DISSERTATION

THE LIVED EXPERIENCE OF RURAL COMMUNITY COLLEGE APPLIED SCIENCE ENGINEERING TECHNOLOGY GRADUATES

Submitted by

David (DeeJaay) Beals

School of Education

In partial fulfillment of the requirements

For the Degree of Doctor of Philosophy

Colorado State University

Fort Collins, Colorado

Summer 2015

Doctoral Committee:

Advisor: Timothy Davies

Bruce Hall
Don Quick
Jeff Foley

ABSTRACT

THE LIVED EXPERIENCE OF RURAL COMMUNITY COLLEGE APPLIED SCIENCE ENGINEERING TECHNOLOGY GRADUATES

Society is proliferated with devices that have been designed, developed, and constructed to enhance everyday life emphasizing the importance of the engineering profession. But the number of students pursuing the engineering technology field continues to decline. The purpose of this interpretive phenomenological study was to explore the lived experiences of graduates who navigated through and completed an Associate of Applied Science (AAS) degree in Engineering Technology from a rural community college and then transitioned into the engineering workforce. To explore this phenomenon, participants completed in-depth interviews.

The structures that emerged from the interviews and described how the participants experienced their journey were Perception and Experiences of Engineering Technology, Captivation of Engineering Technology, Significant Influences and Relationships, Value of an Associate of Applied Science degree in Engineering Technology, and Transition to the Workforce. These structures interweaved to create the textural structural synthesis of transformation. As their transformations occurred graduates were able to refine the direction of their engineering educational journey giving way to the essence of this study the unexpected journey.

The findings of this study can help faculty develop and implement strategies to gain and keep perspective students interested in engineering programs. The findings can also help academic advisers guide students seamlessly through their education to a career.

ACKNOWLEDGEMENTS

Many students feel the need to confront their educational journey on their own but it is a very arduous journey without help, support, and encouragement. My support and encouragement came from my advisor and methodologist Dr. Timothy Davies. Words cannot express my appreciation for all the help and encouragement that you have given me over the years. I appreciate the time you have given me while I pursued my dream.

I would also like to acknowledge the individuals who shared their personal stories. Thank you for taking me along on your educational journeys. You demonstrated that this is important matter to you with your willingness to share so many of your educational and professional experiences. It was so meaningful for me to hear about your determination in pursuing your educational aspirations and seeing your accomplishments that you have achieved professionally and as well as in your personal lives.

DEDICATION

I dedicate this work to my hero, my Mom. Throughout my life you have always inspired and motivated me in times of difficulty. I also want to thank you for your unwavering patience, support, and encouragement as I pursued my degree. You are the most important teacher that I continue to learn so many valuable lessons from every day. Thank you so very much.

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION

The United States (US) infrastructure supports, creates, and develops the nation's economy. After World-War II the US infrastructure flourished with advancements in technology and engineering research that developed the networks of roads, bridges, waterways, sanitation systems, power plants, electrical grids, airports, harbors, and the transportation of goods. The nation's infrastructure is currently deteriorating and has the potential to dramatically impact the US economy (ASCE, 2009). An American Society of Civil Engineers report (2013) indicated that if the infrastructure of transportation continues to decline, it will cost the US economy more than 900,000 jobs and restrict the growth of the nation's gross domestic product (GPD) by billions of dollars. If this trend continues families will have a lower standard of living, business will be paying more while producing less, and the US will fall behind in the global knowledge economy (ASCE, 2013).

Economist Lester Thurow indicated that the education and skills of the workforce are the backbone to the US infrastructure which supports the US economy. Since the rise of the global knowledge economy, the US has experienced the slow and painful demise of the American blue-collar economy in which workers earned good wages with a high school education or less (Carnevale, Smith, & Strohl, 2009). Because of the exponential growth of the global knowledge economy, the US economy has become critically dependent on and vulnerable to any deficiencies in the talents and knowledge of the available technical workforce (Chubin, May, & Babco, 2005) which in turn affects the US infrastructure.

While offshoring of manufacturing jobs has been documented for decades, there is a surge in the relocation of service related jobs in banking, IT, and most importantly engineering

(Gereffi, Wadhwa, Rissing, & Ong, 2008). The US stands to lose its ability to "invent" the next big technology (Wadhwa, Jasso, Rissing, Gereffi, & Freeman, 2007) and support the current US infrastructure.

The information presented here is to help illuminate the importance that Science, Engineering, Technology, and Mathematics (STEM) majors and careers (with emphasis on engineering technology) has on US society and the economy. As the global knowledge economy continues to grow with advancements in technology, it will become increasingly harder for the US to import educated workers or export high-pay/high-skills jobs to skilled workforces overseas. For the US to remain globally competitive in the world economy the US needs to develop a more qualified workforce to support the nation's infrastructure and aid in the development and design of sustainable and renewable technologies. In turn these innovative advancements will improve society's quality of life and raise the nation's standard of living. But how can the US develop a more qualified workforce when there is a declining student population pursuing STEM majors and careers, especially in the engineering technology field.

In this chapter I begin by reviewing the background for the study. I then transition to the purpose of the study, and the research questions. Next I illustrate the significance of the study and present my perspective of the study. I conclude the chapter by describing the organization for the rest of the study.

Background of the Study

Carnevale et al. (2010) project that by 2018 nearly two-thirds (63%) of all new jobs will require more than a high school diploma. Georgetown University Center on Education and Workforce also predicts that 60 % of US jobs will require some form of postsecondary education by 2018 (Lumina Foundation, 2012, p.5). In addition the Bureau of Labor Statistics projects that

21 of the 30 fastest growing occupations will require postsecondary education (Lacey & Wright, 2009). There is growing recognition that some high-paying technological careers require more education than a high school diploma but less than a four-year baccalaureate degree.

The number of jobs requiring science, engineering, and technology training continues to grow as technology advances, but the National Science Board (2004) indicated there is a declining population of students and adults pursuing STEM majors and careers in the US. The current and projected need for more STEM workers combined with the continual lagging participation of students are indicators that US policy makers need to find ways to increase participation and interest in STEM majors and careers (Chubin et al., 2005).

It is not clear if US policy makers realize that by 2020 there will be 40 million college educated professionals between the ages of fifty-five and seventy five and census data indicate that the US is not producing college educated workers fast enough to replace these aging professionals leaving the workforce. More than 60 % of Americans go on after high school to obtain postsecondary education or training. But even at these current rates of college enrollment, the share of workers with at least some college education will only increase by 3 % between 2000 and 2020 (Carnevale et al, 2009).

During the late 1990s and early 2000s, a study by Yurtseven (2002) found the trends related to supply and demand of engineering graduates were below economical demand. At that time there were 2.6 million engineers in the US and approximately 1.2 million of them were employed in an engineering related field. Approximately one million engineers did not actually practice engineering while more than 400,000 people from other fields such as science, technology, mathematics work in an engineering field. This information illustrates the

importance and the interchangeability of STEM careers, but for this study focus and emphasis will be given to the engineering technology field.

Yurtseven (2002) pointed out that the average number of employed engineers only grew by 10 % per year for the last 50 years. What had also occurred in the previous ten years was a 15 % decline in the number of engineering graduates while total number of graduates in all other fields increased by 16 %. More recent reports by the American Society for Engineering Education (ASEE) found that enrollment between 2001 and 2005 for full-time engineering undergraduates leveled off and have been moderately stagnant in the US. In 2001 the national enrollment for full-time engineering undergraduates was 357,837 with 96,962 being freshmen. In 2005 the national enrollment for full-time undergraduates was 364,767 with 95,961 being freshmen. This illustrates a slight decline in freshmen enrollment from 2001 to 2005 and just a slight increase in full-time enrollment over the same period (Cited in Karcher, 2011). While the increase in full-time enrollment may appear to be positive, on closer examination of these statistics by ASEE showed that it was still below the economical demand that the US requires to be economically competitive globally. By examining the growth for the past few decades it can be seen that the number of engineering graduates do not meet the US need for engineering professionals.

If this trend is not addressed and is allowed to continue, it is predicted that three events will steadily occur. The number of jobs in the US economy that require engineering and technology training will continue to grow while no domestic workforce will be available. The number of US citizens prepared for these types of positions will level off, if it has not already, and then begin to decline. The availability of talent from other countries who have the required engineering and technological training will decline as well due to H1B temporary work visa

limitations set by US national security or by global economic competition. With the growing need of postsecondary education and as interest for students and adults continually decline in the engineering technology field it becomes increasingly more important to explore this issue.

Currently the engineering related fields can anticipate grueling consequences which will be felt throughout the US economy for many years to come. As interest declines in engineering related careers there will be low participation and membership efforts made to professional associations and the number of engineering graduates within the US will continue to fall below the economical demand more and more as every year passes (Yurtseven, 2002).

Purpose Statement

This interpretive phenomenological study explored the lived experiences of graduates who navigated through an engineering technology program and completed an Associate of Applied Science (AAS) degree in Engineering Technology from a rural community college and then transitioned into the engineering workforce. For this study, the graduates' interest in studying the engineering technology field was considered the phenomenon. Since there was no true way to question students' who do not enroll in the field of engineering technology, the questions proceeded to the students who had already graduated from an engineering technology program to explore what made them interested in the engineering technology field and what helped the graduates complete their degree. Furthermore, it was advantageous to explore the graduates' experiences as they transitioned from college academics to the engineering workforce. This research used a qualitative approach to investigate the research questions that frame this study.

The most attractive place for students to begin competing in industry, creating new knowledge, becoming an efficient participant of the workforce, and identifying new technology

to match community needs was at a rural community college. A US Department of Education study reported that 20 % of engineering degree holders began their academic careers at a community college (Adelman, 1998). Community colleges are valued for their perceived role in higher education because they serve a large number of minority and low-income populations (Cohen & Brawer, 2008). The community college is a point of entry into higher education for a large portion of this population who are first-time students that come from diverse backgrounds and are underprepared for college-level coursework. Based on these facts it was apparent that a two year Associates of Applied Science degree in an engineering technology program from a rural community college would provide the most diverse pool of potential participants.

Research Questions

Not much attention has been given in current literature about understanding what makes and keeps students interested in studying the engineering technology field. More importantly, understanding the graduates experiences as they transition from academia to the engineering workforce. In order to discover the meaning that engineering technology graduates construct from their rural community college educational experience and how they experience their transition from education to the engineering workforce in the local and regional community, the following questions guided the research:

1. What experiences influenced these participants to study Engineering Technology at a rural community college?
2. How did these participants make meaning of their experience in an Engineering Technology Program at the rural community college?
3. How did these participants make meaning of their experience as they transition into the local and regional engineering workforce?

Significance of the Study

The intent of this study was to contribute to the understanding of the overall experience that engineering technology graduates constructed from their rural community college education and how they experienced their transition from education to the engineering workforce in the local and regional community. Specifically, this study focused on graduates from an engineering technology program and concentrated on what experiences made and kept graduates interested in studying and completing the Engineering Technology Program at a rural community college. As interest declines in engineering related fields, it is important to understand the graduates' experiences and how those experiences influenced their decisions to stay and complete the program.

The study also focused on how the graduates education helped them transition to the engineering workforce, and what helped them be better prepared for the workforce. Having knowledge of the graduates' perspectives served as an appropriate starting point for understanding the complexities and nuances as to why students decided to study engineering technology and pursue work in the engineering field. By having a better understanding of graduates' experiences it may help in creating a more attractive field of study and draw more perspective students in the future.

This study has the potential to lead to understanding specific structures and processes that contributed to students wanting to study the engineering field. The study included graduates who decided to study engineering technology and persisted in completing their AAS degree from a rural community college and then transitioned into the engineering workforce. The student stories contributed to understanding the student's perspective of their educational pathway to the

workforce, which may be of interest to faculty, program directors, administrators, and staff at community colleges offering engineering related programs.

Researcher's Perspective

I see my role not just as a teacher of engineering and a practicing professional, but also as a researcher interested in learning by methodically reflecting on the experiences of graduates from an engineering technology program. Berthoff (1987) described the teacher/"researcher" as one who did not need findings from researchers sitting in their university offices, but works to improve instruction, curriculum, and programming through dialog with other teachers, industry leaders, and past graduate students of the program to generate theories grounded in practice. As an instructor of engineering, I believe that I have to constantly reflect on my teaching and engage in constructive dialog with past students who are employed in the field of engineering to have a better understanding of their experiences and how those experiences influenced them into studying and completing the engineering technology program at a rural community college, what were their experiences in the engineering technology program, and what were their experiences as they transitioned into the engineering workforce.

Researcher's role in the qualitative research

In the qualitative research paradigm the researcher is an important part of the process. The researcher cannot separate him or herself from the topic or actors of the study. It is the interaction between the researcher and the participants of the study that create knowledge. As the researcher I had to work with the idea I was the learner in this situation and the research participants had the knowledge I was interested in acquiring. I needed to be driven by what I wanted to know and not by what I already knew about the experiences in engineering. I believed I started thinking like a researcher when I began to question what I knew and what I believed.

Like any researcher, I brought biases to this study based on my personal experiences. In this case my bias as the researcher entered into the study even when I attempted to remain neutral because I could not erase my personal stories from memory, but in qualitative research it assumes that the self of the researcher has an effect on the subject and context of the study. However meaningful knowledge can be constructed in a way that provides room for personal and subjective ways at looking at the world.

Researcher's education and experience

I began my academic collegian career in a rural community college in an engineering technology program where I earned my Associates degree. I then transferred from the community college to the state university to earn a Bachelor and then a Master of Science degree in Civil Engineering. I have completed a large portion of the courses in the engineering curriculum, and I have experienced the majority of the subject matter at one point of time or another. Because of this experience, I had an insider role in the research and I built a trusting relationship and rapport with the research participants which allowed me to gain a better sense of the participants' reasoning for studying and completing the engineering technology degree and then transitioning to the engineering workforce. Because the participants saw me as a peer and knew I was knowledgeable about their experiences, they will felt freer to explain their opinions and experiences that they would probably not have explained to outsiders because outsiders wouldn't or couldn't possibly understand.

Researcher's bias

Researcher bias and subjectivity are commonly understood as inevitable and important by most qualitative researchers. But a researcher's personal beliefs and values are reflected in the choice of methodology and interpretation of findings. Scheurich (1994) states that one's

historical position, one's class, gender, religion along with many other characteristics all interact, influence, limit, and constrain the production of knowledge. Denzin (1989) states that "interpretive research begins and ends with the biography and self of the researcher" (p. 12). In this case I had to continually pose the question about the role of "self" and how my worldview, my educational and professional background, and my learning style influenced my research and methodology. Denzin indicates that all research is really about the researcher, but in order for the research to be of value it must move beyond the researcher and researcher's situation. As the researcher I have to learn about all sides of the story in order to be able to tell the participants' story. This approach will help me to move beyond my bias and present the knowledge I gained form the participants of the study.

Organization of the Study

This chapter introduced the study for this dissertation and presented an overview of the background, outlined the purpose of the study, stated the research questions, significance of the study, and presented the researcher's perspective. This introductory chapter is followed by chapter 2 which presents relevant literature.

Chapter 2 reviews literature on global economics, motives for American engineering corporations going offshore, community college efforts to fill the need for quality technicians, community college collaboration with industry, community benefits of a quality workforce, and students benefits of a rural community education. Chapter 3 defines the epistemological framework that was used in this qualitative phenomenological study, research design and site, participant information, data collection and analysis, trustworthiness, and ethical considerations. Chapter 4 will present and discuss the findings for this study. Chapter 5 will discuss implications

of the findings based on the examination of the study results and review of the literature and discuss what the implications mean as well as provide recommendations for future research.

CHAPTER 2: REVIEW OF LITERATURE

Overview

Investigating the experiences of graduates' who earned an Associate of Applied Science (AAS) degree in Engineering Technology from a rural community college and then transitioned into the engineering workforce requires the attention of several related areas. This chapter will highlight literature that has influences on technical education, specifically vocational/career programs relating to engineering technology. The chapter will begin by examining the economics of China and India. By exploring the economic development of these two countries, it will demonstrate the effects of the Chinese and Indian engineering education has on the advancement of their economy as well as their technology. This section is then followed by examining the various aspects of American engineering corporations offshoring work to China and India along with the education requirements needed by typical American engineering corporations. These two sections are intended to help illustrate the important role that engineering technology fields play in economic development and the advancement of technology.

Next the chapter will progress into the various efforts by community colleges to fill the need for quality engineering technicians in American industry. The chapter will examine some community colleges that have collaborated with local industry to help create strong two year AAS degree programs and the benefits associated with these programs. The chapter will continue with exploring how community colleges and local industry influence development in rural communities and create economic opportunities. These sections are intended to help the reader

understand the role that community colleges play in developing a quality workforce to support local industry and create community development.

The chapter will begin to conclude by looking at how these opportunities from community colleges influence students in rural communities. More precisely a closer examination as to why students decide to go to a community college instead of a traditional four year university, the types of challenges faced by community college students, and the advantages of an AAS degree. This section is intended to demonstrate how community college programs integrate students with education to help foster students' economic and social prominence into the community.

The chapter will conclude by weaving these highlights and areas of interest and show how these influences have a role in students' educational experiences. In addition, this section will also attempt to weave how these areas influence graduates' transitions into the workforce.

Global Economics

Global economics has a significant influence on the US Workforce and demonstrates to many potential students the importance of many career fields. The most predominant fields that many societies can agree upon in the global knowledge economy are Engineering and Technology. These areas are also the interest of many government officials throughout Asia due to their influential power on the economy.

According to Bill Gates, the former chief executive and current chairman of Microsoft, the US for decades has had innovation as its engine for prosperity. Science and engineering are and have always been the backbone of US innovation (Wulf, 2005). Now with the continually advancing technology, economic progress depends more than ever on engineers to advance innovation in the US or progress will shift to other nations that are more committed to the pursuit

of innovation (Competitiveness & innovation on the Committee's 50Th Anniversary with Bill Gates, 2008).

The US has 5% of the world's population with 30% of the world's wealth. The governments and policy makers of China, India, Brazil, along with many other motivated countries around the world do not see why this trend should continue and are taking calculated and concerted efforts to improve their competitiveness in the global marketplace through engineering and technology (Alexander, 2005).

China and India's Economic Trends

The US graduates roughly 70,000 undergraduate engineers annually. The US Department of Education cited that China graduates approximately 600,000 while India graduates 350,000 engineers. China and India collectively graduate 12 times more engineers than the US, which can infer that the US is in trouble (Gereffi, Wadhwa, Rissing, & Ong, 2007). The percentage of undergraduates studying engineering in the US is the second lowest among developed countries. In the US approximately 4 % of the student population is studying engineering compared to 12% in most European countries and more than 40% in China (Wulf, 2005). Citizens and policy makers of these countries view engineers as vital to their national development. Engineering and technology fields not only interest students, but more importantly attract the attention of government officials and industry's technological leaders (Alexander, 2005).

As technology has advanced through the years, both China and India have worked diligently to break into and set the pace in the high-tech industries while maintaining their advantages in low-end manufacturing such as textiles and apparel (Gereffi et. al., 2008). Both China and India have played a large role in offshoring trends and capturing large number of jobs from other areas of the world. By capturing a significant number of oversea jobs, China has been

able to sustain economic growth and has averaged a growth rate of 9 – 10 % for nearly two decades. China now ranks among the world's largest economies (Gereffi et. al., 2008). India has been able to sustain economic growth as well by capturing many overseas jobs. It has averaged an annual increase in its gross domestic product (GDP) of 3.5 %. As India began to proliferate in capturing offshore jobs, it expanded its GDP by 6 % per annum since 1980 and more than 7 % since 1990 (Wilson & Purushothaman, 2003). Both the economies of China and India have flourished as a result of their investment in engineering and technology to create innovation.

China's and India's Technical Engineering Education and Technology Advancements

Global competition for engineering talent is growing as many countries increase their research and development capacity and improve their own engineering education systems (NSB, 2010). Undergraduate engineering students in relatively advanced developing nations such as India and China follow a curriculum roughly comparable to curriculums taught in developed nations creating and growing a global pool of conventionally trained engineers (Dossani & Kenny, 2006). The US is not the only research-capable country. China and India have recognized the value of research universities to their economic development and are investing heavily in them (Wulf, 2005).

By China investing in engineering, and technology it has increased its dominance in traditional industries like textiles/apparel and foot wear, and medium growth in high-tech products like air conditioners, washing machines, construction equipment, and mobile telephones (Appelbaum, Gereffi, Parker, & Ong, 2006). India has led the economic explosion by investing educational resources into computer science and business processes. In 2008 it was estimated that India exported 20 billion US dollars in software and business outsourcing services worldwide while research and development centers attracted 6.6 billion US dollars (United

Nations Conference on Trade Development, 2006). In 2005 it was estimated that 150 of the 500 US Fortune firms had established research and development centers in India (Lane, 2005).

The high-tech industry in both China and India are growing sharply as more and more firms seek to take advantage of both countries' low-cost but highly skilled talent pools that are provided by their education systems (Gereffi et. al., 2008). The creation of a global talent pool has raised serious questions about the continued competitiveness of the US economy relative to the emerging economic powers like China and India (Gereffi, 2006).

US Economic Concerns

In Bill Gates' testimony to the US House Committee on Science and Technology, he explained the U.S. pre-eminence in science and technology and this nation's unmatched ability to turn innovation into thriving business have long been the engine of job creation and the source of US global economic leadership. But according to the Bureau of Labor Statistics the US higher education system is not producing enough top scientists and engineers to meet the needs of the US economy. Every year there are limited number of students who earn degrees in computer science and engineering and that number continues to decline (Competitiveness & innovation on the Committee's 50Th Anniversary with Bill Gates, 2008).

