants in the study were 1st and 2nd semester FVTC welding students. The study consisted of a quantitative phase I of online surveys and a qualitative phase II of virtual interviews. Questions about student dual credit involvement, dual credit experiences, and personal welding experience led to insights about the opportunities and challenges that dual credit welding courses present to students. Findings indicate that dual credit opportunities build student courage change this to confidence if you changed it below and persistence, and lead to realistic career aspirations that propel students to a successful post-secondary education. Parents, family, peers, and teachers play a critical role in both student dual credit involvement and success. In addition, strong partnerships between secondary and post-secondary institutions are vital to the continuation and improvement of dual credit welding course offerings for future students.

Acknowledgements

"Information in the world doesn't tell you what to do with it." -Steven Pinker

I would, first and foremost, like to thank my wife Vanessa for her never-ending support, encouragement, and understanding through the course of my graduate studies. There were times that this commitment of mine took precedence over our family and home, and it was you that kept everything together and moving forward. I want to thank our children, Max and Sophie, for your patience during all the hours I had to choose research over quality family time. I hope that in some small way this inspires you both to pursue your goals with passionate abandon. I also want to thank my parents, grandparents, brother and sister for their continuous words of encouragement. I am beyond grateful for my family and the support they have provided.

I want to say a special thank you to Dave Fisher, who has been instrumental in implementing new dual credit welding programs at many high schools in the FVTC district. He has been a wealth of information and insight concerning the topic, and in part inspired my interest in the first place. This study could not exist without the work that came before it, and I am indebted to the guidance of Drs. Peterson, Schultz, Tiala, Brock, Brewer, Reisinger, and Kovach. Finally, I would like to thank Dr. Urs Haltinner, who agreed to be my research advisor. Your experience, wisdom, encouragement, and positive attitude through this process convinced me that it was indeed possible. I am honored and grateful.

This study is dedicated to my grandfather, Richard Kaminski. He was humble in success, kind to all, a consummate family man, and my role model. He taught me that skilled craftsmanship is a noble endeavor, and that true strength lies in the refusal to accept failure. I think he would be very proud.

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Chapter I: Introduction

In the United States, Career and Technical Education (CTE) has had a robust history of training the nation's future workforce by providing the skills, attitudes, and abilities necessary for successful employment in a variety of professions. CTE combines academic, technical, and employability skills with a specific career pathway to offer both students and employers the most well-rounded technical training available (Association for Career & Technical Education [ACTE], 2018). Although the appearance and operation of CTE have evolved since its formal inception in the early 1900s, the goal of rigorous educational standards has remained unchanged and continues to propel CTE to greater recognition and acceptance in this country (Gordon, 2014).

There are many aspects to modern career and technical education, and one prominent factor to the success of current CTE programs is the articulation agreement. According to Moldoff (n.d.), articulation agreements are "agreements that document a pathway between two or more institutions of learning and their academic programs" (p. 1). Articulation benefits are helpful for students looking to earn advanced placement or looking to avoid repeating course work. Dual credit opportunities, which are a foundational component of articulation agreements, allow high school students to earn college credit while still in high school. The goal of any dual credit offering between a technical college and a high school is to simplify the transition between high school and college for students (Moldoff, n.d.). This goal is accomplished by allowing secondary students to participate in college-level courses while still in high school.

Dual credit course offerings are uniquely structured in several ways. Because each state has its own technical college system, dual credit opportunities are often restricted by state boundaries and are not transferable across state lines (Cowan & Goldhaber, 2015). Courses offered are typically representative of a given college-level program and consist of entry-level classes a student would encounter in their first college semester. Dual credit courses are taught either by college faculty or by high school instructors. High school instructors must have previously completed the same courses and met the Higher Learning Commission (HLC) accreditation requirements to teach in higher education to be considered qualified to deliver the required course content (Cowan & Goldhaber, 2015). High school students benefit from the ability to earn college credit early and at no cost to them; technical colleges benefit by capturing the interest of potential future program students (Moldoff, n.d.).

Data show that high school students who take advantage of dual credit opportunities are more successful in school, and high school CTE concentrators graduate at an average rate of 95% (ACTE, 2020). Over 2 million students participate annually in the United States, and dual credit is now second in the nation in popularity behind advanced placement courses (Cowan & Goldhaber, 2015). For dual credit programs to be successful, collaboration is needed between both institutions as well as routine assessment of each program. Dual credit offerings are centered around the student with student success being the driving force (Irvine, 2017).

In the state of Wisconsin, articulation agreements between technical colleges and secondary schools are a reliable method of providing high school students the opportunity to explore various career options while earning college credit, often at no additional cost. According to the Association for Career & Technical Education (ACTE, 2019), in Wisconsin CTE is delivered at the secondary level through comprehensive high schools, career academies, and CTE-specific high schools.

At the post-secondary level, the Wisconsin Technical College System (WTCS) oversees sixteen technical colleges along with their satellite campuses. In the 2014-2015 school year, Wisconsin served 88,117 CTE high school students and 124,734 CTE post-secondary students. In the same school year, 97 percent of Wisconsin CTE high school students graduated, which includes concentrators and non-concentrators (ACTE, 2019). More recently, according to the Wisconsin Technical College System (WTCS, 2020), "in 2019-20, 52,543 students earned over $31 million in college credit savings. That's an average savings of $602 per student" (p. 1).

Fox Valley Technical College (FVTC), whose main campus is in Appleton, Wisconsin, has a program for offering dual credit courses for high school students within its five-county district. As of the 2018-2019 school year, FVTC had transcripted credit agreements with 39 area high schools (FVTC, n.d.). Of those 39 articulation agreements, 20 of the high schools involved offered at least one welding-related course through FVTC. The welding and metal fabrication field has a strong presence in Northeast Wisconsin and skilled welders are in demand (Dallos, 2017). These dual credit opportunities allow secondary students within the FVTC district a glimpse into the career of welding and metal fabrication.

Statement of the Problem

Considering the high number of college-level credits earned by secondary students across the state of Wisconsin, it is important to understand the impact of these course offerings. There is little doubt that a secondary student's ability to earn college credit while still in high school has numerous advantages as discussed in several existing studies (Cowan & Goldhaber, 2015; Hodges, 2018; Kronholz, 2011; Taylor, 2015). Each of these studies provides data and arguments for the success of dual credit offerings in school districts across the country. Dual credit course offerings and articulation agreements between technical colleges and high schools are often successful with significant collaboration and feedback between the involved institutions, as well as a continuous dialogue between course takers and their instructors and mentors. Less attention has been paid to the impact these dual credit courses have on the eventual success of dual credit students in the college setting.

In Wisconsin, some research has been conducted on dual-credit learners in broad sections of the state (Mindham, 2015; Schield, 2014). Little research exists, however, that focuses on dual credit technical skills programs like welding within the FVTC district. In addition, there is a lack of research related to the factors that influence students to pursue the FVTC welding program and welding careers in general, as well as the success of dual credit-earning students within the FVTC district after high school.

Purpose of Study

The purpose of this study was to identify student perceptions of the FVTC welding program. More specifically, the study sought to understand the influences that cause students to pursue welding courses at the secondary and post-secondary levels, as well as to pursue welding as a career path in general. Dual credit welding course offerings can afford high school students with opportunities for personal growth and career exploration, but these course options and their outcomes deserve in-depth study so that the findings can be applied to make them as successful as possible. The results of the research may lead to recommendations for cultural, curricula, and/or delivery modifications influencing the welding and metal fabrication program at FVTC. Results may also lead to changes in the way the welding and metal fabrication program is marketed to the community.

Research Objectives

This study attempted to answer the following questions:

1. What are the perceptions of the FVTC welding program among current students who took welding dual credit courses in high school?

2. What influences cause students to pursue welding courses at the secondary and post-secondary levels and to pursue welding as a career?

Significance of Topic

The national workforce currently faces numerous shortages, and the welding and manufacturing industry is no different. Research focused on the future of welding suggest that the need for skilled welders and fabricators will increase in the next decade (Dallos, 2017; Powell, 2018). This information comes at a time when many skilled welders are leaving the profession permanently due to retirement. In a series of interviews with industry leaders, Cullision and Johnson (n.d.) found that nearly two-thirds of interviewees believe there is already a shortage of skilled welders and that the problem will only worsen in the future.

Based on the researcher's professional experience, many companies have resorted to developing their own internal training programs to address the welder shortage issue. The future of the FVTC welding program will depend on the partnerships it has developed with high schools in its district, the dual credit options available to secondary students, and the methods used to successfully market the welding program for the future.

Limitations of Study

The limitations of this study included the following:

1. This study consisted of current welding students from FVTC who were currently enrolled in first and second semester classes. The results of the study reflected data on the FVTC welding program.
2. The study was limited to data from within the FVTC welding program. It does not represent trends among other programs at FVTC or in other Wisconsin technical colleges.
3. Data collected from surveys and interviews represented a population of approximately 114 students enrolled in one of five certificate and degree programs in the FVTC welding program.
4. Due to the researcher's relationship with and proximity to the welding and metal fabrication program at FVTC, bias may be present in the study's instruments and recommendations.

Definition of Terms

The following terms are used throughout this study and are defined here to provide clarity for the reader.

Articulation agreement. An agreement used to formalize transfer arrangements between two different educational institutions. They are detailed in nature and focus on the policies that guide credit transfers between schools.

CTE concentrator. A CTE concentrator is a high school student that has completed at least two course credits in a single CTE program of study (POS) or career cluster.

Dual credit. Dual credit courses are a component of articulation agreements. They allow high school students to earn college credit for classes taken while they are in high school. These courses are usually only open to high school juniors and seniors that have met the same admissions requirements as their college-age peers.

Post-secondary. Post-secondary education is defined as any education pursued after high school is completed.

Secondary. Secondary education in the U.S. refers to the last seven years of required formal education for students. The first phase is lower secondary, or middle school, and the second phase is upper secondary or high school.

Chapter II: Literature Review

The purpose of this study was to evaluate the efficacy of the welding and metal fabrication program at FVTC, to understand student perceptions of the program, and to assess the influences that cause students to pursue welding. The need for skilled welders in this country dates back prior to World War I, and community colleges have led the charge when it comes to training future generations of welders and metal fabricators.

