Factors that influence course completion of individuals enrolled in craft-training courses offered by a large organization of member construction companies

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FACTORs THAT INFLUENCE COURSE COMPLETION OF INDIVIDUALS ENROLLED IN CRAFT-TRAINING COURSES OFFERED BY A LARGE ORGANIZATION OF MEMBER CONSTRUCTION COMPANIES

A Dissertation
Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in
The School of Human Resource Education
and Workforce Development

by
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December, 2009
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This dissertation may mark the end of a formal educational journey, but not the end of my learning. The dissertation represents the knowledge, successes, and achievements that began with the decision to return to college after working in the industrial construction and maintenance industry for over twenty years. The journey to accomplish the Doctor of Philosophy, Ph.D., has been challenging, frustrating, exhilarating, enabling, and humbling experience. Success in this journey would not have been possible without the support, guidance, and encouragement of the many important people in my life. I do not have the words to properly thank all the people who contributed to obtaining a Ph.D. I hope to return to them and society the generosity, love, care, and support given to me in achieving this important goal.

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ABSTRACT

The construction industry is one of the largest providers of jobs in the United States. Between 2009 and 2013, approximately 20% of the 7.7 million Americans employed in construction related jobs (Bureau of Labor Statistics (BLS), 2009) would be eligible to retire. The industrial construction industry must attract, train, and retain a significant number of people to the construction industry.

The primary purpose of this study was to determine the influence of selected personal demographic characteristics and academic behaviors of individuals participating in craft training courses offered by a large organization of member construction companies who successfully completed or left the construction training courses prior to its completion. The study used descriptive, comparative, and discriminant analytical statistical procedures to achieve the primary purpose.

The population was defined as adult students who were enrolled in craft-training courses offered by one large organization of member construction companies during the 2008 Fall semester. Data was transferred from the training provider into a researcher design spreadsheet for analysis.

The descriptive analysis found 96.6% of the respondents were male and 74.8% respondents were classified as non-metropolitan residents. Welding and Electrical crafts had the largest numbers of students enrolled. The comparative analyses found that crafts, craft levels, attendance, and grades tended to be related to course completion rates.

Due to the findings that not all courses awarded grades, two discriminant analyses were used to identify substantively and statistically significant models that increased the researcher’s ability to explain the completion status of students enrolled in the craft training courses. The discriminant model for graded courses correctly classified 89.4% of the original grouped cases (completers and non-completers), which was a 64.8% improvement over chance. The discriminant model for non-graded courses correctly classified 83.0% of the original grouped cases (completers and non-completers), which was a 66.03% improvement over chance. The variable attendance had the greatest impact in both models.
Since attendance was found to be related to completion status, the researcher recommended further studies on determining why students were absent from classes. Additionally the researcher recommends reviewing other possible variables that may influence students’ completion status.
CHAPTER 1. INTRODUCTION

Importance of Construction

The construction industry is one of the nation’s largest industries with 7.7 million Americans employed in construction related jobs in 2006 (Bureau of Labor Statistics (BLS), 2009). Revenue from the construction industry makes up a disproportionately large percentage of the Gross Domestic Product (GDP) (Nixon, 2003). In 2006, 4.8%, $630 billion, of the National Gross Domestic Product was in the construction industry (National Center for Construction Education and Research (NCCER), 2009). The construction industry is important to the national economy (Jacobs, 2007; Nixon, 2003), because it provides a major source of jobs, it contributes to the national GDP, and it purchases a significant amount of manufactured goods (Nixon, 2003).

The construction industry provides opportunities for entrepreneurship and higher hourly wages than other hourly paid jobs. The construction industry has a greater opportunity for people to own their own firm than those in any other industry, with 1.9 million self-employed individuals in the construction industry in 2006. In 2006, the average hourly wage for production and non-supervisory workers in construction was $20.02, compared to an average of $16.76 for production and non-supervisory workers in all other private industries (Katz, 2007; NCCER, 2009).

Construction involves building, maintaining, and repairing equipment and facilities by highly skilled professionals. These skilled professionals include: heavy equipment operators, excavation and crane operators; structure and pipe welders; pipefitters; plumbers; carpenters; electricians; millwrights; masons; and several other crafts depending on type and size of the construction project. The construction industry can be divided into the following three categories: residential, commercial, and industrial.

Residential construction builds, maintains, and expands single-family homes. Commercial construction includes office buildings, multiple-family dwellings, churches, dams, and highway construction. Industrial construction includes chemical plants, petroleum refineries, pulp and paper mills, and other manufacturing plants.
Impending Skilled Workforce Shortage

Secretary of Labor Chao reported in 2004 that the United States needs more skilled tradesmen and women than ever before (Frank, 2004). In 2003, former Wisconsin Senator Steve Gunderson (2003) predicted that by the year 2028, the United States would be faced with 90 million more jobs than qualified workers. The skilled workforce shortage is the result of many factors: the baby boomers eminent retirement (Frank, 2004; Gunderson, 2003), the major expansions of industrial plants (Jacobs, 2007), the image of construction work, changing demographics, and natural disasters (Walker, 2000). The lack of emphasis on vocational trades in the education pipeline has contributed to students not following trade curricula (Walker, 2000). Because of Hurricane Katrina, the shortage of skilled workers has driven wages up 25-45% in an attempt to attract skilled workers into the industrial workforce (Jacobs, 2007).

In 2007, the average craft professional was 47 years old (NCCER, 2009). By 2010, over half of the United States population will be over 50 years of age, with 20% of the construction workforce eligible to retire between 2009 and 2013. In 2005, the Bureau of Labor Statistics predicted opportunities in the construction industry to grow 11% per year through 2016 (BLS, 2005; NCCER, 2009). The 20% of the present construction craft worker eligible to retire in addition to the 11% industry growth increases the need to attract, train, and retain more workers than ever before.

Between 1980 and 2003, companies were reluctant to build or expand industrial facilities in the United States due to unfavorable economic conditions. In 2005, the industrial industry in the Baton Rouge area, as well as other parts of the gulf coast, began the first major expansions in 30 years to address increased demands in power and petroleum. These expansions required more skilled workers than ever before (Jacobs, 2007).

Many contractors are attempting to complete projects with less than adequate number of skilled workers causing significant delays, increased costs, and overtime (Recommendations for Confronting, 2006). Many industrial contractors are turning down work because of skilled labor shortage (Jacobs, 2007). When owner-operators cannot find skilled construction workers, they turn to offshoring to satisfy
their production needs (Meisinger, 2004). Owner operators will build their production facilities in other countries where production costs less or skilled labor is more prevalent (Atkinson, 2004). The result of offshoring is loss of construction jobs and future maintenance job opportunities.

Many people are reluctant to enter the construction industry because of the traditional image of the construction industry as hard work for those with strong backs and weak minds. Because of the “strong back, weak mind” image, many people perceive construction only as a second choice when their first career choice fails. The perception of construction workers needing strong backs and weak minds may have also hurt the quality of people entering the construction trades. The construction industry may not require college degrees, but does require highly skilled workers (Jacobs, 2007).

Louisiana was struggling with a skilled industrial construction workforce shortage before Hurricanes Katrina and Rita in 2005. Many skilled construction workers were displaced by the hurricanes and chose not to return to Louisiana (Frey & Singer, 2006). Present forecasters estimate Louisiana will need 90,000 new trained workers in the next five years. Some construction occupations will grow 50% in the next four years on recovery related work alone (Jacobs, 2007).

Many employers lament that the present pipeline of schools and society are not preparing students to enter the workforce. Employers need employees with soft skills training in addition to technical skills: critical thinking and problem solving; communications: writing, speaking and listening; mathematics; adaptability and flexibility; computer literacy; and the ability to work in a team-based environment (Byrne, 1999; Meisinger, 2004).

**Changing Demographics**

Historically, the construction workforce was predominantly white male (Amaratunga, Haigh, Lee, Shanmugam, & Elvitigala, 2006), but the changing demographics of the national population will require recruiting a diverse population consisting of minorities and women in all jobs. Traditionally, construction workers came from construction workers families and friends or people who lost jobs in other industries. The people who lost jobs in other industries chose construction as a second choice (Jacobs, 2007).
Industrial facilities began requiring construction contractors to hire more certified workers, thereby minimizing the number of entry-level employees. This change in hiring practice eliminated the entry-level family member or the second choice worker because neither would have adequate skills to enter at mid-level or upper-level jobs. Therefore, the only people entering or re-entering the construction workforce would be more mid-career and older workers (Facteau, Dobbins, Russell, Ladd, & Kudisch, 1995).

The complexion of the future workforce is changing drastically. Gunderson predicted 40% of the workforce would be classified as minority by 2028. In 2003, Gunderson reported 13% of the workforce was over fifty-five years old. By 2010, the percentage of workers over fifty-five years old will grow to 20%. In 2003, 73% of the United States workforce was white non-Hispanic but is estimated to be 50% by 2050. The balance of the workforce in 2050 is estimated to be 25% Hispanics, 14% Black, and 10-15% Asians (Gunderson, 2003). The construction industry must attract more minorities into its workforce simply to find an adequate number of workers.

The construction industry is one of the few industries that are still perceived as a male dominated industry. Women constitute 50.8% of the workforce in the United States (Dunne, 1997), but make up only 12% of the construction industry, mostly in sales, marketing, office jobs, and management (Fielden, Davidson, Gale, & Davey, 2000). Women make up only 2% of the construction craft workers (Dohm & Shniper, 2007). The number of women continues to increase in the workforce, but not at the same rate in construction. If the construction industry is to survive, it will need to increase the number of women (National Association of Women in Construction (NAWIC), 2009).

The available pool of workers for the construction industry is retired workers, mid-level workers, Generation X or Xers (born from 1961 -1981 (Brown, 1997)), Generation Y or Yers (born after 1982 (Chester, 2001)) and recent high school graduates. Many retired workers will re-enter the workforce due to poor retirement planning, the desire to remain socially active, or other personal reasons (Robson, 2001). Many mid-level workers are available to enter the construction
industry after being displaced by technology, organizational downsizing, and plant closing (Facteau et al., 1995).

The Xers and Yers will be more education and have a higher technological aptitude with the ability to concentrate on multiple tasks simultaneously (Lankard, 1995). Increased technological aptitude and multitasking capabilities fit with organizational needs for higher qualified entry-level employees (Facteau et al., 1995).

High school students, parents, and counselors do not have a clear understanding of the construction industry. Society has created a delusion that the only way to success is by attaining a college education (Gray & Herr, 1999). For students battling with completing high school, the prospect of another four years of college after high school is overwhelming. Many of these students will quit school as soon as they reach the legal age of 18 years. Sixty percent of these high school dropouts will become incarcerated (Cassel, 2001; Mincy, 2006).

The industrial workforce provides students with a non-college option to be successful with a rewarding career path, not just a job. Participation in vocational education programs has been shown to improve graduation rates among high school students (Bishop, 1998). Skilled craftspeople are in great demand in today’s industrial construction industry.

**Workforce Shortage**

Organizations facing their aging workforce are losing talented, trained employees to retirement and poaching. These organizations are seeking ways to attract new employees and address employee retention. To attract new employees, some employers have resorted to aggressive poaching tactics to attract skilled workers from other employers (Robson, 2001; Roussel, 2000) within the open shop as well as from the union trained labor force (Bilginsoy, 2007).

Some employers are looking at ways to increase employee retention by increasing employee job satisfaction through job enlargement (Gallagher & Einhorn, 1976), enrichment, and career development
(Stolovitch & Keeps, 1999). Job enlargement, enrichment, and career development requires building on employees’ existing skills and talents (Stolovitch & Keeps, 1999). A careful assessment of an employee’s skills and talents compared with organizational needs has been used to develop an employee development plan (Buckingham & Coffman, 1999). Each of these methods of increasing employee satisfaction requires some form of training as a component of employee development.

**Purpose of Study**

The primary purpose of the study is to determine the influence of selected personal demographic characteristics, craft, craft level and academic behaviors on whether individuals participating in a craft training course offered by a large organization of member construction companies successfully complete the course or leave the course prior to its completion.

**Limitations of Study**

This study is limited to an industrial training facility in a southern Louisiana metropolitan city. In 2009, South Louisiana was still recovering from the effects of Hurricane Katrina and Rita in 2005 that drove a substantial number of skilled construction workers from Louisiana.

The variables being researched are limited by constraints of the governing body of the large organization of member construction companies. The governing committee of the large organization of member construction companies asked the researcher to identify ways to improve student completion rates in the training program. The committee agreed to permit the researcher to access the existing database as a start to research student characteristics and behaviors that may affect the problem of students’ low course completion rates. The training organization is presently using an anonymous student survey instrument that has no mechanism to link back to the individual student. The governing body wished to see the results of the demographic and academic behaviors before granting the use of a survey instrument that would link student opinions and perceptions to the student.

The only required information on the student application was the student’s name, the mailing address, and the sponsoring organization. Some students may choose not to include the demographic data.
Objectives

The following objectives were formulated to guide the researcher in accomplishing the purpose of the study:

1. To describe individuals participating in a craft training course offered by a large organization of member construction companies on the following personal demographic characteristics:
   a. Age;
   b. Gender;
   c. Race;
   d. Location of residence defined as metropolitan and non-metropolitan;
   e. Course (craft) in which enrolled; and
   f. Level (defined by individual craft as introductory, advanced, or some gradation between these levels) of course in which individual is enrolled.

2. To describe individuals participating in a craft training course offered by a large organization of member construction companies on the following academic behaviors:
   a. Attendance (defined as the percentage of class sessions absent during the period in which the individual was enrolled in the course); and
   b. Grades received (defined as the final course grade (each module is graded on a 100 point scale and the student receives a grade defined as the percentage of that 100 points earned in the module/course)).

3. To compare individuals participating in a craft training course offered by a large organization of member construction companies who successfully completed the course with those who left the course prior to its completion on the following personal demographic characteristics:
   a. Age;
   b. Gender;
   c. Race;
   d. Location of residence defined as metropolitan and non-metropolitan;
e. Course (craft) in which enrolled; and

f. Level (defined by individual craft as introductory, advanced, or some gradation between these levels) of course in which individual is enrolled.

4. To compare individuals participating in a craft training course offered by a large organization of member construction companies with those who left the course prior to its completion on the following academic behaviors:
   a. Attendance (defined as the percentage of class sessions absent during the period in which the individual was enrolled in the course); and
   b. Grades received (defined as the final course grade (each module is graded on a 100 point scale and the student receive a grade defined as the percentage of that 100 points earned in the module/course)).

5. To determine if a model exists that significantly increases the researcher’s ability to correctly classify individuals who participated in a craft training course offered by a large organization of member construction companies regarding whether or not they successfully completed the course from the following personal demographic characteristics and academic behaviors:
   a. Age;
   b. Gender;
   c. Race;
   d. Location of residence defined as metropolitan and non-metropolitan;
   e. Course (craft) in which enrolled;
   f. Level (Defined by individual craft as introductory, advanced, or some gradation between these levels) of course in which individual is enrolled;
   g. Attendance (defined as the percentage of class sessions absent during the period in which the individual was enrolled in the course); and
h. Grades received (defined as the final course grade (each module is graded on a 100 point scale and the student receive a grade defined as the percentage of that 100 points earned in the module/course)).

**Significance of the Study**

Training has been shown to improve productivity, reduce turnover, reduce absenteeism, and improve safety (Associated General Contractors (AGC), 2008). The United States spends billions of dollars on training each year (Gray & Herr, 1998; Stolovitch & Keeps, 1999).

Human Performance Technology is a systematic human resource-performance-improvement process that begins with the analysis phase. The analysis begins with identifying a problem that needs resolution to improve the process (Stolovitch & Keeps, 1999). The problem this study addresses is the retention and attrition rates of students participating in craft training courses offered by a large organization of member construction companies. After the problem is determined, research is required to determine circumstances surrounding or causing the problem.

Without this type of research on demographic, behavioral, and craft influences, the cause of low retention and attrition rates are speculative. This research will provide some empirical data supporting or disproving the speculations.

This study may identify some demographic anomalies, student behaviors, or craft-training curriculum issues that provide key issues in improving course completion rates of industrial craft training programs around the world. If this study does identify demographic characteristics that influence students’ decisions to stay or leave the training, the training organization could research ways to make improvements to the process to address such issues.

This study may identify specific craft issues that will enable the training organization to pinpoint resources to make improvements to address those craft issue. Better communication of the expectations of certain crafts may be needed to improve a student’s prior knowledge before the student begins training in each craft.
This study is important because it may identify students who are more likely to complete the training based on selected demographic, academic, and behavioral characteristics. From this information, the recruiting process could target students who tend to complete the training. The study may identify students who need more guidance or coaching to improve their completion rates in craft training programs.

**Definitions of Selected Terms**

The following terms are defined for use in this study. Many are operational definitions developed by the researcher.

**Completers** – Students who remained enrolled in the course the duration of the semester. The training organization database has several classifications for completers: Active, Complete, Graduated, and Incomplete (Researcher Developed).

**Lean Manufacturing** – A management process developed to minimize non-essential movements and material used during the manufacturing process. Lean Manufacturing begins with motion studies observing the behaviors of the workers looking for non-essential movements to accomplish the specific task. From these observations, a set of procedures is developed and implemented for employees to follow for each described task. Lean manufacturing also will evaluate effective use of raw materials. The organization using lean manufacturing philosophy utilizes just-in-time material handling practices (Byrne, 1999). Just-in-time shipping practices schedules parts to arrive at the facility when needed, not before. This will minimize the storage cost. This just-in-time mentality is also applied to the workforce, in hiring consultants only when needed to save time and money (Wiggenhorn, 1990).

**Metropolitan** – the United States Census Bureau defines a metropolitan area as a central city having a population of at least 50,000 residences (Wiki, 2009).

**Non-metropolitan** – the United States Census Bureau defines a non-metropolitan area as a central city having a population of less than 50,000 residences (Wiki, 2009).

**Non-completers** – Students who attended a minimum of one class, but did not remain enrolled in the course the duration of the semester (Researcher Developed).
Offshoring – Used to describe the use of foreign labor to accomplish work formally accomplished by domestic labor. In the context used for this research project, Offshoring may take place in other countries by shipping manufacturing facilities to other countries or by the organization importing foreign labor to domestic soil to accomplish the work (Atkinson, 2004; Meisinger, 2004).

OJT – the open shop believed that On the Job Training (OJT) was the best method to train new workers in the construction trades. OJT involved the employer assigning the new employee or protégé to a master craftsperson to learn from their experience. Sometimes the protégé would work with several different Craftspeople to learn many different approaches to solving different problems. Problems would arise when the craftsperson was reluctant to teach the protégé the skills in fear of training their future competition or the craftsperson did not have the teaching skills to teach the protégé (Collins, 2001).

Poaching – Poaching is the act of businesses hiring employees from other employers by paying more for the prospective employees. Poachers do not invest in developing the employee skill-sets. The result of poaching is neither the employee nor the employer respecting each other, resulting in the new employee continuing to look for the next higher bidder (Robson, 2001).

ROI – Return on Investment – An evaluation method that measures the output of an investment of resources. The ROI can be measured financially, emotionally, or any other valuable commodity important to the participant. Many people are unaware they are continuing to evaluate the cost-benefit ratio, except in qualitative measures (Phillips, 1997).

Six-Sigma – Six-Sigma is a management system originally developed by Motorola to minimize wasted time and mistakes. A data-driven systematic process improves quality to the six standard deviations. One component of Six-Sigma is no changes in behavior are allowed without justification by available data (Wiggenhorn, 1990). The result is minimal experimentation allowed for new discovers and little room for training new employees.

Taylorism – Zachary Taylor designed a systematic method of breaking down jobs into tasks that would require minimum time to train new employees to become productive members of the workforce (Gray & Herr, 1998).
TQM – Total Quality Management – Business strategy model designed to improve quality at all levels of the organization. TQM develops appropriate best practices for given facility based on a set of standards set by the facility (Martin, 2001).

TES – Tailored Engineering Systems – Develop an engineering system that describes a systematic process of maintenance practices. A group of maintenance special analysts reviews maintenance procedures and engineers the best routines to repair the equipment. TES develops a more detailed set of steps than standard Job Safety Analysis, JSA. A JSA only delineates safety procedures for accomplishing the given procedures.
CHAPTER 2. REVIEW OF LITERATURE

The purpose of the review of literature is to introduce the problem being studied; explain why this problem is important to the author, the reader, and society; identify locations for the reader to research deeper on the topics being researched; and suggest where more research may be needed on the subject. The review of literature is divided into three main sections, the introduction, the body, and the conclusion. The introduction begins with a history of the situation that led to the topic or situation being researched. The body contains a discussion of variables important in this study and introduces some relevant previous research on the topic. The summary will explain how the literature will be used to develop the methodology of the study.

Construction Skilled Workforce Shortage

Increased Demand

The new millennium welcomed a renewed boom in the construction industry increasing the demand for a skilled construction workforce. The construction workforce is divided into the open shop and organized or union labor shop.

Organized labor saw their membership increase to 1.3 million in 2001, but then saw their membership drop to 1.11 million by 2004. The recent upturns in demand for energy, petrochemical, and public works construction, consequently demand more trades people. Union labor saw their membership increase to 1.232 million in 2005 (Belman & Smith, 2008). Union Labor accounts for approximately 13.5% of the construction industry’s workforce (Srour, Haas, & Borcherding, 2006, as cited in Wang, Goodrum, Haas, & Glover, 2008).

In 2005, the Gulf Coast had begun many new industrial plant upgrades, commercial construction projects, and new infrastructure construction projects requiring an increase in skilled workers. Then Hurricanes Katrina and Rita hit the Gulf Coast driving many skilled workers away from the Louisiana Gulf Coast exasperating the shortage of skilled workers (Frey & Singer, 2006). In an attempt to attract skilled workers, employers increased hourly wages 25-45% (Jacobs, 2007). Other geographic regions responded by increasing wages to keep the local skilled workers home and attract new workers to fill
their skilled workforce shortages. One example, the Houston Ship Channel, responded to Louisiana’s increased wages by raising the wages for craftspeople, like the skilled pipefitters were increased from $18/hour to $28/hour (Wang et al., 2008).

In 2007, The Business Round Table (BRT) sent out surveys to get the pulse of the construction industry. The survey found 86% of construction companies reported a shortage of skilled workers (Wang et al., 2008), up from 60% in 1996 (BRT, 1997, as cited in Wang et al., 2008). The 1983 BRT Annual Report predicted a growing shortage in the skilled workforce unless the construction-training providers made some major changes. BRT contributed the skilled workforce shortage to the shift from union contract labor that included employee apprenticeships programs in their contracts to the merit shop contracts that may not contain employee-training components in their contract, and the negative construction image in schools and the public.