In Bill Gates' Testimony, Ms. Gifford the former senator of Arizona testified that her state's 9 billion dollar high-tech industry depends on the ability to recruit and retain scientists and mathematicians. In 2006 the University of Arizona, Arizona State University, and Northern Arizona University combined were not producing enough of these students to support the high-tech industry of Arizona (Competitiveness & innovation on the Committee's 50Th Anniversary with Bill Gates, 2008).

In addition to these concerns, the US dilemma continues to grow with the increasing possibility that foreign engineers may return to their home countries in response to new incentives to develop high-technology fields in their native countries (Gereffi et. al., 2008). In both China and India there has been an increase in the number of expatriates returning home and bringing their extensive knowledge and experience with them. In 2005 it was estimated that 30 % of all Chinese students studying abroad returned home after their education, and this number is steadily increasing (Gereffi et. al., 2007). Foreign nationals comprise a significant number of engineering students in the US education system. Approximately 60 % of engineering PhD degrees, 40 % of engineering Master degrees, and 7 % of engineering Bachelor degrees awarded annually are earned by temporary residents (Gereffi et. al., 2008) with Chinese and Indian students being the dominant foreign student groups (Gereffi et. al., 2007).

This is a critical issue because a recent study showed for every H-1B holder that technology companies hire, five additional jobs are created around that person. In the case of Microsoft when the corporations bring in world-class engineers, these engineers create additional jobs around their position (Competitiveness & innovation on the Committee's 50Th Anniversary with Bill Gates, 2008). This "export" of American earned education that will benefit other economies marks a reversal of the traditional international "brain drain" from which the US high-technology community has long benefited (Pollak, 1999).

With the rapid ascent of the Chinese and Indian economies and many foreign nationals returning to their native countries with beneficial educational experiences, the US high-technological landscape is becoming more treacherous with the changes in the US visa system since 2001. The current US visa policies greatly limit the country's capability to recruit and retain exceptional individuals once they graduate (Wadhwa, Jasso, Rissing, Gereffi, & Freeman,

2007). These circumstances are greatly increasing the economic benefit to China and India at the expense of the US economy and tax payer.

Bill Gates tried to emphasize in his testimony that to address the shortage of scientists and engineers, the US House Committee on Science and Technology must aid the current education system and immigration policies. If these issues are not addressed, American companies will simply not have the talent they need to be innovate and compete globally (Competitiveness & innovation on the Committee's 50Th Anniversary with Bill Gates, 2008).

Motives for American Engineering Corporations Offshoring Work

There are many reasons for US corporations committing to offshoring work, but according to Bill Gates there are two main reasons. First, US companies face a severe shortfall of scientists and engineers with expertise to develop the next generation of breakthroughs. Second, the US does not invest enough as a nation in the basic research needed to drive long-term innovation (Competitiveness & innovation on the Committee's 50Th Anniversary with Bill Gates, 2008).

Currently, majority of Microsoft sales are outside the US while the vast majority of work is performed in the US. Now Microsoft is expanding its employment in the US at a very rapid rate, but it is limited by the supply of engineers. As a way to remedy the limited supply of engineers and circumvent the current US immigration policies, Microsoft has opened an office up in Vancouver, Canada. The Canadian government, unlike the US government, recognizes that competing for talent and encouraging talent, particularly talent educated in the US is very important (Competitiveness & innovation on the Committee's 50Th Anniversary with Bill Gates, 2008).

In addition Gereffi et. al. (2007) conducted a study exploring trends in engineering education and the hiring practices of US companies engaged in outsourcing. The study explored several areas:

- If companies going offshore were due to the superior education and skills of workers in China and India, or a deficiency in US workers
- If offshoring companies were hiring a large number of two or three year graduates of technical programs opposed to the US companies norm of hiring four year graduates
- What were the relative strengths and weaknesses of US engineering graduates when compared to multinational graduates
- What skills would give US graduates a greater advantage
- And, would offshoring continue if US graduates improved the required skills.

To answer these questions the study surveyed 58 US corporations that engaged in outsourcing engineering and technology jobs. The information found in the study is provided in the following sections.

Main Reasons for Engineering Corporations Going Offshore

In addition to the limited number of engineering graduates and the lack of investment by the US in basic research needed to drive long-term innovation, the study found the main reasons for these corporations going offshore were salary and personnel savings, overhead cost savings, 24/7 continuous development cycle, access to new markets, and the proximity to new markets. The corporations also cited that they were responding to big opportunities provided by these rapidly growing markets and expected that research and development would be relocated closer

to the growing markets where it would be more readily available to cater to worldwide needs (Gereffi et. al., 2007).

Disadvantages of Hiring US Engineers

The corporations stated that the disadvantages of hiring US engineers were salary demands, limited supply of available people, and lack of industrial experience. Some corporations indicated that they were not moving abroad due to a deficiency in the US education system or in the quality of the workers, but to attain an economic and competitive advantage (Gereffi et. al., 2007).

US Engineering Corporations Required Employment Qualifications

Many corporations that responded to the study by Gereffi et. al. (2007) indicated that they did not mandate that job candidates possess a four-year engineering degree. Approximately 40 % of the corporations hired engineers who only attained two or three year degrees. An additional 17 % of the corporations would hire similar applicants if they had additional training or experience. The study also found that 37 % of the corporations perceived US engineering employees as more productive while 24 % perceived that US and offshore engineering teams were equivalent in terms of productivity. The corporations furthermore indicated that 38 % of their US engineering employees produced higher quality work while only 1 % said their company's offshore engineering employees produced higher quality work (Gereffi et. al., 2007). This is a clear indication that US engineers are equivalent to if not more productive than foreign engineers and produce at a higher quality. The only significant difference is that corporations going offshore only required two to three year degrees and not the traditional four-year baccalaureate degree.

The Need for a Sub-Baccalaureate

Carnevale, Smith, and Strohl (2010) project that by 2018 nearly two-thirds (63%) of all new jobs will require more than a high school diploma. Georgetown University Center on Education and Workforce also predicts that 60 % of US jobs will require some form of postsecondary education by 2018 (Lumina Foundation, 2012). In addition the Bureau of Labor Statistics projects that 21 of the 30 fastest growing occupations will require postsecondary education (Lacey & Wright, 2009). There is growing recognition that some high-paying technological careers require more education than a high school diploma but less than a four-year baccalaureate degree.

The share of sub-baccalaureate attainment more than double from 12 % to 28 % and Associate degree holders currently comprise a third of the sub-baccalaureate workforce (Carnevale, Strohl, & Smith, 2009). Zeiss (2000) faulted community planners for not recognizing that most jobs in the new economy do not require a baccalaureate degree and for overlooking the fact that the community college has a vast education and training infrastructure.

One of the leading reasons for this trend in requiring less than a bachelor's degree is that the US creates and destroys jobs faster than any other economy in the world (Carnevale et. al., 2009). The American workforce has very dynamic characteristics. Every year more than a third of the entire US labor force changes jobs and every year more than 30 million Americans are working in jobs that did not exist in the previous quarter. Many occupations workers have today did not exist five years ago (Carnevale et. al., 2009). Carnevale (2000) labeled today's changing labor market the "new economy" because of the dynamic characteristics of the workforce at the sub-baccalaureate level. As the infrastructure for inter-commerce continually improves and the new economy becomes global, it is vital to understand that more than half of the new jobs

created will require some college education (Carnevale et. al., 2009) but not a traditional four year degree.

This has been demonstrated in recent decades as the share of technology jobs doubled from 4 to 8 %. In 1973 it was estimated that 63 % of technology workers had at least some college education. Now it is estimated that 86 % of the technology workers have some postsecondary education with 16 % earning an associate degree and almost 20 % with some college education but no degree (Carnevale et. al., 2009). This demonstrates that as the economy evolves with the continual advancements in technology, it will require workers to obtain additional skills and knowledge through post-secondary education.

The Need for Certificate of Completion

Formal collegiate credentials are still mainstay of higher education and community colleges, but technological skills and knowledge are playing an increasing important role in the new global knowledge economy. New certificate programs are appearing in community colleges throughout the US. Certifications are growing as programs are offered in flexible formats and condensing course work that traditionally take months into a matter of weeks. Community colleges are designing new courses in collaboration with local employers and combining them with existing courses to create skill-based certificate programs in order to create a pool of qualified talent that is ready for the workforce in a short period of time. The economy has a strong influence on students seeking noncredit offerings, especially when they know employment is waiting for them after they have completed their certificates (Van Noy, Jacobs, Korey, Bailey, & Hughes, 2008).

Community College Efforts to Fill the Need for Quality Technicians

Community colleges are uniquely positioned for the local sub-baccalaureate labor market. High schools find it challenging to develop and maintain ties with local employers and four-year colleges concentrate on baccalaureate degrees. The community colleges mission makes them capable to contribute and support this important segment of the new economy (Jacobs, 2001).

Community colleges now play a vital role in preparing today's dynamic national workforce (Boggs, 2010). Recently, evolving labor requirements in the high technology field located in rural areas have influenced the creation and expansion of community college relationships with local business and industry. These partnerships with the private sector have become increasingly popular over the past decade as the occupational role in local labor markets for place-bound students of all ages has increased (Kisker & Carducci, 2003).

The constant for community colleges has been their ability to adapt to the demands of the economy and times. Today, technology is the driving factor that affects economics and academic challenges for community colleges. Innovation and technological advances in the workforce have forced students and employees to obtain, upgrade, or seek advanced skill training. Individuals entering the workforce have an increasing need to add to their skills through postsecondary education.

Community colleges stress that workforce development is responsive to the demands of employers for particular types of training. This responsiveness to employers then adds to the responsiveness to students that takes place in the regular credited and sometimes non-credited programs of the college (Grubb, Badway, Bell, Bragg, & Russman, 1997). Currently among higher education institutions, community colleges are the leading institution that provides higher

education with real world application. It is at community colleges where Americans learn to apply a mix of technical knowledge, business acumen, and creativity to add value to firms in order to compete and be innovative (Osterman, 2008). This complex mix of talent requires knowledge and skills gathered from both academic education and vocational training (Soares, 2010) and community colleges have employed innovative methods to apply training to students in order to support local firms and industry.

Career and Shadow Training

Community colleges in the past have provided career and shadow training through vocationally oriented courses that lead to a certificate and future employment. This service has increased the importance of community colleges, specifically community colleges located in rural areas where training is difficult to obtain (Kasper, 2003).

In the 1980s the community college began expanding its mission in response to market demands. These institutions created course and course-cluster-based curriculums as a way to assimilate and shadow jobs to provide a realistic training system (Carnevale et. al., 2009). The primary focus of the shadow system was the student and not the employer. The shadow system offered many benefits to students. It was typically constructed of a grouping of courses that would provide students with basic skills and provide knowledge to help students to continue learning on the job independently.

Formal courses provided transferable credits for students to continue their education if they desired or the skills to be employed upon completion of their training. The system also provided students with immediate earnings and career mobility in the labor market. The only drawback to the shadow system in community colleges was that a large proportion of programs

and courses were non-degreed and non-credit (Carnevale et. al., 2009) leaving the students with only knowledge, skills, and abilities.

Business and Contract Training

In the past two decades community colleges have broadened their economic development role to include contract training, small business development, and local economic planning (Dougherty & Bakia, 2000). In 1988 the Nationwide Commission on the Future of Community Colleges recommended that colleges help build communities by creating partnerships with employers and making facilities available for workforce training. Currently community colleges are the main source of vocational training programs that terminate in certificates, coursework leading to an associate degree, remedial educational services, customized or contract training designed to meet the needs of local employers (Kasper, 2003).

Contract training is different from traditional occupational education in that the employer rather than the student is the client. The employer contracts for a specific course or a set of courses with the community college. The employer then prescribes the course content, selects students, and establishes what constitutes as success (Dougherty & Bakia, 2000).

Community colleges often design and implement critical training programs for small to medium size employers. Characteristically these firms are too small to be able to provide formal training on their own (Kasper, 2003). Contract courses are often customized and the mode of delivery may be different than traditional education courses. Typically contract courses are shorter than a traditional semester and may be offered over weekends. On occasion the course maybe offered at the employer's premises, or may even use the employers as instructors but use the college's curriculum or course lesson plans (Dougherty & Bakia, 2000). The customized

courses provide job specific skill training and may even contain remedial training to help develop employees.

One of the largest benefits of business and contract training for community colleges is that it brings employed workers who often would not be pursuing higher education into the college. This allows these workers to see what the college has available in terms of programs, facilities, and service. These workers may desire to take more job-related technical courses to update skills or even pursue an associate's degree on their own time (Dougherty & Bakia, 2000).

New Vocationalism

A new paradigm of education is beginning to materialize which integrates vocational education and employment-oriented goals into academic educational programs. Bragg (2001) as well as Townsend (2001) referred to this movement as the "New Vocationalism" movement. The new vocationalism has growing emphasis on vocational-technical education for growing industries of the new economy, but with academic outcomes (Orr, 2001).

This new approach that combines academic and technical education provide individuals with skill sets not only for entry level occupations, but to continue and pursue careers in high-wage, high-skill occupations. The goal of this approach is long-term preparation for careers, not short term simply quick preparation for entry level positions. The features of the new vocationalism are especially important in the preparation of low income citizens for more economically secure employment (Jacobs, 2001).

The new vocationalism emphasizes career clusters and pathways that begin with the entry level and extend to the professional level in career fields that are central in the new economy. Careers in business and technological fields require technical skills and knowledge which are obtained largely in sub-baccalaureate vocational programs at community colleges. The new

vocationalism focuses on skills and knowledge pertaining to international activity, cyberspace, ever changing market needs and demands, rapid product life cycle, continual advancement in technology and computers along with a more thorough knowledge of the business environment that goes beyond specific skills and job tasks (Lynch, 2000). The new economic environment requires the ability to manage information and technology, analyze and resolve problems, and continually participate in learning new technology and updated information (Bragg, 2001). Students are prepared by a variety of methods to help attain knowledge and skills that will empower them to succeed in current and future employment as well as further their education and training.

Community College Industry Partnership

During the mid-1990s nearly 90 % of two year colleges had joined "the business of training workers for specific companies rather than just teaching generic subjects or trades" (Stamps, 1995). As it has been illustrated, business and industry increasingly turned to community colleges to provide new types of vocational-technical education and training to employ a quality workforce. Several factors have contributed to the popularity of two year college partnerships with the private sector. The most recent factor has been the economic recession.

Zeiss (2000) points out that there is a great need for better-skilled workers. "Every community is crying out for more skilled and productive workers, and businesses and trade associations are scrambling to develop dependable sources for providing new workers. Employers are equally concerned about keeping existing workers trained with the skills needed to be more productive" (p.48) as technology continually advances. Secondly Zeiss points out that business and industry are looking for certified occupational and workplace skills and not degrees.

In the Knowledge Net report of 2000 the American Association of Community Colleges argued that community colleges should increase their collaboration with business, industry, and other educational entities as a strategy for developing a higher-quality, better-prepared workforce. Swindle (1999) argues that partnerships between business and industry with community colleges are necessary to improve the workforce through more advance academic and technical skill development, thereby improving competition in the global economy. In order for the workforce to have the skills to innovate and compete globally, the private sector has to contribute as well and it is through these partnerships.

Motives for community colleges' collaborations with business and industry are also advantageous for forecasting workforce development needs, developing training opportunities, identifying new student markets, and creating specialized training and preparation. Other motives for the strategic alliance are opportunities for economies of scale, low-cost entry into new markets or segments, managing strategic uncertainty, and managing costs and sharing risks (Orr, 2001).

These types of initiatives have been extremely successful in helping advance technology and rural economies grow and become more competitive (Information Technology Association of America. 2002). Some community colleges play a more active role in stabilizing or increasing employment in a local area, thereby increasing the demand for education and training (Grubb, Badway, Bell, Bragg, & Russman, 1997). Community college administrators, local business leaders, and civic leaders are frequently engaged in dialogue concerning the community's economic growth, labor demands, and social welfare (Kisker & Carducci, 2003) as a means of attempting to stabilize and improve the community.

Community College Collaboration with Industry

This emergence of community colleges as the primary workforce development institutions outside the labor market is evident in the gradual but relentless movement toward vocational, occupational, and professional education in their postsecondary programs (Carnevale et. al., 2009). Traditionally colleges have responded to employer needs through occupational education programs with employers serving on advisory councils for content, methods, and equipment (Grubb et. al., 1997).

Community college presidents stress how important it is for a college to have economic development clearly stated and as a prominent part of the institutions mission (Brand, 1997). Community college and private sector partnerships should work aggressively to increase the economic productivity as well as profits of local industry (Kisker & Carducci, 2003). These institutions develop curricula to respond to the needs of local economies, work closely with industry, government, and other education sectors (Boggs, 2010). These strong relationships provide a deeper and better understanding of the needs of business with regard to employee skill levels, technology, and specialized industry knowledge (Brand, 1997).

By these parties convening, employers within an industrial sector can identify their present and future training needs and community colleges can help employers learn how to increase their productivity in addition to retaining or increasing profitability (Grubb et. al., 1997). It is these types of collaborations and partnerships with the private sector that enable community colleges to create academic and technical training that responds to the high tech labor needs in the community and local industry (Swindle, 1999). This type of collaboration between parties has evolved into Community College Industry Partnerships (CCIPs) and currently enhances the community college's historic mission of university transfer education while also

providing pathways of postsecondary credentials with labor market value for individuals who are not on a traditional college track (Soares, 2010).

This chapter will continue by focusing on four Community College Industry Partnerships located throughout the US. Some of these partnerships were initiated by policy makers, industry, or the community colleges. The institutions that will be presented are Columbia Gorge Community College, Hagerstown Community College, Carl Sandburg College, and Central Piedmont Community College. All of these institutions have a unique background on how their partnerships began, what their program initiatives have to offer, who benefited from the collaboration, and what were the results of the partnership.

Columbia Gorge Community College

Columbia River Gorge was a rural area struggling economically as the timber and aluminum industries declined (White & Walsh, 2008) and needed a shot of economic revitalization. In 2006 Columbia Gorge Community College (CGCC) recognized the regional economic climate and took the initiative to call upon businesses to help it address this challenge. A meeting between the wind energy industry, local workforce, economic development agencies, and the region's community college identified a need for wind turbine technicians in the area. By 2010 the need for wind turbine technicians had more than doubled (Soares, 2010). The nearest wind turbine technician training programs at the time were in Minnesota and Iowa (White & Walsh, 2008). The community college partnered with industry and workforce development representatives from Acciona Energy North America, Black and Veatch, Intel, and the Army Corps of Engineers, to develop a pilot curriculum for a Renewable Energy Technology (RET) program (Soares, 2010).

CGCC worked with the wind industry and workforce development to review its existing curriculum, develop new curriculum, and identify alternative training delivery systems (White & Walsh, 2008). The curriculum was designed to provide workers with the basic skill set necessary to be a wind turbine technician by focusing on electrical circuits and wind turbine mechanics. In addition, the curriculum was developed to provide a broader academic grounding that would enable students to pursue the two-year associate's RET degree at CGCC. The main goal of the RET program is to prepare students for career pathways in various renewable energy industries, including hydro-generation and manufacturing (White & Walsh, 2008).

In September 2007 the community college started a one-year certificate in the RET program. Twenty-four students enrolled in the first class, of which nine were dislocated workers from local aluminum plants (White & Walsh, 2008). At the end of the program, twenty-two of the twenty-four graduates were employed immediately. Many of the graduates received multiple job offers with entry level wages of $20 to $24 per hour. Some graduates also received as much as four weeks of paid vacation (White & Walsh, 2008).

Currently this collaboration between CGCC and industry has been very beneficial to all and the partnership has been catalyzed by the dramatic growth of the wind industry in the region. Concerns by the local wind farm employers that there would not be enough trained wind turbine technicians to meet the region's industry needs increased the demand for more qualified workers (White & Walsh, 2008).

To help the wind turbine industry donated expertise in curriculum development, opportunities for professors to observe the wind turbine industry firsthand, equipment, and $ 4.9 million in cash grants (Soares, 2010). Rather than starting by reinventing the wheel, the college built the program on existing courses from the hydropower curriculum and expertise of its

faculty. The college now offers one and two year programs that prepare students to work in wind-generation, hydro-generation, automated manufacturing, and engineering technician work (Soares, 2010).

The program benefited from significant investments by industry and workforce development representatives. Employers in the area have supported the program and in turn the program has grown significantly since its inception in 2007 (Soares, 2010). Up to 2010 the program had graduated 66 one-year certificates and 23 Associate of Applied Science degrees. Of these graduates, the college reports that 80 % of completers who wanted to work in a wind plant were hired. In addition, because of this interdisciplinary beginning of the RET program, students become diverse in a number of energy generation fields which makes the graduates more diverse and employable (Soares, 2010).

CGCC developed a model program that addressed the needs of local and regional employers, the community, and the students by realigning curricula, providing alternative delivery methods, and offering the flexibility for adults to gain necessary skills that are required in the advance technological labor market. This was a large opportunity for the region and CGCC took advantage of it by providing trained and skilled workers needed by the wind industry.

Hagerstown Community College

Washington County in the state of Maryland had a large concentration of agriculture and a declining manufacturing base. Manufacturing in the county consisted of machinery, apparel, and food processing companies (Regional Technology Strategies Inc., 2011). Mack Trucks (an industrial truck manufacturing company) and Fairchild Industries (a small DOD contractor) along with many other manufacturers called Washington County Maryland home. Most were

small isolated firms in danger of being left behind by technology driven by competitors. Consequently, helping manufacturers get up to speed with technology and become competitive was a natural choice for Hagerstown Community College (HCC).