As technological advances continue to alter the methods of manufacturing in the United States, the need for talented individuals who can thrive in this new, heavily automated, and highly advanced manufacturing world is greater than ever (Foster, 1997). Partnerships between businesses, secondary schools, and post-secondary programs have led to robust training programs and college-level curricula for welding and manufacturing. These alliances have led to articulation agreements between secondary and post-secondary schools, as well as school-to-work programs and a greater number of high-quality apprenticeships. In addition, the education system has taken steps to develop legislation that greatly improves both career and technical education (CTE) itself as well as CTE opportunities for students.

This research study draws from past research studies to create a foundation for the research with the goal of understanding student participation in dual credit welding courses, the perceptions of students who are enrolled in the welding program at FVTC, and influences that cause students to pursue a career in welding. This study may also expose barriers that prevent high school graduates who have taken dual credit welding courses from continuing a particular career path at the post-secondary level.

The following narrative will frame the study by reviewing prior research on welding programs and articulation agreements in the United States. Topics addressed in the literature review include the history of welding education in the United States, the evolution of welding technology in CTE, the history and growth of articulation agreements, legislative actions concerning dual credit programs, and the impact of articulation agreements and dual credit programs. Previous research studies concerning the advantages of dual credit offerings are also included (Cowan & Goldhaber, 2015; Hodges, 2018; Kronholz, 2011; Taylor, 2015). Examining the growth of dual credit programs at all levels of the education system will create the groundwork for this research.

History of Welding Education in the United States

The teaching of welding technology falls under the umbrella of Trade and Industrial (T&I) education. T&I education is a broad category of CTE that includes such other competencies as carpentry, woodworking, electrical systems, automotive technology, and cosmetology, among others. As Scott (2014) writes, “the mission of T&I education is to prepare individuals at the secondary and post-secondary levels for skilled occupations and technical work in industrial occupations” (p. 101). This mission includes instruction not only in the types of manual skills needed to perform complex tasks, but also so-called *soft skills* that are increasingly in demand in today’s job market.

Soft skills are a nebulous set of employability aptitudes that modern employers are increasingly seeking when reviewing resumés and conducting interviews. While every employer may have a different opinion about which soft skills are the most important, recent research has sought to further define and explore the nature of soft skills and their value in the workplace. Heckman and Kautz (2012) define soft skills as “personality traits, goals, motivations, and preferences of an individual” (p. 3). According to Schulz (2008), this list can be expanded to include such skills as creativity, teamwork, etiquette, time management, communication skills, critical thinking, and responsibility.

Although soft skills are just as easily defined as technical or “hard” skills, they can be more difficult to measure using standard aptitude tests. Studies have shown, for example, that despite exemplary performance on a General Educational Development (GED) test, recipients of their GED still perform much worse in the job market than their peers who successfully completed high school (Heckman & Kautz, 2012). This information suggests that in-person education is crucial for soft skill development among students. It also indicates that soft skills are crucial for job market success.

Despite their ambiguous nature, most employers agree that soft skills are a necessity for the modern job seeker (Schulz, 2008). Technical college programs, which are accessible to both GED recipients and high school graduates, seek to facilitate the building of soft skills for all students to prepare them for greater success as employees.

Vocational training dates back hundreds of years, but modern T&I education in the United States can trace its roots back, along with other areas of CTE, to the Smith-Hughes Act of 1917, which first allocated federal funding for vocational education (Gordon, 2014). After World War Two the popularity of industrial education began to take off. As Foster (1997) writes, “the years following World War II may have been the strongest for industrial arts” (p. 1). Today, there exists an ever-increasing demand in the United States economy for skilled workers in a variety of trades, and as Gordon (2014) writes, “the major goal of trade and industrial education is for students to develop sufficient knowledge and skills to secure initial employment or advancements through experience” (p. 243). T&I education is the most far-reaching of the CTE fields, with programs that align with nine of the sixteen nationally recognized career clusters

(Scott, 2014). With this expanse of possible career pathways available to students, T&I education plays a pivotal role in the continued success of our nation's economy.

Evolution of Welding Technology in CTE

The practice of welding, which at its most basic is the use of heat to join two pieces of metal together, has been around for thousands of years. The ancient Egyptians, Greeks, and Romans all were skilled in the practice of forge welding, which involves heating two pieces of metal in a furnace until they reach their melting points and then smashing them together using a hammer and anvil (Jeffus, 2020). Welding changed little until the turn of the 20th century, with the invention of oxyfuel welding and stick welding. At this time, the Douglas Commission issued a report that sparked the nation's interest in vocational education. As Gordon (2014) writes, "the Douglas Commission Report was an instrumental landmark in the development of 'vocationalism' in the public schools" (p. 87).

Welding training in the early 20th century remained far from standardized, and little equipment existed (Foster, 1997). The early 1920s saw slightly more interest in the welding trade after the first World War, but it was not until during and after World War Two that welding took off as a viable industry (Cullision & Johnson, n.d.). Most training was provided by shops started by welders who were trained during the war (Smith, 2014). Welding had not yet found its way into technical schools, and the best forms of training were being conducted by shipyards in U.S. coastal cities, meaning that a desire to learn how to weld meant potentially travelling quite far (Smith, 2014).

Functional equipment was hard to come by in the early days of the welding industry, as were adequate training facilities. This lack of equipment and training continued until the 1960s, when certain grant funds made it possible for some secondary schools to become properly equipped; the grants also allowed for adults to attend the training (Smith, 2014). Some producers of welding consumables also began to provide training using their own products as new welding techniques and equipment became more readily available (Cullision & Johnson, n.d.). While private training centers persisted, and still do, the Perkins I Act (1984) made funding readily available for public technical schools to establish their own welding programs and to provide much-needed training for students interested in pursuing welding as a career (Perkins Collaborative Resource Network [PCRN], n.d.).

In Wisconsin, the first vocational schools were started in 1911 and 1912 and were the first in the nation to be created with the full support of the state (Nelsen, 2016). Early Wisconsin technical colleges began in and around Milwaukee in response to a growing need for skilled labor training among the State's increasing immigrant population as well as higher numbers of young adult workers. Spearheaded by Dr. Charles McCarthy, the Milwaukee Vocational School was established in 1911 (Nelsen, 2016). The success of the Milwaukee Vocational School, now known as Milwaukee Area Technical College (MATC), led to the establishment of other districts in the northern and western parts of the state. Today, the Wisconsin Technical College System (WTCS) contains sixteen distinct technical colleges that serve every county in the state (WTCS, 2020).

FVTC's official district was established in 1967, and the school was first accredited in 1974 (FVTC, n.d.). Today, FVTC offers a full range of welding and metal fabrication courses, and the welding program provides students with a range of certifications to pursue. These include two basic welding certificates, three different technical diplomas, and an associate degree in industrial welding technology.

History and Growth of Articulation Agreements

Articulation agreements, in one form or another, have been a part of the U.S. education system for over a century, and they became even more common as technical colleges began to grow in popularity during the 1960s and 1970s (Mosholder & Zirkle, 2007). According to Moldoff (n.d.), articulation agreements are “agreements that document a pathway between two or more institutions of learning and their academic programs” (p. 3). While articulation benefits are helpful for students looking to earn advanced placement or to avoid repeating course work, historically these agreements have existed solely between two-year and four-year colleges. Irvine (2017) writes that “the majority of such transfer programs involved students’ transitions between community college and university, with relatively few dealing with high school to college programs” (p. 3). Recently many more articulation agreements have been developed between secondary and post-secondary institutions as a way to bring career and technical education back into high schools.

Articulation agreements serve many purposes; above all they allow students to make a more successful transition from high school to college, often with credits they have already earned. These agreements can be formal or informal, broad or specific, and may or may not be mandated by a state. The primary role of an articulation agreement is to prevent students from duplicating course work, but they also outline curriculum coordination and help to solidify faculty member’s roles at each of the institutions involved (Irvine, 2017).

The benefits of an articulation agreement are numerous for both institutions involved. Secondary students can reduce their completion time at the post-secondary level and save a lot of money in the process, and the post-secondary institutions can increase their enrollments as well as their visibility in the community (Irvine, 2017). However, articulation agreements have their challenges as well. They are often difficult to develop, it can be difficult to garner college faculty participation in such programs, and teaching ideologies can differ between faculty at each institution (Irvine, 2017). Regardless of the challenges faced by those wishing to implement an articulation agreement, the data show that this method of introducing high school students to career and technical education before graduation is gaining a lot of ground, especially in Wisconsin (Schield, 2014).

Legislative Actions Concerning Dual Credit Programs

Many pieces of legislation, both at the federal and state levels, have had a tremendous impact on CTE over the past century. The Smith-Hughes Act of 1917 is still regarded as one of the most important pieces of legislation in the history of career and technical education. The Smith-Hughes Act was instrumental in creating collaborations at the local, state, and federal levels for the purpose of strengthening and standardizing career and technical education in the United States (Hall & Marsh, 2003).

Prior to the passing of the Smith-Hughes Act, there was little organization of CTE in the United States. Federal funding was available for states under the First Morrill Act, but no governing body existed at either the federal or state level to oversee CTE and no guidelines existed for how CTE should be organized and operated (Hall & Marsh, 2003). The Smith-Hughes Act paved the way for much more impactful national legislation, such as the Perkins Act.

The Perkins I Act (1984) was passed by the U.S. government in order to strengthen and centralize the Vocational Education Act of 1963 (PCRN, n.d.). Its goal was to assist each state with expanding and improving technical education programs using federal funding specifically designated for technical education. The success of Perkins I has led to the renewal of the act four times, most recently with the passing of the Perkins V Act (2018). Perkins V allocates $1.3 billion per year for CTE programs nation-wide (PCRN, n.d.). This allows technical colleges to apply for funding to bolster course offerings, expand facilities, and purchase new educational technology. The use of Perkins funding by U.S. technical colleges can help to keep students engaged and competitive in an increasingly dynamic job market.

Legislation concerning dual credit and articulation agreements, however, is a more recent development. Currently, all states allow dual enrollment, and 46 of the 50 states have at least one statewide dual enrollment program that has been put together by state policy (Cassidy, Keating, & Young, n.d.). As early as 1995, states like Wyoming and Idaho were among the first to enact legislation concerning student access to dual credit programs. Wyoming bill S.B. 127 authorized school districts and post-secondary institutions to establish enrollment options for high school juniors and seniors, and Idaho bill H.B. 171 provided the initial provisions for dual enrollment programs in the state (Education Commission of the States [ECS], 2020). By the late 1990s and early 2000s, many more states were passing their own laws allowing secondary and post-secondary schools to form articulation agreements, as well as for high school students to pursue dual credit options (ECS, 2020).