**Increased Quality Demand**

Historically, workers would enter the construction industry through connections with friends and family members already working in construction, after losing jobs in other industries with construction becoming a second choice career, or fresh out of high school (Jacobs, 2007). The union halls required the new entrant to participate in a 3-5 year apprenticeship program to develop their chosen craft (Glover & Bilginsoy, 2005). The merit shop agrees that the apprenticeship training programs does produce skilled craftspeople, but at what cost. The open shop, led by Associated Builders and Contractors (ABC) has developed it own unilateral multiple-organization training programs (Whyte, & Greene, 2006). The open shop believes the apprenticeship programs are outdated and take too long to gain certification.

Industrial owner-operators realized the quality of the construction skilled workforce was becoming a problem. The owner-operators began requiring the construction companies to hire more certified workers to build and maintain their industrial facilities. The result of these certification requirements is that the only people entering the construction industry workforce are the mid-level or re-entering older workers (Facteau et al., 1995), or people who have received skills training external to the
industry from high schools, trade, technical, and community colleges. These increased credentials reduced the pool for new entry-level construction workers.

**Changing Demographics**

The changing demographics are also having a dramatic effect on the skilled workforce shortage in the United States. The skilled workforce shortage is compounded with the ageing of the baby-boomers. The average age of the skilled craftsperson was 47 years in 2007 (NCCER, 2009) up from 36.2 in 1985 (Wang et al., 2008). According to Gunderson (2003), between 2003 and 2010, 20% of the construction workforce will be eligible to retire.

Traditionally, the construction workforce consisted of white males. In 2003, 73% of the skilled construction workforce was white non-Hispanic, but is predicted to be only 50% white non-Hispanic by 2050 (Gunderson, 2003). In 1985, only 6% of the construction workforce was Hispanic (Wang et al., 2008), and is expected to increase to 25% by 2050 (Gunderson, 2003). The increase Hispanic population is a welcome addition, but the Hispanic population has an unwelcomed “disproportionate higher number of fatalities and injuries compared to the non-Hispanic counterparts” (Richardson, 2003, as cited in Wang et al., 2008).

Other minorities including Asians, African-Americans, and Women need to be attracted to the construction industry. The image of the construction industry as dirty, masculine, and somehow less intelligent than other career paths has been a deterrent to many possible new entries (Lynch, 2000). Construction trades were seen as a place for people who either lost jobs in other industries or failed at going to college.

**Future Predicted Shortages**

The future predictions for the commercial and industrial skilled workforce shortages are not improving. According to the Construction Labor Research Council (CLRC), the United States will need to attract, train, and retain 185,000 new workers per year until 2016 just to keep up with the demand of new construction jobs (Construction Labor Research Council, 2005, as cited in Wang et al., 2008). The Construction User Roundtable (CURT) has predicted 200,000 – 250,000 new skilled workers per year.
will need to be attracted, trained, and retained in the construction industry (Construction User Roundtable, 2004).

**Decreasing Workforce While Increasing Demand**

During the 1990s, the merit shops realized the present lull in the construction skilled workforce demands would soon end. Many of the skilled workers who found themselves out of craft jobs found other career paths outside the construction industry to embark on (Agapion, Price, & McCafferr, 1995) reducing the number of available skilled construction workers in the workforce. NCCER and BLS predict 20% of the construction workforce will be eligible to retire by 2016 (BLS, 2009; Dohm & Shniper, 2007). Additionally, the BLS predicts a continuous 11% annual growth in construction through 2016 (BLS, 2009).

**Changing Expectations**

The industrial revolution, at the turn of the century, increased the need for craft workers in greater numbers than could be supplied by the old apprenticeship systems. In the early days of the industrial revolution, the larger companies bore most of the cost of developing the worker's skills with company-sponsored apprenticeships and training programs with intensive On-the-Job-Training (OJT).

To minimize the cost of extensive employee training, Fredrick Taylor, in the 1890s, developed a process (Taylorism) that included dividing jobs into small tasks that could be taught to new employees quickly enabling them to become a contributing member of the organization without the huge investment of employee training (Gray & Herr, 1998). Taylorism pushed all decisions up to the management level, thus minimizing the need to hire or invest in developing highly skilled workers.

Because of the “dumbing-down” of the workforce, long hours, low pay, and dangerous work conditions that resulted from Talyorism, labor unions such as American Federation of Labor (AFL), the Congress of Industrial Organizations (CIO), and other unions, formed to improve worker conditions. The changes included increased safety, child labor laws, and employer-union jointly sponsored apprenticeship programs (Angerer, 2003). From these early beginnings came the craft training programs of today.
In today’s industrial industry, employees are expected to know more and be capable of more skills than ever before. Six-Sigma, TQM, TES, Lean Manufacturing, and several other quality control systems, were designed to produce near perfect results every time; minimize downtime and waste; and improve organization workforce efficiency. Employers have no room for errors. The goal of perfect performance makes (OJT) a hazardous prospect (Martin, 2001). Employees are not permitted to try unproven procedures or behaviors that may produce unplanned results. Employers are evaluating the Return-On-Investment (ROI) for each employee. Some employers see untrained employees as an expense that takes away from the company’s (immediate) ROI, thus the untrained employee should not be hired. These employers believe they can hire people already trained, by someone else, by paying the potential employees more money (poaching) than they are already making.

Organizations are constantly evaluating the ROI of their efforts. One of the measures used to evaluate the training association’s ROI is the ratio of students who enter the training compared to the number of students who complete the training. Lean economic times increase the need and awareness for improving the training ROI.

Construction Transformation 1970-Today

Many transformations have reshaped the construction industry in the three decades from the 1970s to the present (Weil, 2005). Globalization in the 1980s resulted in offshoring (Atkinson, 2004), sending many of the lower skilled jobs and manufacturing facilities overseas to countries with low skilled workers willing to work for lower wages (Gray & Herring, 1998). The 1970s and 1980s saw reductions in domestic new construction, reductions in the number of expansions in existing facilities (Byrne, 1999; Jacobs 2007), and a shift from unionized labor to merit shop labor (Weil, 2005). Today, less than 13% of the construction workforce is union (Bilginsoy, 2007)

The reduction in new domestic construction, offshoring, and the increase in merit shop’s market share contributed to the decrease in organized labor membership from 1.6 million in 1977 to 906,000 in 1992 (Belman & Smith, 2008). The overabundance of skilled employees gave the industrial industries the perception that organizations did not need to spend valuable resources on training new help.
Companies with farsighted plans realized certain skill sets will be high in demand and short in supply. Some of these companies would resort to aggressive poaching actions for employees with projected skills that were expected to be in short supply (Robson, 2001).

The succession plan became simple, hire the people already trained. As union contracts expired, industrial plants replaced many union contracts with open shop maintenance contracts without employee training components. Many times the open shop companies considered the additional cost of employee training in the contract would result in the contractor losing the bid for the job (Wang et al., 2008).

**Craft Training in Public Education**

Since the 1970s, many parents and educators have preached that the only way for a child to be successful is through a college education (Gray & Herr, 1998). The construction and vocational industry training programs suffered from negative image issues in our school systems since the 1970s (Lynch, 2000). Many school systems removed the construction trades from their curricula or reduced the value of attending these courses (Gray & Herr, 1998; Lynch, 2000). Many states used the Perkins Act of 1990 to shift to a more academic base vocational education approach instead of the hands on approach. The 1998 version of the Perkins Act increased the emphasis for schools to prepare students for post-secondary education with measurable proficiencies (Rojewski, 2001). In the present environment of accountability and affordability, more students could be taught in an academic setting by less teachers and achieve more quantitative data than in hands-on vocational application programs. During the 1980s, as result of the glut of domestically trained workers, the devaluing of craft skills, and the desire to save money, the federal government workforce development support fell from $24 billion in 1978 to $7 billion in 1999 (Bills & Hodson, 2007).

**Standardized Training Program**

The construction industry does not require college degrees, but does require a highly developed set of skills for each craft (Jacobs, 2007). In the past, people working in the open shop construction industry learned their trade through OJT by working with experienced crafts-men and craftswomen (Bilginsoy, 2007). When the supervisor felt comfortable with the protégé’s ability, the protégé was
promoted to journey level. The United States Department of Labor requested the open shop to develop standard training programs for high-skilled crafts such as electrical, pipefitting, crane operation and other trades (Bilginsoy, 2007).

In the 1980s, as the Unions lost market share and secondary education systems removed vocational training programs, the merit shop organizations, led by Associated Builders and Contractors (ABC), developed a craft-training program called the “Wheels of Learning” that was designed to meet the United States Department of Labor requirements (Glover & Bilginsoy, 2005).

The merit-shop training organizations continued to face growing criticism from organized labor and the US Department of Labor about the quality and retention rates of merit shop training and apprenticeship programs (Bilginsoy, 2007). In 1996, the merit shop collaborated with the University of Florida to evolve the Wheels of Learning training programs into standardized, valid training curricula and craft-assessment processes approved by the US Department of Labor for the construction trades. The new entity is called the National Center for Construction Education and Research (NCCER), affiliated with the University of Florida’s M.E. Rinker, Sr. School of Building Construction (NCCER, 2009). The curriculum was designed to provide standardized construction training, measurable goals, and achievements, policies and procedures; to satisfy the education systems’ need for accountability (Glover & Bilginsoy, 2005).

The NCCER training curricula is used in many public schools systems, state community and technical colleges, and merit shop training organization consortia. The craft-training curriculum is divided into several modules grouped in levels that may require students to attend several semesters to complete the specific craft-training program. To move from one level of training to the next, the students successfully complete each module test. Upon completion of all the training levels of the specified craft, students are given the opportunity to take the craft assessment. The students who successfully complete the NCCER Craft Assessment will receive that craft certification.

The construction industry has been active for many years and the concept of craft certification is relatively new to the merit shop industrial construction industry. NCCER realizes that many people may
already possess the necessary skills to pass various craft assessments. NCCER developed criteria for experienced construction workers or students to have an option to take the NCCER Craft assessment prior to or while receiving craft training. An individual may take the certification test up to four times a year. A student may chose to take the NCCER Craft Certification at any point during the training process. Students who have successfully passed the NCCER Craft Assessment before completing the training program may discontinue the training.

**Importance of Employee Development**

The United States has the “worst educated and most unskilled nonprofessional hourly workforce in the industrialized world” (Gray & Herr, 1998, p.46). Employers estimated 39% of current workers and 26% of new hires have basic skills deficiencies (Gunderson, 2003). McCain and Pantazis (1997) predict 75% of today's workforce will need extensive training to keep up with technology changes. Technological advances have replaced many low skilled jobs with jobs requiring higher skilled levels than the present workforce possess (Facteau et al., 1995). Lifelong learning is becoming a necessity to maintain a competitive edge in today’s construction industry.

Employee development programs that include training programs have been shown to improve productivity, reduce turnover, reduce absenteeism, and minimize rework. Employees participating in training realized an average of 10 cents per hour increase in wages for every hour worked and electricians saw one dollar per hour increase in wages for each hundred hours training (AGC, 2008).

Local construction industries have formed 79 local ABC Chapters and similar organizations to provide a unified political voice for the open shop construction industry, to promote craft training that serves the local industry, and to become involved in civic improvements in the local communities. The local associations may coordinate with local secondary schools, post-secondary schools, community, and technical college systems to provide the industry the craft training needed. When the local education systems do not provide an adequate number of students with the specific skill sets needed, the association may provide training (Bilginsoy, 2007).
ABC Chapters coordinate or provide multi-employer sponsored training programs to local industries. The multi-employer sponsored training programs were seen as an alternative to union and single organization training programs (Bilginsoy, 2007). These unilateral training operations were a direct result of organizations realizing poaching was only a short-term solution to a long-term challenge (Roussel, 2000).

**Attracting New Workers**

The first step in attracting and retaining employees to the construction industry training and industries is to improve the image. Most construction work does not require a four-year degree, but a highly developed set of skills (Jacobs, 2007). Highly skilled crafts-men and -women require training and education to maintain their edge. Construction requires more than a strong back and weak mind. Employees give the most important reason for not leaving an employer is the employer provides internal training and development to the employees (King, 2005).

Mincy (2006) suggests the way to attract students to any education or training program is to provide expectations of participation and completion in the training program. The training provider should identify short, intermediate, and long-term opportunities in the industry for participants who complete the training. Next, the competencies and skills are identified to get on that career path for the participants. Students need the training provider to create short, intermediate, and long-term expectations of success. The training provider assists the participants to identify student’s barriers to success. Realistic goals and timelines are set for the student to complete the training program.

Organizations must define the image of success that is attractive to potential students who complete the required training. The definition must include a timeline for completion; the effort required to complete studies, resources needed to complete training, and job requirements upon completion. Several resources influence the adult learner to participate in adult learning activities, including family members, teachers, administrators, co-workers, supervisors, and classmates (Covey, 1989; Lumsden, 1998; Wentzel, 1998). The students must first see a value of participating in the program (Phillips, 1999).
Students continually perform a cost-benefit analysis to participate in a training program. The student’s cost-benefit analysis will evaluate the cost, financial and personal, to attend the training program, compared to the potential benefits, to determine if the investment is worth the rewards to complete the training program (McIntosh, 2004; Phillips, 1999). Students will participate in the adult education program if the training or expected rewards of the training program is valued higher than other activities in the student's world. The value adults place on education must fit within a personal priority system that includes work, family responsibilities, and leisure activities. Adult education programs compete with the student’s leisure activities such as resting, eating, recreating, and family activities (Courtney, 1992). Cyril Houle (1961, as cited in Rezabek, 1999) “postulated adult learners had three motivational orientations for participating in learning activities: goal orientation, activity orientation, and learner orientation”.

Goal oriented learners seek learning for the sake of learning. The learning activities for the goal-oriented learner are very sporadic from both formal and informal resources. They will seek learning from different institutions dependent on the type of learning they are interested in. The goal-oriented learner’s time is spent reading and traveling to satisfy perceived learning needs or desires (Boshier, 1971).

The activity-oriented learners participate in group-learning activities for social activities. The activity-oriented learner may attend one or several different learning institutions, depending on which institution best satisfies their social needs. The activity-oriented learner does very little reading (Boshier, 1971).

The goal of the learning-oriented learner is to gain specific knowledge or achieve a specific goal. The learner-oriented learner is an avid reader from early childhood. He or she attends serious learning activities with or without groups. The learner-oriented learner is there for the learning, not to socialize (Boshier, 1971).
Researchers have been studying student learning, attrition, and retention, in construction and adult education programs for several years (Bilginsoy, 2003; Cross, 1981; Glover & Bilginsoy, 2005; Quigley, 1995; Wang, Goodrum, Haas, & Glover, 2008).

**Attrition and Retention**

Student attrition and retention are described as the number one problem in adult education programs. Quigley (1995) reports attrition rates as high as 60-70% in state and federal adult basic education statistics. According to recent studies based on data collected on a national survey of Construction Industry Institute (CII) members and U.S. industrial and commercial contractors, open shop training completion rates average 40.3% compared to 81.3% in the union sector training programs (Wang et al., 2008).

Referring to students as dropouts, i.e., those who leave adult training or educational programs early would be misleading (Callan, 2005; Harris, Simons, Bridge, Bone, Symons, Clayton, Pope, Cummins & Blom, 2001; Kerka, 1995). The phenomenon of leaving training before the completion of the training program may be the result of the non-completer achieving some goals (Harris et al., 2001; Kambouri & Francis 1994; Perin & Greenberg 1994). According to Bilginsoy (2007), three-quarters of the construction workforce is involved in production work that does not require craft certification. It is typical for some adults to go through cycles of attending, withdrawing, and returning to training programs. Sometimes conditions occur that influence students to place the student role temporarily on the back burner (Kerka, 1995).

Most non-completers leave early in the training program. In studies done by Kambouri and Francis (1994) and Malicky and Norman (1994), most non-completers left early in the program, with the greatest percentage leaving the training program after only 2-3 weeks. In the case of some 3-5 year apprenticeship programs, it is common to see the greatest percentage of the apprentices leaving in the first 4 months of the program (Bilginsoy, 2007).

Adults enroll in adult education and training programs for more reasons than to just learn the subject (Rezabek, 1999). The reasons for attending training range from securing and maintaining
employment (Greenhalgh & Mavrotas 1994) to socialization with like-minded people (Callan, 2005; Kerka, 1995; Rezabek, 1999; Vann & Hinton, 1994). Completion of training certification usually comes with certification pay, but the certification comes with added responsibilities that the apprentice may not want to accept. Apprenticeships require joint commitments between the apprentice and the sponsoring organization. During high unemployment times, apprentice attrition is lower than when jobs are plentiful (Bilginsoy, 2007).

Patricia Cross explained that a combination of elements influence learners to enroll, participate, and remain in training and education programs. She explains a seven-step process each individual goes through to make the decisions to enroll, participate, and remain in training through completion.

1. Self-evaluation
2. Attitudes about education
3. The importance of goals and the expectations that these will be met
4. Life transitions
5. Opportunities and barriers
6. Information on educational opportunities
7. The decision to participate (Cross 1981: 125)

“The more positive the learner's experience at each stage, the more likely he or she is to reach the last stage - the decision to participate” (McGivney 1993: 27)

**Learner Choices**

According to William Glasser’s Choice Theory, people will do what they want to do for their own reasons (1998, p. 21). Bob Pike (1994) says everyone is motivated to do what they believe will achieve the greatest pleasure/pain balance. Jack Phillips (1999) suggests every person is continually measuring, sometimes unconsciously, the Return of Investment (ROI) of the activity in which the learner is participating.

The ROI is a measure of perceived or calculated cost-benefit ratio of the expected outcome of participation in an activity, versus the resources, sacrifices, degree of difficulty, and barriers to complete
the program. The ROI measurement may be in the form of money, emotions, or other component of a person’s value system. If the student does not value the learning activity, then the student will discontinue the activity (Phillips, 1999). A student’s choice to perform is influenced by internal and external factors such as the student’s ability, motivation, and cultural relationships (Fuller, 1990). Students are influenced to perform by teachers, school administrators, the school environment, classmates, co-workers, and family members (Covey, 1989; Lumsden, 1998; Wentzel, 1998).

Researchers identify the influencers that motivate adults to participate in formal learning activities as barriers and enablers (Cookson, 1986; Courtney, 1992; Cross, 1981; Rezabek, 1999). Courtney suggests adult education competes with other leisure activities such as eating, resting, recreating, family activities, and other leisure activities (1992). Adult learners participate in adult learning activities for three motivational orientations: goal orientation, activity orientation, and learner orientation (Boshier, 1971; Rezabek, 1999).

Goal-oriented learners seek learning for the sake of learning. The learning activities for the goal-oriented learner are very sporadic from both formal and informal resources. The goal-oriented learner will seek out different learning institutions dependent on the type of learning activity and subject the goal-oriented learner is seeking. The goal-oriented learner’s time is spent reading and traveling to satisfy perceived learning needs or desires (Boshier, 1971).

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The goal of the learning-oriented learner is to gain specific knowledge or achieve a specific goal. The learner-oriented learner is an avid reader from early childhood. They only attend serious learning activities with or without groups. The learner-oriented learner is there for the learning, not to socialize (Boshier, 1971).
Bilginsoy identified three situational barriers that may influence non-completers to leave the training before the training is complete. First, the non-completer may transition to a job outside the trade. Second, the non-completer may take a job not requiring the craft certification. Last, the non-completer may successfully complete the craft certification before completing the training (Bilginsoy, 2007).

A significant body of literature supports multiple factors having singular and cumulative impact on student retention (Bilginsoy, 2007; Lynch, 2000; National Centre for Vocational Education Research, 2001; Roussel, 2000; Smith, 1998; Wang et al, 2008). This research will look at demographic characteristics such as student’s age, gender, race, location of residence, craft, craft level, and academic behaviors.

Much of the research concerning craft training programs concentrate on comparing union apprenticeships with non-union apprenticeship programs (Bilginsoy, 2007; Wang, 2008; Wang et al, 2008). Many factors contribute to the different completion rates for apprentices in union and non-union apprenticeship programs. A condition of employment for new union members is to participate in the apprenticeship program, where participating in an apprenticeship program is an option in the open shop. Another cause for higher attrition rates in the open shop is the lack of a coordinated effort between the training sponsor and the employer to match the apprentice with a qualified master craftsperson (Bilginsoy, 2003). Both union and non-union training apprenticeships found some consistent factors most related to student retention and attrition rates. According to Bilginsoy’s (2007) research based on data from a national database for all registered apprenticeship programs, race and gender are the most influential factors for retention and attrition. The study found African Americans dropped out sooner than whites and women dropped out sooner than men. The average entry age of the apprentices was 26 (Bilginsoy, 2007).
Student Characteristics

Age

Age is considered to have single and cumulative relationship on students’ decisions for attracting to, remaining in, and completing a training program. According to Roussel (2000), the most likely age of students to be attracted to training is 20 years. Research has shown students younger than 26 years of age tend to have higher attrition rates than older students (NCVER, 2001). Workers in their prime working years, 26-45 years of age, are more likely to complete the training. The least likely age group of people to be attracted to training programs is 60-65 years old (Bills & Hodson, 2007; Roussel, 2000). The older population is reluctant to participate in training efforts from employers (Fahy & Steel, 2008; Roussel, 2000). Older workers (aged 50 and older) develop a disposition that they are too old to learn (Cross, 1981) and therefore become resistant to training. Younger students may be less committed to learning the craft than older students already committed to the craft and industry (Bilginsoy, 2007). Younger white-collar males are more likely to attend training than older blue-collar workers (Fahy & Steel, 2008) are.

People learn differently according to their age. Robson (2001) found younger workers who recently graduated from high schools might learn faster than workers who have been in the workforce for an extended period of time, but do not have the level of experience for new training to build upon that older workers will have (Robson, 2001). Martin found older workers learn at rates similar to younger workers (Martin, 2001) under certain conditions. Adults learn best when the new knowledge builds upon previous learned material. Reflective teaching methods require the instructor to explore the student’s knowledge level and build from there (Mathieu & Martineau, 1998).

Adults have the freedom to seek learning opportunities based on their perceived needs and desires, develop a phenomenon referred to as “Swiss Cheese Knowledge”. Swiss Cheese Knowledge is based on the learner learning just enough to satisfy the perceived needed pocket of knowledge. The result is a learner lacking basic education in some areas while being extremely proficient in others (Helping Job Seekers, 2004).
Employers commit differently to training according to the student’s age and quality of service with an employer. Employers evaluate the ROI of sending their employees to training functions. The fluid nature of construction adds a certain degree of difficulty in determining an organization’s ROI by sending employees to long-term training programs. Younger workers tend to change jobs more often than older workers do. From the time workers reach their mid-thirties, until they reach retirement age, they tend to remain on the same job or with the same company. The middle age workers would be encouraged to participate in continuing education more than their older and younger counterparts would. Organizations may be reluctant to train older workers for fear the older worker will retire or leave the company before the company reaps the return on their investment (Robson, 2001). Effective training must not be targeted at one age group, but address all ages and learning styles (Robson, 2001).