In response to the region's economic downturn, HCC developed the Advance Technology Center (ATC) with the intention to promote industrial modernization and updating the skills of the regional workforce through training and technical assistance programs. This initiative was meant to help small to medium size manufacturers in the region become more viable in a struggling economy with the motivation of creating a more competitive local industry (Kisker & Carducci, 2003).

The center hosts the college's credit-bearing training initiatives as well as the noncredit, contract, and customize training for entry and advance level positions in the local industry. To bolster its training and offering efforts, the ATC has several types of facilities. Within the center there are High Technology learning classrooms and labs, a shared production center that has a CAD/CAM lab, and telecommunications facilities. The success of these facilities has made the center and the college the primary hub of the region's economic activities. Soon after the integration between the ATC and the academics of the college took place and the director of the ATC assumed authority over the engineering technology program (Regional Technology Strategies Inc., 2011).

While academic and vocational spectrums are not in complete agreement in how to address future workforce needs, the ATC at Hagerstown has been successful in its endeavors and the state of Maryland adopted the concept and created similar programs at other community colleges across the state (Regional Technology Strategies Inc., 2001). In their first two years,

ATCs statewide developed and delivered industry specific customized training to more than 650 companies and 29,000 workers (Kisker & Carducci, 2003).

HCC later added the Technical Innovation Center (TIC) within the ATC. Two factors drove the creation of the TIC. First, a recognition that changes in technology meant that new types of companies with special needs were being formed. And secondly, a fear that the local intellectual capital base would erode as would be entrepreneurs took their ideas elsewhere (Regional Technology Strategies Inc., 2001).

The TIC's mission as a business incubator was to help start-up manufacturers and technology-oriented firms survive and thrive during their critical years when they did not have all the resources. The TIC allowed companies to prove their idea or technology without having to make a huge upfront investment because its facilities consist of 30,000 square feet of open and flexible manufacturing floor space with 30 office suites, and shared conference facilities. Companies renting space share office support services such as access to computer integrated manufacturing equipment, TI Internet access, a shared administrative assistant, fiber optic line access, and office equipment (Regional Technology Strategies Inc., 2011).

The center has had 34 tenants, which together have created or retained roughly 170 jobs (Regional Technology Strategies Inc., 2001). It has been estimated that the Tenants have made investments of more than $4.5 million in equipment that they use on site and the average wage of workers employed by the TIC tenants is more than $34,000 a year (Regional Technology Strategies Inc., 2011).

In the past the TIC has done a significant amount of recruiting from Montgomery County, a neighboring county that is home to a flourishing high-tech economy. The TIC promotes its services of lower cost with a higher quality of living in Washington County

(Regional Technology Strategies Inc., 2001). According to Tim Troxell, Assistant Director of the Hagerstown Washington County Economic Development Commission, the center is making strong efforts in helping the region become the next cluster of high-tech industries. Currently the TIC is one of only two incubators that are coupled with an advanced manufacturing center on a community college campus in the US (Regional Technology Strategies Inc., 2011).

The TIC is an example of how a community college can position itself to help a community transition to the new technological economy. The TIC is a proven incubator in a rural area that draws on the sources of the college's advanced manufacturing center making it a valuable asset to the community. The TIC combines the resources of many partners to bring education, training, economic development, manufacturing assistance, and small business development together in the same facility creating a regional interactive support center (Regional Technology Strategies Inc., 2011).

The benefits from the TIC accrue widely. Clients benefit from low-cost space, services, access to equipment, expertise, and networking that the TIC offers. The local economy benefits from jobs, wages, and taxes (Regional Technology Strategies Inc., 2001). The area benefits when outside companies move in when the center attracts more high-tech jobs for local workers in the community. Students benefit because the TIC provides students experience in real world scenarios as well as access to equipment used in industry everyday (Regional Technology Strategies Inc., 2001).

Hagerstown Community College is a rural comprehensive community college that offers an array of services to help businesses in the region to improve their industry competitiveness. The ATC and TIC work together to see that academia and industry collaborate for the benefit of

the region and foster economic development in the community (Regional Technology Strategies Inc., 2001).

Chris Marschner, the manager of the TIC, indicates it is necessary to recruit companies from outside the county because there are two few entrepreneurs in Washington County. He attributes this in part to a lack of foreign nationals ("who tend to be more entrepreneurial") and the residents' tradition of working for one company for life. When outside companies move into Washington County, they bring jobs for local workers (Regional Technology Strategies Inc., 2011, p.152).

The Hagerstown Advanced Technology Center and the Technology Innovation Center provides an excellent example of the economic and educational benefits that come from collaborative partnerships between the centers and local industry. By the college infusing state-of-the-art facilities, technology, and equipment with customized training packages that meet local demand, the local unemployment rate went down to 2.7 %, much lower than current rates in neighboring counties (Kisker & Carducci, 2003).

Carl Sandburg Community College

Carl Sandburg College (CSC) is located in Galesburg, Illinois, an area that has had its share of economic setbacks. The economy of west central Illinois historically has been based on manufacturing and farming. In the 1980s many manufacturers closed down and left the area while many farmers turned to other sources of income as farm profits dwindled (Regional Technology Strategies Inc., 2011). However, manufacturing is regaining strength with the growth of such companies as Maytag, Butler, Midstate Manufacturing, MC Products, and Alexis Fire Equipment which are all located in the ten county area served by CSC. But this new growth

is limited by the lack of technology training opportunities (Regional Technology Strategies Inc., 2011).

Area businesses were sending employees out of the region for training and continuing education. This resulted in high training costs and presumably lowering firms' investments in local workforce development. Local leaders believed that the economy would stabilize with a reliable workforce and saw potential for more growth in the future. But the high cost of staying up-to-date with technology, combined with limited ability to interact with technology made it difficult for any one institution to offer advanced technology training to its own students or employees. Because computer technology changes so rapidly, no one institution or industry could afford to keep up with every change and thereby maintain a state-of-the art computer facility (Regional Technology Strategies Inc., 2011).

Carl Sandburg College, Knox College, and Community Unit School District (CUSD) # 205 pooled their resources to form a technology training center. The three institutions agreed that the area's technological training and education needed to be met locally. By pooling resources it provided all three institutions and the entire community access to cutting-edge computer technology and training. The center provided training opportunities to businesses, students, and residents and improved the local workforce. The three education institutions met with local economic development entities, business leaders, and gained support to create the Educational Technology Center (ETC) (Regional Technology Strategies Inc., 2011).

The ETC offers a wide variety of technological training facilities: The Teleconference Center, The Distance Learning Classroom, The Computer Classroom, and the Computer Laboratory. Demand for its services and facilities have outpaced its physical and staffing capabilities. More than 50 area businesses have taken advantage of the ETC's training and

education facilities. As result the center has increased citizens' skills and has given more opportunities to workers while it has expanded opportunities for business to grow in the region (Regional Technology Strategies Inc., 2011).

The educational institution partnership and support of local business enable the ETC to provide a much needed service cost-effectively. Those involved in the ETC point to extensive collaboration as the primary strength of the ETC. Community leaders say that educating prospective businesses about these enhanced training opportunities has helped the region attract more businesses (Regional Technology Strategies Inc., 2011). In addition to the ETC, Carl Sandburg College collaborated with Maytag-Galesburg Refrigeration and created the Center for Manufacturing Excellence (CME).

In the first year of operation the CME facility trained more than 700 individuals which included Maytag employees. In the second year of operation, the facility retained approximately 230 Maytag employees (Sundberg, 2002). The partnership between CSC and Maytag-Galesburg Refrigeration has allowed the college the ability to acquire state-of-the-art equipment, software, and technology to expand the educational offerings of the program and prepare students for employment in today's continually changing high-tech labor market (Hurley, 2002; Sundberg, 2002).

By these institutions coming together and pooling resources, it helped address the economic and technological needs of the local community and industry. These institutions worked diligently to create programs that would provide opportunity to regional industry as well as train workers with needed technological skills.

Central Piedmont Community College

Central Piedmont Community College (CPCC) is the largest community college in North Carolina. The college has six satellite campuses and an extensive "Virtual Campus" that serves the Charlotte area. CPCC offers over 258 degree, diploma, and certificate programs and serves approximately 70,000 students (Retrieved 1/14/13 from http://en.wikipedia.org/wiki/Central_Piedmont_Community_College).

Tony Ziess, CPCC's president is devoted to serving students and the community through customized training and workforce development (Retrieved 1/14/13 from http://en.wikipedia.org/wiki/Central_Piedmont_Community_College). CPCC demonstrated this devotion by developing a Workforce Development Continuum as one of four initiatives in a strategic plan for the Charlotte North Carolina region. The Continuum provided a continuous stream of qualified workers in all career fields. Policy makers from the government, business, and educational leaders from the community college developed and designed this strategic plan to create a knowledge-supply chain for emerging, existing, entrepreneurial, and transitional workers to fill a pipeline of skilled and re-skilled workers (Ziess, 2000).

As a way to attract employers to the local region the Economic Development Director of CPCC accompanies city and county officials when they meet with potential employers interested in relocating to the Charlotte area and offers training and support incentives. As a member of the team the community college representative describes the types of customize and conventional training services available to new employers and guide the firm in determining its workforce needs (Grubb, Badway, Bell, Bragg, & Russman, 1997).

In April of 2012 the president of CPCC signed an agreement with IHK Karlsruhe, a German chamber of industry and commerce to allow the college to offer IHK-certified advance

manufacturing training. The agreement gives German firms access to a pool of highly-trained workers who meet desired workforce requirements and gives CPCC the ability to offer advance manufacturing certificates to its students. This collaboration addressed the need by industry for qualified labor by training local residents into a technologically skilled workforce.

This agreement was a significant benefit to the state of North Carolina since there are approximately 500 German companies located in the state and nearly half located in the Charlotte area. At Central Piedmont workforce development took place in non-credit occupational extension courses in the New and Expanding Industries program. The program provided customized training for employees of local firms. The President of CPCC, Dr. Tony Zeiss, states that "Industry drives our training curriculum. We want Charlotte to be the place in the United States for three areas: harnessing innovation to create things; leading the way in advanced manufacturing to make things; and using intermodal transportation to move things" (Harris, 2012). This collaboration has created a unique partnership that has made CPCC and Charlotte the hub for high-tech jobs.

There is evidence to show that certain credited programs are very valuable and beneficial for students. The Dean of Business, Engineering, and Computer Science at Central Piedmont Community College stated that, "Those degrees are almost exactly what employers want" (Grubb et. al., 1997). CPCC is also involved with Apprenticeship 2000, a technical training apprenticeship program that lets local students and workers enroll in a four year program that ends with a degree and job at a local firm. Currently Siemen is one of the German partner firms along with Chiron, Stabilus, Sarstedt, Blum, and Daetwyler.

In President Obama's State of the Union Address in January 2012, he told the story of Jackie Bray. Jackie is a single Mom from Charlotte North Carolina who was laid off from her job

as a mechanic. Jackie reentered the workforce by taking advantage of the partnership between CPCC and the German company Siemens. The company Siemens opened a gas turbine factory in Charlotte and has worked with the college to design courses in laser and robotic training. Siemen paid for Jackie's tuition and hired her to help operate their plant after she had graduated.

Conclusion

These cases provided in this literature review are not necessarily unusual or exemplary, but demonstrate the many ways that community colleges have undertaken to develop new markets by addressing the educational and workforce development needs of their communities.

These programs are successful because they align training goals with courses offered by the colleges that meet the workforce needs of local firms and regional industry. These partnerships have been very beneficial in addressing community and economic development, meeting local firms and industry needs, and providing low-income citizens with a more fortunate future. While the programs provided in this literature promoted better-paying jobs as a means of preparing students for viable careers, employers played a critical role in helping develop curriculum, providing students with jobs, and most importantly encouraging students to stay in school. But it is important that these programs attract a new and diverse constituency of students in order to continue their success. As the student population declines in these types of engineering and technological fields it becomes a concern for community colleges. Community colleges cannot support programs where there is limited interest by students. These programs do not place students in dead-end jobs, but instead prepares them for viable career pathways in the new global knowledge economy.

Community Benefits of a Quality Workforce

Community colleges are positioned to play a critical role in the process of upward mobility for individuals of any age because it is the main point of access to, exit from, and reentry to higher education in American society. Over the past 30 years the poor, the working-class, and ethnic and racial minorities have enjoyed increased access to postsecondary education, largely through the doors of community colleges (Shaw, Valadez, & Rhoads, 1999). Community colleges help individuals learn what they need to know to be effective and responsible members of their society. They also make it possible for people to move between social classes.

Community colleges are institutions at the center of government workforce development efforts, coordinating credit programming with "non-FTE-based employment and training, welfare-to-work, and adult literacy systems" (Katsinas, 1994, p.25). The prominent reason for this is in times of economic uncertainty community colleges have provided an affordable option to both recent high school graduates and returning adult learners (College Board, 2009).

The economic benefits associated with community college industry partnerships (CCIPs) include the promotion of regional competitiveness, industrial modernization, and the opportunity to attract new and retain current businesses in the local community and region. CCIPs also help increase in the productivity of existing businesses through the recruitment and training of a skilled workforce (Sundberg, 2002). Partnerships create programs and initiatives that provide college students and members of the local workforce with meaningful personal and employment development experiences that contribute to educational advancement and high levels of job satisfaction (Allen, 2002). In addition these partnerships help build engineering and technological talent and keep jobs and industry local instead of forcing industry to find talent elsewhere or abroad.

Without community colleges and their flexible nature, citizens from the community would more than likely under invest in their educational needs to remain employable in a rapidly changing economy. It is critical for community colleges to address the local demand of industry and afford citizens the opportunity to advance their knowledge and skills at affordable rates, flexible schedules, and at a lower risk than entering a four-year institution (Honeyman, Wattenbarger, & Westbrook, 1996). Community colleges also help industry to find the best candidates locally. Without community colleges to create and develop candidates locally, jobs are more likely to go where the talent is available and take supporting jobs as well.

The community college's ability to help students develop, create, and sustain a quality workforce provides many benefits to a community. It allows citizens to stay close to home and work in their community, reduce the number of welfare and unemployment recipients in the community, create economic and community development, and create a larger tax base. These areas will be addressed in the following sections.

Citizens Can Stay in Their Home Community to Work

A "Business climate" is affected by local labor force quality, so businesses need to be close to a supply of skilled labor. An increase in number and quality of jobs by local industry will raise local per capita earnings which is the most important benefit of local economic development (Bartik, 2011). A reason that CCIPs have been successful in the past and may continue to thrive in the future is that a surprisingly high proportion of Americans stay for most of their work-life in their childhood state and metro areas. About 66 % of Americans spend most of their working careers in their childhood states while over half spend most of their working careers in their home metro areas. Approximately 40 % of Americans with a college degree spend the bulk of their career in their childhood metro area (Bartik, 2009). When students are

provided an opportunity to attain an education that will support local industry, it appears that these individuals are willing to stay and work in their home community. By these individuals attaining an education and staying in their home community to work, these individuals are less likely to be welfare recipients and claim unemployment benefits.

Reduction in the Number of Welfare and Unemployment Recipients in the Community

A primary reason why individuals pursue a college education is to boost future earnings. Over a lifetime a worker with an associate's degree will earn nearly $500,000 more than someone with no education beyond a high school diploma (Brock, 2010). Since the 1970s the share of workers with at least some college education tripled while their wages over workers with only a high school education doubled (Carnevale et. al., 2009). Between 1983 and 2007 the number of prime-age workers with some college but no degree increased by 11 million people and their average wage increased from $22,571 to $29,070. During the same period, the number of prime-age workers with associate degrees increased by 1.5 million people and their wage increased from $ 25,000 to $ 33,000 (Carnevale et. al., 2009).

In 2009 it was estimated that 22 % of those with an occupational or vocational AAS degree earned more than the median earnings of those with a BA and 14 % earned more than the median earnings of people with graduate degrees. Roughly 25 % of those with a BA earn less than those with a vocational AAS degree and 23 % earn less than those with a license or certificate but not an AAS (Carnevale et. al., 2009).

An April 2007 report by the Aspen Institute found that community colleges that participated in workforce programs increased average monthly income of program completers by an estimated $1,500 (Cited in Soares, 2010). In another Aspen Institute report found that in six workforce initiative programs the participants' earnings raised on average from $ 8,580 to $

14,040 following the first year and $ 17,752 after completing the degree (Cited in Zandnipour & Conway, 2001). These additional earnings of graduating students vastly improve their socioeconomics as well as the community's economy.

The Texas Association of Community Colleges in collaboration with Community College Benefits, Inc. conducted a study of the economic benefits generated from the state's community colleges. The study found that higher education benefits society and local communities in general through higher personal income which generates increased tax revenue, reduced welfare costs, reduced unemployment costs, improved health, and reduced crime. The study concluded that from a statewide perspective, the Texas community college graduates annual earnings come to $13.4 billion which roughly equates to 351,530 jobs that contributes to the state's economy. The study also found that the state of Texas benefited from a $276.3 million in avoidance costs per year from reduced crime, reduced welfare, unemployment related expenses, and improved health of citizens (Texas Higher Education Coordinating Board, 2008).

Create Economic and Community Development

Job creation is the main barometer for economic development efforts. Growth in the economy is becoming increasingly divided into high-tech high wage jobs and service sector low wage jobs with many medium wage jobs being downsized, automated, or moving abroad. Low economic development creates low wages with a low tax environment. In the new economy this low economic approach leads to volatile jobs that are more likely to be eliminated through either productivity improvements or move offshore. This is why it is vital for community colleges to partner with industry and help create and develop a quality workforce for current employers and possible future employers.

North Carolinas Southeastern Community College's Business and Industry Skills Training Center offer services to firms even after the firms have become established in the community. This continually contributes and sustains the health of the local organization as well as the community. The recruitment and retention of these new industries is a source of significant regional economic growth resulting in 30 million in local investments and the creation of nearly 200 jobs (Regional Technology Strategies, Inc., 2011).

Create a Larger Tax Base for the Community

In a report by Alssid, Goldberg, and Schneider (2011) graduates from a Massachusetts community college more than doubles full-time annual earnings potential from $21,200 to $42,600. Adding up these gains throughout the course of a working life could bring in approximately $330,000. These additional earnings of the graduates not only improve their socioeconomics but also affect the finances of the state and region. These types of additional earnings that come from graduates of community colleges and industry partnerships help contribute to the tax base and in turn strengthen the community, region, the state, and the US infrastructure.

Student Benefits of a Rural Community College Education

There are four preeminent types of benefits that can come from a community college education. The first and foremost is access to education. Adelman (1992) points out that four year institutions usually have a "culture of credentialism," with students locked into academic calendars and making it difficult for them to serve the occasional learners. Without the community college, these individuals might presumably find few opportunities for structured study (p.22).

The second benefit is learning efficiency. Community colleges help students to receive specific career level-training for jobs in high demand and allow students to upgrade their skills for work reentry, for advancement, or for the transfer of credits to a four-year institution to earn a bachelor's degree in a timely manner. An example is an employee who takes a computer course to enhance and update job skills may learn those skills in a more timely and efficient manner with the guidance of an instructor (Honeyman, Wattenbarger, &Westbrook, 1996) at a community college. At the university level, students wanting to learn immediate skills would have to tolerate large classes with limited interaction with instructors.

The third benefit to individuals entails enhanced earnings. Grubb (1995) suggests that the wage benefits of non-degree holders accrue only to those who earn vocational credits and not academic credits. Larger returns are traditionally enjoyed by students in technical fields while courses in sales, basic education, and the liberal arts show relatively negligible earning increments. The requirement that students possess a degree before one can obtain a job in certain fields come into play. Associate degree and certificate holders have considerably greater rates of return and nearly all analysts conclude that community college attendance yields an earning enhancement benefit (Cohen & Brawer, 2008).

The fourth benefit is the "option value." This is the ability to enroll in class and discover whether a student is "college material" or not. For those who do not exercise the option of completing college and leave after a few classes still enjoy a small wage increase over traditional high school graduates. In this case college education can still be described as being worthwhile since the returns are large enough to justify the public and private investments (Kane & Rouse, 1995).

These four benefits can become very appealing to many citizens' of the community and perspective students. Grubb (1999) reported a 54 % increase for associate degree holders, 29 % for those gaining a certificate, and 8 % for those who leave with less than 12 credits. These increases in associate degrees, certificates, and extra college credit along with the many benefits are a product of the affordability and flexibility of the community college.

Affordable and Flexibility of a Community College Education

A college education is one of the most important, but expensive investments a student can make. By attending a community college students can stay close to home and save on transportation, room, board, and most importantly on tuition. In addition, students may also choose to attend college part-time which may be an option that is not always available at a four year institution. Community colleges offer more flexible class hours to help meet the diverse needs of their students. Whether a student is working during the day, has family commitments, or desires a more flexible schedule, students are likely to find the classes they need at the times that work best for them since community colleges offer both day and evening sessions. Many colleges also offer weekend and online classes as well to help address its students' busy lives.

Community colleges also offer smaller class sizes that allow students greater classroom interaction and one-on-one opportunities with other students as well as the instructor. Community college instructors are also focused on teaching rather than research projects like professors at the university level. But in the same instance, community colleges have to meet the same accreditation standards as four-year schools and students have to perform at the same high level they would at any other college or university. One of the most important aspects of the community college mission is to provide students with affordable access to a four-year degree.

A large proportion of four-year colleges' and universities accept credit transfer from community colleges due to accreditation standards and articulation agreements.

Many students turn to the community college because of its ability to help address students challenges and barriers which typically stops and deters students from continuing their education at a four-year institution.