Wisconsin has long been a leader in the United States when it comes to championing the cause of CTE and supporting its goals of educating the community and strengthening the workforce. In 2004, bill A.B. 183 was signed into law and amended dual and concurrent enrollment options. It also provided payment to higher education institutions for technical college courses.

In 2013, Act 20 served to expand the part-time open enrollment program to create a course options program in Wisconsin. This allows a student enrolled in a public school to attend a different educational institution for the purposes of taking a class (ECS, 2020). Most recently, Wisconsin bill S.B. 407, enacted in 2018, advocates for students taking dual credit courses. It requires the UW System to establish policies for the transfer of credits earned by a high school student. If the credits are considered non-transferable, the board must permit the student to take a competency exam (ECS, 2020).

Impact of Dual Credit Programs

While articulation agreements and dual enrollment programs have developed steadily over the past 30 years, research concerning the effects of these programs has shown positive results. The primary objective of dual credit programs is to improve the depth of study for high school students, but these course offerings also help high school students form realistic expectations of what college will be like (An, 2013). In Wisconsin over the past five years the state has seen a 69% percent growth in dual credit participation, and in 2019 over 50,000 Wisconsin high school students saved over $31 million in college credit fees (WTCS, 2020).

Students now have an unprecedented number of options for earning college credit while still in high school. These options include Start College Now, transcripted credit, youth apprenticeship, and advanced standing. Findings from Schield (2014) support the fact that the most successful way to improve student learning, graduation rates, and student retention rates is through rigorous dual credit programs. According to Schield (2014), the total number of credits earned by dual enrollment participants at Northcentral Technical College (NTC) in Wisconsin was 22,249 between the years of 2008 and 2013. During that same time period, persistence rates at NTC remained higher for dual enrollment students, and second semester persistence was found to be consistently above 77% (Schield, 2014).

Summary

Studies consistently show that skilled welders and metal fabricators will continue to be in high demand throughout the next decade. The economy of the United States has historically relied on the talent of welders and fabricators who receive a comprehensive education from technical college programs. Despite humble beginnings, welding programs at U.S. technical colleges have grown and improved through dedicated legislation and funding at both the state and federal levels.

Technical college welding programs have also benefitted in recent decades from the formation and maintenance of articulation agreements. Articulation agreements between secondary and post-secondary educational institutions have led to the creation of dual credit offerings at high schools across the country, including many dual credit course offerings within the FVTC district. These courses allow high school students to engage in college-level course work and earn college credit at no cost to them. High school student engagement with dual credit courses allows secondary students the opportunity to accelerate their career paths and jump-start their college careers.

Chapter III: Methodology

This chapter examines the outline, methods, and procedures that were used to complete this study. The purpose of this study was to evaluate the efficacy of the welding and metal fabrication program at FVTC, to understand student perceptions of the program, and to assess the influences that cause students to pursue welding. The research and data collected for this study were guided by the following research questions: *(1) What are the perceptions of the FVTC welding program among current students who took welding dual credit courses in high school? (2) What influences cause students to engage in welding courses at the secondary and post-secondary levels and to look into welding as a career?*

Description of the Study

Prior research conducted on the topic of this study does exist, although previous studies have explored dual credit articulation agreements on a broader or even national scale. Two recent studies have addressed similar topics in different regions of Wisconsin. Schield (2014) performed an analysis of the dual credit program at Northcentral Technical College in central Wisconsin, using a nonexperimental, ex post facto quantitative method. Sullivan (2016) performed a qualitative, descriptive study of factors influencing secondary students' choice to pursue college-level manufacturing programs in the Midwest. This study is, therefore, not without precedent in some manner.

Due to the nature of the data required for the purposes of this study, a nonexperimental, descriptive, mixed-method case study was chosen. A mixed-method approach utilizes both quantitative and qualitative methods of data collection. Qualitative research is a broad method that encompasses many subdisciplines. It is by nature more adaptable in its design and tends to be less rigid than most research designs found in the quantitative method (Wiersma & Jurs, 2009). Research questions that are historical, ethnographic, or anthropological in nature must be researched holistically because of their complexity and data must be gathered within a natural setting because context is crucial for interpretation (Wiersma & Jurs, 2009). Sangasubana (2011) notes that gaining access to the group in question can be difficult if the researcher is unfamiliar. However, the researcher has worked within the culture and region in question and access to subjects and data was unhindered.

Qualitative research is generally less structured and by nature more flexible. Qualitative research relies heavily on a working design because hypotheses and data collection methods may change over time. Observation, interviews, data collection, and oral histories may be used in this type of research. Qualitative research offers more focus on context and the use of thick description which may allow the reader an increased ability to connect with and understand the research (Cox, 2012). However, qualitative research methods have weaknesses as well. Researchers pursuing qualitative methods can struggle to develop the skills needed to collect data, develop relationships in the field, and confront their own internal biases (Cox, 2012). In addition, qualitative research often requires additional time to complete due to lengthy methods of gathering information, and qualitative research can suffer from data saturation in which too much is collected unnecessarily (Wiersma & Jurs, 2009).

An observational case study gathers information through direct observation of current phenomena (Wiersma & Jurs, 2009). Case studies are detailed examinations of current events through the eyes of the researcher. The subjects and location of this study are specific to a single program within one technical college in Wisconsin. An observational case study, conducted through online surveys and in-person interviews, was deemed appropriate in order to gather data and information.

A quantitative method of research was utilized for this study as well. Quantitative research is characterized by structure and a strong background in the scientific method. Empirical methods are employed, and research results are often numerical in nature. The size of a quantitative study can offer high levels of statistical precision, thus improving its external validity (Zyphur & Pierides, 2017). Quantitative research is performed in a wide variety of disciplines, which include but are not limited to psychology, biology, and sociology. It is concerned more with the development of hypotheses that are then tested through data collection in order to explain observed behaviors and empirical information (Hoy & Adams, 2016).

Quantitative research methods are not without weaknesses as well. This study requires direct human interaction, and researchers using quantitative methods may falsely represent themselves as being passive participants, when in reality a finding cannot be separated from the tools that produced it (Zyphur & Pierides, 2017).

Phase I Secondary Data Inquiry

This study contains secondary institutional data. Included are the number of students who have graduated from the FVTC welding program with a certificate or degree within the last three years. The information was subdivided to show student graduation rates from each of five available certificate, diploma, and degree options within the FVTC welding program. This data will aid the reader in understanding the production of graduates from the FVTC welding program in a given year. Also included are data showing the number of students within the FVTC district that participated in dual credit welding courses at the secondary level during the last three years. This information will aid the reader in understanding the growth and prevalence of such programs in Northeast Wisconsin.

Phase I Quantitative Inquiry

Quantitative data collected for phase I of this study were gathered through the use of an interactive online survey. When collecting qualitative data, methods may be interactive or noninteractive (Wiersma & Jurs, 2009). For the contextual focus of this study and the experiential nature of the data required, interactive research techniques were selected. As the name implies, this involves interacting with the subjects being studied. For phase I of the quantitative inquiry in which an online survey was implemented, the interaction was indirect in nature.

Subject Selection Phase I

The subject pool of students selected for this research were students enrolled in first- or second-semester welding courses at FVTC. Students were only included in the subject pool if they were aged 18 years or older to comply with IRB protocol. These students were selected because if they had participated in dual credit courses at their high school, the experience would be more memorable to them. These students were also selected due to their chronological proximity to the beginning of their college careers at FVTC. The subject pool for this study was not bound by racial, ethnographic, socioeconomic, or gender-based limitations.

Instrumentation Phase I

Phase I of quantitative data collection for this research consisted of creating and administering an online survey to 114 students enrolled in first- or second-semester welding courses at FVTC (Appendix B). The survey was created using the Qualtrics online survey creation tool. This survey creation software was chosen because of its reliable data security features as well as its ability to provide the investigator with anonymous responses, thus protecting the identities of survey respondents.

Each question included in the survey worked to validate one of two research questions this study sought to answer. To answer research question one: *What are the perceptions of the FVTC welding program among current students who took welding dual credit courses in high school?* ten survey questions were designed to gather information from students concerning their personal experiences with dual credit welding courses taken either at their high school or at an FVTC facility.

To answer research question two: *What influences cause students to engage in welding courses at the secondary and post-secondary levels and look into welding as a career?* four survey questions were designed to gather information from students about their personal experiences with welding as a learned skill and potential career. Three initial survey questions were included to gather background data about each student, and two final questions referred to interview participation.

Data Collection Phase I

The survey was sent to 114 students via e-mail. E-mail addresses were obtained from the FVTC college research manager. In order to protect student anonymity, no names were associated with e-mail addresses. The initial e-mail containing the survey included a statement of implied consent to comply with human subject protection (Appendix A). The initial e-mail requested that students complete the survey within one week of receiving it and the target response rate of this study was 80%. For those students that did not respond within one week, a follow-up communication was sent.

Data Analysis Phase I

Data gathered from survey responses was organized for analysis based on the research question each survey inquiry was designed to answer. Responses to each survey question were tallied to signify their importance and then organized into tables for visual representation. Data were analyzed to identify themes among the responses provided. Response data remained secure during analysis and was not shared with other parties. Subjects remained anonymous and survey responses could not be linked at any time to a specific participant.

Phase II Qualitative Inquiry

Qualitative data collected for phase II of this study were gathered through the use of synchronous virtual interviews. Question #18 of the phase I survey asked participants if they would be willing to conduct a brief virtual interview with the researcher. Question #19 of the phase I survey asked participants to provide their contact information if they were willing to be interviewed.

Subject Selection Phase II

The subject pool of students for phase II of the study was a subgroup of the subject pool for phase I. Subjects for phase II were those that identified themselves as willing to participate in a synchronous virtual interview. These students answered *yes* to question #18 of the phase I survey and provided contact information for the interviews to be scheduled and conducted online.