**Gender**

Gender is a dichotomous categorical variable that has single and cumulative effects on the student’s decisions to begin and complete a training program. Men are more likely to participate in construction craft training than women (Anlezark, Karmel, & Ong, 2006).

The sixties saw an increase in divorce, single parent homes, and more moms going to work. From 1960 – 1980 the percentage of working moms increased from 20% to 47% and the number of working moms of children 6-17 years old rose from 43% to 76% (Dunne, 1997). Women account for 49.5% of the UK workforce (Fielden, Davidson, Gale, & Davey, 2000) and 50.8% of the US workforce (Dunne, 1997), but only account for approximately 13% of the construction workforce. The lack of women in construction in the UK and the United States is attributed to the selection criteria and construction “male dominated courses, recruitment practices and procedures, sexist attitudes, male dominated culture, and the work environment” (Fielden et al., 2000). The perception of construction as being a dirty and physically demanding industry has prevented many women from considering construction as a career choice.

The construction industry is one of the few industries that are still male dominated. The 2007 Bureau of Labor Statistics estimate the construction industry employs 11,856,000 people in the United
States, of which 1,119,000 are women. The majority (77%) of these women work in sales and office jobs while only 2% work in construction and maintenance (Dohm & Shniper, 2007). The construction and national culture tends to lead women to the supervisory and sales sector of the construction industry (Harris et al., 2001).

Certain populations of women have been shown to have a higher attrition rates in industrial craft training programs than men (Bilginsoy, 2007; Fielden et al., 2000; Roussel, 2000). Some possible contributing factors to women’s high attrition rates are that women do not have traditional role models and mentors to guide them on the construction path and women have greater domestic responsibilities than their male counterparts (Bilginsoy, 2007) do.

In 2006, journey level employees can earn an average $20.02 per hour (Katz, 2007). Organizations such as the National Association of Women in Construction (NAWIC) and Professional Women in Construction (PWC) began to promote, attract, and provide support to the women who work in the construction industry (NAWIC, 2009; NCCER, 2009a).

**Race**

Race is used as a categorical variable in many studies on student participation and completion in training opportunities (Bilginsoy, 2007; Roussel, 2000). Race has been found as a cumulative variable with gender and age in many studies. Women and men of the different races behave differently. Caucasian males tend to have higher participation and completion rates than other race or ethnic groups (Bills & Hodson, 2007; Roussel, 2000). The retention rates for African American males tend to improve by 10% when training is jointly implemented with OJT programs (Bilginsoy, 2007).

Married African American women are more likely than married Caucasian women to participate in and complete training (Roussel, 2000). Caucasian women tended to have the same attrition rates as African American men (Bilginsoy, 2007). No significant difference was found between single women based on race (Roussel, 2000).

Some races and genders receive more specific training than others do. Examples are African-Americans tend to receive more Adult Basic Education, ABE, than other races. The African-American
population’s high participation rate in ABE programs may be due more to the correlation of low-socioeconomic status in the African-American population than any other factor (Bills & Hodson, 2007; Marks, 2000; Rouse, 2006). The problem of distinguishing if the participation and retention rates are caused by race or socioeconomic status is material for another study.

**Location of Residence**

The location of the student’s residence has been linked to completion rates. Students living in metropolitan areas were less likely to participate in and complete training opportunities than their non-metropolitan counterparts (Anlezark et al., 2006; Roussel, 2000). Roussel (2000) used a meta-analysis to find non-metropolitan residents were more likely to participate in vocation education training than metropolitan residents were. Anlezark et al. (2006) found a higher percentage of non-metropolitan residents had lower academic achievements and were attracted to vocational craft training more than metropolitan residents.

Lichter and Johnson (2006) studied the demographic shift that occurred in the 1980s and 1990s and its affects on poverty. Their study explained how suburbanization created an intermediate area that is neither metropolitan nor non-metropolitan. Their study suggests the poverty level in metropolitan areas adversely affected the population from participating in training programs. The metropolitan population may not have the foundation education to successfully complete the training or have the transportation resources to participate in the training. Lichter and Johnson (2006) report continued that many of the non-metropolitan or rural population were too isolated to participate in training programs.

**Prior Knowledge**

The student’s prior knowledge has been found to be a determining factor in the decision to complete the training program. The prior knowledge includes the student’s foundational skills required to complete the training program, the student’s knowledge or perceptions about the subject matter, the time required to complete the training, and the student’s obligations. The student must have some idea of the course requirements and the rewards that will result from participating in the program. The student will place a value on the expected results of the training program. Vroom’s (1964) Expectancy-
Valance Theory explains the student must know what to expect during and after the course, as well as the valance, which is the rewards or worth of the experience (Quigley, 1998). The challenge during the recruitment and introduction of the courses is to explain to the potential students the effort and time required to complete the course as well as the time required to reap the rewards of the efforts.

The learner’s lack of knowledge or gap between the learner’s expectations and reality is one major contributor for learner leaving the training program (Kerka, 1995). Adult learners are easily frustrated when they are not given enough required information during the registration process. This frustration is exasperated when the adult learner believes the training progress is slower than expected (Hamann, 1994). Many non-completers value education and are motivated enough to enroll (Quigley, 1998), but previous bad experiences of school, that the teacher reminds the adult learner, may be too strong to overcome (Kerka, 1995).

Roussel (2000) found the greatest single influential factor in students who completed training programs was the student’s initial levels of education when the training began. Formal education was found to complement vocational education programs by providing a foundation for learning. The foundational skills learned in high school, such as problem solving, reading and mathematics are used to build upon and therefore tend to have a greater success in craft training programs (Roussel, 2000). A direct correlation between the amount of past learning activities and the student’s completing the training exists (Bills & Hodson, 2007). Students who completed high school with a diploma tended to have higher vocational education-training completion rates than those without the high school diploma (Bilginsoy, 2007; Roussel, 2000). Students with a GED tended to have higher dropout rates than those who quit school before acquiring a high school diploma (Bilginsoy, 2007).

People follow a set of patterns established early in life. People begin developing traits and behavioral patterns early in life that will shape their perception of the world (Wiggenhorn, 1996). One such pattern is participation in learning activities. The more education a person has increases the probability the person will seek more learning (Byrne, 1999). Students who have a history of repeatedly leaving training and educational programs before completion tend to repeat that behavior (Bills &
Hodson, 2007) unless a major life experience changes the student’s perceptions (Knowles, 1996). Student who had negative experiences in schools tended to have a greater attrition rates than those who had positive school experiences (Cervero & Kirkpatrick, 1990; Harris et al., 2001). Learners may have poor self-confidence developed from negative previous education experience, or be tired of classroom and school activities (Cross, 1981).

Craft

Wang, Goodrum, Haas, and Glover (2008) preformed a national study examining “craft training issues in American industrial and construction industries” to explore craft training attraction, completion rates, and various barriers to completion. The researchers sent out a national survey instrument inquiring about construction trades training in civil, electrical, other mechanical, piping, and equipment operator and maintenance. The survey instruments were sent out to construction-company site managers, training directors, and human resource managers, to learn about the effectiveness of present craft training programs relative to basic core training, and training completion rates in various trades and training programs.

A national study estimated the union shops training programs generally had higher full craft certification completion rates than open shop training programs. The electrical craft had the lowest completion rates of the crafts examined in this study and equipment operations had the highest percentage completion rates.

Craft Level

Previous studies suggested the probability that the greatest attrition rates are in the first three weeks of short-term training programs (Quigley, 1998) and in the first three months of long-term training programs (Western Australia Department of Training and Employment, 1999). The literature suggests several reasons for students leaving training programs before completion. Students leave a training program because the students begin the training program without proper understanding of the course and rewards of the course (Vroom, 1964; Quigley, 1998). The student may leave because the student does not possess the foundational knowledge, skills, abilities, and attitude to complete the program. The student
may leave the program before completion because the student does not fit into the culture. Situational issue beyond the student’s control may cause the student to leave before completion (Cross, 1981).

**Culture**

The training environment is a social environment that develops a culture unique to the craft, students, and instructor. It is important to recognize the changing culture in the learning group, but is beyond the scope of this study. Schein describes culture as an important component to successfully bringing a group together to achieve a common goal. Over a period, the group will develop a common communication system. The longer the group is together, the greater the bonds (Schein, 1997).

According to Dunbar’s Number (1998) or Monkey-Sphere Theory, people belong to several different sub-cultures and groups on different planes simultaneously. On the Monkey-Sphere, people are continuously moving people and related activities in and out the nucleus according to the fit (Wong, 2005). Individuals choose which activities fit within their own sphere. If the experience does not fit within the sphere, the individual will seek ways to terminate the experience or leave the program. The lack of cultural fit in the early craft levels may contribute to a higher level of students leaving in the first level than other levels.

Learning activities are considered a social experience (Tinto, 1987). Tinto researched traditional-age college students. He suggested a major component to student completing a college program of study depends on the student’s participation in the college activities inside and outside the classroom (Tinto, 1987). Tinto’s research suggest that students who commute to school do not engage fully in the school culture and thus tend to have a higher attrition rate than students who lived on campus and are more fully engaged in the campus culture (Tinto, 1987). The industrial craft-training program does not have external social activities that compares to college life. Tinto studied traditional age college students between the ages of 18 and 24, whereas the industrial craft training programs may engage students between ages of 18 and 65 who work in a diverse range of industries and organizations.

When individuals engage in a learning program, such as industrial craft training, they engage in a new culture (Schein, 1997). Each class begins with many different student perceptions from different
organizational and social cultures to develop a new culture the first day of class that will continue to evolve until completion of the program (Schein, 1997). Sometimes the cultural clash between the developing class-culture and the student’s personal culture is too great for the student to adjust or overcome, therefore the student may decide to leave the training program (Schein, 1997). The industrial craft training curriculum consist of two to four semesters of course work expanding from one to four years of training. The ability of the individual to fit within the group culture affects the student’s choices early to remain or leave the training program. Quigley says adult education programs found most people leave training in the first three weeks of a short training program. In a separate study, in Western Australia found the greatest attrition rate in the first three months of extended learning programs (WADTE, 1999).

Student’s Academic Behaviors

Student’s academic behaviors are found to be early detectors of student’s decisions to leave a training program. When students begin questioning the value of attending classes, they will find other activities that will rank higher on their value system. With the increase in absences, the student will begin to miss information given in the classroom, therefore adversely affecting their grades.

Absences

Students from the construction industry are absent for reasons other than losing interest in the training. Sometimes the reasons for students being absent from industrial craft training classes include assignment to work overtime on unexpected projects, scheduled outages, and family emergencies. The workplace is a major contributor to the learner completing the training. Management, supervisors, and coworkers’ support can contribute to or create obstacles to the learner remaining in training (NCVER, 2001).

Life events or accidental factors are major contributors that influence adult learners. Some of these life events involve changes in personal circumstances such as relationships, pregnancy, injury, residence, car breakdown, etc. It is not just the accidental factor, but how the learner accesses their
support network to cope with the personal circumstances and workforce changes, such as closures, takeovers, etc. (NCVER, 2001).

Grades

Student retention and attrition rates are directly related to how the learning environment satisfies the adult learner’s intrinsic and extrinsic needs (Knowles, 1996). High achievers need measurements to gauge their progress to achieving their goals and objectives (Keller, 1999; Rush, 1996). If these measurements are lower than expected or the measurements do not exist, the high-motivated learner will be de-motivated to learn thus losing interest and eventually dropping from the courses (Rush, 1996).

Andragogy learning philosophy suggests using grades for adult learners will have a de-motivating effect on adult learners by making them feel more childlike. Adults are motivated by the need to know something or when some life event requires new knowledge, not by external measurements, such as grades from another adult’s evaluation. Learning must be task oriented for adults to be motivated to want to learn (Knowles, 1996).

Knowles (1970, 1996) and Rush (1996) agree several factors influence whether or not learners are motivated or de-motivated by grades. Rush (1996) suggests the adult learner’s need for measurements of their achievements is influenced by the learner’s age, culture, or sub-culture. Knowles (1970, 1996) suggests that attention should be given to learn which pedagogy or andragogy components work best with the specific population.

Previous Studies on Course Completion

Quigley (1998) states the major issue with most research on adult learners is that the researcher develops the research from the researcher’s perception, not that of the adult learner. He continues to explain that researchers do not understand the perceptions, value systems, and experiences of the adult learner.

Motives for leaving adult education program could be grouped in categories (Dirkx & Jha, 1994). Motivational reasons for leaving training programs can be attributed to contextual and cultural barriers (Beder, 1991); bad experiences, especially in early school career (Cervero & Kirkpatrick, 1990;
Quigley, 1998); adult learners arriving without the foundational knowledge, skills, abilities, attitudes, and dispositions; program issues in instructional activities and curricula content (NCVER, 2001; Quigley, 1998; Roussel, 2000); and the adult learner’s support system, including the learner’s family/spouse/partner and employer (Bilginsoy, 2007; NCVER, 2001; Wang, 2008).

The cultural barriers that may exist between the learner, institution, instructor, and other classmates, may be too great for the learner to overcome (Roussel, 2000; Schein, 1997). Many of the cultural barriers are influenced by the student’s demographic characteristics. Researchers have studied student demographics to learn if statistical differences exist in learner’s participation based on age, level of attainment, occupation, income, gender, and presence of dependent children. Older individuals were less likely to participate in training activities than younger individuals. Women with young children were the least likely to participate in learning activities. One of the greatest factors influencing participation in learning activities was the education level prior to beginning the learning activity (Roussel, 2000). Other culture influences involve the interaction between the student, teacher and other students (Australian National Training Authority, 2001; Quigley, 1998)

It is difficult for the researcher to understand that the adult learner may have left earlier learning activities under adverse conditions the researcher never experienced or considered (Quigley, 1998). Quigley suggests that the school experience during the formative years follow the individual throughout the individual’s life. Individuals with unpleasant school experiences during the formative years tend to have higher attrition rates than students with pleasant experiences during the formative years (Cervero, & Kirkpatrick, 1990; Quigley, 1998). Researchers without negative school experiences would not know to ask the questions that would expose those adverse experiences (Quigley, 1998).

Many adult learners do not have the foundational knowledge, skills, abilities, and attitudes necessary to be successful in the learning environment (Roussel, 2000; Quigley, 1998). Quigley believes the attitudinal or disposition barrier is the most influential barrier that the adult learner must overcome (Quigley, 1998).
Program issues in instructional activities and curricula content have an effect on the student’s decision to remain in the program or leave the program (NCVER, 2001; Quigley, 1998; Roussel, 2000). The first three weeks of learning activity is critical in the retention of adult learners (Quigley, 1998). Within the first three weeks of a training program the adult learner has made the decision to either remain in the program or to leave the program. If the learning activity reminds the adult learner of early negative school experiences, then the adult learner will leave the program. Sometimes the decision is acted upon immediately or postponed for an opportunity or excuse to leave the program (Quigley, 1998), usually within the first three months (WADTE, 1999) before the student acquires any substantial skills (Bilginsoy, 2007).

The quality of the training program encourages the adult learner to remain in the program by providing high quality teaching/training, using high quality learning materials, and providing flexible and relevant learning opportunities (ANTA, 2001). Student retention requires a dynamic type of intervention changing from the first couple weeks, three months through the last few weeks (NCVER, 2001). The longer a learner participates in a learning activity, the greater the probability the learner will continue participating in future learning activities (Roussel, 2000). Quigley found that students tended to remain in the program if they engaged in conversation with the instructors and other students, whereas non-completers tended to express their dissatisfaction with counselors and non-instructors. Completers were found to take ownership in their studies, where non-completers said the teachers own the de-motivators (Quigley, 1998).

Adult learners are motivated and de-motivated by their support system including the learner’s family/spouse/partner and employer (Bilginsoy, 2007; NCVER, 2001; Wang, 2008). The family may increase or decrease the difficulty of the adult learner’s participation in the learning activity (NCVER, 2001). The industry/labor market determines the qualifications and perceived rewards for acquiring skills offered by training. The rewards include job respect, availability, and wage rate. The workplace is a major contributor to the learner completing the training. Does the workplace enable the learner to use the new skills to complement the training? Are the hours and demands of the job realistic and
reasonable? Management, supervisors, and coworker support can contribute to the learner remaining in training (NCVER, 2001).

The type of apprenticeship and the sponsoring organization’s culture can determine the cooperation from the supervisor the adult learner will receive to attend the training (Bilginsoy, 2007; Wang, 2008). One reason given for the disparity in the union-employer sponsored programs was the fact that in the union-employer sponsored program, attendance in the apprenticeship program is mandated as a condition of employment compared whereas the non-union apprenticeship-training program is voluntary and not a condition of employment (Bilginsoy, 2007).

Wang study found a cost benefit ratio 1.3:1 to 3.0:1 for the construction industry. Construction received an immediate benefit in employee retention and safety, as well as a reduction absenteeism and turnover. Long-term benefit to the construction companies from improving employee skills through construction training included improved productivity, improved quality, and reduced rework. Employers found providing employees with meaningful training had a significant benefit in attracting and retaining employees in the construction industry. Employees participating in meaningful training not only improved skill level but more importantly, employee satisfaction (Wang, 2008).

Students continue to weigh the benefits and cost involved in participating in the learning activity. As long as the student can evaluate that the cost is worth the potential benefits of participating in the learning, the student will continue participating (Phillips, 1997).

Summary

The imminent retirement of the baby boomer generation and lack of new entries into the construction trades training is creating a vacuum in the industrial construction and maintenance workforce. Organizations have a stake in the attraction and development of qualified, trained workers to continue building and maintaining industrial plants. Construction companies measure the ROI of the training by the completion and attrition rates as well as the quality of the skills learned by the trainees.

Participation in adult education programs is a choice that adults make based on perceived needs, balanced between the personal investments with the potential value placed on the expected outcome.
Completion of craft training and receiving the NCCER Craft Certification has financial benefits for the student and increase ROI for the student’s employer.

Industrial Craft training providers are expected to recruit, train, and graduate qualified, knowledgeable individuals to enter the industrial workforce. Research has shown demographic factors such as age, race, gender, and residence location; and academic behaviors such as grades and attendance, influence adults participation in a training program.

Chapter Three will explain the methodology the researcher will follow to identify the students who are attracted to the training program, which students will remain in the training program, and those who will not complete the training semester.
CHAPTER 3. METHODOLOGY

Purpose of Study

The primary purpose of the study was to determine the influence of selected personal
demographic characteristics, craft, craft level and academic behaviors on whether individuals
participating in a craft training course offered by a large organization of member construction companies
successfully complete the course or leave the course prior to its completion.

Objectives

The following objectives were formulated to guide the researcher in accomplishing the purpose of the study:

1. To describe individuals participating in a craft training course offered by a large organization of
member construction companies on the following personal demographic characteristics:
   a. Age;
   b. Gender;
   c. Race;
   d. Location of residence defined as metropolitan and non-metropolitan;
   e. Course (craft) in which enrolled; and
   f. Level (defined by individual craft as introductory, advanced, or some gradation between
      these levels) of course in which individual is enrolled.

2. To describe individuals participating in a craft training course offered by a large organization of
member construction companies on the following academic behaviors:
   a. Attendance (defined as the percentage of class sessions absent during the period in
      which the individual was enrolled in the course); and
   b. Grades received (defined as the final course grade (each module is graded on a 100 point
      scale and the student receives a final grade that is an average of completed modules)).
3. To compare individuals participating in a craft training course offered by a large organization of member construction companies who successfully completed the course with those who left the course prior to its completion on the following personal demographic characteristics:
   a. Age;
   b. Gender;
   c. Race;
   d. Location of residence defined as metropolitan and non-metropolitan;
   e. Course (craft) in which enrolled; and
   f. Level (defined by individual craft as introductory, advanced, or some graduation between these levels) of course in which individual is enrolled.

4. To compare individuals participating in a craft training course offered by a large organization of member construction companies with those who left the course prior to its completion on the following academic behaviors:
   a. Attendance (defined as the percentage of class sessions absent during the period in which the individual was enrolled in the course); and
   b. Grades received (defined as the final course grade (each module is graded on a 100 point scale and the student receives a final grade that is an average of completed modules)).

5. To determine if a model exists that significantly increases the researcher’s ability to correctly classify individuals who participated in a craft training course offered by a large organization of member construction companies regarding whether or not they successfully completed the course from the following personal demographic characteristics and academic behaviors:
   a. Age;
   b. Gender;
   c. Race;
   d. Location of residence defined as metropolitan and non-metropolitan;
   e. Course (craft) in which enrolled;
f. Level (Defined by individual craft as introductory, advanced, or some graduation between these levels) of course in which individual is enrolled;

g. Attendance (defined as the number of class sessions absent during the period in which the individual was enrolled in the course); and

h. Grades received (defined as the final course grade (each module is graded on a 100 point scale and the student receives a final grade that is an average of completed modules)).

**Population and Sample**

The target population for this study was defined as adult students who were enrolled in industry based craft training courses. The accessible population was defined as adult students who were enrolled in a craft-training course offered by one large organization of member construction companies during the 2008 Fall semester.

The large organization of member construction companies that provides craft training categorizes participants in the database as Active, Complete, Graduated, Incomplete, Dropped, and No Show. No Shows are people who sign up for courses but never attend any class sessions. Since little of the relevant data for accomplishing the objectives of this study would be available for the “No Shows” these individuals were not included as part of the sample.

Ary, Jacobs, and Razavieh, (2002) explains the research sample as the portion of the defined accessible population from whom data is collected for the study to estimate parameters applied to all members of the population. Students, who attend at least one class, then discontinue attending the classes, are classified as Dropped (Non-Completers). Actives include students who enrolled and remained enrolled in the training class through the complete semester and enroll in another course for the subsequent semester. The Actives may or may not have completed all of the module tests. Completes are the students who enrolled and successfully completed the semester training program including all module tests. Individuals classified as Graduated include those who have successfully completed the craft certification examination. Students may opt to take the craft assessment before completing the curriculum. Students who score above the minimum required score on the craft assessment are not
required to complete the remaining craft training, and they are classified as Graduated. Instances occur where students will miss classes and module exams. If these exams are not completed (recorded) by the end of the semester, but the student continues in the course throughout the semester, the student is classified as Incomplete. Students who are classified as Incomplete are eligible to continue to the next course level. All students classified in the database as Active, Complete, Graduated, and Incomplete will comprise the group called Completers in the study.