Student Challenges in a Community College

In part because of community colleges' open admissions policies and relative low cost, it is more popular with low-income and minority students than four-year colleges and universities (Provasnik & Planty, 2008). The central reason for students selecting the community college pathway over a four year degree is the need to minimize cost of their college education (Mattis & Sislin, 2004). Low-income adults and out-of-school youth need more financial aid than the traditional eighteen-to twenty-four year old student. Adult students are more expensive because they need to integrate their studies seamlessly with work and family needs (Carnevale et. al., 2009). A challenge is that most community college students pursue work and have family obligations that compete with school (Brock, 2010) and learning simultaneously in an attempt to build skills with labor market value (Soares, 2010).

Students in two-year programs often work part-time or even fulltime and many have family commitments. Research shows that part-time attendance in college, 35 hours or more of work each week and responsibility for dependents are among the major "risk factors" associated with low persistence and completion (Choy, 2002). Working students frequently carry fewer credit hours and may become discouraged by how long it takes to complete a degree. In addition, low-income adults may require remedial or refresher courses that no one wants to pay for, along with customized work-oriented courses that often need to be offered in bite-sized, non-degreed

chunks which are not eligible for federal subsidies (Carnevale et. al., 2009). The American Association of State Colleges and Universities identified the most challenging barriers for students were the lack of child care, the unavailability of convenient courses for nontraditional students, and the lack of financial aid packages for adult and independent students (Mattis & Sislin, 2004). The lack of financial assistance for community college students is cited as a major barrier to their retention.

Many of the challenging barriers may be the root cause for the high attrition rates among nontraditional degree seeking students. Free traditional students can afford mistakes that many nontraditional students and adults with jobs and families cannot (Carnevale et. al., 2009).

Students Socioeconomic Development

A study by Grubb (1997) indicated the completion of associate degrees enhances wages, employment, and earnings by significant amounts in both the conventional and statistical sense. Men with associate degrees earn 18% more while women with associate degrees earned 22.8% more than high school graduates.

Community college involvement in new economic development activities is quite widespread and attracting over 90% of colleges in 2000 (Dougherty & Bakia, 2000). But data on students' experiences in these new roles is relatively scarce. When students complete these programs, there are potentially significant economic benefits, including higher income and greater stability in the workplace (Grubb, 2001). It is not surprising that community colleges with relatively few resources for research and evaluation have not undertaken how these partnerships and programs affect local commerce and students' lives (Grubb, Badway, Bell, Bragg, & Russman, 1997).

Synthesis

This chapter began with literature that illustrated the many influences on technical education. The investments that China and India put into their education system have given a great return in the form of becoming the world's largest economies. Currently the US is not producing enough top scientists, engineers, and technicians to meet the needs of its economy and is being forced to reexamine education as well as its current visa system to allow foreign nationals to stay and practice their profession in the US. Thus far the primary focus has been on education to create innovative talent to compete globally.

While large American corporations give many motives for going offshore, it is clear that US scientists, engineers, and technicians are as equivalent if not more productive than their multinational competitors and produce at a higher quality. The only significant difference is that many corporations going offshore only require two-three year degrees. This demonstrated a need for sub-baccalaureate degrees in the new economy.

To fulfill this need of quality technicians, community colleges became very innovative in their various forms of training to meet the demands of the new global economy. In addition, community colleges began to partner with industry to help create and develop a more qualified workforce. The collaboration between the community college and industry provided many benefits to the local community, the regional industry, and the citizens of the community. This was evident in the cases of Columbia Gorge Community College, Hagerstown Community College, Carl Sandburg Community College, and Central Piedmont Community College.

By these types of programs and initiatives being implemented, the local community benefited with citizens being able to stay home and work in their community, the ability to attract and retain new business, the reduction in the number of welfare and unemployment

recipients, stronger economic and community development, and a larger tax base to support the community. Industry benefited in the form of a more qualified workforce and the ability to have top candidates trained and ready to work on the first day of the job. Students benefited in the form of an affordable and flexible education by an institution more apt in addressing student challenges in order to help develop students socioeconomic.

But given all this information in the literature review, there is one area that has been resoundingly silent. There seems to be little research into the experiences of the students as they pursue their education in these technical fields. Data on these types of experiences of the students is relatively unknown. This was the primary purpose of this proposed study. To explore the lived experiences of graduates who navigated through an engineering technology program and completed an Associate of Applied Science (AAS) degree in Engineering Technology from a rural community college and then transitioned into the engineering workforce.

Chapter 3 defines the epistemological framework that will be used in this qualitative phenomenological study, research design and site, participant information, data collection and analysis, trustworthiness, and ethical considerations. Chapter 4 will present and discuss the findings for this study. Chapter 5 will discuss implications of the findings based on the examination of the study results and review of the literature and discuss what the implications mean as well as provide recommendations for future research.

CHAPTER 3: RESEARCH DESIGN

Overview

In this chapter I describe the methods and procedures that were used to conduct the study. I start by explaining the rationale for choosing a qualitative research design and the phenomenological approach. Next, I discuss my research site and participant selection. I then describe the process I used to collect data and perform the analysis. I conclude the chapter with the steps I used to ensure trustworthiness in my findings.

Research Rationale and Design

Traditionally qualitative research methods are employed to discover the meaning that people give to events they experience (Bogdan & Bilkin, 2003). My study was conducted to better understand the experiences of graduates who earned an Associate of Applied Science (AAS) degree in Engineering Technology from a rural community college, and their experiences as they transitioned from education to the engineering workforce in the local and regional community. By employing a qualitative design, I interviewed graduates who have navigated and completed this journey in order to better understand their experiences. Since there is little known or written about students who take this journey through technical engineering education, this study is primarily exploratory.

In selecting a qualitative design for this study I considered three factors posed by Creswell (2009). The first factor is the phenomenon being studied. The second factor is the personal experiences of the researcher. And the third factor is the researcher's audience. Qualitative research is the better approach when little is known about the topic or the variables to explore are unclear (Creswell, 2009). In this study I look to understand and describe the

experiences of graduates who completed an AAS degree in Engineering Technology from a rural community college and then transitioned into the engineering workforce in the local and regional community. Little has been written about the experiences of these graduates.

Creswell's (2009) second factor allowed me to include my experiences as a teacher and a program adviser. As a program adviser I have experience in active listening, using open-ended questions, and taking notes to document conversations. This qualitative approach collects data through one-on-one interviewing using open-ended questions and allows the researcher to better understand participants' experiences. As a program adviser I also have a rapport with the graduates which gives me the ability to contact them and since the students have graduated from the program there is no fear of reprisal. My experiences as a program advisor seemed to be an appropriate fit for the qualitative approach.

Creswell's (2009) third factor is that researchers should consider the audience for the study. A qualitative design is not widely accepted in all academic disciplines, but it is recognized as a valid approach in the fields of education. Majority of my experiences have been as a student, an educator, and a program advisor in the community college setting where the qualitative approach is normally accepted. In this case a qualitative approach is an appropriate fit for my intended audience of administrators, faculty, and staff at community colleges offering similar programs.

Qualitative

Qualitative research questions begin with "how," "what," or "why" in order for the researcher to obtain a thorough understanding of what is going on relative to the phenomenon (Patton, 2002). For this study I explored students' educational and collegian experiences as they pursued an Associate of Applied Science Degree in Engineering Technology and continued their

journey into the local and regional engineering workforce by examining the following research questions:

1. What experiences influenced these participants to study Engineering Technology at a rural community college?
2. How did these participants make meaning of their experience in an Engineering Technology Program at the rural community college?
3. How did these participants make meaning of their experience as they transitioned into the local and regional engineering workforce?

A qualitative approach fosters a better understanding of lived experiences of the participants and their own understanding of how these experiences influenced their decisions to study engineering technology. This study allows participants the opportunity to articulate the ways they experienced their education and pursued a position in their related field of study in the local and regional community workforce. The use of rich, critical description will provide in-depth, detailed accounts of participants' experiences.

The Phenomenological Approach

Husserl's (1982) most basic philosophical assumption was that we can only know what we experience. Phenomenology is considered the study of lived experience (Van Manen, 1990) and Husserl (1982) indicated that in its purest form phenomenology is a science of essences. Phenomenology is concerned with the study of experience from the perspective of the individual. Stake (1995) based his approach on a constructivist paradigm. Constructivists claim that truth is relative and that it is dependent on one's perspective. An example of this is how infants, children, and adults construct their understandings from being told what the world is and not by discovering it through experience. This is evident by examining schools and how students study science, math, and history, through rote memorization of answers and through controlled

experiments. What students know of reality is only what they have come to believe, not what they have verified through their own experience (Stake, 1995). The epistemology framework for this qualitative dissertation research is constructivism and uses a phenomenology approach to explain engineering technology graduates' perceptions and experiences as they successfully completed their degree and entered employment in their field of study in the local and regional community. This epistemological approach emphasizes that different people construct meaning in different ways, even when experiencing the same event (Crotty, 1998). There are three fundamental assumptions of constructivism that Crotty (1998) identified that are fundamental to this study:

1. Meaning is constructed by human beings as they engage with the world they are interpreting and qualitative researchers tend to use open-ended questions in order to get participants to share their views
2. Humans engage with their world and make sense of it based on their experience and social perspectives
3. The basic generation of meaning is always social, arising in and out of interaction with a human community. The research interpretations and findings in qualitative research are context specific.

Stake (1995) indicated that out of all the roles that researchers play, the role of gatherer and interpreter is central to this method. Stake stated "Most contemporary qualitative researchers nourish the belief that knowledge is constructed rather than discovered. The world we know is a particularly human construction" (p.99). The qualitative phenomenological study for this dissertation is grounded in this interpretative theoretical construction perspective which guides and anchors the data collection and analysis. Crotty (1998) combined the depth and design to work together instead of making them discrete components and labeled the theoretical perspective "the philosophical stance lying behind a methodology" (p. 66).

In this particular approach it is important to come to know the various perspectives (Stake, 1995). A qualitative phenomenology study provides tools for researchers to study complex phenomena within their context.

The first step of a phenomenological study is to define the purpose clearly. Most commonly recognized as the purpose statement, my purpose for this study was to explore the lived experiences of graduates who navigated through an engineering technology program and completed an Associate of Applied Science (AAS) degree in Engineering Technology from a rural community college and then transitioned into the engineering workforce.

The second step of a phenomenological study is the unit of analysis. Yin (2009) wrote that an appropriate unit of analysis occurs when primary research is accurately specified. The unit of analysis is directly tied to the research questions developed by the researcher. This study's unit of analysis is the student who has graduated with an AAS in Engineering Technology from Ideal Community College and transitioned to engineering related work in the local and regional community.

The third step of a phenomenological study is to connect data to meaning. This connection is made following the data collection phase, as themes emerge. As data are analyzed, the researcher attempts to match patterns that appear in the data to the theoretical meaning of the study. The themes that emerged in this study thus will serve as answers to the research questions that are posed in Chapter 1, and may have the potential to go beyond the research questions.

The fourth step of a phenomenological study is the criteria for interpreting findings. Crotty (1998) presents that interpretation seeks to develop an understanding of an action, and according to Schwandt (2000) positivism focuses on explaining the action. Schwandt also noted that "to find meaning in action, or to say one understands what a particular action means,

requires that one interpret in a particular way what the actors are doing" (p. 191). Miles and Huberman (1994) also stated that researchers following the interpretive perspective "have their own understandings, their own convictions, their own conceptual orientations: they, too, are members of a particular culture specific historical moment" (p.7).

In this step according to Yin (2009), the qualitative researcher codes the data prior to developing themes. After developing themes, I will extract meaning from the findings to determine recommendations for practice and future research.

Rigorous qualitative studies provide researchers with opportunities to explore or describe a phenomenon in context using a variety of data sources. It allows the researcher to explore individuals or organizations, simple through complex interventions, relationships, communities, or programs (Yin, 2003) and allows the reverse engineering of various phenomena. A phenomenological study is an excellent opportunity to gain tremendous insight and enables the researcher to gather data from a variety of sources to illuminate the phenomenon.

This dissertation's research was grounded on the interpretations of graduates' experiences at Ideal Community College's Engineering Technology Program. Of particular interest are the ways students made meaning of their journey as they navigated through Ideal Community College to obtain their education and after graduating transitioned to the engineering workforce in the local and regional industry. I believe the study's participants have constructed reality based on their individual and shared experiences. I wanted to learn more about how the graduates interacted and made decisions based on the actions and reactions of student support services, program requirements, class schedules, family and work obligations which can make the educational process complex and challenging.

The purpose of the phenomenological approach was to illuminate phenomena through the participants' lived experience. In this study I gathered "deep" information and understanding through the inductive method of interviews and representing the perspective of the research participants. Phenomenology involves participants reflecting on the experiences with the goal of constructing a descriptive account. In this phenomenological approach individual accounts were based on personal knowledge, subjectivity, and emphasized the importance of personal perspective and interpretation. These experiences provided insights into people's motivations, actions, and the basis for a structural analysis that leads to themes, meanings, and essences of the experience (Moustakas, 1994). In this study the phenomenological research seeks to describe rather than explain, and the study started from a perspective free from hypotheses or preconceptions (Husserl, 1970).

Creswell (2007) indicated that research problems well suited for the phenomenological approach are those "in which it is important to understand several individuals' common or shared experiences of a phenomenon" (p. 60). It appears that little is known about the actual experiences of graduates who completed an Associate of Applied Science degree in Engineering Technology from a rural community college and then transitioned to the engineering workforce. This phenomenology looks to be a good fit for the research since phenomenology attempts to understand lived experiences from the perspective of multiple participants.

Research Site

I selected a rural community college located in the rocky mountain region as the site for this study. The college offers approximately 80 associate degrees, 30 certificates of completion, and has numerous non-credit courses. Full-time equivalent (FTE) enrollment is approximately 4500 with a headcount reaching 6200. Presently the college has two campuses with two outreach

centers and has articulation agreements with about 20 universities (Retrieved 3/5/13 from http://en.wikipedia.org).

In addition to the college's credit courses, the college offers noncredit courses through its Workforce and Community Development division to help develop and build a stronger workforce for the community. The college seeks partnerships with industry and provides professional and workforce training, career services, facility rentals, and adult academic refresher courses in its pursuit to develop a stronger and more comprehensive workforce.

The college is located in a city that has a population of approximately 60,000. The city's economy is based mainly on light manufacturing, agriculture, tourism, services, and transportation. The city has become diversified with the development of many industries like fertilizer processing plants, light manufacturing that includes electronic products such as precision instruments, restaurant equipment, and ski wear products. According to a 2004 labor force report, the number of workers employed in construction and mining was 2600; manufacturing was 1500; trade; transportation; and utilities was 8600; information was 1000; financial was 2000; professional and business services was 3200; and education and health services was 3100 (Retrieved 3/5/13 from http://www.city-data.com/us-cities/The-West/). For the purpose of this study I gave the college and the city pseudonyms. The college will be known as Ideal Community College (ICC) and the city where the college is located will be known as Pleasantville.

The median income for a family household in Pleasantville is approximately $51,912 while the median income for a nonfamily household is $33,848 (Retrieved 3/5/13 from http://factfinder2.census.gov). According to the 2010 census, the racial makeup of the city was 87.4% White, 2.9% African American, 1.0% American Indian and Alaska Native, 1.2% Asian,

0.2% Native Hawaiian and Pacific Islander, 3.3% from two or more races, and 15.0% being Hispanic or Latino (Retrieved 3/5/13 from http://factfinder2.census.gov).

Pleasantville also has access to two railroads, two interstate freeways going east/west and north/south and the city is a vital transportation center for the state. In addition to being the state's transportation hub, the city also has been labeled a bedroom community to larger metropolitan areas located within a two hour commute. Since Ideal Community College is located within a short driving distance to much larger metropolitan areas, the college is considered to be a rural community college which is appropriate for this study.

Participants and Criteria for Selection

The selection of participating graduate students for this study was not complicated. Since the overall study was intended to explore the graduates' educational experience as well as the graduates' experiences as they transitioned to the engineering workforce, all students who graduated from the Engineering Technology Program at Ideal Community College in the past nine years and are employed in engineering related work in the local and regional community were included in the proposed pool of participants. The selection of participants for this study was based on a strategy referred to as "purposeful selection." Purposeful selection leads to an information-rich sample that can truly illuminate the phenomenon (Patton, 2002).

Maxwell (2005) denotes this process as "a selection strategy in which particular settings, persons, or activities are selected deliberately in order to provide information that can't be gotten as well from other choices" (p.88). All participants must have experienced the phenomenon under investigation and selecting graduates from the engineering technology program who are employed by a local or regional firm to be interviewed for this study was purposeful. By focusing on the graduates of one particular institution's engineering technology program ensured

that all participants had experienced the same phenomenon. These students would best understand the challenges of obtaining an education from an engineering technology program located at a rural community college and obtaining employment in the local and regional community.

Patton (2002) indicated that there are really no rules for selecting the sample size in qualitative research. Instead a minimal sample size should be suggested yet be flexible and emergent. Polkinghorne (1989) recommended phenomenological studies include in-depth interviews with 5 to 25 individuals who all have experienced the phenomenon. Using these guidelines, a list of students who graduated with an Associate of Applied Science (AAS) degree in Engineering Technology from Ideal Community College will be compiled with contact information. The participants were recruited through e-mail or by phone. Email contacts were sent a request to participate in the research project. Phone contacts were asked if they would be willing to participate in the research project. If the contacted participant did not answer the email request or declined by the phone, the selection process progressed to the next perspective participant.

In examining the list of graduates who meet the criteria, there were 28 students who have graduated in the last nine years from the Engineering Technology Program at Ideal Community College who are employed in the local or regional engineering workforce. Fifteen of these graduates were recruited to participate in the study. The Engineering Technology Program at Ideal Community College has a history of a high population of men with very few women. In the past nine years there have only been five women who have graduated from the Engineering Technology Program. This gender difference was evident in the proportion of men and women that were recruited for the study.

During the initial contacts, the participants were informed of the purpose and plan of the study. Their acceptance involved participating in a personal interview that revolved around these main topics: What experiences made and kept graduates interested in studying and completing the Engineering Technology Program at Ideal Community College? What were the graduates' experiences in the Engineering Technology Program? What were the graduates' experiences as they transitioned into the engineering workforce? What would have helped or what could the students do to be better prepared for the workforce?

All participants who agreed to partake in the interviews were provided an informed consent form and asked to sign it. All participants were told that they may withdraw from the study at any point. The consent form outlined information about the study: the project title, the purpose of the study, the significance of the study, time commitment needed by participants, the procedure to be used, the risks involved in participating, confidentiality of information discussed, freedom to withdraw, participants' responsibility, along with the researcher's email address and phone number. The importance of confidentiality was fully explained to participants and they were given pseudonyms for their names so they would not be identified. In addition, participants were also informed that all recorded audio media from the interview sessions will be destroyed after the study.

Data Collection

For this study the phenomenon under investigation was to discover the meaning that engineering technology graduates construct from their rural community college educational experience and how they experienced their transition from education to the engineering workforce in the local and regional community. In this study I collected data through in-depth personal interviews with the graduates and employed a reflexive journal.

Investigation of a phenomenon should involve the long interview or in-depth interviewing (Creswell, 2007; Moustakas, 1994). This type of interview allowed the phenomenological researcher to develop detailed, holistic descriptions of how the phenomenon was experienced (Weiss, 1994). Moustakas (1994) described the purpose of these interviews as to obtain a rich, substantive description of the participant's experience of the phenomenon. Interviews were the primary data collecting approach. Interviews promoted close collaboration between the participant and me, which enabled participants to tell their stories of their experiences (Crabtree & Miller, 1999). Through these stories the participants were able to describe their views of reality and enabled me to better understand the participants' actions (Lather, 1992; Robottom & Hart, 1993).

Interviews were conducted to ensure a reliable study. The interview was viewed as a conversation occurring between the participant and me. I asked questions, waited patiently and listened carefully to the participants' responses. When conducting the interviews, I attempted to establish a relationship and rapport with the participant to build trust. As the researcher I shared information about myself with the participants to establish the trust and rapport necessary for this conversation to occur. According to Patton (2002) the purpose of interviewing is to find out what is in and on someone's mind. I interviewed participants to find out about events that cannot be observed (p.196). In addition it was also important for me as the interviewer to have active listening and nonjudgmental behavior as to not influence the participant or interview process. Esterberg (2002) prescribes to a specific line of questioning called "open ended" questions and cautioned against dichotomous or leading questions. Dichotomous or leading questions could lead to a closed style of questioning.

One of the primary objectives of this study was to understand how the participants made meaning of their experiences. The in-depth interview approach attempted to link the making of meaning to the behaviors of the participants as they express the ways in which they viewed their college educational experience and their transition to the workforce. In following Esterberg (2002), semi-structured interviews were conducted and allowed for a freer exchange between the participants and I to get in-depth data. This semi-structured process will be discussed in more detail later in this section.

There are six areas of questions that were employed during the interview process for this study (Merriam, 2009). The six areas of questions were experience/behavior, opinion/belief, feelings, knowledge, sensory, and background.

An initial interview of program graduates lasted 60 to 90 minutes and were conducted in a mutually agreed upon location. Weiss (1994) indicated that 60 to 90 minutes is reasonable for most participants. All interviews were audio-recorded. In addition I took notes during the interview process. Participants were reminded that breaks were allowed if they felt the need to do so. They were also informed that they would be anonymous and that a pseudonym was provided for them. All participants were provided a consent form and told that they may withdraw from the study at any point.