Instrumentation Phase II

Qualitative data gathered for phase II of the study was collected using a semi-structured interview process. The target number of interviews for the study was eight. The researcher utilized Microsoft Teams to conduct each interview. Students who agreed to participate in an interview were sent an online invitation to the email address they provided. Each interview was recorded in Microsoft Teams using the interactive recording tool included in the program. All interviews were recorded for the purpose of transcribing the conversation into a text-based transcript.

Each interview conversation was guided by the researcher's semi-structured interview guide (Appendix C). The interview guide was intentionally designed to address both research questions this study sought to address. Each interview question was designed to be open-ended to avoid leading the respondent. Prompts were included to facilitate further discussion only as needed. To answer research question one: *What are the perceptions of the FVTC welding program among current students who took welding dual credit courses in high school?* the first, fourth, and fifth questions of the interview guide were designed to gather more information from respondents regarding their personal experiences with FVTC dual credit welding course offerings.

To answer research question two: *What influences cause students to engage in welding courses at the secondary and post-secondary levels and look into welding as a career?* the second and third interview questions were designed to gather personal information from respondents about the factors in their lives that introduced them to welding as a career path as well as FVTC as their college choice.

Each interview conducted through Microsoft Teams was recorded for both audio and video. Recordings were used to create a written transcript of each conversation. To protect the identities of subjects who agreed to participate in interviews, recordings were not retained after transcripts of each interview were created. Personal identifiers, if present, were removed from all written transcripts. Transcripts were then used as a source for developing a thematic analysis. The anonymity of respondents was retained throughout the analysis process as each subject's responses were reduced to overarching themes.

Data Collection Phase II

A semi-structured interview was conducted with respondents who agreed to contribute added insight in support of the study. Each survey participant who indicated they would be willing to participate in an interview was sent a separate e-mail communication asking them for three dates and times that best fit their schedules. When a date and time was agreed upon by both the participant and the researcher, a Microsoft Teams meeting invitation was sent to each interviewee. All interviews conducted for the study took place in November of 2020. At the beginning of each interview, before recording began, the interviewer informed the participant that the session would be recorded. Once acknowledged by the interviewee, recording began. Interviews were scheduled as thirty-minute blocks of time.

Data Analysis Phase II

Anonymity of interview participants was protected at all times. Interview recordings were saved to a password-protected computer located in a secure office for the purpose of transcript creation. Microsoft Stream was used to automatically generate transcripts of each interview. Automatically generated transcripts were then reviewed and compared to the original recordings for clarity. Once transcripts were created for each interview, recordings were deleted. Transcripts were reviewed for personal identifiers and any found were removed.

Data gathered in transcript form was analyzed using a reductive process. Each interview consisted of more than 1,000 words in its raw text form. This information was reduced by removing unnecessary words and simplifying the meaning of statements made by respondents. These simplified portions of text were then sorted to detect common thoughts and ideas. The final step involved the identification of a theme present in the interviewee’s responses. This reductive process of thematic analysis is informed by Haltinner (2008) and is visually represented in Figure 1.

Figure 1

Thematic Analysis Process

Research Question Transformation (Trans)			
Trans 1	Trans 2	Trans 3	Trans 4
Listing and reading raw text	Eliminating extraneous words and clarifying meaning	Sorting and identifying common ideas	Declaring themes

Limitations of the Study

The researcher acknowledges that there were limitations to this study. Limitations of this study included the following:

1. This study consisted of current welding students from FVTC. The results of the study reflected data on the FVTC welding program.
2. The study was limited to data from within the FVTC welding program. It does not represent trends among other programs at FVTC or in other Wisconsin technical colleges.
3. Data collected from surveys and interviews represented a population of approximately 114 students enrolled in one of five certificate programs in the FVTC welding program. Students could not be identified based on their participation in welding dual credit courses.
4. Due to the researcher’s relationship with and proximity to the welding and metal fabrication program at FVTC, bias may be present in the study’s instruments and recommendations.

Summary

This nonexperimental, descriptive, mixed-method case study was designed and conducted to answer two specific research questions. Quantitative data were gathered through the administration of an online survey through Qualtrics. Qualitative data were gathered by conducting synchronous online interviews through MS Teams. Quantitative data were collected from survey results and organized into tables for clarity and further analysis Qualitative data were collected from interviews and transformed into transcripts for thematic analysis. Themes that emerged from both data sets were developed using interpretational analysis and thick description. Results were examined in depth, and conclusions were drawn based on the collected information.

Chapter IV: Results

The purpose of this study was to examine in greater detail both student perceptions of the FVTC welding program as well as the influences that guided students to participate in dual credit welding courses offered by FVTC. The research design used was a nonexperimental, descriptive, mixed-method case study encompassing a quantitative Phase I (PI) and a qualitative Phase II (PII). PI collected secondary demographic data as well as quantitative data through an online survey administered to 114 FVTC welding students enrolled in 1st or 2nd semester classes as of Fall 2020.

Phase II consisted of virtual interviews with a subgroup of the PI subject pool. The target number of participants for interviews was five. Data were collected using a semi-structured interview guide and included interviewee field notes. Interviews were recorded for the purpose of generating written transcripts. Transcripts were analyzed using a reductive process to identify themes among responses.

PI: Quantitative Findings

Phase I transitioned into an online survey administered to all welding students currently taking 1st or 2nd semester welding classes as of Fall 2020. The target response rate for the survey was set at 80%. Respondents of the survey were given the option to self-invite into PII with an opportunity to contribute their voice through a semi-structured virtual interview.

PI Secondary Data

FVTC institutional data illustrate the number of students that have graduated from the FVTC welding program over the past three years, along with information regarding which credential each student earned upon graduation. Table 1 highlights that FVTC offers five different credentials within its welding program, and demonstrates an overall decline across all five programs of study between the 2017/18 and 2019/20 academic years. Welding fundamentals certificates awarded over this time declined 27%. Attainment of the production welding technical diploma declined by 32%, and the number of students earning a welding/metal fabrication technical diploma fell by 45%. Completion of the welding/metal fabrication technician diploma declined by 28% in the past three years, and attainment of the industrial welding technology associate degree fell by over 42%. The overall number of distinct graduates earning a credential from the FVTC welding program fell by nearly 28% in the past three years.

Table 1

Number of Graduates from Each FVTC Welding Program of Study

Credential Awarded	2017-18	2018-19	2019-20
616211- Welding Fundamentals Certificate (7 Credits)	159	138	116
304421- Production Welding Technical Diploma (13 Credits)	79	73	54
314571- Welding/Metal Fab. Technical Diploma (29 Credits)	76	53	42
326211- Welding/Metal Fab. Technician Diploma (54 Credits)	25	37	18
106211- Industrial Welding Technology AAS (63 Credits)	26	37	15

Table 2 represents students across 27 high schools within FVTC's five-county district over a three-year period. Note that participation indicates that a student enrolled in one or more courses; it does not require that students successfully completed the course or courses in which they were enrolled. From the 2017-18 school year to the 2018-19 school year, welding dual credit course participation increased 19% among all in-district high schools. From the 2018-19 school year to the 2019-20 school year, participation increased an additional 17%.

Table 2

Number of FVTC Dual Credit Welding Course Offerings Taken Per Year

Total per year	2017-18	2018-19	2019-20	Distinct Count
	357	426	499	1114*

*Some students enrolled in the same class multiple years

PI Primary Data Analysis

During quantitative data collection, data were gathered by distributing an online survey using the Qualtrics online survey software. The survey consisted of 20 questions designed to gather information from students about their experiences with welding dual credit classes in high school, as well as information about each student's personal experiences with welding in general (see Appendix B). Surveys were e-mailed to 114 students in the FVTC welding program. The target population for these surveys was students enrolled in their first or second semester of the program.

E-mail addresses for first and second semester welding students were provided by the FVTC research manager, who supplied them in an anonymous format. Survey links were sent to each student with an introductory letter explaining the goals of the research and asking them for their input. After an initial survey distribution, three follow-up letters with survey links were sent in an effort to obtain additional responses. The target response rate for the survey was 80%.

The survey remained active for one month. Of the 114 students who received the survey, 30 welding students supplied their responses. This constitutes a response rate of approximately 26%. It should be noted that in an effort to retain student anonymity through the duration of this research, as well as limitations of FVTC data management software, it could not be determined prior to the survey which specific first and second semester welding students had participated in dual credit welding courses in high school. Therefore, not all survey respondents were able to provide answers to questions regarding welding dual credit offerings during their high school experience and not all survey questions received a 100% response rate.

Demographic Respondent Profile

The first seven questions of the survey were designed to capture the demographic profile of the survey respondents. Question one of the survey asked respondents if they were in their first or second semester of study. The question received a total of 30 responses. Of the provided answers, 23 respondents were first semester students and 7 were second semester students. Nearly 77% of survey respondents were enrolled in their first semester of study in the FVTC welding program.

Question two of the survey asked respondents whether or not they entered the FVTC welding program directly after graduating from high school. The question received a total of 30 responses. Of the provided answers, 12 respondents indicated that yes, they entered the program directly after high school. Eighteen respondents indicated that they did not enter the welding program directly after high school.

Question three of the survey asked respondents how much time had passed between their high school graduation and FVTC enrollment if they had not started at FVTC directly after high school. The question received a total of 29 responses. Of the provided answers, one respondent each indicated “6 months” and “1-2 years,” respectively. Four respondents indicated “3-4 years,” and eleven respondents indicated “5 years or more.” The remaining twelve respondents indicated that they had in fact entered the FVTC welding program directly after high school.

Due to the design characteristics of the Qualtrics survey tool, question four of the survey was not a question but a statement included in the survey by the researcher. The statement informed respondents that the next two questions of the survey would be about dual credit welding courses that may have been available to them at their high school. It then went on to describe what dual credit courses are and the potential benefits they offer.

Question 5 of the survey asked respondents if the high school they attended offered dual credit welding courses through FVTC. The question received a total of 30 responses. Of the provided answers, 11 respondents indicated that yes, their high school did offer dual credit welding classes. 12 respondents indicated “no,” and 7 respondents indicated “not sure.”

Question 6 of the survey asked respondents to indicate whether or not they participated in at least one dual credit welding class offering at their high school, if in fact their high school offered one. The question received a total of 21 responses. Of the answers provided, 10 respondents indicated that they had participated in at least one dual credit welding course at their high school. The remaining 11 respondents answered “no.” Question 6 was designed with skip logic so that a “no” answer automatically redirected the respondent to question 15, bypassing all additional questions regarding respondent dual credit experiences. Data gathered from the first six survey questions is shown in Table 3 for clarity (see Appendix B or above paragraphs for survey questions).