**Sampling Plan**

This study incorporated a stratified sampling plan. When the sample is divided into homogeneous units, it is called a stratified sampling plan (Freund & Wilson, 2003). Members of the accessible population were divided into the two previously defined groups. The first group (Completers) included all of the participants listed as Active, Complete, Graduated, and Incomplete. These subjects remained as an active participant in the course throughout the entire semester. The second group (Non-completers) included all the subjects who enrolled in courses but did not remain active in the course to the completion of the identified semester. Non-completers were dropped from the course by two methods. The first method was the non-completer formally withdrew from the course. The second method was the student was dropped due to excessive absents. The group defined, as “No Shows” were not included in the study as research participants. The sample in the study will consist of 100% of the individuals who are defined as members of the “Completer” group and 100% of those who were defined as members of the “Non-Completer” group.

**Instrumentation**

The instrument that was used to collect the data for this study was an electronic recording form that transferred information from selected files maintained by the organization of member construction companies offering craft training courses. An electronic file was created in an electronic database for each student upon enrollment. The information the student chose to enter on the application was transferred from the application to the database. During the training course, the instructor recorded the student’s grades and absences in the student records. All demographic characteristics and academic
behaviors, used as measurements as part of this study, were electronically transferred from the relevant files (including the enrollment application form) from the existing database maintained by the organization to the researcher-designed electronic spreadsheet. All of the student files included, as one of the measurements, a unique identification code for each of the enrolled students. This code was used as a sorting variable to ensure that all measurements for each individual participant were maintained together. The identity of the participants will be kept anonymous. IRB permission was granted (#E4600) and is attached at the end of this document.

**Data Collection**

The data was collected to identify if certain demographic characteristics and academic behaviors influenced student retention in a multi-organization sponsored industrial craft-training program. The data set was downloaded to a researcher-designed spreadsheet designed to categorize data by students’ demographics: age, gender, race/ethnicity, residence (Metropolitan or Non-Metropolitan), the particular craft, and craft level enrolled and academic behaviors: grades and attendance.

The researcher was asked by the governing body of the large training organization of member construction companies to study retention and attrition rates for the craft-training courses offered by a large organization of member construction companies. The Director of Education instructed the IT, Information Technology, Department to assist in downloading the demographic and academic data for the researcher. The information was downloaded to a researcher-designed spreadsheet.

**Data Analysis**

The first objective of the study was to describe individuals participating in a craft-training course offered by a large organization of member construction companies on the following personal demographic characteristics:

a. Age;

b. Gender;

c. Race;

d. Location of residence defined as metropolitan and non-metropolitan;
e. Course (craft) in which enrolled; and

f. Level (defined by individual craft as introductory, advanced, or some graduation between these levels) of course in which individual is enrolled.

Age was recorded as a continuous variable. The statistics is given as Range, Mean, and Standard Deviation.

The Variables Gender, Race, Location of Residence, Craft, and Craft Level were listed as frequencies and percentages. Gender was coded as Male (“1”) and Female (“0”).

The enrollment application gave participants the opportunity to indicate their race by checking off one of the following races: African American (“1”), Asian (“2”), Caucasian (“3”), Hispanic (“4”), Spanish American (“5”), and Not Specified (“0”).

Location of residence was a dichotomous variable grouped as either metropolitan (“1”) or non-metropolitan (“0”). Metropolitan cities were defined as cities with a population larger than 50,000. The participants’ addresses were reviewed to classify them into two groups: larger than 50,000 and smaller than 50,000. The residence data was given as frequency and percentages. The researcher identified and coded metropolitan cities involved in the study and coded them as “1”. All other participants were coded as “0”.

Participants had the option to select from several different crafts. These crafts were classified as categorical data. The crafts were described using frequencies and percentages. Each craft had between two to four levels. The participants’ participation frequency and percentage were listed in each level.

The second objective of this study was to describe individuals participating in a craft-training course offered by a large organization of member construction companies on the following academic behaviors:

a. Attendance (defined as the percentage of class sessions absent during the period in which the individual was enrolled in the course); and
b. Grades received (defined as the final course grade (each module is graded on a 100 point scale and the student receive a grade defined as the percentage of that 100 points earned in the module/course)).

The academic behaviors were measured by two continuous variables attendance and grades. The descriptive statistics used to describe the academic behaviors were reported by the Range, Means, and Standard Deviations of the attendance and grades of the individuals participating in a craft-training course offered by a large organization of member construction companies. The training organization provided the total number of class sessions scheduled for each craft and level. This total was divided by the number of classes the student attended to determine the percentage of class sessions attended during the period in which the individual was enrolled in the course. The student’s average grades were drawn directly from the dataset from the large organization of member construction companies provided.

The next two objectives compared the sample by students who completed the training with the students that did not complete the training. This study compared the sample by the dependent variable, if the student completed or did not complete the semester training program. Students were coded as Completers (0) and Non-Completers (1). The sample was compared by categorical data (nominal and ordinal), such as race, gender, location of residence, craft, and craft level, will be reported as frequencies and percentages in each category. These categorical variables were tested for independence using the Chi-square test of independence. Independent t-tests were used to test the independence of the continuous variables age, grades, and attendance.

The third objective compared individuals participating in a craft-training course offered by a large organization of member construction companies who successfully completed the course with non-completers on the following personal demographic characteristics:

a. Age;

b. Gender;

c. Race;

d. Location of residence defined as metropolitan and non-metropolitan;
e. Course (craft) in which enrolled; and  
f. Level (defined by individual craft as introductory, advanced, or some graduation between these levels) of course in which individual is enrolled.

Students were compared using the dependent variables completers (“0”) and non-completers (“1”). Independent t-tests determined the independence of the interval data points of age with the dependent variable. A Chi-Square independence test measured the independence of each of the categorical data sets Gender, Race, Location of Residence, Craft, and Craft Level. The test of independence evaluated the individual and cumulative affects of the selected demographic characteristics, craft, and craft level influence on student completing or leaving the craft-training course.

The fourth objective compared individuals participating in a craft-training course offered by a large organization of member construction companies with non-completers on the following academic behaviors:

a. Attendance (defined as the percentage of class sessions absent during the period in which the individual was enrolled in the course); and  
b. Grades received (defined as the final course grade (each module is graded on a 100 point scale and the student receive a grade defined as the percentage of that 100 points earned in the module/course)).

Grades and attendance were treated as interval scale variables. Interval scale variables sequence the data and establish equal intervals between units of measure (Ary et al., 2002). Mean and standard deviation were used to summarize interval data. Students who completed the training grades and attendance were compared to the students who did not complete the training semester with a t-test for independence.

The fifth objective determined if a model exists that significantly increased the researcher’s ability to correctly classify individuals participating in a craft-training course offered by a large organization of member construction companies who successfully completed the course with course non-completers on the following personal demographic characteristics and academic behaviors:
a. Age – treated as a continuous variable;

b. Gender – treated as dichotomous variable, coded Male (“1”) and Female (“0”);

c. Race – categorical data will be coded as binary variables where each variable will be coded as possessing the trait or not possessing the trait, such as African (0) and non-African American (1), Caucasian (0) and non-Caucasian (1);

d. Location of residence defined as metropolitan and non-metropolitan - treated as dichotomous variable, metropolitan (1) and non-metropolitan (0);

e. Course (craft) in which enrolled - categorical data will be coded as binary variables where each variable will be coded as possessing the trait or not possessing the trait, Electrical (0) and non-Electrical (1), Welding (0) and non-Welding (1);

f. Level (defined by individual craft as introductory, advanced, or some graduation between these levels) of course in which individual is enrolled - treated as a continuous variable;

g. Attendance (defined as the percentage of class sessions absent during the period in which the individual was enrolled in the course) - treated as a continuous variable; and

h. Grades received (defined as the final course grade (each module is graded on a 100 point scale and the student receive a grade defined as the percentage of that 100 points earned in the module/course)) - treated as a continuous variable.

Based on the information gleaned from the listed objectives, the last objective compared the data to determine if a relationship exists between the student demographics and academic behavior that influence the student's decision to remain in industrial craft training program offered by a member owned industrial training organization.
CHAPTER 4. RESULTS

The findings of this study are reported here, and are organized by the objectives of the study. The primary purpose of this study was to determine the influence of selected personal demographic characteristics and academic behaviors on whether individuals participating in a craft training course offered by a large organization of member construction companies successfully completed the course or left the course prior to the completion of the semester.

Objective One

The first objective was to describe individuals participating in a craft-training course offered by a large organization of member construction companies on the following personal demographic characteristics:

a. Age;
b. Gender;
c. Race;
d. Location of residence defined as metropolitan and non-metropolitan;
e. Course (craft) in which enrolled; and
f. Level (defined by individual craft as introductory, advanced, or some graduation between these levels) of course in which individual is enrolled.

Age

The first demographic variable used to describe participants in a craft-training course offered by a large organization of member construction companies was the participants’ ages. The participants’ birthdates were included in the dataset received from the large organization of member construction companies and was used to compute the participants’ ages. The participants’ ages were calculated from their birthdates as of the beginning of the semester. Thirty participants did not provide usable data for their birthdates. The age of these individuals could not be determined, thus they were coded as missing data. The age of the 1161 participants for whom data was available ranged from 18 to 62 years. The mean age of the participants was 29.4 years (SD = 9.38), with a mode of 20 years. To describe
participants by their ages in more detail, the participants were categorized into the following five-year age
groups: 18-22, 23-27, 28-32, 33-37, 38-42, 43-47, 48-52, and over 52 years old. The age category with
the largest number of participants was 23 to 27 (n = 315, 27.1%) years of age. The age distribution is
displayed in Table 1.

**Table 1**

Age of participants in a craft-training course offered by a large organization of member construction
companies.

<table>
<thead>
<tr>
<th>Age Category</th>
<th>Frequency $^a$</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 – 22</td>
<td>299</td>
<td>25.8</td>
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<tr>
<td>23 – 27</td>
<td>315</td>
<td>27.1</td>
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<td>28 – 32</td>
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<td>19.5</td>
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<td>33 – 37</td>
<td>111</td>
<td>9.5</td>
</tr>
<tr>
<td>38 – 42</td>
<td>66</td>
<td>5.7</td>
</tr>
<tr>
<td>43 – 47</td>
<td>66</td>
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</tr>
<tr>
<td>48 – 52</td>
<td>48</td>
<td>4.1</td>
</tr>
<tr>
<td>&gt; 52</td>
<td>30</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1161</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

*Note.* Mean age of the participants was 29.4 years (SD = 9.38). The youngest participant was 18, and the
oldest was 62. The mode was 20 years.

$^a$30 participants did not provide usable data for their birthdates therefore age could not be computed.

**Gender**

The second variable used to describe participants in a craft-training course offered by a large
organization of member construction companies was gender. The 1191 participants consisted of 1151
(96.6%) males and 40 (3.4%) females.

**Race**

The third variable used to describe the participants in a craft-training course offered by a large
organization of member construction companies was race. The participants were asked to provide their
race on the application they completed during registration for classes. The participants were asked to
select a race following available categories: African American, Asian, Caucasian, Hispanic, Spanish
American, Other and Other than Caucasian. For the categories of “Other” and “Other than Caucasian”, registrants were asked to specify the “Other” race. Eight hundred seventy nine participants did not provide usable data for race. Of the 312 participants who provided usable data, the race that was identified by the largest number was Caucasian (n = 212, 68.0%). The race that was identified by the second largest number of subjects was African American (n = 88, 28.2%). All other races were identified by less than 4% of the subjects who reported their race (See Table 2). Additionally, even though participants who marked an “Other” category for their race were asked to specify the “Other” race, none of the six individuals who marked one of these two categories provided the information about their race.

Table 2

Race of participants in a craft-training course offered by a large organization of member construction companies.

<table>
<thead>
<tr>
<th>Race</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>212</td>
<td>68.0</td>
</tr>
<tr>
<td>African American</td>
<td>88</td>
<td>28.2</td>
</tr>
<tr>
<td>Hispanic</td>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>Indian</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>Spanish American</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>1.3</td>
</tr>
<tr>
<td>Other Than Caucasian</td>
<td>2</td>
<td>0.6</td>
</tr>
<tr>
<td>Total</td>
<td>312</td>
<td>100.0</td>
</tr>
</tbody>
</table>

* 879 participants did not provide usable data for Race.
* Participants who marked “Other” and “Other Than Caucasian” did not specify the other race as asked.
* The Total number of participants who provided usable data for Race.

Location of Residence

Another variable on which participants in a craft training course offered by a large organization of member construction companies was their location of residence. For purposes of this study, this variable was defined as whether the participants resided in an area that was classified as metropolitan or
non-metropolitan. The participants’ home addresses, including the city of residence, were collected during the registration process. The city of residence was used to classify the participants’ residences as metropolitan or non-metropolitan. The Bureau of Labor Statistics classifies metropolitan cities as having a population of at least 50,000 residents and non-metropolitan areas as less than 50,000 residents (BLS, 2009). The Louisiana cities with over 50,000 residents are Baton Rouge, Bossier, Kenner, Lafayette, Lake Charles, Metairie, Monroe, New Orleans, and Shreveport. Using these criteria, the majority of participants (n = 891, 74.8%) were classified on their location of residence as non-metropolitan, and the remaining 300 (25.2%) participants were classified as metropolitan.

Craft

Another variable used to describe the participants in the craft-training course offered by a large organization of member construction companies was the craft-training course in which the participants were enrolled. Thirteen different training courses are offered by the training facility. The craft-training course in which the largest number of students was enrolled was Welding (n = 321, 27.0%). The craft-training course in which the second largest number of students was enrolled was Electrical (n = 195, 16.4%). The craft-training course in which the smallest number of students was enrolled was HVAC (Heating, Ventilation, and Air-Conditioning) (n = 9, 0.8%). (See Table 3).

Craft Levels

Another variable used to describe the participants in the craft-training courses offered by a large organization of member construction companies was the craft level in which the participants were enrolled. The crafts offered at the large organization of member construction companies have different levels of training.

Craft training may require up to four levels of training to complete the craft programs of study. Core and Basic Prints are considered introductory classes to several different craft training courses, so they are considered as Level 1. The (NCCER Construction) Core course is designed as an introductory or prerequisite course built into most of the Level 1 craft training programs of study. Earthmoving and
Table 3
Craft-training courses offered by a large organization of member construction companies in which participants were enrolled.

<table>
<thead>
<tr>
<th>Craft</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welding</td>
<td>321</td>
<td>27.0</td>
</tr>
<tr>
<td>Electrical</td>
<td>195</td>
<td>16.4</td>
</tr>
<tr>
<td>Pipefitting</td>
<td>100</td>
<td>8.4</td>
</tr>
<tr>
<td>Equipment Operator</td>
<td>99</td>
<td>8.3</td>
</tr>
<tr>
<td>Instrumentation</td>
<td>97</td>
<td>8.1</td>
</tr>
<tr>
<td>Millwright</td>
<td>73</td>
<td>6.1</td>
</tr>
<tr>
<td>Core</td>
<td>64</td>
<td>5.4</td>
</tr>
<tr>
<td>Safety Management</td>
<td>58</td>
<td>4.9</td>
</tr>
<tr>
<td>Basic Prints</td>
<td>57</td>
<td>4.8</td>
</tr>
<tr>
<td>Supervisory Training</td>
<td>40</td>
<td>3.4</td>
</tr>
<tr>
<td>Earthmoving Equipment</td>
<td>39</td>
<td>3.2</td>
</tr>
<tr>
<td>Commercial Electrical</td>
<td>39</td>
<td>3.2</td>
</tr>
<tr>
<td>HVAC&lt;sup&gt;a&lt;/sup&gt;</td>
<td>9</td>
<td>0.8</td>
</tr>
<tr>
<td>Total</td>
<td>1191</td>
<td>100.0</td>
</tr>
</tbody>
</table>

<sup>a</sup>HVAC - Heating, Ventilation, and Air Conditioning

Equipment Operations only require two levels, Level 1 and Level 2. Earthmoving and Equipment Operations are behavioral-based crafts that do not require the same level of textbook knowledge as some of the other crafts. Supervisory Training courses are considered mid-level craft training courses because the students are required to have some training or work experience to sign up for these courses. Safety Management is one course that has only Level 4. The prerequisites for students to enroll in the Safety Management course are to have completed a craft-training certification, have completed construction management training, or have been selected by their respective employer. The crafts with four craft-training levels include Welding, Electrical, Pipefitting, Instrumentation, Millwright, Commercial Electrical, and HVAC. Welding requires the participants to pass a welding certification test to be promoted to the next level. The other crafts levels are progressive in nature in that each level builds on
the student’s previous skills. In order to pass the craft assessments in Electrical, Pipefitting, Instrumentation, Millwright, Commercial Electrical, and HVAC, a student would need to pass all four levels (Robert Clouatre, personal communication, February 18, 2009).

The craft level distribution is illustrated in Table 4. The majority of participants were enrolled in Level 1 training (n = 691, 58.0%). The number of participants drops off at Level 2 (n = 246, 20.7%) and Level 3 (n = 121, 10.1 %). Level 4 has a larger number of participants (n = 133, 11.2%) than Level 3.

**Table 4**

Number of participants enrolled in the craft-training course levels offered by a large organization of member construction companies.

<table>
<thead>
<tr>
<th>Craft Group</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>1</td>
<td>482</td>
<td>168</td>
<td>109</td>
<td>75</td>
<td>834</td>
</tr>
<tr>
<td></td>
<td>57.8</td>
<td>20.1</td>
<td>13.1</td>
<td>9.0</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>88</td>
<td>50</td>
<td></td>
<td></td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>63.8</td>
<td>36.2</td>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>121</td>
<td></td>
<td></td>
<td></td>
<td>121</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>28</td>
<td>12</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70.0</td>
<td>30</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>58</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>691</td>
<td>246</td>
<td>121</td>
<td>133</td>
<td>1191</td>
</tr>
<tr>
<td></td>
<td>58.0</td>
<td>20.7</td>
<td>10.1</td>
<td>11.2</td>
<td>100</td>
</tr>
</tbody>
</table>

*a* Includes Commercial Electrical, Electrical, HVAC (Heating Ventilation and Air-Conditioning), Instrumentation, Millwright, Pipefitting, and Welding

*b* Includes Earthmoving and Equipment Operations.

*c* Includes Core and Basic Prints.

*d* Includes Supervisory Training.

*e* Includes Safety Management.
Objective Two

The second objective of this study was to describe individuals participating in craft-training courses offered by a large organization of member construction companies on the following academic behaviors:

a. Attendance (defined as the percentage of class sessions absent during the period in which the individual was enrolled in the course); and

b. Grades received (defined as the final course grade (each module is graded on a 100 point scale and the student receives a grade defined as the percentage of that 100 points earned in the module/course)).

Attendance

The first variable used to describe participants’ academic behavior in a craft-training course offered by a large organization of member construction companies was attendance, which was defined in this study as the percentage of class sessions absent during the period in which the individual was enrolled in the course. The number of absences was drawn from the downloaded dataset from the training organization. The number of absences was divided by the scheduled number of class sessions to determine the absenteeism percentages. The non-completers’ absenteeism percentages were calculated by dividing the non-completers’ absences by the number of class sessions scheduled before the student’s enrollment in the course was terminated. The percentage of absences ranged from 0% to 92.31%. The mean percentage of absences was 21.7% (SD = 19.46). To describe participants on their Attendance in more detail, the participants were categorized into ten-percentage groups: 0-10, >10-20, >20-30, >30-40, >40-50, >50-60, >60-70, and over 70 percent absence. The category with the largest number of students (n = 462, 38.7%) was the 0-10 category. The percentage of absences distribution is displayed in Table 5.

Grades

The second variable used to describe participant’s academic behavior in a craft-training course offered by a large organization of member construction companies was the grades received by the participant. The student’s average grades were drawn directly from the dataset received from the large
Table 5

Attendance percentages of participants in craft-training courses offered by a large organization of member construction companies.

<table>
<thead>
<tr>
<th>Attendance Percentage Categories</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10</td>
<td>462</td>
<td>38.7</td>
</tr>
<tr>
<td>&gt;10 - 20</td>
<td>257</td>
<td>21.6</td>
</tr>
<tr>
<td>&gt;20 - 30</td>
<td>147</td>
<td>12.3</td>
</tr>
<tr>
<td>&gt;30 - 40</td>
<td>121</td>
<td>10.1</td>
</tr>
<tr>
<td>&gt;40 - 50</td>
<td>83</td>
<td>7.0</td>
</tr>
<tr>
<td>&gt;50 - 60</td>
<td>72</td>
<td>6.0</td>
</tr>
<tr>
<td>&gt;60 - 70</td>
<td>23</td>
<td>1.9</td>
</tr>
<tr>
<td>&gt; 70</td>
<td>27</td>
<td>2.3</td>
</tr>
<tr>
<td>Total</td>
<td>1191</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Note. The participants’ mean percentage of absences was 21.7 (SD = 19.46). The participant’s percentage of absences ranged from 0 - 92.31. The participants’ mean percentage of absences was 21.7 (SD = 19.46). The participant’s percentage of absences ranged from 0 - 92.31.

organization of member construction companies. Some of the participants (n = 493, 41.4%) did not receive grades. Of the students who did not receive grades, 418 were enrolled in courses that did not award grades. The other 75 students were enrolled in courses that awarded grades, but left the program before receiving any grades. The craft courses that did not award grades to the participants included Welding, Supervisory Training, and Basic Prints. The welding participants’ progress is measured by successful completion of a third party administered welding test. Participants in the other non-graded courses receive a Certificate of Completion at the end of the course. The other 698 (58.6%) participants received grades that ranged from 36% to 100% with a mean grade of 90.15% (SD = 7.55). To describe participants on their Grades in more detail, the participants were categorized into ten-percentage groups: 100-95, <95-90, <90-85, <85-80, <80-75, <75-70, and <70. The category with the largest number of students (n = 226, 32.4%) was the <95-90 category. The Grades distribution is displayed in Table 6.
Table 6

Grades received by participants in craft-training courses offered by a large organization of member construction companies.

<table>
<thead>
<tr>
<th>Grade Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 – 95</td>
<td>214</td>
<td>30.7</td>
</tr>
<tr>
<td>&lt;95 – 90</td>
<td>226</td>
<td>32.4</td>
</tr>
<tr>
<td>&lt;90 – 85</td>
<td>137</td>
<td>19.6</td>
</tr>
<tr>
<td>&lt;85 – 80</td>
<td>69</td>
<td>9.9</td>
</tr>
<tr>
<td>&lt;80 – 75</td>
<td>31</td>
<td>4.4</td>
</tr>
<tr>
<td>&lt;75 – 70</td>
<td>10</td>
<td>1.4</td>
</tr>
<tr>
<td>&lt;70</td>
<td>11</td>
<td>1.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>698</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

*Note.* 493 participants (41.4%) did not receive grades. The grades of the 698 participants who did received grades range from 36% to 100%. The mean grade of the participants was 90.15% (SD = 7.55).