The interviews were a dynamic process where I worked off a standard structured set of protocol questions to begin the interview and then I asked follow up questions, which were not scripted or structured to get clarification, richer, thicker, and in-depth data in order to get a better grasp of the phenomenon or situation. A standard set of questions for the participant is located in Appendix A. Since the interviews were dynamic in nature, some interviews required a second

interview to help process data and clarify any lingering thoughts by me. The second interviews lasted 30 minutes.

The following were the research steps that were taken for this study. The research conducted followed a uniform protocol to ensure that all interviews yield data consistent with the study's goals:

1. Participants were invited to participate in the study and I informed the participants of the risks involved.
2. In-depth (semi-structured) interviews were held with participants in their desired environment.
3. Interviews were digitally recorded and transcribed within a week of the interviews.
4. A follow up interview was scheduled to answer any lingering questions, if needed.
5. A follow up informal contact was initiated and each participant was given his or her respective transcript for member-checking, to verify the transcript content and validate the interpretation of the interview.
6. I coded the data for emergent themes and perform an analysis.

The purpose of the interview was to establish the participant's story and allow the participants to reconstruct the details of their experience. I concluded the interview by having the participants reflect holistically on their experience. After completing the interviews I transcribed the interviews and began to analyze the data.

Data Analysis

Moustakas (1994) detailed four processes integral to the phenomenological research methodology. The four processes are epoche, phenomenological reduction, imaginative variation, and synthesis of meanings and essences. To help phenomenological researchers in organizing and analyzing phenomenological data, Moustakas (1994) modified an existing method of analysis, the Stevick-Colaizzi-Keen data analysis which I used in this study. This section will discuss the Moustakas (1994) four processes followed by the steps that were used to perform the data analysis.

Epoche

Before beginning the interviews, I prepared for the experience of listening to the participants' stories and hearing new knowledge. For Moustakas (1994) this preparation is known as epoche, the "suspension of belief." This involves suspending the "natural attitude" and freeing my thoughts from the influence of previous experiences which allowed me to enter into the research with an untarnished perspective. Moustakas (1994) described this step as "a process of setting aside predilections, prejudices, predispositions, and allowing things, events, and people to enter anew into consciousness, and look and see them again, as if for the first time" (p.85). I attempted to begin participant interviews with an unbiased and receptive perspective by partaking in epoche prior to conducting the interviews.

Phenomenological Reduction

Data analysis began with the transcription of the interview recording. I transcribed each participant's interview within a week of conducting the interview. Once I had transcribed the interview, I examined every line of the interview transcripts for relevance to the experience. This phase of the analysis is horizonalizing the data, where I highlight each statement considered to be significant to the experience of journeying from an AAS in an Engineering Technology Program at a rural community college to the engineering workforce. I then took each significant statement from the transcript and put it into another Word document where I assigned it an inductive code. I then removed similar or overlapping statements and left the invariant horizons of meaning units of the experience. Next I grouped the invariant horizons into themes. I then created the individual textural description of the phenomenon. This individual narrative is a synthesis of the horizon themes constructed from the verbatim quotes and examples of the participants' experience with the phenomenon.

Imaginative Variation

The major task of imaginative variation was to create an individual structural description of the experience (Moustakas, 1994). To construct the individual structural description, I develop structural themes from the individual textural descriptions created in the phenomenological reduction phase. The structures describe the "how" of the experience while explaining the essential factors that contribute to the "what" was experienced by the participants. When the individual textural and structural descriptions were written, I contacted the participants to schedule a member check with the participant to verify the transcript content and validate the interpretation of the interview.

Synthesis

The final process in the phenomenological research is the synthesis. The synthesis involves integrating the textural and structural descriptions into one. The resulting composite textural structural description was a universal description of the experience for all the participants (Moustakas, 1994). The composite textural structural description was constructed from all the individual textural structural descriptions. This synthesis was represented an integrated statement of the meaning of the experience of graduates starting in an AAS Engineering Technology Program at a rural community college, graduating from the program, and transitioning to the engineering workforce in the local and rural community as a whole.

This research will follow Moustakas (1994) modified data analysis. These steps described in the following outline in linear order were used for analyzing the transcribed interviews of the participants:

1. *Listing and Preliminary Grouping*
   List every expression relevant to the experience. (Horizonalization)
2. *Reduction and Elimination:*
   To determine the Invariant Constituents, test each expression for two requirements:

    a. Does it contain a moment of the experience that is a necessary and sufficient constituent for understanding it?
    b. Is it possible to abstract and label it? If so, it is a horizon of the experience. Expressions not meeting the above requirements are eliminated. Overlapping, repetitive, and vague expressions are also eliminated or presented in more exact descriptive terms. The horizons that remain are the invariant constituents of the experience.

3. *Clustering and Thematizing the Invariant Constituents:*
   Cluster the invariant constituents of the experience that are related into a thematic label. The clustered and labeled constituents are the core themes of the experience.
4. *Final Identification of the Invariant Constituents and Themes by Application:* (Validation)
   Check the invariant constituents and their accompanying theme against the complete record of the research participant. (1) Are they expressed explicitly in the complete transcription? (2) Are they compatible if not explicitly expressed? (3) If they are not explicit or compatible, they are not relevant to the study and should be deleted.
5. Using the relevant, validated invariant constituents and themes, construct for each participant an *Individual Textural Description* of the experience. Include verbatim examples from the transcribed interview.
6. Construction for each co-researcher an *Individual Textual and Structural Descriptions* of the experience based on the Individual Structural Description and Imaginative Variation.
7. Construct a composite of the *Textural-Structural Descriptions* into one integrated statement of the meaning and essence of the experience, incorporating the invariant constituents and themes (p. 120).

The composite synopsis of the transcripts of the interviews, journal entries, field notes developed for analysis, and other factors were identified and reported in chapter 4 under the results section of this study.

Trustworthiness

With any type of research, the researcher is concerned with getting the information and data correct. Qualitative research entails that I take an active role in the collection and the interpretation of others' meaning making, and to be credible qualitative research I must be good and trustworthy. Stake (1995) suggested that researchers learn to understand their research as their participants do and not impose their own assumptions (p. 109). In this study I wanted to accurately capture and re-represent the essence of my participants with the phenomenon, but it

was very challenging since I was studying people's lived experience. What participants told me was their interpretation of their experience of the event. Trustworthiness commonly is created through deliberate and constant attention to dependability, creditability, and transferability of a study (Lincoln & Guba, 1985).

In order for a study to be dependable, credible, and transferable the qualitative researchers have to be trustworthy and be good in the ethical sense. A sound study is significant, complete, and evaluates alternative perspectives along with other evidence that provides data to report in a meaningful manner (Yin, 2009). The following are strategies that I followed to be trustworthy:

Member checks	Taking data and interpretations back to the people from whom the data was derived, and verifying its plausibility.
Methodologist review	Discussing the process of the study and the congruency of emerging findings with the data and the tentative interpretations with my methodologist.
Reflexivity	Engaging critical self-reflection by regarding assumptions, biases, and the relationship to the study, which may affect the investigation.
Engagement	Allowing for adequate time to collect data, such that it becomes saturated.
Rich description	Provide enough rich, thick description to contextualize the study, such that readers will be able to determine the extent to which their situation matches the research context (Merriam, 2002, p. 31).

The last strategy for trustworthiness that was used is a reflexive journal and detailed field notes. The journal allowed me to describe my feelings, observations, and thoughts about conducting research in this area of study. The practice of using a reflexive journal added rigor to a qualitative study as it allowed me to record my reactions, assumptions, expectations, and biases

about the research process. The field notes provided additional data for analysis and helped me keep track of observations.

The prominence of Merriam's strategies in this study's methodology ensured the trustworthiness of this research. I also employed Stake's "critique checklist" and relied on it to assess the quality of the study (1995, p.131). This twenty criteria checklist was used to assess the quality of the study and is located in Appendix B. By employing all these strategies, the validity, reliability, dependability, credibility, and transferability of this qualitative study were strengthened.

Ethical Consideration

All of the participants were treated in accordance to the ethical guidelines set forth by the American Psychological Association (APA) and Colorado State University Institutional Review Board (IRB). While there are no identifiable risks for participating in this study, considerations were incorporated in the design and caution was taken to ensure that all participants felt safe, comfortable, and had the freedom to withdraw from the study if they feel the need.

Employing Patton's (2002) "ethical issues checklist," I relied on it to pursue ethical considerations for the study. The check list contained 10 considerations:

1. Explaining purpose of the inquiry and methods used
2. Promises and reciprocity
3. Risk assessment
4. Confidentiality
5. Informed consent
6. Data access and ownership
7. Interviewer mental health
8. Advice (who will be your counselor on ethical matters)
9. Data collection boundaries
10. Ethical versus legal conduct (pp. 408-409)

The part of ensuring trustworthiness and credibility of a study is the researcher is trustworthy in carrying out the study in the most appropriate ethical manner (Merriam, 2009).

Summary

Chapter 3 outlined the theoretical grounding, the methodology for this study, and the ways in which these decisions anchored the research design and process of analysis. The constructivist paradigm was described along with the rationale for the qualitative research methodological decisions for this study. Chapter 3 also defined the epistemological framework used in this qualitative phenomenological study, research design and site, participant information, data collection and analysis, trustworthiness, and ethical considerations. The theoretical perspectives, methodology, and methods helped to illuminate the various complexities and experiences of the Engineering Technology Program located at Ideal Community College. The phenomenological research includes the graduate's experiences transitioning into the engineering workforce. The chapter concluded with a discussion of strategies that were employed to enhance trustworthiness as well as ethical practices for the study.

Chapter 4 will present and discuss the findings for this study. Chapter 5 will discuss implications of the findings based on the examination of the study results and review of the literature and discuss what the implications mean as well as provide recommendations for future research.

CHAPTER 4: RESULTS

Overview

Chapter 4 is organized into five parts: Introduction to Engineering Technology, Introduction to the participants, the structures, the textural structural synthesis, and the essence. The lived experience of the participants who entered, studied, and transitioned into the engineering technology workforce can be heard through the participants' voices. It is through their voices that we can begin to understand this experience. Part 1 of the chapter I introduce the Engineering Technology Program at Ideal Community College. Part 2 of this chapter begins with an introduction to each participant. Fifteen separate introductions provide information on the educational and work experiences of the participants. In Part 3 of this chapter I present the structures that emerged from the interviews to describe how the participants experienced the journey of entering and graduating from the Engineering Technology Program at Ideal Community College, then transitioning into the engineering workforce. The structures that emerged are Perception and Experiences of Engineering Technology, Captivation of Engineering Technology, Significant Influences and Relationships, Value of an Associate of Applied Science degree in Engineering Technology, and Transition to the Workforce. Together, these structures create the phenomenon through the participants' voices.

Part 4 of this chapter I introduce the textural structural synthesis of transformation. This synthesis is the integration of the five structures. It depicts how the five structures interweave together to move the participants through the states of perception of the engineering discipline. The chapter then concludes with Part 5, the essence of the lived experience. Here I describe how the unexpected journey was common and universal in how each participant experienced the

phenomenon. The meaning and essence of the unexpected journey portrays how the direction chosen has led the participants to their current career.

Part 1

Introduction to Engineering Technology

The Engineering Technology Program was initiated in the fall of 1978 in response to community demands for technicians and drafters. The most popular courses have been the CADD courses. Very advanced computers are used to teach and train on the CADD software. The program's state-of-the-art equipment and facilities are among the best in the state. Currently the program has a 3-D Prototype machine, 75 Watt Laser, wide format Contour Cutter, wide format plotters, and robotic equipment.

The Engineering Technology Program has expanded down many different avenues. Currently the program instructs on Autodesk (i.e. AutoCAD, Revit, and Civil 3D), Bentley (i.e. MicroStation, GeoPAK, and Solid Works), ESRI (ArcGIS and GPS), Catalyst, and Corel Draw software. These programs are the standard platform software utilized by the engineering industry which incorporates architectural, civil, industrial, and mechanical engineering.

The students in the program find employment while they are enrolled in the program. Many graduates are immediately employed upon graduation. Graduates of the program generally enter the workforce as engineering technicians or drafters with state, city, and local employers. Some students may decide to pursue a four year degree in engineering or an allied field of engineering. Some students are currently employed in industry but are returning to school to upgrade their skills and learn newer more sophisticated software as technology advances.

The programs mission is to provide technical training and skill certification to students who plan on technical careers in the engineering industry. The program has the following goals:

I. To offer a nine-month certificate or an Associate of Applied Science degree to students in the Engineering Technology Program.
II. To provide training to drafting technicians who need to enhance their skills and to community members who want to achieve their own personal objectives.
III. To prepare the program's graduates for immediate employment in technician-level occupations in engineering, manufacturing, construction, government, management, estimating, and related occupations.
IV. To cooperate and collaborate with the engineering community in order to improve the program curricula.

The curriculum offered to the students is reviewed and approved by the program's advisory committee. The committee ensures that the program meets national standards for Engineering Technology education by maintaining and adhering to the guidelines set forth by the Accreditation Board for Engineering and Technology. To assist with this charge is a program director and lead instructor. The lead instructor has a Master of Science in Civil Engineering and has passed the Fundamentals of Engineering Exam. In addition to the lead instructor the program has adjuncts from local industry.

Part 2

Introduction to the Participants

This section presents a synopsis for each participant in the study. These were derived from information provided by the participants in the initial interview. The synopsis provides a snapshot of the lived experiences that influenced each of these participants to study engineering technology at a rural community college, their experiences in the Engineering Technology Program, and their experiences as they transitioned into the engineering workforce. The synopsis focus on the positive experiences that made participants interested in the engineering technology field, what help keep the participants interested in the Engineering Technology Program, complete their education to earn their degree, their transition from college academics to the engineering workforce, and what kept the participants committed to their chosen career field.

This provides the reader with a surface understanding of the career path each participant forged as they began their journey of choosing then entering the Engineering Technology Program at Ideal Community College to obtain an Associate of Applied Science degree and then transitioning into the engineering workforce. I then supplement this information with the work experiences of each participant since completing their AAS degree. Due to the importance of confidentiality I created participant pseudonyms.

Robert

Robert's educational and career path began in junior high. He enjoyed the course and from there he took computer-aided drafting courses in high school. But the high school classes that Robert experience didn't seem like it had a real world application. In the absence of guidance from a career counselor and the high school instructor's inability to connect class lessons with real world applications, it was not apparent to Robert how he could use what he learned in high school in the real world, so Robert gave up on the thought of continuing with school and decided to seek employment after high school.

After graduating from high school Robert basically worked at a retail company that took him eight years to earn $12 an hour. Robert and his wife struggled to make ends meet. After a long day at work Robert was complaining about his job to his wife. Noticing the reality of being unsatisfied with his retail job his wife spurred the notion that if he wanted to have a better life he needed to go back to school and earn a degree.

Robert decided to return to school and entered Ideal Community College as a non-traditional student. As a non-traditional student he decided to study radiography, but after going through some of the courses he decided it was not really for him. He had a hard time deciding what he wanted to do, but after talking to his mother he reflected on what he enjoyed in junior

high and high school and that was board drafting. It was a little bit of a fluke but while reading about programs at Ideal Community College Robert found that the college had courses in drafting. When Robert examined the Engineering Technology Program literature he felt it was something he could get a job with and became pretty committed to the program. He didn't realize he was going to enjoy it as much as he did. Financially it was hard to get the money he needed to keep going to school. Nonetheless Robert had a really good experience with most everything in the Engineering Technology Program as well as Ideal Community College.

Robert graduated from the Engineering Technology Program with an Associate of Applied Science degree six years ago. Although Robert faced many obstacles in coming back to school and earning his AAS degree in Engineering Technology, when he graduated he had overwhelming feelings of joy, accomplishment, pride, as well as relief because he no longer had to look for jobs with only a high school diploma. Today Robert is a technician for a fairly large civil engineering firm with 800 employees. He has been with the firm since he graduated from Ideal Community College. He does a little bit of a lot, which means a lot of different duties in his position. He builds and detail plan sets, does a little bit of design, processes survey data, and works on redline plans that come back once they have been reviewed in order to fix any problems. He does construction inspections during the summer as well. Now that he has his degree and his current position he has additional earnings which help him a lot. He is making quite a bit more money than he was in the retail industry.

Robert ended up in the civil discipline which he studied the least at Ideal Community College. He stays in this field because of the challenge. There is still a lot for him to learn about design. In the next ten years he is hoping that he will be a full time designer so he can be more of an asset to the company. Robert is very glad he made the decision to study and earn his

Associates of Applied Science degree in Engineering Technology. It's just been the best thing he has ever done. Robert accepts that the civil engineering profession is tough, but has been very rewarding. He also realizes that his life would be completely different if he didn't get the degree.

Mike

Mike's journey into engineering started when he told his parents that he wanted to design cars. He took as much as the high school could offer in engineering. He did talk to his high school instructor a little bit but it wasn't enough to make a conscious decision to pursue the field of engineering at the university level. After graduating from high school he tried the state university but it didn't really work out. He decided to go to Ideal Community College to see what he could do and find out what programs were available at the college. What he found interesting always ended up leading to Engineering Technology. After talking to the Engineering Technology instructor he felt compelled to enroll in the Engineering Technology Program. Once he decided on earning an Associates of Applied Science degree in Engineering Technology he became committed to that goal.

The classroom environment helped Mike through the Engineering Technology Program. The way the classes were built and the way the curriculum progressed Mike didn't feel as though there was really a transition between classes. He felt the curriculum was all one class that just focused on different things each semester. In the end it was actually ideal for Mike to come to a community college and study Engineering Technology. The smaller classes and the labs that Mike had access to really made it a better experience than what he thought it was going to be. He felt he had the support of his classmates and colleagues in the Engineering Technology Program. They all pushed through the program together and really helped each other out which was the nature of the program.

Mike was able to push through the obstacles of transitioning from a university to a smaller college setting, not doing anything engineering wise for two years while he was at the state university, financial challenges, and extracurricular responsibilities to earn his Associates of Applied Science degree in Engineering Technology. Mike's graduation was the tail of two stories. It was kind of a sad point because he was losing his classmates and his support, but he believed that the Engineering Technology Program was a good stepping stone. Mike graduated from the Engineering Technology Program with an AAS degree two years ago. His graduation brought him a huge relief. It opened his options while he was going to school and he has been able to earn better wages compared to if he didn't have his degree.

Mike is currently a technician at a facility planning office and deals with a lot of projects around a large campus. He has had the position for more than a year and he really likes being a technician because it's not as stressful as being a full engineer. He basically modifies certain plans, changes the CAD plans, and works a lot with the different entry level projects. He checks what the projects entail and where he needs to be to get to a finish product. He is given projects, deadlines, and expected to have it completed in a timely manner. Mike had a very fluid transition into the engineering workforce. Everything that was taught and covered in the Engineering Technology Program covered what he uses in his current position. Mike recognizes that if he did not have the degree he wouldn't have the job he has right now.

Mike feels accomplished for the most part and it's definitely been worth all the time that he spent as a non-traditional student getting his associates in Engineering Technology. Mike reminisces about it all the time. It was definitely a time in his life that it was a lot of fun and learned a lot while messing around with his colleagues.

Zack

Zack's interest in engineering started in wood shop and transitioned into drafting courses in the technical education department of his junior high school. In high school Zack took similar courses, but the classes were more advanced. The closest experience Zack could get to engineering was constructing projects in shop class which he found really appealing. Nobody in the high school classroom really talked about engineering or college and Zack never talked to a career counselor. In the absence of guidance from a career counselor or his school instructors Zack didn't really have a perception of engineering technology or even knew that it existed.

Zack ended up going to Ideal Community College because he was going to play soccer for the college. With the lack of career and academic guidance Zack's transition to college was very frustrating. He didn't know what types of programs were available at the college. In the beginning Zack spent his first year just taking general entry level classes and pre-requisite classes for a program he didn't completely understand. It was a setback for him because he spent that whole first year really questioning what he was doing and where he was going to end up.

In frustration Zack decided to look at other programs and discovered the Engineering Technology Program on his own. He never heard about it or really knew what it entailed. After looking at the curriculum and seeing what students did in the classes, Zack decided Engineering Technology was right up his alley because it was all hands-on and it was a family environment with everybody getting along.

Once Zack got into the Engineering Technology Program he spent a ton of time in the classroom. He found the actual design aspect of it most appealing. Students in the program were involved in designing projects from start to finish. Because of the comradery with other students in the program, Zack doesn't think there was ever a class he really didn't enjoy. It was a

meaningful experience to him because of those contacts, those people, and the relationships he made in the Engineering Technology Program.

Zack's education gave him the confidence and the knowledge to feel very comfortable in applying for engineering positions. He had obtained his first position in the engineering workforce before he graduated from Ideal Community College as an estimator and bid specialist for a concrete company. Zack graduated from the Engineering Technology Program with an Associate of Applied Science degree two years ago. From graduation to this point in his life, he thinks his education and degree had put him in a very unique position. Zack is currently a project manager and estimator. The position he holds ideally would require a bachelor's degree in Construction Management, but with his education and experience he was able to fill the position. Zack works for a heavy highway construction firm and he is in charge of all the asphalt and aggregate components of the company. He is an estimator during the off season and a project management during the construction season. As a project manager he deals with roadway projects. As a field manager he takes care of any office paperwork as well as being in the field managing projects from start to finish. He has been with the firm for more than a year and feels he is going to trying to stick with the company as a project manager or an estimator for a while longer. For Zack, the path that he took with the class work actually made it a very easy transition into the heavy highway construction firm. He believes with his educational background and degree he would be able to transition into any engineering firm.

Overall it was a phenomenal journey for Zack and a great experience. Without the associate's degree Zack wouldn't have had any of those opportunities that he obtained up to this point. His education and associate's degree has allowed him to enter the workforce right away.