Table 3

Survey Respondent Answers to Questions 1-6

Question 1	Question 2	Question 3	Question 5	Question 6
1st: 23	Yes: 12	6 months: 1	Yes: 11	Yes: 10
2nd: 7	No: 18	1-2 years: 1	No: 12	No: 11
		3-4 years: 4	Not Sure: 7	
		5+ years: 11		
		None: 12		

Respondents who answered "yes" to question 6 were able to continue to question 7, which asked respondents to list the names of dual credit welding classes they attended while in high school. The answers included Gas Metal Arc Welding 1, Print Reading, Metals and Fabrication, Welding for Industry (Metals 2), Welding Symbols, and Introduction to Welding and Safety.

Quantitative Findings

Survey questions 8 through 14 continued with the topic of student dual credit welding course experiences while in high school. Question 8 asked respondents to indicate who most influenced them to take a dual credit welding class by placing options in order of importance, with a ranking of "1" being most important. Of the responses recorded, shown in Table 4, 86% ranked a parent or guardian as the most influential. 43% indicated themselves as most or second most influential, followed by 36% for counselors. Teachers, friends, family members, and employers were consistently ranked as less influential.

Table 4

Who influenced you to take a dual credit welding class? N=14

#	Ranking:	1 or 2	3 or 4	5 or 6	7
1	Parent/Guardian	**12**	1	0	1
2	Self	**6**	**8**	0	0
3	Counselor	**5**	**5**	2	2
4	Teacher	3	4	6	1
5	Friend	1	6	7	0
6	Family Member	1	3	10	0
7	Employer	0	1	3	10

Question 9 asked respondents to indicate their primary motivation for taking a dual credit welding course by placing options in order of importance, with a ranking of “1” being the strongest motivator. Of the responses recorded, shown in Table 5, 91% percent ranked the lack of additional cost as their highest or second highest motivator for pursuing dual credit followed by rigorous course work at 55%. Less highly ranked, but still of note, were the ability to get a head start for college and the chance to be with friends. The remaining options were consistently ranked as less important motivators.

Table 5

What was your primary motivation for taking a dual credit welding course? N=11

#	Ranking:	1 or 2	3 or 4	5 or 6	7
1	No cost (no college tuition)	**10**	1	0	0
2	Rigorous course work	**6**	3	2	0
3	Getting a head start for college	3	**8**	0	0
4	Being with friends	1	**6**	4	0
5	Seeing what college coursework is like	2	2	7	0
6	Taking a class not offered at your high school	0	2	7	2
7	Access to college resources	0	0	2	9

Question 10 asked respondents to indicate which adult resources helped them the most as they participated in a dual credit welding course in high school. Respondents were asked to list options in order of importance, with a ranking of “1” being the greatest resource. Of the responses recorded, shown in Table 6, 82% ranked a high school teacher as the most or second-most helpful adult resource, followed by a parent or guardian at 64%. Less highly ranked, but still of note, are dual credit course instructors and guidance counselors. Each was ranked third or fourth most helpful by 55% of respondents, respectively. College advisors, special education teachers, and family members were consistently ranked as less helpful adult resources.

Table 6

Which adult resources helped you most with dual credit? N=11

#	Ranking:	1 or 2	3 or 4	5 or 6	7 or 8
1	High School Teacher	**9**	1	0	1
2	Parent/Guardian	**7**	3	1	0
3	Dual Credit Course Instructor	3	**6**	1	1
4	Guidance Counselor	1	**6**	4	0
5	Career/Tech. Ed. Counselor	1	1	8	1
6	College Advisor	0	1	5	5
7	Special Ed. Teacher	0	1	2	8
8	Family Member	1	3	1	6

The eleventh question of the survey asked respondents if taking a dual credit welding course in high school changed their attitude toward college. The question received eight responses. Of those responses, five respondents answered, “definitely yes.” Two respondents answered, “probably yes,” and one respondent indicated “definitely not.”

Question 12 of the survey asked respondents if they felt that their experience taking an FVTC dual credit welding course in high school was positive. The question received eight responses. Of those responses, five respondents answered, “definitely yes,” and three respondents answered “probably yes.” Responses were similar for question 13, which asked respondents if they felt that their experience taking an FVTC dual credit welding course adequately prepared them for college-level welding courses. The question received eight responses. Of those responses, four respondents answered, “definitely yes,” and four respondents answered “probably yes.”

Question 14 of the survey asked respondents to indicate the challenges they faced while participating in an FVTC dual credit welding course in high school. Respondents were asked to list options in order of importance, with a ranking of “1” being the greatest challenge. Of the responses recorded, shown in Table 7, 78% ranked a lack of support from FVTC as the greatest or second-greatest challenge they faced, followed by a lack of support from their high school at 67%. Challenges consistently ranked as the third or fourth greatest by respondents were that the course was too difficult, at 44%, and that the course was too easy, at 56%. Other difficulties, such as a lack of funds for supplies or a lack of technology access, were consistently ranked as less challenging.

Table 7

What Challenges Did You Face While Participating in Dual Credit? N=9

#	Ranking:	1 or 2	3 or 4	5 or 6	7
1	Lack of support from FVTC	**7**	1	1	0
2	Lack of support from my high school	**6**	0	3	0
3	College course was too difficult	2	**4**	1	2
4	College course was too easy	0	**5**	4	0

#	Ranking:	1 or 2	3 or 4	5 or 6	7
5	Lack of funds for textbooks or supplies	2	3	4	0
6	Lack of access to internet/technology	1	3	4	1
7	Lack of access to personal protective equipment	0	2	1	6

The final four survey questions designed to gather data were focused on the respondents' personal experiences with welding in general. Question 15 of the survey asked respondents how old they were when they first learned about welding. The question received 24 responses, and the results are shown in Table 8. Of the provided answers, five respondents indicated that they were between the ages of six and ten. Five other respondents indicated that they were between the ages of eleven and fifteen. The remaining fourteen respondents indicated that they were age sixteen or older when they first learned about welding, which is a response rate for that age group of over 58%.

Table 8

How old were you when you first learned about welding? N=24

#	Answer	%	Count
1	16+ years old	58.33	14
2	11-15 years old	20.83	5
3	6-10 years old	20.83	5
4	0-5 years old	0.00	0

Question 16 of the survey asked respondents where they first learned about welding. The question received 25 responses, and the results can be seen in Table 9. The two options most commonly indicated for where a respondent first learned about welding were at school, closely followed by a family member.

Table 9

Where did you first learn about welding? N=25

#	Answer	%	Count
1	At School	28.00	7
2	From a Family Member	24.00	6
3	At Work	12.00	3
4	On the Internet	12.00	3
5	At Home	12.00	3
6	From a Friend	8.00	2
7	Media/Movies	4.00	1

Question 17 of the survey asked respondents to indicate which factors influenced their decision to pursue welding as a career. Respondents were asked to list options in order of importance, with a ranking of “1” being most influential. Of the responses recorded, shown in Table 10, 78% or respondents ranked the ability to work with their hands as the most or second-most influential factor that led to their choice of welding as a career path, followed by income potential at 74%. The factors of challenging work and physical work were consistently ranked as third or fourth-most influential, at 65% and 61%, respectively. Though highly ranked less consistently, the fact that a respondent had a friend or family member who was a welder is also of some significance.

Table 10

What factors influenced your decision to pursue welding as a career? N=23

#	Ranking:	1 or 2	3 or 4	5 or 6	7 or 8	9 or 10	11 or 12	13 or 14
1	Work with your hands	**18**	4	0	0	1	0	0
2	Income potential	**17**	3	1	1	0	0	1
3	Challenging Work	4	**15**	2	1	1	0	0
4	Physical work	3	**14**	4	0	0	1	1
5	Family member is a welder	1	**6**	**7**	3	0	2	4
6	Friend is a welder	1	3	**9**	1	4	2	3
7	Counselor suggestion	0	0	5	9	3	3	3
8	School Presentation	0	0	0	8	8	6	1
9	Technical college open house	0	0	2	4	7	8	2
10	Career fair	0	0	1	3	10	7	2
11	Company tour	0	0	2	3	1	4	13
12	Online advertisement	0	0	3	2	4	10	4
13	Parent suggestion	0	1	5	9	3	2	3
14	Media (TV, online, etc.)	2	0	5	2	4	1	9

Question 18 of the survey asked respondents which factors most influenced their decision to choose FVTC as their college for welding education. Respondents were asked to list options in order of importance, with a ranking of “1” being most influential. Of the responses recorded, shown in Table 11, 68% of respondents ranked location as the most or second-most highly influential factor. Suggestions by counselors and parents also ranked highly as factors. A parent suggestion was placed in the top four rankings by 64% of respondents, and a counselor suggestion was placed in the top four rankings by 73% of respondents. Less highly ranked, but still of note, were technical college open houses and friend suggestions.

Table 11

What factors influenced your decision to choose FVTC for your welding education? N=22

#	Ranking:	1 or 2	3 or 4	5 or 6	7 or 8	9 or 10	11
1	Location	**15**	3	0	1	0	3
2	Parent suggestion	**3**	**11**	6	1	1	0
3	Counselor suggestion	**8**	**8**	3	0	0	3
4	Tech. college open house	**7**	**7**	3	0	3	2
5	Friend suggestion	3	3	**10**	4	2	0
6	School presentation	0	4	12	3	3	0
7	Media advertisement	2	1	1	14	3	1
8	Dual credit welding course instructor	2	1	2	6	11	0

#	Ranking:	1 or 2	3 or 4	5 or 6	7 or 8	9 or 10	11
9	Job fair	1	4	3	13	1	0
10	Dual credit welding course content	0	2	2	1	14	3
11	High school teacher suggestion	3	0	2	1	6	10

The remaining two questions of the survey were designed to lead into phase II of the qualitative data collection process. Question 19 asked respondents if they would be willing to participate in a virtual follow-up interview, and question 20 offered space for those interested in an interview to provide their contact information.

PII: Qualitative Findings

The qualitative data collection process consisted of virtual interviews conducted by the researcher via Microsoft (MS) Teams. Students who participated in the survey were asked if they would like to take part in a virtual interview. The target participation number for interviews was five. Of the 30 students who took the survey, three students indicated their willingness to be interviewed and provided their contact information.