**Objective Three**

The third objective was to compare individuals participating in a craft-training course offered by a large organization of member construction companies who successfully completed the course with those who left the course prior to its completion on the following personal demographic characteristics:

a. Age;

b. Gender;

c. Race;

d. Location of residence (defined as metropolitan and non-metropolitan);

e. Course (craft) in which enrolled; and

f. Level (defined by individual craft as introductory, advanced, or some gradation between these levels) of course in which individual is enrolled.

The third objective was accomplished by analyzing the data with either an independent t-test or a chi-square test of independence according to the level of measurement of the variable.
Age

Age was the first demographic variable used to compare the individuals participating in a craft-training course offered by a large organization of member construction companies who successfully completed the course with those who left the course prior to its completion. The thirty participants (2.5%) who did not provide usable data for their age were omitted from this portion of the study. An independent t-test was used to compare the mean ages of participants that successfully completed the course with those who left the course prior to its completion. Levene’s Test for Equality of Variance was used to test the assumption of homogeneity of variance. The results of this test ($F = 3.219, p = .073$) indicated that no significant difference existed in the variance of the groups; therefore the researcher used the t-test with equal variances assumed. Students who completed the training program ($n = 805, 67.7\%$) were found to be significantly older ($M = 29.77, SD = 9.495$) than individuals who left the course ($n = 356, 29.8\%$) prior to its completion ($M = 28.53, SD = 9.070$) ($t_{1159} = 2.080, p = .038$). Although the t-test showed significant difference, the difference of 1.24 years may provide no practical significance.

Gender

The second demographic variable used to compare individuals participating in craft-training courses offered by a large organization of member construction companies who successfully completed the course with those who left the course prior to its completion was the gender of the student enrolled. A Chi-square Test of Independence was used to determine if the variables of whether or not the student completed the training course and the gender of the student enrolled were independent. The results of the Chi-square test indicated that the variables were independent ($\chi^2 (1, N=1,191) = .915, p = 0.339$). (See Table 7).

Race

The third demographic variable used to compare individuals participating in craft-training courses offered by a large organization of member construction companies who successfully completed the course with those who left the course prior to its completion was the race of the student enrolled. A large percentage of students ($73.8\%, n = 879$) did not include any data on their race. The group of participants who did not
have useable data on Race were listed as missing data points, thus were not used to calculate the chi-square. The Race variable was divided into three categories, African American, Caucasian, and Other. The two Race categories with the largest number of participants included in this study were African American (n = 88) and Caucasian (n = 212). The remainder of the races comprised of only 1% (n = 12) of the total student population; they were grouped together in the category “Other”. A Chi-square Test of Independence was used to determine if the variables whether or not the student completed the training course and race of the student enrolled were independent. The results of the Chi-square test indicated that the variables were independent ($\chi^2 (2, N=312) = .545, p = 0.761$).

Table 7

Comparison of completers and non-completers participating in craft-training courses offered by a large organization of member construction companies on selected demographic variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>df</th>
<th>$X^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Craft</td>
<td>1191</td>
<td>12</td>
<td>57.168</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Craft Level</td>
<td>1191</td>
<td>3</td>
<td>53.515</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Race</td>
<td>312</td>
<td>2</td>
<td>.545</td>
<td>.761</td>
</tr>
<tr>
<td>Gender</td>
<td>1191</td>
<td>1</td>
<td>.915</td>
<td>.339</td>
</tr>
<tr>
<td>Residence $^a$</td>
<td>1191</td>
<td>1</td>
<td>.346</td>
<td>.557</td>
</tr>
</tbody>
</table>

$^a$ Students were identified as metropolitan if they lived in cities with a minimum of 50,000 residents or nonmetropolitan if they live in areas with less than 50,000 residents.

Location of Residence

The fourth demographic variable used to compare individuals participating in craft-training courses offered by a large organization of member construction companies who successfully completed the course with those who left the course prior to its completion was the race of the student enrolled. A Chi-square Test of Independence was used to determine if the variables of whether or not the student completed the training course and the participants’ Location of Residence (Defined as metropolitan and non-metropolitan) were independent. Students were identified as metropolitan if they lived in cities with
a minimum of 50,000 residents or nonmetropolitan if they live in areas with less than 50,000 residents. A Chi-square Test of Independence was used to determine if the variables of whether or not the student completed the training course and location of residence of the student enrolled were independent. The results of the Chi-square test indicated that the variables were independent ($\chi^2 (1, N=1,191) = 0.346, p = 0.557$). (See Table 7).

Craft

The fourth demographic variable used to compare individuals participating in craft-training courses offered by a large organization of member construction companies who successfully completed the course with those who left the course prior to its completion was the craft in which the students were enrolled. A Chi-square Test of Independence was performed to determine if the variables of student retention and craft in which the students were enrolled were independent. The Chi-square results ($\chi^2 (12, N=1,191) = 57.168, p = < 0.001$) indicated the variables; the craft in which the student was enrolled and course completion were not independent (See Table 7). The nature of the relationship between these two variables was such that individuals enrolled in the Commercial Electrical (46.2%) and Electrical (59.5%) had the lowest completion percentages. HVAC (100%), Millwright (86.3%), Safety Management (84.5), and Supervisory Training (82.5) had the highest completion percentages. (See Table 8).

Craft Level

The fifth demographic variable used to compare individuals participating in craft-training courses offered by a large organization of member construction companies who successfully completed the course with those who left the course prior to its completion was the craft-level in which the students were enrolled. A Chi-square Test of Independence was used to determine if the variables of whether or not the student completed the training course and craft-level of the course in which the students was enrolled were independent. The results of the Chi-square test indicated that the variables were not independent ($\chi^2 (3, N = 1,191) = 53.515, p = <0.001$). (See Table 7). The nature of the relationship between the variables
Table 8

Cross-Classification of completers and non-completers by crafts in craft-training courses offered by a large organization of member construction companies.

<table>
<thead>
<tr>
<th>Scale: Craft</th>
<th>Print Read</th>
<th>Com Elect</th>
<th>Core Equi</th>
<th>Earth Equip</th>
<th>Equip Oper</th>
<th>HVAC</th>
<th>Inst</th>
<th>M/W</th>
<th>P/F</th>
<th>Safe Mgm</th>
<th>Supv Trg</th>
<th>Weld</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completers</td>
<td>35</td>
<td>18</td>
<td>52</td>
<td>31</td>
<td>116</td>
<td>69</td>
<td>9</td>
<td>66</td>
<td>63</td>
<td>78</td>
<td>49</td>
<td>33</td>
<td>207</td>
</tr>
<tr>
<td></td>
<td>61.4%</td>
<td>46.2%</td>
<td>81.3%</td>
<td>79.5%</td>
<td>59.5%</td>
<td>69.7%</td>
<td>100%</td>
<td>68</td>
<td>86.3%</td>
<td>78%</td>
<td>84.5%</td>
<td>82.3%</td>
<td>64.5%</td>
</tr>
<tr>
<td>Non-Completers</td>
<td>22</td>
<td>21</td>
<td>12</td>
<td>8</td>
<td>79</td>
<td>30</td>
<td>0</td>
<td>31</td>
<td>10</td>
<td>22</td>
<td>9</td>
<td>7</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td>38.6%</td>
<td>53.9%</td>
<td>18.8%</td>
<td>20.5%</td>
<td>40.5%</td>
<td>30.3%</td>
<td>0.0</td>
<td>32.0%</td>
<td>13.7%</td>
<td>22.0%</td>
<td>15.5%</td>
<td>17.5%</td>
<td>35.5%</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>39</td>
<td>64</td>
<td>39</td>
<td>195</td>
<td>99</td>
<td>9</td>
<td>97</td>
<td>73</td>
<td>100</td>
<td>58</td>
<td>40</td>
<td>321</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note. $\chi^2 (12, N=1,191) = 57.168, p < 0.001.$

Print Read - Print Reading
Com Elect - Commercial Electrical
Earth Equip - Earthmoving Equipment
Elect - Electrical
Equip Oper - Equipment Operator
HVAC - Heating, Ventilation, and Air Conditioning
Inst - Instrumentation
M/W - Millwright
P/F - Pipefitting
Safe Mgm - Safety Management
Supv Trg - Supervisory Training
Weld - Welding
was such that a lower percentage of individuals enrolled in craft Level 1 courses tended to be completers (38.1%) and a higher percentage of individuals enrolled in craft Level 4 courses tended to be completers (91.0%) (See Table 9).

Table 9

Cross-tabulation of the Craft-Level in which enrolled by participants in craft-training courses offered by a large organization of member construction companies who successfully completed the course with non-completers.

<table>
<thead>
<tr>
<th>Student Status</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completer</td>
<td>427</td>
<td>187</td>
<td>92</td>
<td>120</td>
<td>826</td>
</tr>
<tr>
<td>%</td>
<td>61.8</td>
<td>76.0</td>
<td>76.0</td>
<td>90.2</td>
<td>69.4</td>
</tr>
<tr>
<td>Non-Completer</td>
<td>264</td>
<td>59</td>
<td>29</td>
<td>13</td>
<td>365</td>
</tr>
<tr>
<td>%</td>
<td>38.2</td>
<td>24.0</td>
<td>24.0</td>
<td>9.8</td>
<td>30.6</td>
</tr>
<tr>
<td>Total</td>
<td>691</td>
<td>246</td>
<td>121</td>
<td>133</td>
<td>1191</td>
</tr>
<tr>
<td>%</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Note. $\chi^2 (3, N = 1,191) = 53.515, p = < .001.$

Objective Four

The fourth objective was to compare individuals participating in a craft-training course offered by a large organization of member construction companies with those who left the course prior to its completion on the following academic behaviors:

a. Attendance (defined as the percentage of class sessions absent during the period in which the individual was enrolled in the course); and

b. Grades received (defined as the final course grade (each module is graded on a 100 point scale and the student receives a final grade that is an average of completed modules)).

Attendance

Attendance was the first academic behavior variable used to compare the individuals participating in a craft-training course offered by a large organization of member construction companies who
successfully completed the course with those who left the course prior to its completion. Attendance was defined as the percentage of class sessions absent during the period in which the individual was enrolled in the course. An independent t-test was used to compare the mean percentage of class absences of participants that successfully completed the course with the mean percentage of class absences of participants who left the course prior to its completion. Levene’s Test for Equality of Variance was used to test the assumption of homogeneity of variance. The results of this test ($F = 119.017, p < .001$) indicated that a significant difference existed in the variance of groups; therefore the researcher used the t-test with equal variances not assumed. The individuals who completed the training program ($n = 826, 69.4\%$) were found to have significantly lower percentage of class absences ($M = 13.0\%, SD = 11.896$) than individuals who left the course ($n = 365, 30.6\%$) prior to its completion ($M = 41.25\%, SD = 19.068$) ($t_{493.537} = -26.138, p < .001$).

**Grades**

Grades received was the second academic behavior variable used to compare the individuals participating in a craft-training course offered by a large organization of member construction companies who successfully completed the course with those who left the course prior to its completion. Grades received were defined as the final course grade calculated on a 100-point scale from averaging the module grades during the time enrolled in the course. Each module was graded on a 100-point scale and the student received a grade defined as the percentage of that 100 points earned in the module/course. An independent t-test was used to compare the grade means received by the participants that successfully completed the course with the grade means received by the participants who left the course prior to its completion. Levene’s Test for Equality of Variance was used to test the assumption of homogeneity of variance. The results of this test ($F = 113.849, p < .001$) indicated that a significant difference existed in the variance of groups; therefore, the researcher used the t-test with equal variances not assumed. Of the total semester enrollment of 1191 participants, 773 were enrolled in courses that awarded grades to the students in the course. Of the 773 participants who were enrolled in graded courses, only 698 participants received grades. The other 75 students left the program before receiving any grades. Of those 698
participants that received grades, the 548 (78.4%) completers were found to have received a significantly higher grade point average ($M = 91.48\%, SD = 5.306$) than non-completers ($n = 150, 21.6\%$) ($M = 85.28\%, SD = 11.527$) ($t_{166.629} = 6.411$, $p < .001$).

**Objective Five**

The fifth objective was to determine if a model exists that significantly increases the researcher’s ability to correctly classify individuals who participated in a craft-training course offered by a large organization of member construction companies regarding whether or not they successfully completed the course from the following personal demographic characteristics and academic behaviors:

a. Age;

b. Gender;

c. Race;

d. Location of residence defined as metropolitan and non-metropolitan;

e. Course (craft) in which enrolled;

f. Level (defined by individual craft as introductory, advanced, or some graduation between these levels) of course in which individual is enrolled - treated as a continuous variable;

g. Attendance (defined as the percentage of class sessions absent during the period in which the individual was enrolled in the course); and

h. Grades received (defined as the final course grade (each module is graded on a 100 point scale and the student receive a grade defined as the percentage of that 100 points earned in the module/course)).

To accomplish this objective, the multiple discriminant analysis statistical technique was used. Multiple discriminant analysis requires that all independent variables entered into the analysis must be on a continuous scale of measurement (interval or ratio), or must be coded as a dichotomous variable. All the variables were examined for their level of measurement. Whether or not the student completed the craft course in which they were enrolled, measured as a dichotomous variable (students completed or did
not complete the course), was the dependent variable in the analysis. The independent variables in the analysis were entered in the model either as continuous or as binary-coded (dichotomous) variables.

The independent variables entered into the model as continuous variables are outlined below:

a. Age (this measurement was measured as a continuous variable); Age was calculated from the student’s birth date at the time of enrollment.

b. Attendance (this measurement was measured as a continuous variable); Attendance was calculated by dividing the number of days absent by the number of scheduled days of class. The non-completer’s attendance was calculated by dividing the number of absences by the number of days scheduled before the date the non-completer was dropped from the program.

c. Grades (this measurement was measured as a continuous variable); Grades were drawn directly from the students files received from the training facility. Upon reviewing the data, the discovery that some crafts did not award grades to the participants enrolled created a situation where the researcher had to make a decision. The researcher had to make a decision from one of three choices. The first choice was to drop the grades from all the participants, possibly losing an important factor for participants who were enrolled in courses that awarded grades (n = 773, 64.9%). The second choice was to keep the grades and lose the 418 (35.1 %) participants that were enrolled in courses that did not award grades. The third choice was to run two different discriminant models, one model for the participants enrolled in courses that awarded grades and another model for the participants who were enrolled in courses that did not award grades. Two discriminant models were chosen to evaluate all applicable variables for respective participants; one discriminant model for participants who were enrolled in courses that awarded grades and the other discriminant model for participants that were enrolled in courses did not award grades. Using two discriminant analyses allowed the researcher to develop discriminant
models that are applicable to all participants with the factors applicable to each participant.

The independent variables entered into the model as binary or dichotomous variables were as outlined below:

a. Gender (this variable was as coded males = 1 and females = 0).

b. Race (each of the racial groups was coded as a binary variable); Three binary-coded variables, African American, Caucasian, and Other, were entered into the model for analysis. An insignificant number (n = 12) of participants were made up of the races Asian, Hispanic, Indian, Spanish American, and other. The variable “Other” included the participants that mark a race other than African American or Caucasian, but did not leave the race description blank, Asian, Hispanic, Indian, Spanish American, and Other. Each participant was classified as either possessing the trait or not possessing the trait. For example, a variable was created for the Caucasian race in which all the participants, for which data were available, were classified as either possessing the trait of being Caucasian, coded as 1, or not possessing the trait of being Caucasian, coded as 0. Variables were created for African American and Other the same as described for Caucasian.

c. Location of Residence (this variable was coded metropolitan residence = 1; non-metropolitan residence = 0).

d. Course (Craft) (each of the course variables was coded as a binary variable); Thirteen binary-coded variables were entered into the model for analysis. Each participant was classified as either being enrolled in the course or not being enrolled in the course. For example, a variable was created for the Core course in which all the study subjects were classified as being enrolled in the course “Core”, coded as 1, or not being enrolled in the course “Core”, coded as 0. A
dichotomous variable was created for each course: Commercial Electrical, Earthmoving Equipment, Electrical, Equipment Operator, HVAC, Instrumentation, Millwright, Pipefitting, Print Reading, Safety Management, Supervisory Training, and Welding.

e. Course Level (each of the course level variables was coded as a binary variable); a dichotomous variable was created for each course Level 1, Level 2, Level 3, and Level 4. Four binary-coded variables were entered into the model for analysis. Each participant was classified as either being enrolled in the course level or not being enrolled in the course level. For example, a variable was created for the course Level 1 in which all the study subjects were classified as either being enrolled in the course Level 1, coded as 1, or not being enrolled in the course Level 1, coded as 0.

The statistical procedure used in this analysis was the stepwise multiple discriminant analysis. This was due to the exploratory nature of the study. Thus, all variables were considered equally for the entry into the model.

**Step One of the Discriminant Analyses for Graded Courses**

In conducting the discriminant analysis in this study, the first step was to examine the independent variables that were to be included in the analysis for the presence of multicollinearity. Several techniques are available for conducting this procedure that help to check for the presence of excessive multicollinearity. According to Hair, Anderson, Tatham, and Black (1998, p.2), “multicollinearity is the extent to which a variable can be explained by the other variables in the analysis. As multicollinearity increases, it complicates the interpretation of the variate as it is more difficult to ascertain the effects of any single variable, owing to their interrelationships.” The assessment that provides the most conclusive test for this type of analysis is to regress each independent variable on all the other independent variables (Lewis-Beck, 1980, p. 60). The effectiveness of this method is such that this procedure takes into account the relationship of each independent variable with all of the other
independent variables. This is because multicollinearity denotes the correlation of two or more
independent variables. High multicollinearity exists if any of the cumulative $R^2$ values approach 1.00.
The $R^2$ values for all of the independent variables were checked to ensure that there were no cases of
excess multicollinearity between the independent variables. The result from this series of tests revealed
no cases of excess multicollinearity among the variables to be included in the analysis.

**Step Two of Discriminant Analyses for Graded Courses**

The next step in determining if a model existed, using discriminant analysis, was to compare the
groups (completers verses non-completers) on each of the independent variables. This was accomplished
by comparing the means of each independent variable by the categories of the dependent variable,
whether or not the student completed the course. Using an a’priori significance level of less than .05, 11
of the 22 independent variables had a statistically significant difference in the group means. (See Table 10)

Of these 11 variables for which statistically significant different means were identified, seven of
the variable means (grades, whether or not the student was enrolled in a course at craft level 4, whether or
not the student was enrolled in the safety course, age, whether or not the student was African American,
whether or not the student was enrolled in the Core course, and whether or not the student was enrolled in
the Millwright course) were lower for the non-completers than they were for the completers. The means
for the remaining four variables were higher for the non-completers than they were for the completers.
These variables included attendance (measured by the percentage of class absences), whether or not the
student was enrolled in a course at craft level 1, whether or not the student was enrolled in the Electrical
course, and whether or not the student was enrolled in the Commercial Electrical course. The means and
standard deviations for all groups including the F-ratio values and their respective probability values are
presented in Table 10.
Table 10
Comparison of selected personal demographic and academic variable means by Retention Status of participants who received grades in craft-training courses offered by a large organization of member construction companies.

<table>
<thead>
<tr>
<th>Discriminating Variable</th>
<th>Group</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Complete</td>
<td>553, 71.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-Complete</td>
<td>220, 28.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attendance</td>
<td>M</td>
<td>11.84</td>
<td>10.66</td>
<td>38.85</td>
<td>155.50</td>
<td>596.177</td>
</tr>
<tr>
<td>Grades</td>
<td>M</td>
<td>91.56</td>
<td>5.46</td>
<td>85.80</td>
<td>14.33</td>
<td>56.445</td>
</tr>
<tr>
<td>Level 4</td>
<td>M</td>
<td>.21</td>
<td>.41</td>
<td>.03</td>
<td>.18</td>
<td>26.052</td>
</tr>
<tr>
<td>Level 1</td>
<td>M</td>
<td>.44</td>
<td>.50</td>
<td>.67</td>
<td>.47</td>
<td>24.499</td>
</tr>
<tr>
<td>Electrical</td>
<td>M</td>
<td>.21</td>
<td>.41</td>
<td>.37</td>
<td>.49</td>
<td>16.071</td>
</tr>
<tr>
<td>Safety</td>
<td>M</td>
<td>.09</td>
<td>.28</td>
<td>.02</td>
<td>.14</td>
<td>7.568</td>
</tr>
<tr>
<td>Commercial Electrical</td>
<td>M</td>
<td>.03</td>
<td>.18</td>
<td>.08</td>
<td>.27</td>
<td>6.270</td>
</tr>
<tr>
<td>Age</td>
<td>M</td>
<td>30.68</td>
<td>9.54</td>
<td>28.52</td>
<td>8.21</td>
<td>6.187</td>
</tr>
<tr>
<td>Race: African American</td>
<td>M</td>
<td>.07</td>
<td>.25</td>
<td>.02</td>
<td>.14</td>
<td>4.771</td>
</tr>
<tr>
<td>Core</td>
<td>M</td>
<td>.10</td>
<td>.30</td>
<td>.04</td>
<td>.20</td>
<td>4.798</td>
</tr>
<tr>
<td>Millwright</td>
<td>M</td>
<td>.12</td>
<td>.32</td>
<td>.06</td>
<td>.24</td>
<td>3.986</td>
</tr>
<tr>
<td>Scale: Gender</td>
<td>M</td>
<td>.97</td>
<td>.18</td>
<td>.97</td>
<td>.16</td>
<td>1.000</td>
</tr>
<tr>
<td>HVAC</td>
<td>M</td>
<td>.02</td>
<td>.13</td>
<td>.00</td>
<td>.00</td>
<td>2.522</td>
</tr>
<tr>
<td>Race: Not Specified</td>
<td>M</td>
<td>.74</td>
<td>.44</td>
<td>.79</td>
<td>.41</td>
<td>1.670</td>
</tr>
<tr>
<td>Pipefitting</td>
<td>M</td>
<td>.14</td>
<td>.35</td>
<td>.10</td>
<td>.30</td>
<td>1.652</td>
</tr>
<tr>
<td>Level 2</td>
<td>M</td>
<td>.23</td>
<td>.42</td>
<td>.19</td>
<td>.39</td>
<td>1.103</td>
</tr>
<tr>
<td>Instrumentation</td>
<td>M</td>
<td>.12</td>
<td>.32</td>
<td>.14</td>
<td>.35</td>
<td>.534</td>
</tr>
<tr>
<td>Equipment Operator</td>
<td>M</td>
<td>.12</td>
<td>.32</td>
<td>.13</td>
<td>.34</td>
<td>.177</td>
</tr>
<tr>
<td>Scale: Metro</td>
<td>M</td>
<td>.27</td>
<td>.44</td>
<td>.30</td>
<td>.46</td>
<td>.999</td>
</tr>
<tr>
<td>Level 3</td>
<td>M</td>
<td>.12</td>
<td>.32</td>
<td>.11</td>
<td>.102</td>
<td>.749</td>
</tr>
<tr>
<td>Earthmoving</td>
<td>M</td>
<td>.05</td>
<td>.22</td>
<td>.05</td>
<td>.21</td>
<td>.059</td>
</tr>
<tr>
<td>Race: Caucasian</td>
<td>M</td>
<td>.19</td>
<td>.39</td>
<td>.19</td>
<td>.39</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note. df = 1 & 677 for all tests.
Step Three of Discriminant Analysis for Graded Courses

In the third step of this discriminant analysis, the researcher examined the computed standardized canonical discriminant function coefficients. As seen in Table 11, the centroids for the groups were found to be -.514 for course completers and 1.861 for non-completers. A total of four independent variables entered into the discriminant model: (a) attendance, (b) grades, (c) whether or not the student was enrolled in Level 1 of the craft training, and (d) whether or not the participant was enrolled in the course Core, producing an overall canonical correlation of $R_c = .700$. (See Table 11).