He landed positions in engineering firms that would normally require a bachelor's degree. He thinks that speaks a lot for the Engineering Technology Program and degree.

Neil

Neil's journey started back in elementary school where he was really big into art, drawing, and wild life. Then Neil got more interested in drawings in 8th grade where he took his first drafting class. He believed his interest in engineering reflected back on his creativity. He saw everything in engineering as being pretty creative. In high school Neil designed a 3D flashlight by using the 3D plotter and CNC router. The class also built clocks and a couple other things that were more of mechanical designs.

When Neil finished high school he started looking into state colleges that offered something similar to what he did in high school, but no information was provided by the high school about any type of associate degrees in engineering. In the end Neil decided to study engineering technology because he was influenced by more opportunities and more money. When he was looking at the colleges throughout the state he decided that Pleasantville was just an overall better place for him to go to school. The college had convenient class scheduling and the opportunities in the Engineering Technology Program at Ideal Community College were much better than anywhere else.

Because of the class scheduling of the Engineering Technology Program, Neil was able to get an internship with the Bureau of Land Management (BLM) as an engineering technician after his first year in the program. It made him realize after one full year of college, just half way through the program he was able to get a job with good money doing something that he love to do.

Throughout the course of two years at Ideal Community College, he never really gave a second thought about the study of Engineering Technology. He liked how the program did a little bit of everything. Some things rolled into others as if it was almost a periodic table where at the bottom was all the basics and the more he experienced the higher the level he would go on the table. Neil felt the program had a great environment with all the guys he had class with every day, five days a week, four to five hours a day. They became really great friends working together in the same room, which Neil found very helpful.

Neil graduated from the Engineering Technology Program with an AAS degree three years ago and is currently an engineering technician that deals with 11 oil fields. A lot of what he does is a little bit of everything. He works with civil, mechanical, architectural, and electrical engineering. Every class that he took in the Engineering Technology Program reflects back on what he does daily in his career. He is working toward his third year with an oil and gas corporation. Neil did not know that he was going to enjoy his current job so much. It's still a new world to him even after almost three years.

Neil has great pride when he sits down with other oil and gas companies and he tells them all about his projects. They are amazed that he is the only guy working on all those projects. Other companies have teams of engineering technicians, drafters, and design specialist that work together to perform similar tasks. Instead Neil is the engineering technician that deals with eight facility engineers, two electrical engineers, along with many other technicians. In the next ten years Neil hopes to be in the same position that he is now and if things go right he wants to actually become a full engineer or a facility engineer.

Neil believes that with engineering technology you can use it for so many different career fields out in the world. Neil is very satisfied with the choice he made in life. Without the

education that he received he would not be in his current situation at all. He realizes that without an education he would probably be stuck cleaning up oil spills or helping a welder in the oil and gas industry.

Jack

Jack's journey into engineering began in elementary school when there was an engineer that came to his class and showed the students how bridges were constructed. To Jack construction seemed fun, building with your hands and being outdoors. Everything about engineering seemed to be an adventure to Jack. In junior high Jack was set out in his class with a straight edge, no.2 pencil, and just a piece of notebook paper to draft out projects and solve common problems. In high school he took some manufacturing and drafting classes that helped develop a better perspective of the engineering profession.

Jack's mom and dad supported him in junior high and high school, but they became less supportive as he got closer to going to college because they never made it to college themselves. It was Jack's high school instructor that pushed and recommended that Jack go to the Engineering Technology Program at Ideal Community College. Jack's teacher knew that money was an issue for his family. After graduating from high school Jack went to Ideal Community College to pursue his education. He wanted to go into the mechanical part of drafting and detailing. Jack thought it through and he wanted to become a mechanical engineer and he knew this was something he could do if he stuck with it.

Jack graduated from the Engineering Technology Program with an Associate of Applied Science degree one year ago. When he graduated from Ideal Community College it was a sad moment because he finished what he liked doing with people he liked being around. He didn't know what he was going to do next. He wanted to continue his education and earn a bachelor's

degree in engineering. South Dakota School of Mines accepted Jack after he graduated from Ideal Community College, but he still had money issues in his family. In the end he did not attend South Dakota School of Mines because he had to take a job to earn money.

Jack's transition to the engineering work force was kind of hard psychologically for Jack but it was actually a great step from college. His job has many classified titles, but it's mainly field drafting and detailing for an oil and gas company. He currently is drafting out the companies pumping units. College pretty much prepared Jack for what he had to do for the company. He has been with the company for a year, since he graduated from Ideal Community College. Right now the company is new and starting many new ventures and Jack wants to grow with company.

Jack's job created an economic a monster. Economically it has made him stable with cash and made him wiser about money and finances. His financial woes have seemed to subsided with his job. Jack essentially ended up where he wanted to be and doing what he likes for a career. He would recommend the program and the college to anyone looking to get into the field of engineering.

Brad

Brad knew since he was a kid that he would grow up to become an architect or work in some sort of architectural field. He was always doing some crazy contraptions that would drive his parents crazy. His other pastime was to go to the grocery store to get real estate magazines and look at houses. Frequently Brad and his mom would build wood projects together. He would draw and design while his mom built because she has always been really good at constructing projects.

Brad knew drafting was a big part of what he was doing with his mom. In high school he was able to take the drafting and construction technology classes. He really enjoyed it, but then he fell off the ball with his classes. Brad did not have any ambitions to go to college and had no real drive to do anything but work from 9 to 5. In the end it was a miracle he graduated from high school on time and he would say he was absolutely at the bottom of his class.

Then Brad started to see all his friends having a good old time in college, meeting new people, and just having good experiences. That's when he decided to go to college and after looking at different colleges he found the Engineering Technology Program at Ideal Community College. He decided it was what he really wanted to study. At the time Brad didn't have too much of a perception of engineering, but the Engineering Technology Program looked like something he would be interested in because he liked to draw, he liked computers, and he liked to design. He believed the areas of engineering technology and architecture was interchangeable when it came to skills.

The Engineering Technology Program was the perfect learning environment. Brad enjoyed the friendliness, the openness of the program, and the facilities that were provided to the students. The classes had projects to work on and students would work on them together. Nobody really seemed to go separate directions because unlike other classes the students' interests were the same so everybody enjoyed doing their work alongside of each other.

Brad's favorite classes were the more hands-on learning where he constructed projects that were out of the box like the Robotics and Manufacturing classes. The laser engraver, the contour cutter, and the 3D printer boosted more interest and started new adventures for Brad that he really didn't foresee nor had any aspirations of before, but are now his favorite. He liked that

the knowledge continued to grow and was always able to apply what he learned from the very first to the last day of the class. This is what made Brad enjoy engineering as a hobby.

Brad graduated from the Engineering Technology Program at Ideal Community College a year ago, but he received his job before he graduated and been with the company a year and a half. The job wasn't necessarily on his radar at all when it came to a career field. He currently works for a railroad contractor that builds and restores railroad equipment. He works on anything from a miniature steam locomotive all the way to an 80 foot passenger car. He does enjoy his current job but it is not what he pictured himself doing. In his job Brad does a lot of reverse engineering which he really enjoys. It wasn't much of a transition at all because it was exactly what he was doing at college. For Brad it was really just a change of environment and not as much of a transition. He finds his job very rewarding and it made him want to pursue more design, assembly, build something from nothing, make it do something else, or make it function again.

Brad's education didn't narrow the possibility of what he could be in the engineering workforce. Instead it grew with opportunities that were a lot different than he thought. Even though he didn't know a lot about the engineering field, he definitely would not have changed any of his experience. With engineering technology the sky is the limit and if he can imagine it can be done.

Nate

Nate's educational journey and career path started during junior high in a drafting class. Nate really started to get into it more in high school when he started working with CAD software. He liked architecture but wanted to do more mechanical design. In high school Nate

was involved in the Skills USA program which really boosted his confidence in the engineering field.

His engineering teachers in high school had big influences that directed him toward an engineering career. They helped Nate by telling him about what companies did and the type of information he would have to learn to be part of those companies. The career opportunities are what really convinced Nate to go into engineering. But Nate did not like the state university engineering program and decided to transfer to Ideal Community College and into the Engineering Technology Program. He felt a lot better coming into the Engineering Technology Program than he did with the state university engineering program. His engineering teachers at Ideal Community College just kept making everything new and interesting every time he came to class. He felt he learned something new every day.

Nate made several friends going through his classes which he still talks to today. The Engineering Technology Program at Ideal Community College was fun, easy going, and a good learning atmosphere where everyone was helping each other. This created a good environment for Nate to learn. The Manufacturing class was Nate's favorite because he got to work with the different machines like the prototype machine, the laser engraver, and the contour cutter. Nate really enjoyed doing 3D models because he got to make models from different parts of drawings. Nate felt he learned a lot at Ideal Community College because it had a lot of hands-on learning. Going through the program he really didn't have anything that altered his desire to finish the Engineering Technology Program. It was a happy and a sad moment when Nate graduated a year and a half ago. He was happy and really enjoyed his experience of earning his associates degree and transitioning into the workforce. It was also the end of a chapter in his life because up until then he had always been going to school as far back as he could remember.

It was an easy transition in the end for Nate to go from his education to the engineering workforce. Shortly after he graduated he got a job with a railroad contractor doing CAD drawings and 3D models. He pretty much jumped straight into the job and stayed with the company for eight months. Nate didn't enjoy his first job with the railroad contractor mainly because of the people at the company. He wasn't enjoying his job as much as he would have liked, so it altered his desire to continue working in the engineering field. But once an international engineering firm offered him a job, he started to enjoy it again and want to stay in the engineering field.

The international engineering firm offered Nate a lot better benefits and pay. Currently Nate is an asbestos air monitoring specialist and building inspector. He has been with firm for less than a year. He works with CADD to construct as-built and abatement location drawings for buildings. Nate likes his current working atmosphere because he has good coworkers as well as fun in what he is doing. In the company Nate has the possibility of moving up the chain because the engineering career field as well as the company is so diverse. He is always learning something new every day about his career and that is one of the things that makes him want to stay with the firm. The big thing for Nate is that he enjoys his job. He thinks that's what everybody wants. To make money doing something they enjoy. Nate thinks it has been a pretty good experience. He has done well in his academic career and it has prepared him to start his professional career. He has found out that his education has diversified his career opportunities.

Eric

Erik never really thought too much about engineering at a younger age, but he enjoyed working with numbers. He excelled at math so he thought that a career that worked with numbers wouldn't be bad. So in high school Erik decided to study engineering, but in high school

nobody talked to Erik about the different types of engineering careers. What he learned about engineering was on his own up to that point. He pretty much assumed and guessed about the various engineering fields.

After graduating from high school Erik went to the state university to study mechanical engineering, but after some classes changed his mind and decided against it. He wasn't sure where he really wanted to go but ended up transferring to Ideal Community College. Once he found the Engineering Technology Program it started to change for Erik. He became excited more than anything because he felt lost when he left the state university engineering program. Other than going into an engineering profession, Erik felt at a loss about what to do for the future. Any other type of job just didn't appeal to Erik.

The promise of having a career after college or being able to get a further degree seemed like a very promising way to go for Erik. If he wanted to get a job immediately after college he could or if he wanted to pursue his education for a higher degree he could as well. Balancing work with his classes was hard sometimes, but his experiences in the classroom were pretty good. The Engineering Technology Program and the classroom had a great atmosphere. The classroom always felt positive because everybody always seemed pretty happy to be there in the classes and enjoyed what they were doing. Some other classes at the college Erik felt like he was sitting there for no reason and not getting anything out of it. But he honestly did not feel that way in the Engineering Technology classes. Erik thinks just the overall environment lead him to believe that he was moving in the right direction.

Erik enjoyed regular drafting because he was actually drawing and creating projects with his hands. It takes more skill do draw it on the table than to draw it on a computer. His experience really felt good and he never had a bad experience in the program. He was really

happy in the decision he made about which career to study. Erik graduated from the Engineering Technology Program four years ago. When Erik graduated he was sure his parents were happy. He felt a lot of happiness as well, but also pride. He would never change his experience for anything.

Going from Ideal Community College to the workforce wasn't a bad jump for Erik. He works for a state transportation department and has been there since he graduated from the Engineering Technology Program. When he started he wasn't surprised by anything. Really it was smoother than he anticipated. The first year with the state department he worked on bridges. He got to detail and put information on bridge plans. He enjoyed it and it has made Erik feel comfortable in his decision because it really opened his eyes to all the technology and techniques of the industry. He discovered how the industry operated and built projects. He learned an extreme amount of information in his fabrication inspection position.

Erik's current job is a CAD support specialist. He got all his skills he needed for the job from Ideal Community College and his previous positions in the department. It's a support job for the state department. He figures out software, network, and some project issues. His work can be stressful, but it is not always that way. It was different going from a position with little to a lot of responsibilities all at once, but it felt good. One of Erik's favorite tasks he gets to do in his job is creating displays for the public. He also gets to make some projects in 3D which encourages him to stay in his career.

The career path and the program have provided Erik with an independent lifestyle but it's also given him a job where he doesn't rely on anybody else. His education has provided him with a job that pays fairly well, takes care of him, and allows him to afford what he needs in life. Erik's recommendation to future students is that it is a very smart career path. It's something that

will always be needed in the country, somehow, some way. It's a lot of fun and it's very rewarding.

Dan

In high school Dan was just a skate boarder and that was all there was to him. That's all he really cared about and nothing else really caught his attention. In high school all the students took a career test. The test indicated he should be a border guard which he did not find interesting. Dan went and talked to career counselors about what the test indicated, but that was basically the end of him planning his future.

He really didn't think about engineering for a career. He never had any drafting or construction classes in school. It wasn't something he talked about in high school. After high school Dan ended up making cabinets until he started having some health issues concerning his sinuses. He couldn't work in the woodshop anymore because the dust started to hurt him and give him constant headaches.

He worked down the hall from the Engineering Technology Program and saw the drawings on the wall all the time. That's how he knew about the drafting classes at Ideal Community College. Looking at those drawings gave him an idea that he would be able to draw those types of drawings. Dan thought there would be more opportunities in the engineering technology field. With the desire to get back into woodworking, Dan saw those drawings as a way of getting back into the cabinet industry, but without the dust. A lot of the woodshops he worked at had a draftsman who did their plans for the cabinets and restaurant furniture.

Dan was excited about everything. He was excited to learn more. It kind of reignited his desire to learn. There were so many good people in his class who were enjoyable to talk to and be around. If he had a problem they were more than happy to help him with it. When he came

across a problem that he felt he couldn't get on his own, either the instructor, the teaching assistant at a time, or one of the other students in the class would have an idea of how to help him. The instructor of the Engineering Technology Program along with other instructors from the college had a big influence on Dan. They impacted his desire to finish his education and complete his degree.

The Architectural drafting class is when Dan really got a taste of what a drafting and detailing job might entail. He also worked on his own designing the house for the Construction Trades Program. It made him believe that he would be able to do the work once he got hired in the engineering workforce. It gave him the belief that he might be able to succeed in life and that there was hope for the future. To actually complete his education was a good feeling. He accomplished his goal of obtaining his AAS degree. Based on his high school experiences he didn't think he could actually achieve it.

Dan was still at college when he accepted a part-time position at the state transportation department. When he got there he started to realize how much of it changed because anymore it's not a draftsman the department is hiring. He became a full time employee after he graduated from the Engineering Technology Program. Now Dan draws bridge, culvert, and scenic structure plans. He draws the plans for the repair work as well. This involves tracing the original set of plans to show removal and new construction details. He is also responsible for checking the plans of other detailers and consultants. There are occasions where Dan goes to inspect bridges and culverts to find out what exactly the department needs to do to fix any problems so he can put the information in the plans.

Dan believes that the engineers' workload has shifted to the draftsman. Dan has been in his current position with the state transportation department for eight years, since he graduated

from Ideal Community College. Dan is not sure he would have a life without his education and degree. For the most part all of his experiences have been good. Just because he thinks he can't do something doesn't mean he is not going to try. He gave it everything he had and not only did he complete his education with a degree, he completed it with a pretty high grade point average.

Joe

In his senior year, reality hit Joe that he was going to have to make some life decisions real soon. At first he thought he could bunt that particular ball by a couple years by going on to college and then figuring out a plan. But then he saw some drawings taped up on the walls in his high school. That got him looking at the profession of engineering. He talked to the high school teacher who gave him a good idea and perception about engineering. But nobody mentioned or even talked about the engineering path containing so much math.

The atmosphere in the high school engineering classes was laid back. The planning was very precise and organized. It just seemed like it was an excellent combination for Joe. During his senior year his teacher took him a side and mentioned that if he was heading to college he would be well advised to look up the Engineering Technology Program at Ideal Community College. But there wasn't really much literature about it, just word of mouth.

Joe knew immediately where he wanted to go to college. There were no other programs at Ideal Community College that even caught his eye. He enjoyed the program very much. The laid back atmosphere really represented a lifestyle he wanted. It changed his complete lack of enthusiasm for education. Finding something that he enjoyed that still counted as education and a way to earn a degree that he actually wanted to do made him feel great. He could not see himself working or doing anything else. He thought it was a profession that if he worked hard he could make a living and support his family.

The Engineering Technology courses provided Joe with specifics about the different fields of engineering. Joe also thought the instructors were laid back about the direction of the classroom while providing a good overall impression of the various fields of engineering. He didn't feel rushed like he did from other teachers outside the Engineering Technology Program. There seemed to be a pretty good camaraderie among those in the program. A lot of the kids who were there didn't seem to fit in a lot of other places. He had a good time and it was a good place to come to unwind, to take his mind off other problems, and just focus on his work.

Joe's favorite classes were the hand-drafting on the tables. It was one of the features that glued him to the program in the first place. Joe liked the academic freedom in the Engineering Technology Program. He was very free as to how to go about his work and he really liked that he could do design and create in his way, through his own procedures, and still come up with a product that was of high quality. He thought the design, creation, and construction of the product didn't matter as much to the final product. Being able to do it his own way and still end up with a final product that was not distinguishable from anyone else in the class did matter.

Joe enjoyed his college experience very much. Overall he would say his experiences were very good. He was not overly sure that his family was confident with his decision to pursue Engineering Technology in the beginning, but he thinks in the end it all turned out very well. His family was a little concerned if he would be able to make this into a career, but they were pretty relieved that he had found something in life to work towards and they really started giving him more support.

Joe found a position opened in the civil drafting section of the state department. He has been with the agency since he graduated from the Engineering Technology Program at Ideal Community College six years ago. Currently he creates details for the state transportation

department regarding the construction of bridges, culverts, and sign structures. Some of his projects are more interesting than others, for example there are Antelope bridges so that the Antelope can cross the interstate without having to touch the pavement. Joe found the further he went and the more complicated the details the more the more he learned. He receives tons and tons of data and it takes months of collecting the information just so he can start drawing plans and details. While Joe did some GIS classes in college where he focused on GIS data and surveying, he didn't realize how much of that information he was going to be using in his current position.

He always knew this was the profession he wanted to do. The longer he worked the more artsy it became to Joe. He wouldn't have done it any other way if he had a choice. Even if he couldn't work in the field professionally he would still do it on the side, so he could still tinker with it.

Matt

Matt had his first experience of engineering in junior high when he took drafting and shop classes. Most of his high teachers didn't really treat him like a person at all. This is one of the major reasons that Matt did not finish high school and instead opted to get his GED and go on to work. He went into the field of construction where he has known it all his life and worked in it for 35 years. While he was at work, he mostly liked roofing and spent 24 years as a roofer. Matt knew roofing, but he felt he needed to move on after 35 years to something that would be better for him and his family.

When Matt was talking about getting out of the roofing business and going into a different field, his brother and cousins suggested that he use his roofing background and get into engineering and designing roofs. He talked to an architect that said it would be a good idea and

he would be willing to hire Matt once he acquired his education. His knowledge would be very beneficial since he knew a lot about roofs before he entered the engineering field he could design complex roofs that could be built.

The major reason that Matt selected Ideal Community College was that he couldn't afford quitting his work to go to a university. He selected the school mainly because he's married, has kids, and couldn't quit work to go to a university so he decided to go to Ideal Community College to start his education. He decided to take the engineering and designing aspect because he liked to work with his hands and figured engineering technology was as close as he could get with working with his hands and building projects without getting dirty.

Matt thought the Engineering Technology Program had a relaxing atmosphere, it was enjoyable, and he met good friends. The class helped each other, they joked with each other, and they ate pizza together on special occasions. The times that Matt had in these classes were fun. His favorite class was the AutoCAD Architecture. Everybody dreams about owning and designing their own house. This course gave Matt creative freedom in his design. The experiences that Matt had at Ideal Community College and the Engineering Technology Program was good.

Graduation was a big moment for Matt. It was a pretty proud moment for him since he is now the only one in his family that actually has a degree. Financially, Matt wouldn't be where he is now or as comfortable without his education and degree. The degree has increased his wages and helped him get half of things that he owns today, especially his recreational toys.

While he was going to school Matt was hired as a drafter at an architectural firm so he was already in the workforce while he was going to school. When he got through his engineering degree the firm bumped him up to a project manager and roofing consultant. Matt decided not to

continue his education any further because he couldn't afford the cost and would have to quit work to go to a university. He just couldn't afford to go to school with a family.

Matt is currently a project manager for an architectural firm. He design roof systems and goes out and ensure the roofs are constructed properly. He had no idea that he would be made into a project manager. Everybody else at the firm has a bachelor's or a master's degree. He is the only project manager in the office that does not have a bachelor's degree. He is pleased with the job and the firm. It was a combination of the job he got offered and seeing how everybody in the office worked together to create the same type of atmosphere he experienced in his Engineering Technology classes.