The three respondents who provided their contact information for interviews were sent a meeting invitation through MS Teams with several suggested dates and times. Once a date and time were agreed upon, three interviews were conducted. Each interviewee was informed at the beginning of the virtual meeting that it would be recorded for the purpose of creating a transcript of the interview, but that recordings would be destroyed upon completion of the transcripts.

Interview recordings were uploaded to Microsoft Stream, which allowed for the automatic creation of transcripts. These digitally produced transcripts were then compared to the original interview recordings and edited for spelling and clarity. Personal identifiers were removed, and pseudonyms were added as needed.

Completed transcripts were then incorporated into a transcription table for the purpose of reducing the raw capta of each interview into overarching themes present in the responses of the interviewees, a process informed by Haltinner (2008). The primary themes identified through this process are shown in Figure 2. The reductive process of thematic analysis is represented in Appendix D.

Figure 2

Overarching Themes Present in Interview Responses

- Dual credit opportunities in high school build students' courage and persistence in their post-secondary program of study
- Friends, family, and peers play an important role in introducing young people to their career-focused program of study
- The relationship between curricula, equipment, and delivery methods of dual credit skill courses is important for student success
- Student career aspirations, and their preparation for it, advances to the degree that the learner is realistic about their dual credit program of study and its commitment to continued learning and skilling
- Dual credit course partnerships between secondary and post-secondary institutions, and the presence of each at the other's facility, is important for students identifying their program of study opportunity

Summary of Themes

The themes that emerged from the distillation of raw interview capta offer critical information for the present and future of dual credit welding course offerings. Interviewees commonly spoke of the advantages they gained through dual credit participation. As one interviewee remarked, “I got through [my work] …faster than if I didn’t take…the high school class…” *Dual credit opportunities in high school build students’ courage and persistence in their post-secondary program of study.* Dual credit students tend to have greater success at the college level because they have some understanding of the expectations that will be placed on them, and this knowledge builds confidence that they will be successful. Another interviewee said, “I got college credit, experience…got to attend school, work, and weld…” Dual credit participation also strengthens student resolve by allowing them to begin college ahead of their peers, and this head start can lead to more consistent student persistence.

Personal interactions with close relatives are often an individual’s first exposure to the world of work and the variety of career options available in a given economy. As one interviewee remarked, “I believe my dad does welding…my brother went to the Tech for welding…grandpa was a welder…it’s a family thing…” This theme extends to the profession of welding, where personal relationships often lay the foundation for a future in welding and manufacturing. *Friends, family, and peers play an important role in introducing young people to their career-focused program of study.* Another interviewee said, “I knew other welders who took the classes…I got to see their skill level, how good they became…” These relationships lend themselves to eventual student participation in dual credit welding courses, where available, as students see the benefits that such courses can offer and the possibility of taking career-focused classes with friends.

Although welding dual credit opportunities exist at many high schools within the FVTC district, equipment and facilities are far from standardized. One interviewee remarked, “we can take Fox Valley Tech classes…take more trades-based classes…I took 10 dual credit classes.” Another interviewee remarked, “…looking at other schools, more support would be nice…for welding…I didn't have the ability to travel if I wanted to…do a different class." *The relationship between curricula, equipment, and delivery methods of dual credit skill courses is important for student success.* Not every high school offers the same opportunities for students, and this leads to variation in the experience of students at different schools. Standardization of dual credit course offerings is important for providing an equal experience for all interested students.

Student career aspirations, and their preparation for it, advances to the degree that the learner is realistic about their dual credit program of study and its commitment to continued learning and skilling. Prior to learning about welding as a viable career option, many secondary students entertain career ambitions that require advanced post-secondary education. One interviewee stated, "I started out wanting to be an eye doctor…" Another remarked, "…my other option…would have been a lawyer…" Others aspire to career paths that turn out to be unsustainable for various reasons. A third interviewee said, "…the money was a huge thing…culinary arts were my passion…but it doesn't pay the bills…" These two potential scenarios can cause students to languish unnecessarily in unproductive vocational pursuits. Dual credit opportunities at the secondary level show students that there is a more direct path to career fulfillment.

Relationships between high schools and technical colleges can increase program visibility and improve student awareness of their career options. This allows students to better understand the choices they have. As one interviewee stated, "…I did a walkthrough of the welding classes…to make sure…I was going down the right path…" When a technical college like FVTC is visible at a local secondary school, students will notice. *Dual credit course partnerships between secondary and post-secondary institutions, and the presence of each at the other's facility, is important for students identifying their program of study opportunity.* Career fairs, college tours, job fairs, and dual credit options demonstrate to secondary students the numerous career opportunities that exist. Student awareness of these opportunities, however, is equally important. One interviewee summed up his experiences with the following: “If I ever got the opportunity to go back…I would have taken it sooner…if I had known.”

Summary of Findings

When considered holistically, the data gathered by this study presented numerous correlations between the quantitative statistical results and qualitative themes. An emergent qualitative theme suggested that dual credit opportunities build high school students’ courage and persistence in their post-secondary program of study. This theme is supported by several notable quantitative findings. Data from Table 3 showed that out of the11 students who were aware of welding dual credit opportunities at their high school, 10 chose to participate. Students recognize the value of dual credit participation as a means of getting a head start for college, and this is further supported by data from Table 5 which shows that getting a head start for college was notably ranked as a student motivator. Table 5 also demonstrates that the most popular motivator for student welding dual credit participation is a lack of additional cost.

A second qualitative theme indicated that friends, family, and peers play an important role in introducing young people to their career-focused program of study. This theme is reinforced by numerous quantitative data. Parents and guardians featured prominently in multiple data sets, as did friends and family members to a lesser extent. In Table 4, parents and guardians were ranked as the number one influencers of respondents participating in welding dual credit, and in Table 6, they were ranked as the second most important adult resource to dual credit participants. Table 11 further demonstrates that a parent’s suggestion was the second-highest ranked factor for respondents choosing FVTC as their college for post-secondary welding education. Quantitative data are also consistent with the importance of friends and family members to a lesser extent. Data from Table 5 show that respondents ranked being with friends as a notable secondary motivator for taking a dual credit welding course. Family members were ranked second when respondents were asked where they first learned about welding in Table 9, and family members and friends were ranked as notable secondary factors that influenced respondents' decisions to pursue welding as a career in Table 10.

A third theme indicated that the relationship between curricula, equipment, and delivery methods of dual credit skills courses is important for student success, and this theme is consistent with the quantitative survey data. Question seven of the survey asked respondents to list which dual credit welding courses they participated in during high school, and there was a large variation among respondents for both the types of courses offered and the number of courses respondents took as a result. In Table 5, respondents ranked the option of rigorous course work as their second highest motivator for taking a dual credit welding course, but they also indicated that the difficulty of the dual credit course work was their third greatest challenge to being successful, as noted in Table 7.

The theme of welding dual course credit consistency was also demonstrated by indications in Table 6, where respondents ranked their high school teachers and dual credit instructors as their second and third most helpful adult resources, respectively, while taking welding dual credit courses. Respondents also ranked a lack of high school support as their second greatest challenge to being successful in their welding dual credit courses as seen in Table 7.

A fourth theme revealed that student career aspirations, along with their preparation for them, advances to the degree that the learner is realistic about their dual credit program of study and its commitment to continued learning and skilling. This theme is reliably supported by the quantitative data. Table 3 shows that of 29 respondents to the survey, 17 did not indicate a direct transition from their high school to the FVTC welding program. Getting a head start for college was ranked as the third highest motivator for respondent participation in dual credit welding courses as seen in Table 5.

Data from Table 10 show that the four highest-ranked factors that influenced respondents' decision to pursue welding as a career were the ability to work with their hands, income potential, challenging work, and physical work. In addition, respondents to question 11 of the survey indicated that their participation in welding dual credit courses either *definitely did* or *probably did* change their attitude toward college. Respondents to question 13 of the survey indicated that their participation in welding dual credit courses either *definitely did* or *probably did* adequately prepare them for college-level welding courses.

A final theme suggested that dual credit partnerships between secondary and post-secondary institutions, and their presence of each at the other's facility, is important for students identifying their program of study opportunity. This theme is consistent with the quantitative data. Of 23 respondents, Table 3 shows that seven were not aware of dual credit options at their high school. Table 8 shows that 58% of respondents were at least sixteen years old before they learned about welding. Respondents ranked a lack of support from FVTC as the greatest challenge to their welding dual credit success in Table 7, but also indicated that FVTC's geographic location was the most influential factor in their decision to choose the college as their school for post-secondary welding education as seen in Table 11. Of note are other findings shown in Tables 4, 6, and 11 as well. Respondents ranked school counselors as third most influential in their decision to take a dual credit welding course, and as the fourth best adult resource while taking those classes. School counselors were also ranked by respondents as third most influential in their decision to attend FVTC for post-secondary welding education.

Chapter V: Discussion, Conclusions, and Recommendations

The purpose of this study was to identify student perceptions of the FVTC welding program. More specifically, the study sought to understand the influences that cause students to pursue welding courses at the secondary and post-secondary levels, as well as pursue welding as a career path in general. The study sought to answer the following research questions:

1. What are the perceptions of the FVTC welding program among current students who took welding dual credit courses in high school?
2. What influences cause students to pursue welding courses at the secondary and post-secondary levels and pursue welding as a career?

Due to the nature of the data required for the purposes of this study, a qualitative, observational case study method was selected. The study employed online surveys and virtual interviews to gather data within a natural setting due to the importance of context for the interpretation of qualitative data. An initial institutional data inquiry was performed to gain insight about FVTC welding program participation. These data were included to provide background information about the statistics concerning enrollment numbers for the FVTC welding program, as well as secondary student participation in dual credit welding course offerings from FVTC.

Phase I of quantitative data collection consisted of administering an online survey through Qualtrics to 114 students enrolled in first- or second-semester welding courses at FVTC. The survey used for data collection consisted of twenty questions designed to gather information from students about their experiences taking dual credit welding courses in high school, as well as about their personal experiences with welding as a career in general (Appendix B). Student contact information was provided anonymously by the FVTC college research manager, and surveys were distributed through the researcher's student e-mail account. The target response rate for the survey was 80%, with a final participation rate of approximately 26%.