Table 11

Summary Data for the Stepwise Discriminant Analysis of the Exploratory Model for completion in craft training courses for students who were enrolled in courses that awarded grades, offered by a large organization of member construction companies.

| Explanatory Factors | $\beta^a$ | $s^b$ |  |
|---------------------|-----------|-------|--|---|
|                     |           |       |  |   |
| Group Centroids     |           |       |  |   |
| Completers          | -.514     |       |  |   |
| Non-Completers      | 1.861     |       |  |   |
|  |
| Attendance           | .928      | .958  |  |   |
| Grades               | -.209     | -.295 |  |   |
| Level 1              | .192      | .194  |  |   |
| Core                 | -.142     | -.086 |  |   |
|  |
| Eigenvalue          | .960      |  |
| Canonical Correlation | $R_c = .700$ |  |
| Wilk’s Lambda       | .510      |  |
| $p$                 | < .001    |  |

Note. $N = 773$

$^a$ Standardized Canonical Discriminant Function Coefficients

$^b$ Within Group Structured Correlations

The variable that entered the discriminant model first and had the greatest influence on the dependent variable, whether or not the student completed the course, as shown by the highest standardized discriminant function coefficient ($\beta = .928$), was the percentage of class absences. The nature of the influence of the percentage of the class absences on whether or not the student completed the
course (the dependent variable) was such that having a lower percentage of absences increased the likelihood that the student completed the course in which they were enrolled. The second variable that entered the discriminant model that had the second greatest influence on the dependent variable, whether or not the student completed the course, as shown by the second highest standardized discriminant function coefficient ($\beta = -.209$), was the grades the participants received during the training program. The nature of the influence of the grades the participants received during the training program on whether or not the student completed the course (the dependent variable) was such that the participants who received higher grades tended to be more likely to complete the course in which they were enrolled. The third variable that entered the discriminant model that had the third greatest influence on the dependent variable, whether or not the student completed the course, as shown by the third highest standardized discriminant function coefficient ($\beta = .192$) was whether or not the student was enrolled in Level 1 of the craft training. The nature of the influence was such that students enrolled in Level 1 of the craft training tended to decrease the likelihood that the student completed the course in which they were enrolled.

Enrollment in the Core craft course was the fourth variable to enter the discriminant model to have influence on the dependent variable, whether or not the participant completed the course. The nature of the Standardized discriminant function coefficient ($\beta = -.142$) was such that if the student was enrolled in the craft-training course Core, it increased the likelihood that the student completed the course in which they were enrolled.

In addition to the standardized canonical discriminant coefficients, the researcher examined the within-group structure correlations. The structure correlations provide the reader with a simple linear correlation of the relationships between each of the independent variables and the discriminant score computed for each subject from the variables that entered the discriminant model. A substantively significant structure correlation is considered to be any coefficient that is half or greater than the magnitude of the highest structure correlation. In this study, the highest structure correlation magnitude was for the variable Attendance with a magnitude of .958. Thus, any structure correlation of .479 (half
the value of .958) or higher would be considered to be substantially meaningful in this analysis. In cases, such as in this study, where the highest correlation is substantially higher than the other correlations, the second correlation may be used as the basis. The basis is a reference point used to determine the significance of the variable’s affect on the dependent variable. Grades were the second highest structure correlation with a magnitude of -.295. Thus, any structure correlation of .148 (half the value of .295) or higher would be considered to be substantially meaningful in this analysis. Enrollment in Level 1 with a magnitude of .194 would be considered substantively significant.

**Step Four of Discriminant Analysis for Graded Courses**

Finally, the researcher assessed the predictive accuracy of the discriminant function by examining the correctly classified cases. The information presented in Table 12 shows that the discriminant model derived in this study correctly classified 89.4% of the original grouped cases (completers and non-completers). In this study, the researcher used the Tau statistic as presented by Barrick and Warmbrod (1988) in measuring substantive significance of the percentage of correctly classified cases.

**Table 12**

Classification of cases by the Discriminant Model for course completion in craft training offered by a large organization of member construction companies who successfully completed the course versus non-completers.

<table>
<thead>
<tr>
<th>Actual Group</th>
<th>Number of Cases</th>
<th>Predicted Group Membership</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Completers</td>
<td>Non-Completers</td>
</tr>
<tr>
<td>Completers</td>
<td>548</td>
<td>496</td>
</tr>
<tr>
<td></td>
<td>90.5%</td>
<td>9.5%</td>
</tr>
<tr>
<td>Non-completers</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>128</td>
</tr>
<tr>
<td></td>
<td>14.7%</td>
<td>85.3%</td>
</tr>
</tbody>
</table>

*Note.* $N = 698$

*Note.* 75 cases had at least one missing discriminant variable.

*Percentage of classes correctly classified = 89.4%.*

The result of this analysis procedure shows the amount of improvement with regard to the proportion of cases correctly classified over chance. The researcher found a 64.8% improvement over
chance. A finding of 25% improvement over chance is considered to be a substantively significant improvement (Barrick & Warmbrod, 1988).

\[ Tau = \frac{n_c - \sum p_i n_i}{N - \sum p_i n_i} \]

\( n_c \) = Number correctly classified

\( p_i \) = Probability of being classified into group by chance

\( n_i \) = Number in group

\( N \) = Total number of cases

\( n_c = 624 \)

\( p_i = 50\% \)

\( n_i = 548 \) (completers); 150 (non-completers)

\( N = 773 \)

\[ TAU = \frac{624 - (.5)(548) + (.5)(150)}{773 - (.5)(548) + (.5)(150)} \]

\[ TAU = \frac{624 - 349.5}{773 - 349.5} = 64.8\% \]

Step One of the Discriminant Analyses for Non-Graded Courses

In conducting the discriminant analysis in this study, the first step was to examine the independent variables that were to be included in the analysis for the presence of multicollinearity. Several techniques are available for conducting this procedure that help to check for the presence of excessive multicollinearity. According to Hair, Anderson, Tatham, and Black (1998, p.2) multicollinearity is “the extent to which a variable can be explained by the other variables in the analysis. As multicollinearity increases, it complicates the interpretation of the variate as it is more difficult to ascertain the effects of any single variable, owing to their interrelationships.” "The assessment that provides the most conclusive test for this type of analysis is to regress each independent variable on all
the other independent variables” (Lewis-Beck, 1980, p. 60). The effectiveness of this method is such that this procedure takes into account the relationship of each independent variable with all of the other independent variables. This is because multicollinearity denotes the correlation of two or more independent variables. High multicollinearity exists if any of the cumulative $R^2$ values approach 1.00. The $R^2$ values for all of the independent variables were checked to ensure that there were no cases of multicollinearity between the independent variables. The result from this series of tests revealed no cases of excess multicollinearity among the variables to be included in the analysis.

**Step Two of Discriminant Analysis for Non-Graded Courses**

The next step in determining if a model existed, using discriminant analysis, was to compare the groups (completers verses non-completers) on each of the independent variables. This was accomplished by comparing the means of each independent variable by the categories of the dependent variable, whether or not the student completed the course. Using an a’priori significance level of less than .05, 4 of the 14 independent variables had a statistically significant difference in the group means (completers and non-completers). (See Table 13).

Of the four variables for which statistically significant different means were identified, two of the variable means (whether or not the student was enrolled in the Supervisory Training and whether or not the student was Caucasian) were lower for the non-completers than they were for the completers. The means for the remaining two variables were higher for the non-completers than they were for the completers. These variables included attendance (measured as the percentage of class absent) and if the student was enrolled in Level 1. The means and standard deviations for all groups including the F-ratio values and their respective probability values are presented in Table 13.

**Step Three of Discriminant Analysis for Non-Graded Courses**

In the third step of this discriminant analysis, the researcher examined the computed standardized canonical discriminant function coefficients. As seen in Table 14, the centroids for the groups were found
to be -.619 for course completers and 1.193 for non-completers. The only independent variable entered into the discriminant model was percent absent, producing an overall canonical correlation of $R_c = .653$. 

**Table 13**

Comparison of selected personal demographic and academic variable means by Retention Status for participants who did not receive grades in craft-training courses offered by a large organization of member construction companies.

<table>
<thead>
<tr>
<th>Discriminating Variable</th>
<th>Group</th>
<th></th>
<th></th>
<th>F-Ratio</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Completers</td>
<td>Non-Completers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$N = 275$, 65.8%</td>
<td>$N = 143$, 34.2%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attendance</td>
<td>15.08</td>
<td>.40</td>
<td>40.93</td>
<td>16.89</td>
<td>302.559</td>
</tr>
<tr>
<td>Level 1</td>
<td>.66</td>
<td>.48</td>
<td>.79</td>
<td>.41</td>
<td>7.538</td>
</tr>
<tr>
<td>Supervisory</td>
<td>.12</td>
<td>.32</td>
<td>.04</td>
<td>.20</td>
<td>6.343</td>
</tr>
<tr>
<td>Caucasian</td>
<td>.20</td>
<td>.40</td>
<td>.12</td>
<td>.33</td>
<td>3.994</td>
</tr>
<tr>
<td>Level 2</td>
<td>.23</td>
<td>.48</td>
<td>.16</td>
<td>.37</td>
<td>2.706</td>
</tr>
<tr>
<td>Level 4</td>
<td>.02</td>
<td>.14</td>
<td>.00</td>
<td>.00</td>
<td>2.629</td>
</tr>
<tr>
<td>Level 3</td>
<td>.10</td>
<td>.30</td>
<td>.06</td>
<td>.23</td>
<td>2.170</td>
</tr>
<tr>
<td>African American</td>
<td>.10</td>
<td>.30</td>
<td>.14</td>
<td>.34</td>
<td>1.464</td>
</tr>
<tr>
<td>Welding</td>
<td>.77</td>
<td>.42</td>
<td>.81</td>
<td>.39</td>
<td>1.228</td>
</tr>
<tr>
<td>Race: Not Specified</td>
<td>.70</td>
<td>.46</td>
<td>.74</td>
<td>.44</td>
<td>.828</td>
</tr>
<tr>
<td>Basic Prints</td>
<td>.11</td>
<td>.32</td>
<td>.14</td>
<td>.35</td>
<td>.663</td>
</tr>
<tr>
<td>Age</td>
<td>27.96</td>
<td>9.11</td>
<td>28.74</td>
<td>9.70</td>
<td>.659</td>
</tr>
<tr>
<td>Metro</td>
<td>.23</td>
<td>.16</td>
<td>.24</td>
<td>.43</td>
<td>.050</td>
</tr>
<tr>
<td>Gender</td>
<td>.97</td>
<td>.16</td>
<td>.97</td>
<td>.17</td>
<td>.025</td>
</tr>
</tbody>
</table>

Note. df = 1 & 408 for all test.

The variable that entered the discriminant model that had the greatest influence on the dependent variable, whether or not the student completed the course, as shown by the highest standardized discriminant function coefficient ($\beta = 1.0$) was the percentage of class absences. The nature of the influence of the percentage of the class absences on whether or not the student completed the course (the
dependent variable) was such that participants who had a lower percentage of absences tended more likely to complete the course in which they were enrolled.

**Table 14**

Summary Data for the Stepwise Discriminant Analysis of the Exploratory Model for completion in craft training course for students who were enrolled in courses that did not received grades, offered by a large organization of member construction companies.

<table>
<thead>
<tr>
<th>Explanatory Factors</th>
<th>Discriminant Function</th>
<th>Group Centroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent Absent</td>
<td>$\beta^a$</td>
<td>$s^b$</td>
</tr>
<tr>
<td>Percent Absent</td>
<td>1.000</td>
<td>1.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>Canonical Correlation</th>
<th>Wilk’s Lambda</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>.742</td>
<td>Re = .653</td>
<td>.574</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

*Note.* N = 418

$^a$ Standardized Canonical Discriminant Function Coefficients

$^b$ Within Group Structured Correlations

In addition to the standardized canonical discriminant coefficients, the researcher examined the within-group structure correlations. The structure correlations provide the reader with a simple linear correlation of the relationships between each of the independent variables. The structured correlations are used to calculate the discriminant score for each participant from the variables that entered the discriminant model. A substantively significant structure correlation is considered to be any coefficients that is half or greater than the magnitude of the highest structure correlation. In this study, the highest structure correlation magnitude was for the variable Attendance (measured by the Percentage of Absences) with a magnitude of 1.0. No other independent variables entered into the discriminant model.

**Step Four of Discriminant Analysis for Non-Graded Courses**

Finally, the researcher assessed the predictive accuracy of the discriminant function by examining the correctly classified cases. The information presented in Table 15 shows that the discriminant model derived in this study correctly classified 83.0% of the original grouped cases (completers and non-
completers). In this study, the researcher used the Tau statistic as presented by Barrick and Warmbrod (1988) in the substantive significance of the percentage of correctly classified cases.

The result of this analysis procedure shows the amount of improvement with regard to the proportion of cases correctly classified over chance. The researcher found a 66.03% improvement over chance. A finding of 25% improvement over chance is considered substantively significant improvement (Barrick & Warmbrod, 1988).

**Table 15**

Classification of cases by the Discriminant Model for student retention in craft-training courses offered by a large organization of member construction companies who successfully completed the course versus non-completers.

<table>
<thead>
<tr>
<th>Actual Group</th>
<th>Number of Cases</th>
<th>Predicted Group Membership</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Completers</td>
<td>Non-Completers</td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Completers</td>
<td>275</td>
<td>235</td>
</tr>
<tr>
<td>Non-completers</td>
<td>143</td>
<td>31</td>
</tr>
</tbody>
</table>

*Note. N = 418

a Percentage of classes correctly classified = 83.0%.

$$Tau = \frac{n_c - \sum p_i n_i}{N - \sum p_i n_i}$$

$n_c$ = Number correctly classified

$p_i$ = Probability of being classified into group by chance

$n_i$ = Number in-group

$N$ = Total number of cases

$n_c = 347$

$p_i = 50\%$

$n_i = 275$ (completers); 143 (non-completers)

$N = 418$
\[ Tau = \frac{347 - (.5)(275) + (.5)(143)}{418 - (.5)(275) + (.5)(143)} \]

\[ Tau = \frac{347 - 209}{418 - 209} = 66.03\% \]
CHAPTER 5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

The primary purpose of the study was to determine the influence of selected personal demographic characteristics and academic behaviors on whether individuals participating in a craft training course offered by a large organization of member construction companies successfully complete the course or leave the course prior to its completion. The dependent variable was whether the participants completed or not completed the semester of craft training offered by a large organization of member construction companies.

Objectives

The following objectives were formulated to guide the researcher in accomplishing the purpose of the study:

1. To describe individuals participating in a craft training course offered by a large organization of member construction companies on the following personal demographic characteristics:
   a. Age;
   b. Gender;
   c. Race;
   d. Location of residence defined as metropolitan and non-metropolitan;
   e. Course (craft) in which enrolled; and
   f. Level (defined by individual craft as introductory, advanced, or some gradation between these levels) of course in which individual is enrolled.

2. To describe individuals participating in a craft training course offered by a large organization of member construction companies on the following academic behaviors:
   a. Attendance (defined as the percentage of class sessions attended during the period in which the individual was enrolled in the course); and
   b. Grades received (defined as the final course grade (each module is graded on a 100 point scale and the student receives a final grade that is an average of completed modules)).
3. To compare individuals participating in a craft training course offered by a large organization of member construction companies who successfully completed the course with those who left the course prior to its completion on the following personal demographic characteristics:
   a. Age;
   b. Gender;
   c. Race;
   d. Location of residence defined as metropolitan and non-metropolitan;
   e. Course (craft) in which enrolled; and
   f. Level (Defined by individual craft as introductory, advanced, or some graduation between these levels) of course in which individual is enrolled.

4. To compare individuals participating in a craft training course offered by a large organization of member construction companies with those who left the course prior to its completion on the following academic behaviors:
   a. Attendance (defined as the percentage of class sessions absent during the period in which the individual was enrolled in the course); and
   b. Grades received (defined as the final course grade (each module is graded on a 100 point scale and the student receives a final grade that is an average of completed modules)).

5. To determine if a model exists that significantly increases the researcher’s ability to correctly classify individuals who participated in a craft training course offered by a large organization of member construction companies regarding whether or not they successfully completed the course from the following personal demographic characteristics and academic behaviors:
   a. Age;
   b. Gender;
   c. Race;
   d. Location of residence defined as metropolitan and non-metropolitan;
   e. Course (craft) in which enrolled;
f. Level (Defined by individual craft as introductory, advanced, or some graduation between these levels) of course in which individual is enrolled;

g. Attendance (defined as the number of class sessions absent during the period in which the individual was enrolled in the course); and

h. Grades received (defined as the final course grade (each module is graded on a 100 point scale and the student receives a final grade that is an average of completed modules)).

**Summary of Methodology**

The target population for this study was defined as adult students enrolled in merit shop industrial craft training courses. The accessible population was defined as adult students, between the ages of 18 and 62 years, who were enrolled in a merit shop industrial craft-training course offered by one large organization of member construction companies during the 2008 Fall semester.

Participants enrolled in craft training were categorized as Completers, Non-Completers, and No Shows. No Shows were people who signed up for courses but never attended any class sessions. Since little of the relevant data for accomplishing the objectives of this study would be available for the “No Shows” these individuals were not included as part of the sample.

**Sampling Plan**

This study incorporated a stratified sampling plan. A stratified sampling plan is defined as when the sample is divided into homogeneous units (Freund & Wilson, 2003). Members of the accessible population (N = 1191) were divided into two groups, Completers and Non-Completers. Participants who completed the semester of training were classified as Completers (n = 826). Students who attended at least one class, then discontinued attending classes were classified as Non-Completers (n = 365). The sample in the study consisted of 100% of the individuals who are defined as members of the “Completer” group and 100% of those who were defined as members of the “Non-Completer” group.

**Data Collection**

Data was collected to identify if certain demographic characteristics and academic behaviors influenced student retention in a multi-organization sponsored industrial craft-training program. The data
set was downloaded to a researcher-designed spreadsheet designed to categorize data by students’ demographics: age, gender, race, residence (Metropolitan or Non-Metropolitan), the particular craft, and craft level enrolled; and academic behaviors (grades and attendance).

Student demographic and academic data for this study was archived in electronic records at the training organization of member construction companies. The selected data was downloaded to a researcher-designed spreadsheet. Student anonymity was maintained by using the system assigned unique student code to track each student’s data set. This code was used as a sorting variable to ensure that all measurements for each individual participant were maintained together. The University Institutional Review Board (IRB) permission (#E4600) is attached at the end of this document.

Summary of Major Findings

Objective One

The purpose of the first objective was to describe individuals participating in a craft-training course offered by a large organization of member construction companies on the following personal demographic characteristics in the 2008 Fall semester. Descriptive statistics were used to describe the students’ demographics using continuous and categorical variables.

Age

The first variable used to describe participants in a craft-training course offered by a large organization of member construction companies was the participant’s age. Thirty participants did not provide usable data for their age. The remaining participants (n = 1161) age ranged from 18 - 62 years with a mean of 29.4 (SD = 9.380) and a mode of 20 years. The age category with the largest number of participants was 23 to 27 (n = 315, 27.1%) years of age.

Gender

The second variable used to describe participants in a craft-training course offered by a large organization of member construction companies was gender. The 1191 participants consisted of 1151 (96.6%) males and 40 (3.4%) females.
Race

The third variable used to describe the participants in a craft-training course offered by a large organization of member construction companies was race. Eight hundred seventy nine (73.8%) participants did not provide usable data for race. Of the 312 participants who provided usable data, the largest group of participants was Caucasian (n = 212, 68.0%). The second largest group to provide usable data for race was African American (n = 88, 28.2%). The remaining 12 (3.8%) participants provided Other as their Race.

Location of Residence

The fourth variable used to describe participants in a craft-training course offered by a large organization of member construction companies was the participant’s location of residence. The majority of the participants (n = 891, 74.8%) were classified as non-metropolitan residence and the remaining 300 (25.2%) participants were classified as metropolitan residence.

Craft

The fifth variable used to describe participants in a craft-training course offered by a large organization of member construction companies was the craft in which the participants were enrolled. The craft-training course in which the largest number of students was enrolled was Welding (n = 321, 27.0%). The craft-training course in which the second largest number of students was enrolled was Electrical (n = 195, 16.4%). The craft-training course in which the smallest number of students was enrolled was HVAC (n = 9, 0.8%). The craft-training courses with the second smallest numbers were Commercial Electrical (n = 39, 3.2%), Earthmoving Equipment Operations (n = 39, 3.2%), and Supervisory Training (n = 40, 3.4%).

Craft Levels

The fifth variable used to describe participants in a craft-training course offered by a large organization of member construction companies was the craft level in which the participants were enrolled. The majority of participants were enrolled in Level 1 training (n = 691, 58.0%). The level with the least participants was Level 3 training (n = 121, 10.1%).
**Objective Two**

The purpose of the second objective was to describe individuals participating in a craft-training course offered by a large organization of member construction companies on the following academic behaviors in the 2008 Fall semester. Descriptive statistics were used to describe the students’ academic behaviors using continuous and categorical variables.

**Attendance**

The first academic behavior variable used to describe participants in a craft-training course offered by a large organization of member construction companies was the participants’ attendance. Attendance was measured by the percentage of absences during the time enrolled in the craft-training course. The participants’ percentage of absences ranged from 0% to 92.31%. The mean attendance percentage was 21.7% (SD = 19.46).