Matt believes there are a lot of opportunities in the engineering profession. The education he received gave him the basic information he needed to do his job and he felt he was prepared for the work he does at the architectural firm. If Matt did not have his education or his degree he would still be working on roofs in bad weather. If Matt could have changed his educational journey, he would have started a whole lot sooner, right when he got out of high school.

Doug

Doug was assigned technical education classes in junior high school. One class was a shop class and the other was an architectural class. Not knowing the classes was just one of the adventures he followed, liked, and decided to stay with it. The classes got him interested since he really liked drawing houses and constructing blueprints. He followed that area of study all the way through high school. Just the experiences Doug had back in high school made him like drafting. But he never pursued it after high school. He dropped out of school and went straight into the Army.

Later in life Doug started coming down with an illness and thought it was time to do something that would be easier on his body. He went to Vocational Rehab and they talked about sending him back to school. His first thought was going into Engineer Technology. That's when he decided to go back to school and study architectural and CADD. Doug knew it was time to go back to school and try it again.

Doug decided to go to Ideal Community College in Pleasantville because he had easy access and it was something that he could do in his own time. At first he was scared because he had not been to school in 20 years, but he found that the Engineering Technology Program was a good environment with decent size classes. The class sizes really helped him to get into group discussions with other students in the class.

Doug always enjoyed drawing and being in the classes with that type of atmosphere. The all-around atmosphere was good because everybody in the classes seemed to have the same interest and was willing to help each other. It didn't take much to get and keep him involved in class because it was what he wanted to do. He just really liked the classes and looked forward to learning.

A lot of the classes were important with different information, different computer classes that all integrated into one. The way the Engineering Technology Program was constructed kept everybody's interest and the instructor helped keep their interest as well. The way the class projects progressed kept Doug interested and he never had a second thought of even stopping.

Although Doug was out of school for so long, his all-around class experiences were great and he thought his education went great as well. He was very happy with his education and the program he went through. He thought it was great to be able to go through the Engineering

Technology Program and graduate from Ideal Community College. Doug graduated from college four years ago.

Doug dropped out of high school, but to actually go through and complete the classes and the associate's degree meant a lot to him. For Doug it was an accomplishment. It took him an extra two years but he did it and it was something that he always wanted to do. He is happy he has the knowledge that he can apply to his career.

Doug is currently the lead carpenter for a building firm. He has been with the company for the last three years. He does a lot of building from blueprints and uses a CAD system for constructing, changing blueprints, and updating different details on projects. At his previous job Doug worked for an international infrastructure corporation developing new housing projects in the Pleasantville community. He designed the company's warehouse to store equipment and supplies. Doug didn't realize how diverse the field of engineering had become. Doug enjoys the facets of engineering. He enjoys sitting and thinking of new designs to develop instead of somebody else's contraption.

Doug was all in all very pleased with his educational experience. If he didn't get his degree he would have probably let himself down for not doing it. He acknowledges that he would have never been able to do what he does without information from those classes. It's helped him on many different occasions. Doug wished it was something that he would have started his education years earlier.

Val

At a young age Val had an idea about engineering. He grew up in Silicon Valley California and both of his parents were engineers for Lockheed Martin. But when his family moved to Washington he found himself in more of an agricultural environment. The pursuit of

engineering in high school was not an option. The high school curriculum was geared more toward entering the military or a blue-collar profession. Val focused on construction and plumbing while he was in high school and when he graduated went straight into the plumbing industry.

After spending more than two decades in the plumbing industry Val's significant other found him struggling getting out of bed one morning. She pushed and motivated him to go to school. He felt very fortunate that his significant other had the resources to support him going back to school. So Val went to the closest community college and was looking to study either civil or mechanical engineering.

Val enrolled in the Engineering Science Program at Ideal Community College, but after two semesters of Engineering Science classes he decided he needed a little bit of a distraction to take his frustrations off his mind. That is when he discovered the Engineering Technology Program and took a MicroStation class. Val liked the class because it was an individual study class and he was able to move at his own pace. To Val the MicroStation class broke the ice for the Engineering Technology Program. He felt he found a program that had a more conducive environment for him to learn.

Val thought the Engineering Technology classes were smaller and relaxing, but not in a disrespectful or unserious way. He thought the students in the classes had a healthy competitive attitude about them, but nobody was ever beat down or left behind which Val found encouraging. The classes that Val enjoyed were Architectural Design and AutoCAD 3D. He liked those classes because he was making 3D models which he thought were a lot of fun but challenging.

In Val's experiences at Ideal Community College he thought it was hit or miss with instructors. He acknowledges that there were some fantastic instructors there, but it wasn't 100%

of the time. While he thought his academic advisor was not very helpful, he thought his Engineering Technology instructor was very different and helped him in his journey through the Engineering Technology Program. Val found his experience in the Engineering Technology Program to be fantastic and an overall positive experience at Ideal Community College.

While Val was in the Engineering Technology Program he got an internship and that is when it hit him that the program provided him skills that were marketable in the engineering workforce. Transitioning from a blue collar career into a white collar profession gave him a sense of accomplishment. When Val graduated from the Engineering Technology Program he became a mechanical designer for an engineering consulting firm and has been with the firm almost one year. Architects typically will give him the blueprints for a building which is an empty shell. It is his job to put in all the utility services that make the building work. This includes sewer and domestic plumbing, electrical, and HVAC.

Val's transition from the Engineering Technology Program at Ideal Community College to the engineering workforce was remarkably easy. Although his work is not exactly what he set out to study and do, he was happy with his current job and career. Val was tickled pink that his was able to find ample employment in an environment that he found surprisingly pleasing with his two year degree. He likes where he is working and what he is doing. His days fly by really fast.

While Val enjoys his job in Pleasantville thoroughly, an employer has offered him a position with the same responsibilities for more money for an engineering firm in New Zealand. He believes it is too good of opportunity to pass and is currently getting his work papers in order. Val would wholeheartedly endorse the Engineering Technology Program at Ideal Community College.

Sara

Sara never talked to a career counselor or high school instructor about studying or having engineering as a career, so she didn't have much of a perception of it until she went to college. She took a drafting class in college because she needed a class to make her a full time student. At the time Sara was going to school for something totally different and was like, *"Okay I'll take that, that sounds fun. How hard can it be?"*

The class reviewed and did everything from the textbook. She didn't know what she was drawing until she was done. She was like *"oh wow, that's what I just made."* It was cool and she just loved doing that sort of project. She loved drafting and she knew then if she ever got the chance to go back to college full time, that's what she was going to study.

Sara decided to go to Ideal Community College because it was local, lower price, and she didn't want to go all the way to the state university. She already knew she wanted to study drafting of some kind. She was interested in architecture and she knew she could learn about it in the Engineering Technology Program.

The instructors she found the best were the ones who were relaxed and kicked back to an extent. She understands there has to be professionalism, but at the same time if the instructor is so uptight that the world is going to end with one mistake makes a difference in the classroom environment. It was good to be able to sit, talk, and go back over information the class learned. Sara doesn't think if she attended the state university she would have had the same experience. She doesn't think the classes are small enough to have that type of atmosphere and she wouldn't have had a chance to get to know everyone in class. For Sara it just made it easier, more relaxing, and she didn't feel so uptight.

Sara thought there was a lot of good instruction in the classes. There were a lot of the times where she came in to work on assignments and there was always somebody available to help. Whether it was another student or the instructor, somebody was always there if she was lost or confused. She thought everybody worked together in all of their classes.

She enjoyed a lot of her classes she had outside of the engineering section as well. One of her algebra instructors was really good at giving the class practical uses for the information they were learning. The instructor knew that when they walked out the door they would probably forget about it so she related the information with the field the students were going into and she did that with all of the students which Sara thought was pretty cool.

Sara found it interesting learning all the different fields of engineering. She didn't have one bad class. She enjoyed all of her experiences. She graduated from the Engineering Technology Program at Ideal Community College almost 10 years ago. Her graduation gave her a sense of pride.

Sara works for the state transportation department and her technical position is office support specialist. The job that she has right now is the first legit job she ever had. She wanted this job just because it was diverse. It was pretty exciting. She works on a huge variety of things because she does CADD work, office work, as well as training. She doesn't do any buildings, but she does a lot of drafting, a lot of CADD work. At one point she was helping to instruct the MicroStation CADD program for all of the agency employees and now likes teaching.

Sara feels that her education and degree have gotten her quite a ways in life. She loves her job. She doesn't find it as a job per se. It is not taxing. To her it is a fun thing to do. Before Sara got her degree her past jobs were working as a cashier in a minimart, waiting tables, and home day care. She was making minimal money each month and her husband was working full

time. She remembers that she was making $500 a month and now she makes well over that. Her education and degree gave her family a lot of stability because now she has a nice job and career. Overall she thinks it was a really good experience. She absolutely enjoyed her experiences and would do it again, but she would have made some changes. She would have probably started studying engineering technology a little sooner than what she did because she was in her 40s when she started.

Rick

Rick was in his late thirties. He had a successful small business and could have kept on going with that business, but he couldn't see himself in his late sixties still doing the same kind of work. It was a furniture repair and refurbishing business that he owned. There were some financial factors with his business that played into his decision. There was no retirement and no health plan. He knew he had to get an education and he needed to pick out something that could effectively get him working in the workforce after graduation.

Rick decided to go into engineering technology because his wife had an Engineering Technology degree and she had a very enjoyable position in a career field that fit her very well. He decided to follow in her footsteps and do the same thing because he considered his wife to be very successfully in her career path. Rick's previous experiences virtually offered nothing in preparing him for studying engineering technology. Other than doing drafting in high school, which was required for the woodwork courses he would say his high school experience really didn't help him prepare to study engineering technology.

Rick knew engineering technology would provide him with a career opportunity, but he didn't necessarily have in mind what field he would end up in. He thought once he got to that level of education with the degree, he would be competent in diverse types of engineering career

fields. Rick felt fortunate because his wife was willing to support him while he went to school so he didn't have to work. He decided he would go to school in his own hometown to get his associate degree at Ideal Community College. The environment was really great. The courses had a good atmosphere to learn in, even if it was someone like Rick who was in his late thirties going back to college.

The instructors were very positive and when he asked questions or when someone needed help there was someone who could help. Rick made some nice friends while he was in the program that he could ask for help and he still asks today. Instruction was really good, especially in math, drafting, and business courses. Rick liked that all the drawings started with pencil and paper, and then went on the computer with AutoCAD. He really enjoyed the AutoCAD classes since it made him feel really creative.

Rick did an internship with a geo-tech firm. He did compaction tests on soil, lab work on asphalt, soil, and concrete. It was okay for his first internship. He did another semester of an internship at Layton County where he did construction inspections and checked the depth of pavement on new roads. After the semester at Layton County it totally changed his idea about what he wanted to do. He discovered what area of engineering he wanted to work.

For Rick it was an all-around good experience. He was very pleased about his experience when he graduated from the Engineering Technology Program at Ideal Community College. He felt his hard work brought a lot of happiness, satisfactions, and confidence. It was an achievement for him. Rick graduated from the Engineering Technology Program nearly ten years ago. When Rick got his job at Warner County, he was extremely satisfied. Rick had the job with Warner County since he graduated from Ideal Community College.

Recently Rick became a construction inspector for the Layton County government. When he got the job at Layton and it was sort of icing on the cake because it was where he had his persuasive internship. As an employee of Layton he inspects construction jobs, materials, and workmanship. He is often in charge of coordinating phases of the job, working with contractors, material suppliers, utility companies that have their services within the construction zone, and he solve any problems that arise within any of those identities during the project.

Rick would say that his transition to the engineering workforce went pretty well. He would say his transition if he had to rate it on the scale of 1 to 10 was probably 7. It was mostly good. Fortunately for Rick it has been a very good choice and he feels really good about his decision to study engineering technology.

Summary of the Participants

Fifteen synopses were shared in Part 2 of the chapter. The introduction began with a snapshot of the lived experiences that influenced each of these participants to study engineering technology at a rural community college, their experiences in the Engineering Technology Program, and their experiences as they transitioned into the engineering workforce. This context provided the lens through which each participant viewed their education and their world of work. The introduction included descriptions of positive experiences that made the participants interested in the engineering technology field, what help keep the participants interested in the Engineering Technology Program to complete their degree, and the participants' experiences as they transitioned from college academics to the engineering workforce. The introductions create a "persona" for the participants' voices that emerge in the next section. In this sense each synopsis provided the reader a context for understanding the lived experience of the graduates

who entered the Engineering Technology Program, earned an Associate of Applied Science degree, and then transitioned into the engineering workforce.

Part 3

Introduction to the Structures

The structures presented in this chapter describe how the phenomenon of entering the Engineering Technology Program at Ideal Community College to obtain an Associate of Applied Science degree and then transitioning into the engineering workforce was experienced. Five structures emerged from the transcripts in my analysis of the data. The structures were Perception and Experiences of Engineering Technology, Captivation of Engineering Technology, Significant Influences and Relationships, Value of an Associate of Applied Science degree in Engineering Technology, and Transition to the Workforce. In the following, I use the voice of the participants as they experienced the phenomenon to assist the reader in understanding how each structure framed their lived experience.

Perceptions and Experiences of Engineering Technology

There are two key themes to understanding and making sense of an event. These two themes are experience and perception. An experience is the way an individual consciously encounters, observes, and participates in an event that has occurred. Perception is the way an individual thinks about, notices, and understands the event. Putting these two themes together creates meaning for an individual. A good example is an evening out at a restaurant. If someone experiences good service and great food the individual's perception will be that it is a good restaurant and will more than likely recommend the restaurant to other people. If someone experiences bad food and bad service the individual's perception of the restaurant will be not to

eat there again and probably warn other patrons. Perception and experiences is the first structure that emerged at various points along the participants' journey.

These themes play a role in whether we continue or conclude interacting with a specific event. In this study these themes materialized in three different intervals. These intervals occurred prior to college, during college, and after college when the participants were in the workforce. When the participants reflected over their experiences, it gave them notions of what they would change to give them a better experience in the Engineering Technology Program and better perception of the field of engineering. I will address these intervals in order.

Perceptions and Experiences Prior to College

In examining the participants' perceptions and experiences prior to college, two major patterns emerged from the data. The first pattern to emerge was that the participants who experienced a form of engineering in the public school system characteristically occurred during junior high in a drafting or woodworking class offered in the technical education department. Of the participants that experienced those types of classes there were certain characteristics of the classes that were appealing. The participants reflected on the classes' learning approach as being hands-on in constructing projects. The second pattern to emerge seemed to be the absence of a career or guidance counselor in high school. Participants also expressed that in the absence of career or guidance counselors, their teachers could not or did not communicate relevant information about how the education the participants obtained related to the professional working world or provide realistic problems for the engineering profession. In the following section I will address these patterns.

Many of the participants first discovered a form of engineering in a drafting or woodworking class in the technical education department of their junior high school. But what

appears to make this area of study appealing to many of the participants was the hands-on learning environment. The hands-on learning environment gave the participants the ability to put theory into practice by allowing them to learn through the experience of constructing projects. It became even more apparent that as the participants moved beyond their first experience the more interested they became and the more they enjoyed the subject. The more they enjoyed the subject the more immersed they became with the technical education classes. Zack indicated his technical education experience in the following statement:

> *I enjoyed the mathematics and trying to figure things out and build things, construct them.*

As the participants progressed from drafting tables in junior high to computers in high school they seemed to become even more infatuated by the various software used in the engineering industry. This sentiment was supported by Mike with the following statement:

> *I got into high school and we actually had the opportunity to work with a lot of CAD software that professionals were using.*

For many it seemed like a natural progression from the drafting tables to the CADD programs. The participants found the CADD software exhilarating because the software helped build, design, and plan out projects which was a bigger concept of engineering. Before on the drafting tables the participants could only draw up projects in a two dimensional drawing and could not see the final product until they constructed it. But with the CADD programs the participants were able to design, construct, and visualize the project in three dimensions before they even started constructing the project. The participants found it amazing that they started projects with pencil and paper and progressed to three dimensional software to look at the project before they even built it. Many of the participants explained that being able to visualize this process helped them see improvement in their progress from where they started to where they ended in high school.

High school years are full of excitement, growth, promise, and hope. It is the time when students begin to discover what the future holds for them. High school career and guidance counselors enhance the learning process and promote academic achievement by counseling students to achieve personal growth, acquire positive social skills, values, set appropriate career goals, realize academic potential to become productive contributing members of the community by studying appealing programs in high school. It is in high school that the transition into adulthood begins with an introduction to the world of work and where students start honing, exploring, and defining their future profession. Students are deciding who they are, what they want to do, what they do well, what they will do, and where they will go after they graduate from high school. Career and guidance counselors help students evaluate their strengths, skills, and abilities to find a suitable career to study or profession to enter. Students need guidance and information for making decisions relating to college or entering the workforce and career and guidance counselors are the gate keepers for this transition.

In this study the pattern emerged that this process did not occur with a large portion of the participants. Nearly all of the participants do not even recall talking to a career or guidance counselor prior to graduating from high school. So many of the participants in this study did not have any information about the engineering profession, the earning potential, or what could be accomplished with the knowledge they obtained from junior high and high school. For the participants who did not have any technical education classes in junior high, many did not have an idea and made assumptions about the various engineering professions. When asked *how did you come up with the idea of what architects and engineers do for a living* Erik replied with the following:

I don't know, I guess it was all made by assumptions.

Some of the participants learned about the various engineering fields on their own. The participants assumed and guessed what the engineering fields were about. Even in the high school classes' participants don't recollect talking about the profession of engineering or going to college to study engineering, but many participants remember seeing T.V. advertisements for studying civil, mechanical, or manufacturing engineering which were four year engineering programs. Nearly all of the participants do not remember talking to a career or guidance counselor about an associate's degree in Engineering Technology. Due to the lack of information this left a lot of room to be mistaken about many engineering professions. The following statement by Zack supports the misconstrued concept of the engineering professions:

> *You come out of high school and think that all you need to do, or all you want to be is an engineer. Not knowing that you can be an engineering technician. And do the same engineering stuff, and probably be more of the stuff you feel you'd do as an engineer, but not realizing that the actual engineering technician is the hands on work, and the one who gets to design stuff and everything else. While an engineer verifies numbers and everything.*

In examining all the participants' interviews, only one recalled talking to a career and guidance counselor. In his experience at high school all the students took a career test. He had to talk to the career and guidance counselor to find out the results of the test which indicated a career he had no interest in learning about. Beyond that the career and guidance counselor offered no additional information about other careers or professions and he never talked to the career and guidance counselor again. That was basically the beginning and ending of the participant's planning for his future with the career and guidance counselor.

Since the career and guidance counselor process was missed by so many of the participants, they had inadequate or a piecemeal perception of the engineering professions. With the lack of information or no information at all about the various fields of engineering coming from the career and guidance counselors, the participants pursued an assortment of different

directions after they graduated from high school. Many of the participants went into retail, construction, or the service industry while other participants decided to go to the state university to pursue their education. But in retrospect the participants' pursuits were rather directionless.

After a career and guidance counselor, students' next best source of information about a career or profession is their high school teacher. In the world of education teachers develop students' knowledge, skills, and abilities in preparation of an education or a career after high school by providing lessons and projects that are realistic to working conditions of a profession. In this study this was not the case for some of the participants. Many of their teachers could not convey the relevance of the classes with the engineering workforce leading the participants to believe that there was not a worthwhile career in what they were studying. While some of the participants had discussions with their teachers about pursuing engineering career paths, it appeared to not be enough to help participants make clear decisions about pursuing engineering further. Because some of the participants' teachers could not convey information about the engineering professions, participants pursued alternate avenues for careers and education. It appears that since the bridge between high school and higher education did not seem to connect a large proportion of the participants in this study did not pursue engineering at all. With the exception of two participants, all the other participants of the study had to find their own way to the Engineering Technology Program at Ideal Community College. No information about the program came from the high school or career counselors.

Perceptions and Experiences during College

In examining the interviews, two patterns emerged as the participants entered and went through higher education. The reason I express this next step of the process as higher education is that some of the participants went to the state university instead of the community college after

graduating from high school. The first pattern that emerged is the participants found their perceptions from high school did not align with their expectations and experiences in higher education. The second pattern is the connection between hands-on realistic projects and continual building of skills, knowledge, and abilities. These two patterns are addressed in order in the following sections.

In any journey we begin with the process of putting one foot in front of another. The process of taking steps is having the expectation and familiarization of the landscape to decide where the next foot hold should be in any step by step process. Moving from adolescent to a career minded member of the community is a step by step process where an individual goes through junior high to high school, graduates from high school, goes through higher education, graduates from higher education, and pursues a career in the community. In this study there appeared to be a missed step between the participants graduating from high school and going into higher education to pursue a career. Participants who had previous experiences and perceptions of engineering from junior high and high school discovered their perceptions of engineering did not align when they entered higher education. Participants expressed that they had different expectations or did not have any expectations at all which caused a disruption in their educational journey.

While many of the projects that the participants worked on in high school were hands-on, there appeared to be little relevance to the field of engineering. A lot of the high school projects focused on "out of the box" material and it was difficult for the participants to relate their projects to real world applications. The following statement by Robert demonstrates this perception:

> *The high school class that I had, it didn't seem like a real world application. I mean I suppose it could be considered so. He had us doing things like designing a tennis shoe.*

> *You know, just from designing a tennis shoe to a house that seemed more real world, that's something I can be doing and making a living at rather than you know, building a shoe. That to me really did not fit.*

At first this pushed some of the participants to become disillusioned with the study of engineering and started to explore other options that were available to them for a career or education.