Phase II of qualitative data collection consisted of virtual interviews conducted through Microsoft Teams. Each survey asked participating students if they would be willing to take part in an interview to further discuss their unique experiences. The target participation rate for interviews was five, and three students agreed to interviews. Interviews were conducted using a semi-structured interview guide for some standardization (Appendix C). Each interview was conducted virtually and recorded for the purpose of creating a written transcript for analysis. Transcripts were edited for clarity, reviewed, and analyzed through a reductive thematic analysis process.

Discussion

The findings of this research are consistent with previous studies that explored the role dual credit course offerings play both in providing secondary students with early advancement of their college careers and in exposing secondary students to potential career paths of which they may have been previously unaware (An, 2013; Schield, 2014; Sullivan, 2016). In a 2019 report the Wisconsin Technical College System (WTCS) noted a 62% increase in dual credit participation among secondary students since the 2015-16 school year (WTCS, 2020). Similarly, FVTC institutional data show that dual credit participation within its district has risen 36% since the 2017-2018 school year.

Dual credit participation is on the rise for several notable reasons. As this study has shown, student awareness of dual credit course offerings is increasing. This awareness is made possible by an increased presence of technical colleges in local high schools, as well as community-centered events that take place at technical colleges such as tours, open houses, and job fairs. Also of note in this study is that students and their parents are naturally fiscally conscious, and the potential cost savings offered by dual credit course opportunities is significant. The data show that the benefit dual credit courses offer, of no additional cost to students or parents, cannot be overstated.

More specifically, the findings of this study support a positive perception among students of welding dual credit course offerings at high schools within the FVTC district. These findings are consistent with prior research concerning dual credit earners in broader sections of Wisconsin (Mindham, 2015; Schield, 2014), as well as other studies with a more national scope (Hodges, 2018; Taylor, 2015). Both survey and interview responses were optimistic, which suggests that welding dual credit course takers have a positive experience doing so. Respondents also indicated that they felt the courses they took did a respectable job of preparing them for their future college endeavors, suggesting that these classes have a very real impact on the future of students who are able to participate. Dual credit welding courses can serve as a catalyst that changes student perceptions about both the variety of careers available to them and their own ability to successfully complete college-level work. This change in student perception leads to greater persistence at the college level as students gain confidence (Sullivan, 2016).

However, no class taken is without its challenges, and the increase in influential factors involved in welding dual credit course offerings can present unique challenges to students. Findings of this study indicate that students often receive a lack of support from their high school or a lack of support from FVTC. This presents an opportunity to increase and improve the support offered to high school students when they take on a challenging welding course. It also offers the chance to examine ways in which partnerships between high schools and technical colleges can be further strengthened with the goal of greater student success and a more consistent experience for those interested in welding dual credit courses. Findings indicate a disparity of resources between district high school welding offerings, and as demonstrated by Irvine (2017), this can lead to an inequality of opportunity for students interested in welding courses.

This study shows that welding dual credit students face other challenges as well. One is course rigor, a difficulty cited frequently by respondents. This does not indicate that dual credit course offerings should be made less rigorous, but it suggests that the difficulty level of these courses is not effectively communicated to students prior to their enrollment in a college-level course. This sentiment has been echoed by others as well (Cowan & Goldhaber, 2015; Hodges, 2018). Adults in positions of leadership have a responsibility to accurately communicate the expectations of a dual credit welding course to students.

The findings of this study show that high school teachers and dual credit course instructors are the adult resources most valued by students during their dual credit welding experience. This finding suggests that the importance of these adult resources during a student's dual credit experience is high, and that the availability of these adults is crucial to a student's success in the courses they choose to take. Also of note are the consistent rankings of guidance counselors and career/technical education counselors as fourth and fifth most important, respectively. This finding implies that counselors do play an important role in a student's welding dual credit success, and that more involvement from school counselors could only serve to improve student welding dual credit accomplishments and increase awareness of welding dual credit opportunities available to high school students.

Although research shows that awareness of welding dual credit opportunities among high school students is increasing, it is still not where it could be. The findings indicate that there is a lack of awareness among high school students that dual credit welding course offerings may exist in their local high school. Students may not know that they can experience other potential career paths prior to graduation, and this is a potential missed opportunity. Conversely, the study indicates that when students know about dual credit welding opportunities, they often take advantage of them. The data show that an increased awareness of dual credit opportunities among students will increase participation, and other studies support this conclusion (An, 2013; Sullivan, 2016).

This study also indicates that students are only exposed to welding as a career at a time in their lives when a decision about a particular career path may have already been made. In the current educational climate, high school students interested in college have to begin applying for admission during their junior year, and most juniors are typically sixteen years of age or older. This means that a student may be unaware of his or her opportunity to pursue a shorter college career, incur less student debt, and end up with a successful career doing something they enjoy because they were never made aware of welding a career option. The fact that many respondents indicated that school is where they first learned about welding suggests that it is becoming a more common career suggestion. But when considering the fact that most are still over age sixteen before they first learn of it, and combined with the number of respondents who indicated that they first learned about welding either at home, at work, or on the internet, it becomes clear that secondary students do not receive enough exposure to career paths like welding early enough in their education.

Findings of this study indicate that income potential is a strong influence on a student's decision to pursue welding as a career. This is no surprise; according to the Bureau of Labor Statistics (BLS) the 2019 median annual salary for a welder was $42,490 (BLS, 2020). But respondents also placed high rankings on challenging work and the ability to work with one's hands. These choices suggest that students who choose to pursue welding as a career do so not just because of potential wages but also because they are seeking physically demanding labor that will keep them away from a corporate desk. Welding offers a chance for individuals to physically create, continuously perfect a skill, be detail-minded, and "pay the bills."

Money and challenging work are not the only factors that influences a student's decision to pursue welding as a career. Findings of this study demonstrate that parents, guardians, friends, and to a lesser extent teachers and counselors, all play a significant role in that decision. This finding indicates that a student's personal support system continues to be a significant source of inspiration for their eventual career decisions. As this study demonstrates, many welding students still learn about welding from family members or friends long before they encounter it as a viable career option at school or at work. An increased awareness of welding dual credit opportunities among adult stakeholders can only serve to increase student awareness and, as a result, provide students with greater exposure to the unique opportunities they have in high school, college, and the world of work.

Conclusions

Based on the findings and analyses of this study, the following conclusions were drawn:

- Student participation in welding dual credit course offerings within the FVTC district is increasing at high schools where they are offered.
- Students who participate in welding dual credit courses while in high school experience earlier skill attainment than their peers which leads to greater success at the college level.

- Dual credit earned while in high school allows students a head start toward completing their welding credential resulting in a lower cost for their college education.
- Parents, guardians, and family members play a significant role in student decisions regarding welding dual credit and future career paths.
- Friends, teachers, and counselors play a less significant but important role in student decisions regarding welding dual credit and future career paths.
- Differences between welding facilities, equipment, and curricula at high schools within a technical college district affect the success of students taking welding dual credit courses.
- Dual credit welding courses positively affect student attitudes toward college and help prepare high school students for more challenging college-level welding coursework.
- Welding dual credit partnerships between secondary and post-secondary schools are critical for student involvement.
- Open houses, job fairs, tours, and other collaborative efforts between secondary and post-secondary institutions positively impact student perceptions of welding as a program of study.

Recommendations

Based on the results, discussion, and conclusions of this study, the following recommendations are suggested:

Recommendations for Secondary and Post-Secondary Educators

Based on the results of the study, the following recommendations are made for secondary and post-secondary educators:

- A need exists to standardize welding dual credit course offerings that are currently available at high schools within the FVTC district. Standardized facilities, equipment, curricula, and course offerings will offer all students the same opportunities to get a head start on their college welding careers.
- Where possible, welding dual credit course offerings need to be implemented at all high schools within the FVTC district that do not currently offer them. Co-planning between partnering schools will lead to welding dual credit experiences to the extent possible at each high school. Students are missing opportunities because their high schools lack the same opportunities that other schools offer.

Recommendations for Parents and Guardians

Based on the results of the study, the following recommendation is made for parents and guardians:

- Parents and guardians of middle and high school students need to be further educated about the ways in which student participation in welding dual credit courses can positively influence attitudes about college and better prepare students for rigorous college-level welding coursework.

Recommendations for Secondary Counselors

Based on the results of the study, the following recommendations are made for secondary counselors:

- Where possible, education about welding and manufacturing careers should begin at the middle school level. Academic and career planning should be implemented by counselors and should include every career path. Students at this age are actively encouraged to start thinking about career choices, and every option should be made available for consideration.
- A need exists to further involve school counselors in the discussion surrounding welding dual credit course options in high school. Counselors play an important role when students begin making decisions about their futures, and they can facilitate connections between students and local technical colleges.

Recommendations for FVTC Staff

Based on the results of the study, the following recommendations are made for FVTC staff:

- FVTC marketing department staff should utilize every available medium to effectively communicate the value of post-secondary advanced welding credentials. This communication should extend in every way possible to high schools within the FVTC district.
- FVTC welding department staff should participate in high school advisory committee activities when possible. This will strengthen and/or build relationships between FVTC and partner schools, and may lead to more opportunities for student dual credit welding experiences.

Recommendations for Further Research

Based on the results of the study, the following recommendations are made for further research:

- Further research is needed through the use of inferential statistics to identify the unique characteristics of potential student populations that may benefit from more participation in welding dual credit courses.
- Further research is needed to determine the barriers faced by high schools in the FVTC district when attempting to establish robust and sustainable dual credit welding course offerings at their facilities.

Career and technical education will continue to be an integral part of career planning and skill building for high school students in this country, and its importance for future generations of working adults cannot be overstated. Articulation agreements between high schools and technical colleges allow for the facilitation of dual credit course offerings, which allow students to explore new career paths and build valuable skills at a time when they are making crucial decisions about their own futures. A continuous and coherent stream of communication between technical colleges, high schools, parents, guardians, counselors, and students is necessary to increase student awareness and participation in dual credit course options.

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Appendix A

UW-Stout Implied Consent Statement

for Research Involving Human Subjects

Consent to Participate In UW-Stout Approved Research

Project Title:
Influences and perceptions of the Fox Valley Technical College welding program.