**Grades**

The second academic behavior variable used to describe participants in a craft-training course offered by a large organization of member construction companies was the participants’ grades received. Grades were drawn directly from the data set received from the training provider. Not all participants received grades for participating in the craft-training classes. Participant (n = 493, 41.4%) did not receive grades because they were either enrolled in classes that did not award grades or left the training program before grades were assigned. The crafts did not award grades were Welding, Supervisory Training, and Basic Prints. Participants (n = 698, 58.6%) enrolled in the other courses received grades that ranged from 36% to 100%, with a mean score of 90.15% (SD = 7.55).

**Objective Three**

The third objective was to compare individuals who successfully completed the course with those who left the course prior to its completion on the following personal demographic characteristics: age, gender, race, location of residence, craft, and craft level.
Age

Thirty participants (2.5%) did not provide usable data for their age. The independent t-test results indicated the individuals who completed the training program (n = 805, 67.7%) were found to be significantly older (M = 29.77, SD = 9.495) than individuals who left the course (n = 356, 29.8%) prior to completion (M = 28.53, SD = 9.070) (t_{1159} = 2.080, p = .038).

Gender

A Chi-square Test of Independence was performed to examine the relationship between the dependent variable, whether or not the participant completed the semester of training, and the independent variable, the gender of the student enrolled. The Chi-square results, $\chi^2 (1, N=1,191) = .915, p = 0.339$, were not significant for the relationship of the variable gender and whether or not the participant completed the semester of training. The results show that whether or not the participant completed the semester of training was independent of the gender of the student enrolled.

Race

A Chi-square Test of Independence was performed to examine the relationship between the dependent variable, whether or not the participant completed the semester of training and the independent variable, the race of the student enrolled. The Chi-square results, $\chi^2 (2, N=312) = .545, p = 0.761$, were not significant for the relationship of the variable race of the student enrolled and whether or not the student completed the training course. The results show that whether or not the student completed the training course and the race of the student enrolled were independent. The large percentage (n = 879, 73.8%) of students who did not include any data on their race indicates a need for closer scrutiny in completion of applications.

Location of Residence

The Chi-square results, $\chi^2 (1, N=1,191) = 0.346, p = 0.557$, were not significant for the relationship of the dependent variable, whether or not the student completed the training course, and the independent variable, location of residence of the student enrolled.
Craft

The Chi-square results, $\chi^2 (12, N=1,191) = 57.168, p = < 0.001$, indicated the dependent variable, whether or not the student completed the training course, and the independent variable, the craft in which the student was enrolled were not independent (See Table 7). The nature of the relationship between these two variables was such that individuals enrolled in the Commercial Electrical (46.2%) and Electrical (59.5%) operation had the lowest completion rates. HVAC (100%), Millwright (86.3%), Safety Management (84.5), and Supervisory Training (82.5) had the highest completion rates.

Craft Level

The results of the Chi-square test indicated that the dependent variable, whether or not the student completed the training course, and the independent variable, craft-training level the participant was enrolled, were not independent $\chi^2 (3, N = 1,191) = 54.515, p = < 0.001$. Of the four craft-training levels, Level 1 had the lowest percentage of completers (61.8%). The highest percentage of completers was in Level 4 craft training (90.2%).

Objective Four

The fourth objective was to compare individuals participating in a craft-training course offered by a large organization of member construction companies with those who left the course prior to its completion on the academic behaviors of attendance and grades received. Attendance was defined as the percentage of class sessions absent during the period in which the individual was enrolled in the course. Grades were defined as the final course grade calculated on a 100-point scale from averaging the module grades during the time enrolled in the course. Each module was graded on a 100-point scale and the student received a grade defined as the percentage of that 100 points earned in the module/course.

Attendance

The individuals who completed the training program ($n = 826, 69.4\%$) were found to have significantly lower average of absences ($M = 13.0\%, SD = 11.896$) than individuals who left the course ($n = 365, 30.6\%$) prior to its completion ($M = 41.5\%, SD = 19.068$) ($t_{493.537} = -26.138, p < .001$).
Grades

An independent t-test was used to compare the grade means for participants that successfully completed the course with the grade means for the participants who left the course prior to its completion. Of the total semester craft-training course enrollment of 1191 participants, only 699 received grades for the semester training. Of the participants who received grades, completers (n = 548, 78.4%) were found to have received a significantly higher grade (M = 91.5%, SD = 5.306) than non-completers (n = 150, 21.6%) (M = 85.28%, SD = 11.527) (t_{166.629} = 6.411, p < .001).

Objective Five

The fifth and final objective of this study was to determine if a model exists that significantly increases the researcher’s ability to correctly classify individuals participating in a craft-training course offered by a large organization of member construction companies who successfully completed the course with participants classified as non-completers on the selected personal demographic characteristics and academic behaviors. The researcher chose to use two discriminant models, one discriminant model for participants who were enrolled in courses that awarded grades (n = 773, 64.9%), and another discriminant model for participants who were enrolled in courses that did not award grades (n = 418, 35.1%). These two discriminant models would allow the researcher to develop discriminant models that are applicable to use for all participants with the factors applicable to each participant. The craft courses that did not award grades to the participants were Welding, Basic Prints, and Supervisory Training. All the other courses awarded grades.

Discriminant Analysis for Graded Courses

The discriminant model for the participants (N = 773) who were enrolled in courses that awarded grades compared the factors by completers (n = 553, 71.5%) and non-completers (n = 220, 28.5%). Four independent variables were entered into the discriminant model producing an overall canonical correlation of $R_c^2 = .700$. The combination of the four variables in the exploratory model correctly classified 89.4% of the participants who completed the semester of training. Tau was calculated in order
to determine the overall increase of 64.8% in predictive accuracy over that obtainable by using prior probabilities of group membership.

**Discriminant Analysis for Non-Graded Courses**

The discriminant model for the participants (N = 418) who did not receive grades compared the factors by the completers (n = 275, 65.8%) and non-completers (n = 143, 34.2%). The single most influential variable entered into the discriminant model that explained 83.0% of the variability of students who completed the semester and students who left before completing the semester of the craft-training course was attendance. Tau was calculated in order to determine the overall increase of 66.03% in predictive accuracy over that obtainable by using prior probabilities of group membership.

**Conclusions, Implications, and Recommendations**

Based on the findings from this study, the researcher has derived the following conclusions, implications, and recommendations:

**Conclusion One**

1. The large organization of member construction companies training provider has a low completion rate among students enrolled in the craft-training courses.

This conclusion is based on the finding that only 69.4% of the participants completed the semester of training and that 30.6% were non-completers. The low completion rate of 69.4% for one semester was consistent with the literature review discussing the low completion rate in open shop craft-training programs. Many of the craft-training curriculums require multiple semesters of training to complete. Industrial craft training is one of many different forms of adult education programs. Student attrition is described as the number one problem in adult education programs. Quigley (1995) reports attrition rates as high as 60-70% in state and federal adult basic education statistics. According to recent studies based on data collected on a national survey of Construction Industry Institute (CII) members and U.S. industrial and commercial contractors, open shop training completion rates average 40.3% compared to 81.3% in the union sector training programs (Wang et al., 2008). One of the major differences between open shop training programs and union sector
apprenticeship programs is that in the union apprenticeship program, training is a requirement of employment, and in the open shop training program, the training is not a condition of employment (Bilginsoy, 2007).

Since the training is not required, many adults who choose to go to training do so to satisfy some personal needs. The first step in understanding why adults leave training programs is to learn why adults enroll in training programs. Adults enroll in adult education and training programs for more reasons than just to learn the subject matter (Rezabek, 1999). Researchers identify the influencers that motivate or discourage adults to participate in formal learning activities as either barriers or enablers (Cookson, 1986; Courtney, 1992; Cross, 1981; Rezabek, 1999). The three motivational orientations that drive adult learners to participate in adult learning activities are goal orientation, activity orientation, and learner orientation (Boshier, 1971; Rezabek, 1999). The goal-oriented learners may attend training programs that range from securing and maintaining employment (Boshier, 1971; Greenhalgh & Mavrotas 1994) to completing craft certification. After securing employment, the participant realizes, according to Bilginsoy (2007), that three-quarters of the construction workforce is involved in production work that does not require craft certification. Some participants do not want to assume the responsibilities that accompany craft certification, so they leave the training program before completion.

The activity-oriented learner may attend training activities to socialize with like-minded people (Boshier, 1971; Callan, 2005; Kerka, 1995; Rezabek, 1999; Vann & Hinton, 1994). A unique learning culture develops in each classroom, depending on the industry, subject, instructor, and the students. Sometimes students do not fit into the culture (Beder, 1991; Schein, 1997), and culture clash is too great for the participant to overcome.

The learner-oriented learner may attend training to learn specific information or procedures (Boshier, 1971). The quality of the training program encourages the adult learner to remain in the program by providing high quality instruction and learning materials, and providing flexible and relevant learning opportunities (ANTA, 2001). Program issues in instructional activities and curriculum content affect the student’s decision to remain in the program (NCVER, 2001; Quigley, 1998; Roussel, 2000).
Motives for leaving adult education programs can be grouped into several categories (Dirkx & Jha, 1994). Leaving the training before completion of the training program may be the result of the non-completer achieving some of his or her goals (Harris et al., 2001; Kambouri & Francis 1994; Perin & Greenberg 1994). Bilginsoy identified three situational barriers that may influence non-completers to leave the program before the training is complete. First, the non-completer may transition to a job outside the trade. Second, the non-completer may take a job not requiring the craft certification. Lastly, the non-completer may successfully complete the craft certification before completing the training (Bilginsoy, 2007).

The literature suggests that other reasons students leave training programs before completion include the students: began the training program without the proper understanding and rewards of the course (Vroom, 1964; Quigley, 1998); did not possess the foundational knowledge, skills, abilities, and attitude to complete the program (NCVER, 2001; Quigley, 1998; Roussel, 2000); did not fit into the culture (Beder, 1991; Schein, 1997); or situational issues beyond the students’ control (Cross, 1981). Other influencing factors for leaving training before completion may include the adult learner reached certain goals; the learner had negative educational experiences, especially, early in his or her school career (Cervero & Kirkpatrick, 1990; Quigley, 1998); or the lack of support in adult learner’s support system including the learner’s family, spouse, partner, or employer (Bilginsoy, 2007; NCVER, 2001; Wang, 2008).

The value adults place on education must fit within a personal priority system that includes work, family responsibilities, and leisure activities. Adult education programs compete with the student’s leisure activities such as resting, eating, recreating, and family activities (Courtney, 1992). It is typical for some adults to go through cycles of attending, withdrawing, and returning to training programs. Sometimes life events (Illness, family crisis) occur that force students to place the student role temporarily on the back burner (Kerka, 1995).

Student completion requires a dynamic learning experience that changes to adapt to the changing culture from the first couple of weeks, evolving through the last few weeks of class (NCVER, 2001). On
the first day of an adult education class through the first couple of weeks, the participants and instructors are strangers. The instructor must take the commander leadership role. The commander role establishes the routine, has the instructor taking control, making all decisions, and setting the standards in the classroom. As the classroom rules and routines are established, the adult group starts coming together. During the first phase, the instructor is learning the students as well as the participants are learning each other. This first phase is the beginning of the learning culture being developed. The culture continues to develop into the second phase during the next couple of months. During the second phase, the adult learning is given more decisions about how the learning will develop. During the last few weeks of the semester, the instructor takes on the role of the learning facilitator. The facilitator will facilitate the learning by giving the adult learners the ability to make more decisions (Schein, 1992). When adults are given the ability to make their own decisions, they take ownership of their learning. The ownership gives the adult learner the credit or blame for his or her success.

Many past research projects found that training completion is improved when the training is connected to the job requirements. Because the sponsoring member companies employ the workers, the training organization should use the partnership with the organizations to encourage the participants to attend the classes. The nature of construction is that many of the course participants may change jobs during the time required to progress through the craft-training levels. Effective use of the partnership will enable the participant a smooth transitions from one job to another job without affecting the training.

Based on this conclusion, findings and implications, the researcher recommends that research be conducted to learn why participants leave the craft-training program before completion. The research may be conducted as an exit interview, survey instrument sent to the non-completers’ last address, or student satisfaction questionnaires. The exit interview could be a questionnaire given to the students if they choose to tell the instructor they are quitting. The interview could be as simple as the instructor asking why the student is quitting the class. A survey could be sent to the participants’ last known address in a self-addressed, stamped envelope. The information would be gathered and analyzed to determine the most common reasons for the participants leaving the program.
From the information gathered from the analysis, the training organization can make action plans with the member companies to address the reasons for the participants leaving before completing the training. If the reason the participants are leaving is because they are terminated from their organization, it may benefit the organization to review the reason for termination. The students participating in the training could be used as one contributing factor to keep the student longer than employees not participating in the training. If the reason was normal reduction of force, did the employer attempt to find the participant another position in the area or did the employer transfer the participant to another geographic area of the country? Another possible scenario could be the employer terminated the participant for behavioral issues.

**Conclusion Two**

2. Students who completed the training had a lower percentage of absences than non-completers.

This conclusion is based on the findings that individuals who completed the training program (n = 826, 69.4%) were found to have a significantly lower average percentage of class absences (M = 13.0%, SD = 11.896) than individuals who left the course (n = 365, 30.6%) prior to completing the semester (M = 41.5%, SD = 19.524).

The findings of this study that non-completers had a higher percentages of absences than completers is consistent with the literature that poor attendance was an early sign that a student has decided to leave the training program (NCVER, 2001). Courtney (1992) suggests adult education competes with other leisure activities. Student absences are a symptom of the students losing interest or the student making choices that other activities have a higher priority than the training. Student absences can be grouped into three categories; training facility related, employment related, or personal related.

Students begin evaluating the training activity during the first contact with the training organization. The students begin evaluating if the training facility will provide a value greater than the investment the student is making in the training. The student’s investment in training is in the investment of time, money, and effort. When a student believes the training is not worth the time, money, or effort,
the student begins missing classes (Phillips, 1999). As the number of classes that the participant misses increase, the value of the training decreases. After missing a few classes, the student will lose interest and quit attending classes.

Some of the reasons students from the construction industry miss classes include: assignment to work overtime on unexpected projects, scheduled outages, and family emergencies. Employer support is a major contributor to the learner’s success in completing the training. Management, supervisors, and coworkers’ lack of support can create obstacles to the learner completing the training program (NCVER, 2001).

Life events or accidents are major factors that influence adult learners. Some of these life events involve changes in personal circumstances such as relationship problems, pregnancy, injury, illness, change of residence, vehicle breakdown, etc. It is not just the event, but how the learner accesses their support network to cope with the personal circumstances and workforce changes, that determine whether they will successfully complete their training (NCVER, 2001).

The researcher recommends that the training organization develop a recording instrument to determine why students miss classes. Each time a student misses a class; the teacher will ask the student why they missed the class. Based on the results of the findings of these recordings, the training organization may determine if trends exist for the absences are institutional, work, or personal related.

In reference to Vroom’s Expectancy Theory, the researcher further recommends the practitioner should give incoming students a pre-program expectancy form. The pre-program form will measure the student's expectations of the course. Each student will complete a pre-program expectation form to measure the student’s perception of the training facility. Another purpose of the pre-program form is to measure the student’s learning style: if the student is audio, visual, tactile, or some combination. This would enable the training organization to have empirical data to support developing appropriate training for the learning styles of the students. If the training does not address the student’s learning style, the student will lose interest in the training. If the student loses interest in the training, then the problem may be the training facility’s ability to satisfy or meet the training needs of the student. This researcher
believes students that participate in craft training tend to be more tactile or kinesthetic learners who need more hands-on training. A careful audit of the training facility should be conducted to determine the quality and quantity of the hands-on demonstration items used to teach the students. In line with the kinesthetic learning style, teacher observations should be conducted evaluating the delivery for different types of learners. From these observations, instructor workshops should be developed to teach instructors how to address each learning style as well as the evolving learning culture. Improving the instructional delivery through teacher workshops and increasing the hands-on portion of the training can improve students’ interest.

Based on the literature review (Quigley, 1998; Schein, 1997; Tinto, 1987), the student’s ability to fit into the learning culture and utilize some form of support system to encourage the student to attend the training classes. In the traditional college environment, students have many activities outside the classroom to engage in to assimilate into the college culture (Tinto, 1987). In the industrial craft–training program, no such activities external to the classroom exist. The culture is mostly limited to classroom activities. The first three weeks of classes are critical to the student feeling welcomed into the training culture.

Teacher workshops should address the importance of the first impression the first night of class, especially for Level 1. The workshop will teach the instructors how to connect with the students the first night of class. Instructors will be taught and encouraged to engage every student to begin participating in the class the first night. This will increase the student’s assimilation into the learning culture and give the student more control or ownership of their success in the classroom.

**Conclusion Three**

3. For participants who received grades, student who completed the training had higher grades than non-completers.

This conclusion is based on the findings that of the 698 participants who received grades, the completers (n = 548, 78.4%) were found to have received a significantly higher grade (M = 91.5%, SD = 5.436) than non-completers (n = 150, 21.6%) (M = 85.8%, SD = 14.33%).

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The findings of this study that completers have higher grades than non-completers are consistent with the literature that identified how student completion rates are directly related to how the learning environment satisfies the learner’s intrinsic and extrinsic needs (Knowles, 1996). The importance of grades to adults is dependent on the adult learner’s personal needs (Glasser, 1998) and personal value system (Phillips, 1999). Students whose needs are being met by the learning environment would have higher grades than students whose needs are not being met. If the student does not value the learning activity, then the student will discontinue the activity (Phillips, 1999). A student’s choice to perform is influenced by internal and external factors such as the student’s ability, motivation, and cultural relationships (Fuller, 1990). Students are influenced to perform by teachers, school administrators, the school environment, classmates, co-workers, and family members (Covey, 1989; Lumsden, 1998; Wentzel, 1998).

Knowles (1970, 1996) and Rush (1996) agree that several factors influence whether or not the learners are motivated or de-motivated by grades. Rush (1996) suggests high achieving adult learners’ need for measurements of their achievements is influenced by the learner’s age, culture, or sub-culture. These measurement or grades are how the high-achievers gauge their progress towards their goals and objectives (Keller, 1999; Rush, 1996). When the high-achiever's grades are lower than expected, or if no measurements exist, the high-achiever learner will be de-motivated, lose interest, and eventually drop the course (Rush, 1996).

This study found completers had higher grades than non-completers were in contrast with the andragogical learning philosophy that the use of grades may have a de-motivating effect on adult learners. The adult learner may feel more childlike when another adult evaluates them (Knowles, 1996). In accordance with andragogical learning theory, adults are intrinsically motivated to participate in learning opportunities because of a perceived need to know something, or a reaction to a life event and the learning must be task oriented. Adult Learners are not as frequently motivated by external measurements, such as grades from another adult (Knowles, 1996). Knowles (1970, 1996) suggests that attention should be given to learn which pedagogy or andragogy components work best with the specific population.

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The NCCER curriculum was an answer to the criticism from the union labor market and United States Department of Labor that merit shops were not providing quality training and had high attrition rates of non-union training facilities. The NCCER curriculum was designed to provide standardized construction training, measurable goals and achievements, policies and procedures, to satisfy the education systems’ need for accountability (Glover & Bilginsoy, 2005). Grades are one of the measurements used to measure the training organization’s accomplishments of the goals and achievements. Grades are a measurement of the student’s abilities, motivation, and cultural relationships (Fuller, 1990). The teacher is the point of contact between the training facility and the student. One of the jobs of the instructor is to motivate the student to perform. Grades may be a measurement of the teacher’s ability to motivate the students as well as the students’ ability to perform.

Based on the findings of this study that completers had higher grades than non-completers, incoming students should be given entrance exams to determine if a relationship exist between incoming academic performance can improve predictability of completion status. Students’ grades are based on ability, motivation, and cultural relationships (Glover & Bilginsoy, 2005). The students’ ability is based on the student’s previous knowledge. The NCCER curricula are based on eighth-grading reading comprehension and math levels. This would increase the likelihood the participants would have the previous knowledge and abilities to be successful in the craft training. The researcher further recommends that the students who are found to not possess the necessary academic abilities would be either offered or directed to organizations that offer remedial courses. After completion of the remediation, the student may begin the craft training courses.

Based on the conclusion that completers had higher grades than non-completers, the researcher recommends that further research be conducted to determine what teacher behaviors influence students' grades. The study would consist of regular teacher observations and student teacher evaluations to collect behavior patterns. From these observations and student evaluations, the study would determine the relationship between the students' grades and the teachers’ behaviors that are producing the best grades.
and completion rates. Based on those findings, the researcher further recommends workshops would be designed and developed to teach the instructors behaviors conducive to improving course performance.

**Conclusion Four**

4. The participants enrolled in Level 1 of the craft-training course had the lowest completion rate of the four craft-training levels.

This conclusion was based on the findings that craft-training Level 1 courses had a completion rate of 61.8% and the craft-training Level 4 courses had a completion rate of 90.2%. The completion rates for craft-training Levels 2 and 3 were 76%.

Level 1 is the first level in a craft-training curriculum and is covered in the first semester of training. Each semester is approximately four and half months. Level 1 was found to have the lowest completion rate in this study. Most of the craft-training curriculums are between two and four semesters long. The findings of this study that the lowest completion rates were early in training programs, Level 1, concurred with previous research that identified the greatest attrition rates are in the first three weeks of short-term training programs (Kambouri & Francis 1994; Malicky & Norman, 1994; Quigley, 1998) and in the first three months of long-term training programs (Bilginsoy, 2007; WADTE, 1999). Since the majority of non-completers leave in Level 1, they do not continue to the higher levels. The first three weeks of learning activities are critical in the retention of adult learners (Quigley, 1998). Within the first three weeks of a training course, the adult learner has made the decision either to remain in the program or to leave. There are several other reasons for leaving the training programs before any measureable learning has occurred. Many non-completers value education enough to enroll (Quigley, 1998), but had previous negative experiences in school that may be too strong to overcome. The teacher may remind the adult learner of those past negative experiences (Kerka, 1995). Student who perceived early experiences in schools as negative had greater attrition rates than those who had positive school experiences (Cervero & Kirkpatrick, 1990; Harris et al., 2001). Students who have a history of repeatedly leaving training programs before completion tend to repeat that behavior (Bills & Hodson, 2007) unless a major life
experience changes their perceptions (Knowles, 1996). Learners may have poor self-confidence for a variety of reasons, or be tired of classroom and school activities (Cross, 1981).

Sometimes the decision is acted upon immediately or may be postponed for an opportunity or excuse to leave the program (Quigley, 1998), usually within the first three months (WADTE, 1999) before the student acquires any substantial skills (Bilginsoy, 2007).

People follow a set of patterns established early in life. People begin developing traits and behavioral patterns as a child that will shape their perception of the world (Wiggenhorn, 1996). One such pattern is participation in learning activities. The longer a student participates in a learning activity, the greater the probability they will continue participating in the learning activities (Byrne, 1999; Roussel, 2000). The learner’s investment and value of the learning activity increases the longer they participate in the learning activity, thus the greater the value and expected rewards of the training. The increased value and expected rewards of the new knowledge would explain why each subsequent level, like Level 4, would result in higher completion rates. Quigley (1998) found that students usually remained in the program if they engaged in conversation with the instructors and other students, whereas non-completers tended to express their dissatisfaction with counselors and non-instructors.

The student’s prior knowledge has been found to be a contributing factor in the decision to complete the training program. Prior knowledge includes the student’s foundation skills required to complete the training program, and the student’s knowledge or perceptions about the subject matter. Roussel (2000) found in one study, the single greatest influential factor in students who completed training programs was the student’s initial levels of education when the training began. Formal education was found to complement vocational education programs by providing a foundation for learning. The basic skills learned in high school, such as problem solving, reading, and mathematics, are extremely useful tools for success in craft training programs (Roussel, 2000). A direct correlation exists between the amount of past learning activities and the probability of the student completing the training (Bills & Hodson, 2007). The most obvious time for the student’s lack of foundational and previous knowledge to adversely affect the student is in Level 1. If the student does not possess the foundational knowledge, the
student will not complete Level 1. After successful completing Level 1, the student will have exhibited the ability to complete the training program.

The student must have some idea of the timeline of the course, commitments required by the course, and the expected rewards from completing the course. The student will place a value on the expected results of the training program. Vroom’s (1964) Expectancy-Valance Theory explains that the student must know what to expect during and after the course, as well as the valance (or rewards) of the experience (Quigley, 1998). The challenge during the recruitment phase of the training courses is to explain to potential students the effort and time required to complete the course, as well as the time required to reap the rewards.

The gap between the learner’s expectations and reality is a major factor for students leaving the training program (Kerka, 1995). Adult learners are easily frustrated when they are not given enough information during the registration process. The frustration turns to exasperation when the adult learner believes the training progress is too slow (Hamann, 1994).

Another factor that may contribute to participants in the lower craft-training levels having higher attrition rates than the advanced craft-training levels is the process of assimilation into the industrial learning cultures. When individuals engage in a new activity such as industrial craft training, they engage in a new culture (Schein, 1997). Each class begins with a variety of student perceptions, from different organizations, and social groups to develop a new culture the first day of class that will continue to evolve until completion of the program (Schein, 1997). Sometimes the clash between the developing class-culture and the student’s personal culture is too great for the student to overcome, and the student feeling like an outsider, will drop the class (Schein, 1997).

Participants enrolling in more advanced levels of training, such as the Supervisory Training and Safety Management courses, would have already acclimated to the industry culture and norms.

Based on the findings of this study, the researcher recommends that the training organization should determine the most effective and dynamic instructors be assigned to facilitate Level 1 students. This group of learners has the highest attrition rates. The Level 1 instructor has the opportunity to make
the greatest impression. The first impression of a class sets the expectations for the remainder of the course. The first recommendation refers to participants who are motivated enough to begin a training program, but are not motivated enough to continue or complete the training program (Quigley, 1998). Research identified that if the training programs remind the adult learner of bad experiences in earlier educational settings, then the adult learner will not complete the training.

The researcher further recommends that the training practitioner use an entry test to evaluate if the participant has the basic skills required to be successful in the training program. The NCCER curriculum is designed for eighth grade reading comprehension and math skills level. There is a low probability that participants who cannot function at the eighth-grade level will be successful in the course. The students who do not function above the eighth-grade math and reading levels will be flushed out during Level 1. When participants score below the eighth-grade reading or math level, remediation classes should be offered to the participants. Participants who cannot function at the eighth-grade level will determine in the first three to six weeks that they cannot keep up with their peers. When the learner cannot keep up with the peers, the learner will lose interest and find other activities that are more enjoyable and start missing classes.

The researcher believes some participants are enrolling in courses to learn about the crafts. The researcher recommends that the training organization develop informative “pre-craft” classes or videos that explain the expectations of each of the craft courses. This class will cover the good (rewards), the bad (adverse and hazardous work conditions), and the ugly (the unexpected pitfalls) of each craft. These pre-craft classes would also review what types of people have been found most successful in each of the crafts. Having this class available to interested individuals would address Vroom’s (1964) Expectancy Theory and andragogical theory that refer to adults’ need to know what to expect for rewards and costs of an activity. Satisfying the adults' need to know will minimize the number of students that drop out early in the program. The informational videos would be used to recruit students to the program.

Recommendations for further research include qualitative research projects designed to inquire why student remain in a training program. The first recommendation is to do a qualitative study to
determine what motivates students to stay in craft-training programs. The qualitative study would ask opened ended questions designed to enable the participant to explain why they choose to complete the training program.

Another research project is a survey of past non-completers. The second research project would be to develop a survey instrument to send to non-completers who left the program at different times during the semester to determine why they left the program before completion.

Conclusion Five

5. Some crafts in which participants were enrolled had higher completion rates than others.

This conclusion was based on the findings that the some crafts, such as HVAC (100%), Millwright (86.3%), Safety Management (84.5), and Supervisory Training (82.5) had higher completion rates than other crafts, such as Commercial Electrical (46.2%) and Electrical (59.5).

The findings in this study partially concur with the studies in the literature review. The Wang, Goodrum, Haas, and Glover (2008) study found the greatest attrition rate in the electrical craft training programs and the highest completion rates were for the equipment operator. Several factors are involved that may influence the adult learners completion rates for the different crafts. The HVAC classes were very small and presumably, the instructors spent a lot of personal time with each of the students. The Millwright craft-training curriculum has four training levels, like many of the other crafts. Based on the researcher's perception, most participants who enroll in the millwright craft-training class would already know something about the construction industry and, more specifically, the millwright craft.

Participants enrolled in the Safety Management and Supervisory Training courses would have already participated in previous training programs. The Safety Management and Supervisory Training do not have Level 1 training. The higher completion rates for the Safety Management and Supervisory Training classes would coincide with the research that predicts that people follow a set of patterns established early in life. People begin developing traits and behavioral patterns early in life that will shape their perception of the world (Wiggenhorn, 1996). Once a person establishes the pattern of
participation in learning activities, this pattern will continue. The more education a person has increases the probability that the person will seek more learning (Byrne, 1999).

The differences in the completion rates of the various crafts may have some bases in the perceptions of the different crafts. The literature suggest reasons for student’s leaving before completion of the training is because students begin the training program without proper understanding of the course and rewards of the course (Vroom, 1964; Quigley, 1998); and/or do not posses the foundational knowledge, skills, abilities, and attitudes to complete the program (Cross, 1981). Vroom (1964) and Knowles (1996) stressed the importance of adult learners to know the expected outcome from participation in the learning activity. The Commercial Electrical, Electrical, Print Reading, and Welding courses had the lowest completion rates. It is this researcher’s belief that many participants enroll in these courses with a misperception of the course requirements. Many of the participants enrolling in the electrical programs are expecting some resemblance to residential electrical that is drastically different from either commercial or industrial electrical. Many people have a misperception of what is required of welding. These people believe they could attend some training classes for a short period, pass a test, and begin making high hourly wages with minimal work. After the student enrolls in the welding class, the student finds out that welding requires long hours or intense effort to perfect their welding craft abilities. A harsh reality for many of the welding students is to learn in the class that they will be tested on every job and their work will be inspected by non-destructive testing procedures. Most jobs limit the welder only three repairs per month or six repairs per six months, before being terminated. When some participants learn the reality of these courses, and the expectations on the craft, they quit. Another belief of the researcher is the instructor has a great influence on whether or not the student completes the training course.

Based on the findings of this research project, the two recommendations for the practitioner were mentioned in previous conclusions; administer a pretest designed to measure the student’s readiness to enroll in the course and present a pre-course training video or class. The researcher recommends using a pre-test designed to measure job readiness for different careers. The results may help in placing students
in courses more inline with their aptitude. In addition to the earlier recommendations to measuring the students’ aptitude, this pre-test would contain a craft knowledge test. The craft knowledge test would inform the practitioner the pre-conceived craft knowledge of the potential student. The pre-test would flush out students’ misperceptions about the craft before the course begins. These misperceptions could be cleared up before the student and training organization invest time and money in the learning process. This recommendation may result in lower enrollment numbers, but would improve completion percentages.

The next practitioner recommendation is to develop pre-course videos or classes to give the participant a good understanding of what each craft requires. Developing a pre-class video would improve the completion rates because the students would have a better understanding of the craft they have enrolled in before the student, contractors and training organization invests time and money into the training program.

**Conclusion Six**

6. The majority of the participants were between the ages of 18 and 32 years.

This conclusion was based on the findings that 72.4% of the participants were under the age of 32 years and the minimum age to participate in this study was 18 years. The participants’ age had a mode that was 20 years with an average age of 29.4 years.

The findings that the average age of participants was 29.4 years were consistent with the research that the most likely participants in craft training were workers in their prime working years, 26-45 years of age. Only 10% of the participants in this study were over 45 years and half of those were over 50 years. The literature review revealed that older people were often reluctant to participate in training efforts from employers (Fahy & Steel, 2008; Roussel, 2000). Older workers (aged 50 and older) develop a disposition that they are too old to learn (Cross, 1981) and become resistant to training. The five participants 60 years and older support the research that states the least likely age group of people to be attracted to training programs is 60-65 years old (Bills & Hodson, 2007; Roussel, 2000). One of the
likely reasons for the older participants to enroll in the training course was for the activity-oriented learner who viewed class as a social opportunity (Boshier, 1971; Schein, 1997).

**Conclusion Seven**

7. This research found participants who completed the courses were older than participants who did not.

This conclusion was based the Independent t-test. The t-test results indicated the individuals who completed the training program (n = 805, 67.7%) were found to be significantly older (M = 29.77, SD = 9.495) than non-completers (n = 356, 29.8%) (M = 28.53, SD = 9.070).

These finding are consistent with the literature review in that age is considered to have both single and cumulative relationship to students’ decisions for being attracted to, remaining in, and completing a training program. The mode of 20 years agrees with Roussel (2000), who found students 20 years of age the most likely age of students to be attracted to training. Research has shown that students younger than 26 years of age have higher attrition rates than older students (NCVER, 2001). Younger students may be less committed to learning the craft than older students already committed to the craft and construction industry (Bilginsoy, 2007).

People learn differently according to their age. Effective training must not be targeted at one age group, but address all ages and learning styles. Robson (2001) found younger workers who recently graduated from high schools might learn new material faster than older workers. Older workers have more experience to build on than younger workers (Robson, 2001). Martin found older workers learn at rates similar to younger workers (Martin, 2001) when the new knowledge builds upon previous learned material. Reflective teaching methods require the instructor to explore the student’s knowledge level and build on it (Mathieu & Martineau, 1998).

The researcher recommends that the training organization develop workshops for the instructors on the pedagogy and andragogy teaching techniques. These workshops should also cover how to recognize which techniques are working best with different groups of students, especially as related to age, cultural, and gender differences. The instructors in this training facility are skilled craftspeople.
working in the industry. They were selected for several reasons, some of which may include: the instructor chose to give back to the industry that has provided them a good living, their employer chose them for their expertise in their field, and the instructors were looking for the opportunity to earn extra income. The instructors went through a brief, 12-14 hours, NCCER Instructor Craft Training Program (ICTP) to introduce the instructors to teaching. Pike describes learning as phases; the first one is, "they do not know what they do not know" (Pike, 1994). Many of these instructors attended the ICTP while in this first stage, but now that they have experienced the classroom, it is time for many of the instructors to return to ask valuable questions.

Tinto (1987) suggest learning takes place in a social environment or in a social event. Schein (1997) suggest the learning culture begins with the first class meeting. The majority of the teachers are experienced in their respective craft; and some are retired craftspeople that use the opportunity to socialize with like-minded people. Most of the instructors are older than the students in the classroom. The researcher recommends the training organization provide some coaching for the instructors how to deal with the different generational learning and motivation styles.

Conclusion Eight

8. The majority of the participants were male.

This conclusion was based on the findings that of the 1191 participants, 1151 (96.6%) of the participants were male and 40 (3.4%) of the participants were female.

The findings of this study was consistent with the research that find men are more likely to participate in construction craft training than women (Anlezark, Karmel, & Ong, 2006). The lack of women in construction in the United States is attributed to several factors: the selection criteria, construction “male-dominated courses, recruitment practices and procedures, sexist attitudes, male-dominated culture, and the work environment” (Fielden et al., 2000; Harris et al., 2001). Another reason given for women not entering the construction craft training is the perception of construction as a dirty and physically demanding industry that has prevented many women from considering construction trades as a career choice. The majority (77%) of the women who do chose to work in construction, work in
sales and office jobs while only 2% of the construction and maintenance craft workforce is women (Dohm & Shniper, 2007).

This training facility seemed to have a slightly higher percentage of females than the national average with 3.4% of the students being female. The higher than projected female population could be the result of many factors. The first factor could be the availability of higher paying jobs in the construction industry could be attracting women into the non-traditional construction and maintenance work. Many organizations, such as the National Association of Women in Construction (NAWIC) and Professional Women in Construction (PWC), began to promote, attract, and provide support to the women who work in the construction industry (NAWIC, 2009; NCCER, 2009a). These organizations are providing female role models to influence more women to enter the construction workforce. Furthermore, the federal government regulations prohibit environments perceived to be hostile towards women (and other minorities) in the construction industry. An alternative (outside the box) hypothesis could be that fewer males are entering the construction job market for many of the same reasons women traditionally did not enter the market. With the fewer males entering the market, the percentage of women would increase.

This researcher recommends several options to the practitioner to increase the number of women into the craft training programs. As mentioned above, people are attracted to activities where they feel comfortable. The first recommendation is to review the program for any gender bias that may be offensive to females. This program review would be done by a diverse team of individuals of women and men of various demographic backgrounds. The second recommendation would be to hire female recruiters and instructors. Women need female role models to attract women into the craft or trades section of the industry (NAWIC, 2009). Lastly, this researcher recommends highlighting successful women in the previously mentioned information video series to inform potential students about women in the construction industry.

**Conclusion Nine**

9. The majority of the participants did not provide useable data for Race.
This conclusion was because 879 (73.8%) participants, out of 1191 participants, did not provide usable data for race on the application.

Several possibilities could explain the reason for the high percentage of participants not providing usable data for the variable race. One explanation could be the students’ perceptions that indicating their race may have some impact on the selection process. For many of the participants, their employer’s training coordinator registers most of their participants. The training coordinators may have been in a hurry to get the employees signed up for the classes and did not mark categories they perceived as not necessary, such as race, level of education, or other demographic characteristics. Another possible explanation for why this data was missing is that the data entry people may have failed to enter all the data. During the registration process, two data entry people are assigned to enter data for over 1200 applications in addition to their regular duties.

Based on these findings, the researcher recommends the practitioner start a review process to identify the relevance of the information required to complete the registration process. After the review of the application for relevant information, they should require the application to be completed before the student is enrolled. The application should have a disclaimer such as, “this information is optional and will not be used in a discriminatory manner”.

Many federal and local grants used for supplementing the training expenses are based on the percentage of minorities served by the training provider, along with the success rates.

**Conclusion Ten**

10. The majority of the participants were listed as non-metropolitan residence.

This conclusion was based on the findings that 891 (74.8%) of the 1191 participants resided in communities of less than 50,000 people.

These findings are consistent with the general population of the service area the training provider serves. Although the training provider's service area includes a metropolitan city, the majority of the service area is non-metropolitan. The population of the training provider service area is approximately 23-28% non-metropolitan.
The findings of this study that the majority of the participants were non-metropolitan residents, were consistent with the literature review, that the most likely to participate in vocational craft training would be non-metropolitan residents (Anlezark et al., 2006; Roussel, 2000). Roussel (2000) used a meta-analysis that found that non-metropolitan residents were more likely to participate in vocation education training than metropolitan residents were. The location of the student’s residence has been linked to completion rates. Anlezark et al. (2006) found a high percentage of non-metropolitan residents had lower academic achievements than metropolitan residents did. Anlezark et al. (2006) also found a higher percentage of non-metropolitan residents were attracted to vocational courses than their metropolitan counterparts did. This study did not find a significant difference in the completion rates of metropolitan or non-metropolitan residents.

Lichter and Johnson (2006) studied the demographic shift that occurred in the 1980’s and 1990’s and its effects on poverty. Their study explained how the creation of suburbanization created an intermediate area that behaved as neither metropolitan nor non-metropolitan. The suburban residents were the more affluent, with the financial means to move out of the overpopulated inner city to the outskirts of town, still reaping the benefits of the metropolitan city. Their study explained the suburban population might belong to either metropolitan or non-metropolitan population as defined in this study. Lichter and Johnson (2006) defined the metropolitan cities as the inner city residents mostly living in poverty. Their study suggested the poverty level in metropolitan (inner city) areas adversely affected the population from participating in training programs. The metropolitan (inner city) population may not have the foundation education to successfully complete the training, or have the transportation resources to participate in the training. Lichter and Johnson’s report also concluded that many of the rural population were too isolated to participate in training programs.

This research study divided the service population into two categories, metropolitan and non-metropolitan, based on the 50,000 residents as defined by the U.S. Census Bureau. The researcher recommends that more research is needed to measure other criteria associated with the location of residence. Several other demographic variables are identified as possible factors that influence student’s
completion rates in training programs. Residents could be divided using other criteria, such as: socioeconomic, community racial diversity, and cultural diversity scales.
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APPENDIX

IRB CONSENT FORM

Application for Exemption from Institutional Consent Oversight

Unless exemption is being sought for research involving human subjects, all human subjects, data collected from human subjects, or samples or data collected from human subjects or any act where human subjects are involved must be reviewed and approved by the LSU IRB. The form itself for the Principal Investigator project may be exempted and is used to request an exemption.

- Applicant, please fill out the application in its entirety and include the completed application as well as parts A-E, listed below, when submitting to the IRB. Once the application is completed, please submit two copies of the completed application to the IRB Office or to a member of the Human Subjects Screening Committee. Members of this committee can be found at http://www.lsu.edu/irb/humanscreeningmembers.shtml

- A complete Application Includes All of the Following:
  (A) Two copies of this completed form and two copies of parts B thru E.
  (B) A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts 1 & 2).
  (C) Copies of all instruments to be used.
    • If the proposal is part of a grant proposal, include a copy of the proposal and all recruitment materials.
  (D) The consent form that you will use in the study (see part 3 for more information).
  (E) Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing or handling data, unless already on file with the IRB.

Training link: http://php.nihtraining.com/users login.php

1) Principal Investigator: Alvin James Justice III Rank: Doctoral Student

Dept. EREKD Phone: 225.578.4279 E-mail: ajustice@lsu.edu

2) Co-Investigator(s): please include department, rank, phone and e-mail for each.
   If student, please identify and name supervising professor in this space.

Dr. Michelle E. Garrett, EREKD Director, 225.578.5748, vochir@lsu.edu

3) Project:

Title: Determine if selected demographic characteristics and academic behaviors influence the retention rates of adult learners participating in an industrial craft training program.

4) LSU Proposal? (yes or no) N  If Yes, LSU Proposal Number

Also, if YES, either  □ This application completely matches the scope of work in the grant

□ More IRB Applications will be filed later

5) Subject pool (e.g. Psychology students): Industrial Craft Adult Learners

• Circle any "vulnerable populations" to be used: (children <18, the mentally impaired, pregnant women, the aged, etc). Projects with incarcerated persons cannot be exempted.

6) PI Signature

"I certify my responses are accurate and complete. If the project scope or design is later changed I will resubmit for review; I will not obtain written approval from the Authorized Representative of an non-LSU institution in which the study is conducted. I also understand that it is my responsibility to maintain copies of all consent forms at LSU for three years after completion of the study, if I leave LSU before that time the consent forms should be preserved in the Departmental Office.

Screening Committee Action: Exempted  □ Not Exempted Category/Paragraph

Reviewer: [Signature] Date: 5/1/07
VITA

Alvin James Justelien, III, was born in New Iberia, Louisiana, October, 1958, to Alvin James Justelien Junior and Zoe Rita Justelien. He graduated from Angleton Senior High School, (Angleton, Texas) in 1976. He received an Associate of Arts Degree in computer science from Brazosport College (Lake Jackson, Texas) in 1978. He worked for Shell Oil Company in the Information Center, Information Technology Department, before entering the construction industry.

Mr. Justelien began his industrial construction career as a pipe fitter helper working for Brown & Root Construction. After three months on the job, Mr. Justelien successfully passed his first welding certification test. The hunger to learn more motivated Mr. Justelien to learn pipefitting and operation of heavy equipment during his industrial construction experience. The industrial construction career included building petroleum distillation plants, chemical plants, olefins plants, shipyards, oilfield (on- and offshore), and pulp and paper mills.

In 1984, Mr. Justelien joined Great Northern Nekoosa (purchased in 1990 by Georgia Pacific), at the Leaf River Pulp Operations (LRPO) in New Augusta, Mississippi, as an Industrial Maintenance Technician, specializing in welding and pipefitting. During the 21 years at LRPO, Mr. Justelien became proficient in carpentry, lubrication specialist, millwright, hydraulics/pneumatics, and machinist, in addition to welding, pipefitting, and crane operation. His responsibilities included designing and developing safety training modules, coordinating contractors during annual shutdowns and special projects, and participating in maintenance improvement projects such as TES, TQM, Lean, and CMMS implementations.

In 1999, Mr. Justelien began his quest for more education. By 2003, he had completed a Bachelor of Science degree and a Master of Science degree in workforce training and development at the University of Southern Mississippi (USM) in Hattiesburg, Mississippi.

In August 2005, Mr. Justelien left LRPO to begin a doctoral program at Louisiana State University under the guidance of Dr. Michael F. Burnett, Director of the School of Human Resource Education and Workforce Development. During the pursuit of doctoral degree, Mr. Justelien has had
several diverse leader opportunities. These opportunities included Training Developer with the Louisiana Department of Transportation and Development (LADOTD), Program Director with Louisiana Learns (middle school math tutoring organization), Bicycle Tour Leader with Adventure Cycling Association, Convention Manager for the Louisiana FFA Association, and Director of Workforce Development with the Associated Builders and Contractors, Pelican Chapter.

Mr. Justelien is a National Center for Construction Education and Research (NCCER) Master Trainer, regularly teaching the Instructor Certification Training Program (ICTP). His responsibilities include, but are not limited to, coordinating the High Schools Outreach programs and improving in-house training programs.

He and his wife, Shari Ann Justelien, have three children, Sylvia Nichole Justelien, Alex Lee Justelien, and Holly Lashay Holliman. Sylvia is pursuing a Bachelor of Science Degree at University of Southern Mississippi (USM) in Hattiesburg, Mississippi. Alex is serving in the United States Marine Corps and has two daughters. Holly has one son and is living in Ovett, Mississippi.