Description:
I am seeking information from 1st and 2nd semester students in the FVTC welding program. This research seeks to inform two questions: *(1) What are the perceptions of the FVTC welding program among current students who took welding dual credit courses in high school?* and *(2) What influences cause students to engage in welding courses at the secondary and post-secondary levels and look into welding as a career?* I am asking that you take this brief online survey about your personal experiences with welding and how dual credit welding courses offered through FVTC may have influenced your career path. At the end, you will be asked if you would like to participate in a follow-up interview. Interviews will be conducted virtually through Microsoft Teams. If you have questions, please contact the researcher by phone or e-mail.

Risks:
You may experience minimal risk in the form of mild discomfort while answering survey and interview questions. Some questions are personal in nature and address your personal experiences. Other questions address your experiences with dual credit opportunities. Your identity will remain confidential, and all responses will remain anonymous. In the case of interviews, no personal information will be included in the research and names will be changed if needed.

Benefits:
By completing this survey and/or interview, you are helping the Fox Valley Technical College welding and metal fabrication program better serve you, our students. You are also helping future students by providing information about your experiences with dual credit welding courses and with the current welding and metal fabrication program.

Confidentiality:
No identifying information will be publicized during the course of this research. Answers to survey questions and interview questions will be published as part of the finished project but anonymity will be retained.

Future Use:
Information collected from this survey and interviews may be used for welding program changes. The results of this research may be referenced in the future research projects of others. The completed research project will be made public through the UW-Stout library.

Time Commitment:
Expect the survey to take no more than twenty minutes of your time. If you agree to a personal interview, you may expect the interview to take an additional 15-20 minutes.

Right to Withdraw:
Your participation in this study is entirely voluntary. You may choose not to participate without any adverse consequences to you. You have the right to stop the survey at any time. However, should you choose to participate and later wish to withdraw from the study, there is no way to identify your anonymous survey after it has been completed online. If you choose to participate in an interview and later decide to withdraw your responses, please contact the investigator. Your interview responses will not be included in the final report.

IRB Approval:
This study has been reviewed and approved by The University of Wisconsin-Stout's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study, please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator.

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Statement of Consent:
By completing this online survey and/or agreeing to a personal interview, you agree to participate in the following project: Key Influences and Perceptions of Welding Dual Credit Earners at a Wisconsin Technical College.

Appendix B

Survey Questions

1. Which semester of the FVTC welding program are you currently in?
    1. 1st
    2. 2nd

2. Did you enter the FVTC welding program directly after your high school graduation?
    1. Y/N

3. If not, how much time has passed between your HS graduation and FVTC enrollment?
    1. 6 months
    2. 1-2 years
    3. 3-4 years
    4. 5 years+

4. Did your high school offer dual credit welding courses through FVTC?
    1. Yes
    2. No
    3. Not Sure

5. If yes, did you participate in at least one dual credit welding class offering?
    1. Yes
    2. No

6. If you answered yes to question 5, please list the class name(s) here:

7. If you answered no to question 5, please skip ahead to question 15. Thank you!

8. Who influenced you to take a dual credit welding class? (Place in order by level of importance, with *1 being the most influential*):
    1. Parent/Guardian
    2. Self
    3. Counselor
    4. Friend
    5. Teacher
    6. Family Member
    7. Employer

9. What was your primary motivation for taking a dual credit welding course? (Place in order by level of importance, with *1 being the strongest motivator*):
    1. No cost (no college tuition)
    2. Rigorous course work
    3. Getting a head start for college
    4. Being with friends
    5. Taking a class not offered at your high school
    6. Seeing what college coursework is like
    7. Access to college library and resources

10. Which adult resources helped you most as you participated in a dual credit welding course? (Place in order by level of importance, with *1 being the greatest resource*):
    1. Parent/Guardian
    2. High School Teacher
    3. Dual Credit Course Instructor
    4. Guidance Counselor
    5. Career/Tech. Ed. Counselor
    6. College Advisor
    7. Special Education Teacher
    8. Family Member

11. Did taking a dual credit welding course change your attitude toward college?
    1. Definitely Yes
    2. Probably Yes
    3. Probably Not
    4. Definitely Not

12. Do you feel that your experience taking an FVTC dual credit welding course was positive?
    1. Definitely Yes
    2. Probably Yes
    3. Probably Not
    4. Definitely Not

13. Do you feel that your experience taking an FVTC dual credit welding course in high school adequately prepared you for college-level welding courses?
    1. Definitely Yes
    2. Probably Yes
    3. Probably No
    4. Definitely No

14. What challenges did you face when participating in an FVTC dual credit welding course? (Place in order by level of importance, with *1 being the greatest challenge*):
    1. Lack of support from my high school
    2. Lack of support from FVTC
    3. College course was too difficult
    4. College course was too easy
    5. Lack of funds for textbooks or supplies
    6. Lack of access to internet/technology
    7. Lack of access to personal protective equipment

15. How old were you when you first learned about welding? (Select one)
    1. 0-5 years old
    2. 6-10 years old
    3. 11-15 years old
    4. 16+ years old

16. Where did you first learn about welding? (Select one)
    1. At School
    2. At Home
    3. At Work
    4. On the Internet
    5. Media/Movies
    6. From a Family Member
    7. From a Friend

17. What factors influenced your decision to pursue welding as a career? (Place in order by level of importance, with *1 being the most influential*):
    1. Income potential
    2. Work with your hands
    3. Challenging work
    4. Physical work
    5. Family member is a welder
    6. Friend is a welder
    7. Counselor suggestion
    8. Parent suggestion
    9. School presentation
    10. Career fair
    11. Technical college open house
    12. Online advertisement
    13. Company tour
    14. Media (TV shows, movies, online videos, etc.)

18. What factors influenced your decision to choose FVTC as your college for welding education? (Place in order by level of importance, with *1 being the most influential*):
    1. Counselor suggestion
    2. Technical college open house
    3. Parent suggestion
    4. School presentation
    5. Friend suggestion
    6. Job Fair
    7. Media advertisement (online, billboard, social media, radio, etc.)
    8. Dual credit welding course instructor
    9. Dual credit welding course content
    10. High school teacher suggestion
    11. Location

19. Would you be willing to participate in a brief virtual interview with the researcher about your experiences with dual credit welding courses and the FVTC welding program?
    1. Yes
    2. No

20. If you answered yes to question 19, please provide your contact information here (e-mail and/or phone number):____.
    The researcher will contact you to set up a virtual meeting that is convenient for you. Thank you!

Appendix C

Semi-Structured Interview Guide

1. Please tell me more about your experience taking FVTC dual credit welding courses, either at your high school or at FVTC.
   a. Prompt: Tell me about…
   b. Prompt: You said ___________. Tell me more…
   c. Structured prompts (only asked if participant responses to the first two prompts did not address the following):
      i. What was beneficial?
      ii. What were some challenges you faced?
2. Tell me about the path that brought you to welding as a career.
   a. Prompt: Tell me about…
   b. Prompt: You said ___________. Tell me more…
   c. Structured prompts (only asked if participant responses to the first two prompts did not address the following):
      i. Where and when were you first introduced to welding?
      ii. At what point did you know that welding was what you wanted to pursue?
3. What were some of the deciding factors that led to you choosing FVTC for your welding education?
   a. Prompt: Tell me about…
   b. Prompt: You said ___________. Tell me more…

4. How has your experience been so far at FVTC?
    a. Prompt: Tell me about…
    b. Prompt: You said __________. Tell me more…
    c. Can you provide further explanation about __________?
5. What suggestions do you have for ways that FVTC dual credit welding course offerings can be changed or improved for future students?
    a. Prompt: Tell me about…
    b. Prompt: you said __________. Tell me more…

Appendix D

Interview Transcription Table Excerpt

<table>
<tr><th></th><th>Raw Capta</th><th>Essential Meaning Units</th><th>Rough Themes</th><th>Enduring Themes</th></tr>
<tr><td>Researcher</td><td>Alright, so first question. “Matt”, can you tell me more about your experience taking dual credit welding courses from FVTC at your high school, which, you did have the opportunity to do some at your high school, correct?</td><td rowspan="4">1 took the welding class…
1 TIG, stick and MIG…
1 I wish we did more…
1 lot of theory work at the start…
1 I feel like… been a lot better if…more time to do theory throughout…stick or Mig…Tig…
1 I feel like…been a lot better…just cramming it all within…first week.
1 I wish it was…two-hour class instead of one-hour class…of welding</td><td rowspan="4">1 took the welding class…

1 lot of theory at the start…

1 I feel like…been better if…more theory throughout…

1 I feel like…been better…than cramming…into first week…

1 I wish it was…two hours instead of one hour…welding…</td><td rowspan="4">Dual credit opportunities in high school build students’ courage and persistence in their post-secondary program of study.

Friends, family, and peers play an important role in introducing young people to their career-focused program of study.

The relationship between curricula, equipment, and delivery methods of dual credit skill courses is important for student success.

Student career aspirations, and their preparation for it, advances to the degree that the learner is realistic about their dual credit program of study and its commitment to continued learning and skilling.

Dual credit course partnerships between secondary and post-secondary institutions, and the presence of each at the other’s facility, is important for students identifying their program of study opportunity.</td></tr>
<tr><td>Interviewee 1</td><td>Yep.</td></tr>
<tr><td>Researcher</td><td>So can you tell me more about that experience? What was it like? What worked? What didn't? What classes did you take? Things like that.</td></tr>
<tr><td>Interviewee 1</td><td>~~I~~ took the welding class ~~where you could do all three~~, TIG, stick and MIG ~~over the course of the year~~. ~~And the one thing~~ I wish we did more ~~of was… we did a~~ lot of theory work at the start ~~of each new method of use. And~~ I feel like ~~it would've~~ been a lot better ~~if we had~~ more time to do theory throughout ~~the entire time we were focusing on like~~ stick or MIG, ~~or sometimes~~ TIG. ~~And~~ I feel like ~~that would have~~ been a lot more nice</td></tr>
</table>

	Raw Capta	Essential Meaning Units	Rough Themes	Enduring Themes
	~~instead of~~ just cramming it all within ~~like the~~ first week. I ~~kinda~~ wish it was ~~like a~~ 2-hour class instead of a one-hour class ~~though. That's the one thing I wish was a thing where I went to school where it was two hours~~ of welding ~~compared to one hour. That's one class period of welding.~~			