Other participants thought they had an idea about engineering professions after they graduated from high school and decided that they would enter the study of engineering at the state university. After entering the state university and experiencing the engineering science classes they decided it was not for them and questioned whether they wanted to continue studying engineering. These participants revealed that while the instructors at the university were very knowledgeable, they had great difficulty with the way the instructors were conveying class information. Instructors would stand in front of the class and just write on the board while students took notes. The instructors then would send students out to do homework and afterwards take a test. But working on homework that they could not relate to the real world made it difficult for the participants to conceptualize relevance of class information to the engineering workforce.

While there appeared to be a disconnect for the participants as they began their journey into higher education, many of the participants experiences and perceptions of engineering were enhanced as they started to explore engineering courses in greater depth to discover new technologies, methods, and concepts that applied to the world of engineering. Similar to when a building is constructed it starts with a strong foundation. The framing and shell of the building is constructed on top of the foundation. The roof of the building is constructed on top of the framing creating an umbrella for the structure. In the participants' journey there appeared to be a

strong attraction through real world hands-on projects that continually build upon and developed the participants' knowledge, skills, and abilities.

Many of the participants of the study expressed they really liked the way the Engineering Technology curriculum at Ideal Community College was created. Every class built upon previous classes allowing the participants the freedom to experiment and explore different ways to discover a preferred method to construct projects for the future. The following statement by Mike describes how he experienced the Engineering Technology curriculum:

> *The way* [the instructor] *built the classes and the way that the curriculum progress, I don't feel like we ever really transitioned between classes. I felt like it could be all one class, it just focused on different things each semester. Everything was so fluid between them but there was that big jump like, 'okay you learned all these, now we have to change gears to learn all these.' They all helped build on one another so it was very fluid and I think it was the best way to do it, but it's my personal opinion.*

One participant expressed that the Engineering Technology Program did a little bit of everything. Some of the class components just rolled into others as if the curriculum was almost a periodic table where at the bottom it contained all the basic classes and the more the students experienced the higher they would be on the table. The top of the periodic table would be a student's second year of the Engineering Technology Program. The following statement by Neil illustrates his experiences of the Engineering Technology curriculum:

> *I think the course set up between the two years, all helps within each other, starting out with AutoCAD all the way through Civil.*

One project that participants continually brought up in the interviews was a cabin they designed, drew, rendered, put on the computer, and made a three dimensional model of it using the laser to create a plexiglass cabin. Participants were able to indicate different components with different colors of plexiglass in their models. The participants were also involved in designing the project from start to finish and learning was all hands-on.

Some of the participants expressed they had a feeling of creative academic freedom to learn in the Engineering Technology Program. The participants said that they were given creative academic freedom on how to go about completing their projects. Matt expressed his interpretations of the creative academic freedom in the program with following statement:

It's more of, this is what I want you to make, make it.

This gave the participants the ability to do the projects their way using procedures they were comfortable with to produce a product that was of high quality. The participants believed that the construction didn't matter as much as the final product, but being able to construct the project one's own way while still producing a quality product that was not distinguishable from someone else's was the ultimate goal. Majority of the participants felt this approach to learning allowed them to construct the knowledge they needed to pursue their desired engineering careers.

Participants also felt that these real world hands-on projects gave them a glimpse of the many engineering professions. One participant reflected on his project of designing a house for the Construction Trades Program at Ideal Community College. Being able to see his project go from idea to concept to reality made him believe in himself and gave him an idea of what to expect in an architectural career. Dan demonstrated his feeling of accomplishment after seeing the Construction Trades Program build his house with the following statement:

> *But being able to make it through as much as I did on my own helped me feel more confident that I would be able to actually pull it off. I would be able to do the work once I got hired in the real field.*

Many of the participants reflected on many of their projects involving architectural, civil, mechanical, and industrial aspects, but what the participants remember the most through all the projects was being able to see the projects come from idea to finished product. Whether it was a house, a tool, a modeled part, or even a site plan, being able to see the finish product gave all the

participants an amazing feeling of accomplishment and a greater experience of what to expect when they transitioned to the engineering workforce.

Perceptions and Experiences after College

One of the largest steps in life is transitioning from college to career. What makes that step seamless is that the graduates experiences and perceptions of college are reflected in their new career in the workforce. What can make this last step even more secure is opportunity in the career field. After graduating from Ideal Community College there were two patterns that emerged from the participants' interviews. The first pattern that emerged is that their college experiences matched their workforce expectations. The second pattern that emerged is the diverse opportunities of the engineering technology career field. These two themes are addressed in the following sections.

When the participants of this study transitioned to the workforce their experiences were in line with the expectations of their chosen careers. But their perceptions of the engineering profession became much grander. Their perceptions started to expand as they started to gain experience with the many allied fields of engineering in their everyday work. The participants found that when they entered into the engineering workforce they were tasked to do a variety of work. Robert coined the phrase:

I do a little bit of a lot.

Participants found themselves doing a lot more than just detailing and drafting. Many participants found themselves being their department, company, or organization's jack of all trades. Some participants found themselves working in all the major engineering professions in their current position. Neil stated this is what he does at his current job:

> *A lot of it is a little bit of everything. I work with civil, mechanical, architectural and electrical engineering, so every class that I took within college reflected back to what I do daily within my career.*

Participants found themselves not just working in the field of engineering. Many found themselves doing many other tasks as well. Some found themselves performing construction and field inspections, material testing, metal fabrications, to even instructing large training sessions for employees of the organization. Many of the participants indicate they do variety of things in their everyday work.

Other participants found themselves in engineering positions that encompassed a lot of responsibilities. More responsibilities than they thought ever would have come with just an associate's degree. One participant found himself doing a lot of the same tasks as an engineer with a bachelor's degree except his work is all on the computer. He believes that the engineers' workload has shifted to the draftsman because in many cases it is easier for the drafters to figure information practically than mathematically. The following statement by Dan demonstrates the type of responsibilities he takes on in his job:

> *Anymore we're not draftsmen, we're design specialists which is actually what we're being called these days, because we're more than just putting it on a sheet.*

Some participants have found themselves sitting in positions that would normally be for an individual with a bachelor's degree. The following statement by Val demonstrates how graduates of Ideal Community College's Engineering Technology Program are in career fields that would typically require a bachelor's degree:

> *It's always like that. The most recent is the expansion for this* [commercial retail distribution] *center. I have the architect and the civil engineer on a conference call with them asking me how I had sized their roof drains and would I recommend a synthetic system.*

Val finds himself being amongst colleagues and coworkers who have bachelors and master degrees. The participants acknowledge that they are doing what they learned at Ideal Community College in the Engineering Technology Program. What they did not expect was how diverse their career choices would be. As they became more immersed in their careers, they discovered that there was a wide range of responsibilities as well as a wide range of opportunities.

Whenever there is opportunity and favorable conditions, there is a chance to grow and excel in any environment. The participants of this study expressed that they believe the Engineering Technology Program of Ideal Community College has given them the opportunity because the field of engineering is so diverse and dynamic. There are really good conditions for people to enter the engineering workforce. Many of the participants find themselves sitting in positions they never would have imagined for themselves. In this study the participants explained that the Engineering Technology Program showed many different ways the degree could be used along with many different industries the knowledge falls under in the world of engineering. There is just so much information a graduate could take from the program and go do several diverse jobs not only in the profession of engineering, but for jobs in many other technological fields that uses similar knowledge. This illustrates there is plenty of opportunity under current conditions that are favorable for future graduates to grow. Participants in this study have indicated based on their experiences that engineering technology is a very broad field and will continue to grow. The diversity of this degree is illustrated in the participants' engineering careers.

Change

Reflecting back on previous experiences helps us to move forward. Being human it is one of the ways we learn is by building a bridge between past experiences and future action. This

helps us step around pitfalls and achieve our goals for the future. Without reflecting back and looking at our history, we are committed to repeating our mistakes. That in mind it should be normal to look back and evaluate one's experiences. When the participants of this study were asked to reflect on their experiences and perceptions from high school to their current position in the workforce, many came up with changes that would provide them with better experiences. The changes were expressed in two forms. The first form being what the participants would have changed in their educational journey to their career. The second being the changes the participants would recommend for future students educational experiences based on their current perceptions of the engineering workforce. These changes are addressed in order.

While some participants expressed they wouldn't have changed anything, there were others who admitted they would have changed instances in their educational journey. Many felt this was their chance to share their hindsight moments to help create better experiences for future students studying engineering technology and a better perception of the engineering workforce. The following are the expressed sentiments that the participants wished they would have done differently.

Even though there were many experiences the study's participants wished they could have done differently, the most notable sentiment of regret is they wished that they had started a lot sooner in the Engineering Technology Program. This is illustrated by Sara in the following statement:

I think if I knew then what I know now I probably started back in my 20s.

Other participants wished they focused more on engineering technology in high school so they would have been prepared to study it at Ideal Community College. The participants believed if they would have had a better concept about the study of engineering in high school, especially

when it came to engineering technology, they would have started their college education without delay. If their high school programs were more flushed out they would have had a better idea of what was available to learn in the engineering profession and they could have made better decisions of what to study and where to study it. Many participants went into other programs at other higher education institutions expecting the same type of experience which was not the case.

The participants that had these sentiments did really have a good experience in the Engineering Technology Program at Ideal Community College, but they believed if they had known what they know now they would have entered the program at Ideal Community College a lot earlier and might have saved a lot of resources, graduated earlier, transitioned to the workforce earlier, built a stronger career in the industry, and would have built a more comfortable life. By having better information about careers earlier in their academic careers, the participants felt they would have had a better start at Ideal Community College in the Engineering Technology Program. But now that the participants of this study have transitioned into their current careers, they have a better idea of what to expect from industry and thought their recommendations would provide a better experience for future students in the Engineering Technology Program and a better idea of what to expect in the engineering workforce.

The second pattern of change that emerged from the participants' interviews was recommended changes for future students of the Engineering Technology Program. These recommendations are based on their current experiences and perceptions of their careers in the engineering workforce. With these recommendations the participants believed it would help future graduates transition seamlessly into their particular career fields. These recommendations originate from the advancement of technology and diversifying students' experiences in order to develop a larger base of knowledge to address the broad professions of engineering.

The participants of this study found themselves amazed with the advancements of technology in the engineering professions. The software that engineers use in their jobs has significantly improved over a short period of time. It is also apparent that technology continually advances every year. Before most engineering firms used only one to two types of software, but now all the participants are using a multitude of software that has a wide range of capabilities. Future graduates will have to take the initiative to learn some software applications on their own. Brad stated the following about the various software programs in his engineering industry:

> *And so I think it's important for somebody to know once in a while that's there is going to be exploring on their own with different programs. And it has come to help me in many ways now having different skills that somebody might not have because to take the initiative to learn something that wasn't necessarily taught to me. Engineering this is a big benefit because there are hundreds if not thousands of different software's that different companies might require you to know and everything can make this a little bit more sellable and profitable.*

The participants have indicated that graduates of the program will have to be fluent in at least five to six software programs to be efficient in the engineering workforce. In order to construct, review, transmit, and submit blueprints future graduates are going to have to be versatile in more than one software package. As the profession of engineering becomes broader with more allied fields it becomes even more vital that communication continuous between the various fields uninterrupted. And in a technological instantaneous world it is critical that engineering technicians be able to use various software programs in performing their duties.

Software is not the only technology that is advancing in the engineering industry. A lot of equipment is advancing in many fields of engineering and graduates have to be familiar and be able to manipulate the equipment with the software. Technological advancements in equipment have reached each and every corner of the engineering industry. Participants of the study indicate that future graduates of the Engineering Technology Program will have to be technologically

savvy to be successful in the engineering workforce. Various fields of engineering use different types of equipment and software. Future graduates need to be prepared to work and use different types of technologies throughout the various professions of engineering. As technology advances, so does the scope of the engineering profession.

These are the themes and patterns that emerged from the participants' interviews pertaining to perceptions and experiences of engineering technology. These themes and patterns that emerged were examined during three intervals in the participants' lives. The first interval was prior to Ideal Community College. The second interval was during their time at Ideal Community College. The last interval was when the participants graduated and went to work in the engineering workforce. The last theme to emerge was change with respect to what the participants would do differently in their educational journey and what changes they would recommend for future students of the Engineering Technology Program.

Captivation of Engineering Technology

In any point of one's life there is an attraction or an irresistible appeal towards special items or subjects. This type of attraction can be considered captivation. Many get captivated by art, baseball cards, cars, planes, travel, foreign culture, or any other type of item or subject that magnetizes their attention. Captivation is the second structure that emerged in the participants' journey. In this study this becomes a focal point for the participants in pursuing a career in engineering. While many participants did not have a clear perception about the study or profession of engineering, they were drawn to study it and wanted to have careers in the engineering workforce.

There were three common mechanisms that participants repeatedly recollected that help keep their attention focused on the Engineering Technology Program. The first was interest in

the subject matter contained in engineering technology. The second mechanism was the participants' interaction with peers in the program. The last component was the environment of the Engineering Technology Program. These three mechanisms attracted and retained the participants in the program. I will address these three mechanisms in order.

Interest in Subject

A student's interest is to experience enjoyment in working with a particular subject. Typically a student's interest in a subject generates greater knowledge, skill, and ability for that particular topic over any other subject. For the participants of this study interest was usually the engine that drove the search for deeper knowledge and understanding while providing the force to persevere through hardship, difficulty, and frustration. The interest in engineering technology by far surpassed any other programs of study offered at Ideal Community College. In this study the participants' interests appeared to be attracted by the blueprint drawings, challenge of the subject, and the relevance of the information to the engineering workforce.

Whether it was a hand drawing constructed on a drafting table or on the computer with a CADD program, all participants of the study acknowledged that they were attracted and lured by the organization and great detail of complex blueprint drawings. Many of the participants of this study became interested in the area of engineering when they saw those complex blueprint drawings hanging on the walls of their schools. Seeing those plans on the wall transformed their interests and gave them the idea they would be able to draw and enjoy creating those types of drawings.

A lot of the participants of the study were interested in art and came from an art background. But they realized that there might be some real financial challenges if they continued to pursue the art profession. In engineering technology they would still be able to

construct art, but now it had a purpose and function to serve society. Many participants believed they found a new outlet and career for their interest.

The participants of the study were not only interested in the blueprint drawings, but in constructing the drawings as well. Nearly all the participants of the study remembered they enjoyed the board drafting in junior high or the computer-aided drafting in high school. Constructing drawings is something all of them liked doing, especially when it came to drawing houses and floor plans. Whether it was drawing by hand or by computer, participants enjoyed the facet of drawing. Joe expressed his interest in drawings with the following statement:

> *I wouldn't want to change the requirements for the hand-drafting portions because I truly enjoyed them. That's one of the things that glued me to the program in the first place, was the hand-drafting.*

The participants' enthusiasm towards education changed once they found there was something they could do with their talent they enjoyed. It gave many the feeling of creativity while providing a great challenge. Art has a liberal disordered perception to it whereas drawings for engineering technology seemed to be an attempt to control chaos through detail and order. Joe expresses his interest in order and detail in the following statement:

> *I'd say the type of order that the details provide, that's what really attracted me.*

A lot of the participants enjoyed the challenge of harnessing order and detail in their complex drawings. Certain objectives may have seemed hard, difficult, or an impossible obstacles to overcome but the Engineering Technology Program provided participants a different perspective. Not as impossible obstacles but more of a greater challenge. All the fields of engineering have a lot of information which gets frustrating trying to make and get a project to work, but that is also one of the challenge the participants like taking on and they found interesting. Seeking and succeeding in these challenges is something these participants pursued. Working on challenges

and drawing on computers to devise solutions seemed to be of interest and a promising career for the participants of the program. It looked like a job they want be able to do.

Even though the participants enjoyed drawing and the challenge of organizing projects, it was important they be able to take this knowledge and implement it in the engineering workforce. With realistic projects provided by the Engineering Technology courses to suspend disbelief, participants not only found something really interesting to them but something that had relevance to the engineering workforce. Rick explains how he found the Engineering Technology classes with the following statement:

> *I think it really was that the courses were interesting and not only they were interesting, but I knew that they would be relevant in the workforce.*

For all the participants of the study, once they found the Engineering Technology Program at Ideal Community College there were no other programs that even caught their attention. They indicated that they enjoyed the program very much. Many could not see themselves working or doing anything else. It was something they all were interested in and enjoyed doing. It was a career field many thought if they worked hard they could make a good living and have a comfortable life. With participants having a common interest in engineering and creating blueprints, it seemed it would help with the interaction between their peers in the Engineering Technology Program.

Interaction with Peers

Interaction is a shared action amongst a group of individuals. A peer is a person that belongs to a particular social group. In this case the peers were the participants who entered and graduated from the Engineering Technology Program at Ideal Community College. The interaction between these peers emerged as the mechanism that assisted in keeping the participants' interested in the Engineering Technology Program. In many instances in a student's

academic career there are friendships that are created simply because of a shared class or situation. These individuals may have not known each other and may have come from different walks of life before that common situation that brought them together to forge a friendship. The participants in this study discovered this situational friendship between peers in their class or program created collaboration and support to help encourage and push each other through the program to completion. What made the peer interaction stronger were common interests that went beyond what brought these individuals together in the first place. Typically as classes end usually situational friendships end as well, but when there are commonalities amongst these individuals the bond became much stronger and lasted a lot longer. There were typically greater interactions among these peers with commonalities creating greater collaboration and support. In this case the common interest was the desire to be in the engineering profession creating blueprints.

The participants saw the program as a way of getting their education and skills they needed to get into the workforce and a way to gain friends and possible colleagues for work. Some of the participants articulated that they were actually encouraged to help each other by the instructor. Not to keep their heads buried in their textbooks and notes. Everybody in class made themselves available for assistance when it was needed which seemed to ease the worries from some of the participants in the study. Neil expressed this collaboration in the following statement:

> *We all learned off of each other, came up with more creative ideas between each other. It was very open...yeah, it was a great environment.*

There was nobody left out or behind because if somebody needed help there was always help. Sara demonstrated the type of support she got from her peers in the following statement:

> *At one point when I got lost. I started to wonder if I wanted to do it or not. But I'd spent my spring break in there with another student and he helped me figured out where I was lost. I was fine after that.*

Typically everybody that was in the program seemed to have the same interest so everybody was more than willing to help each other. In many cases the participants indicated they were more than willing to help each other because it was easier to talk to peers instead of an instructor and by helping another student they would get a better understanding of the project.

By the end of the program many of the participants became good friends by working on different projects together throughout the Engineering Technology Program. Some of the participants even found themselves working together on different projects and some found themselves working for the same company. But this closeness between the participants did not just come from collaboration it also came through support of each other through the program. What appeared to make this interaction between these peers possible was the environment. Under a traditional classroom setting, it would have been very difficult to have this type of peer interaction.

Environment

When someone reflects about environment, the first item that usually comes to mind is physical features such as lighting, temperature, and shelter of a location. In this study it goes beyond the physical features and into the social and cultural conditions. These conditions influenced the participants of the Engineering Technology Program at Ideal Community College. The participants' interest in the subject matter was heavily influenced by their environment. When interest in a subject combined with a good environment it created growth in knowledge while providing enriched experiences for the participants.

In many classes outside the Engineering Technology Program the participants felt like they were sitting in a classroom solitarily for no reason and not getting anything out of the class. But the participants did not feel that was the case in the Engineering Technology classes. Everybody in the classes were having fun and learning at the same time. The environment allowed everybody in class the simple pleasure of just enjoying what they were doing. The participants believed that the overall environment lead them in the right direction with engineering technology.

The environment of the Engineering Technology Program was unique in itself. Everybody in the program appeared to have the same interests and always interacted well with one another. The environment appeared be the last piece that pulled the captivation mechanisms together. Based on the participants' interviews, what made the Engineering Technology Program such a great environment were the small class sizes. The smaller classes provided a relaxing atmosphere that neutralized stress.

Many of the participants agree their experiences in the Engineering Technology Program were not that common. The small class size seemed to make it a perfect learning environment to obtain information. Because of the small sizes of the class the participants indicated they were able to enjoy the friendliness, the openness of the program, and the facilities that were provided to the participants. The class sizes helped the participants to get into group discussions about class projects without any body feeling intimidated. For many of them the classroom wasn't just any classroom. It was a place for the students to work as well as to talk to other students and not just about engineering but other school work. To be with people who were willing to help each other. Brad explains how he felt about the Engineering Technology classroom in the following statement:

> *It was also the place to go and just make acquaintances, friendships, and have the space you can call your own.*

Other participants expressed that the engineering classroom was their sanctuary from other parts of their life. Joe illustrates this sentiment in the following statement:

> *In some ways I guess it's nice not having a ton of other classmates because there's not a lot of people trying to talk but I enjoyed coming into class, I enjoyed the time there, it was a good place to come to unwind, to take my mind off other things, just have one thing to focus on.*

The smaller class sizes provided a family environment feeling that many of the participants looked forward to having in class. The classes were small enough that everybody got a chance to know everyone in class. This type of environment just made it easier, more relaxing, and not so overwhelming for the participants. This gave them a better experience than many had in other classes and programs outside of the Engineering Technology Program. This type of environment created an atmosphere of less stress which in turn made it a comfortable place for the participants to learn.

An important aspect to the creating a stress free atmosphere according to the participants of the study was the instructor. They found the best instructors were the ones that were relaxed in their teaching approach. The instructor did not stand over their shoulders dictating what they should do or how they should do it because they were wrong. In their experience having an instructor that was relaxed created a positive attitude in the atmosphere. Erik expressed the attitude of the classroom in the following statement:

> *It was never a negative attitude in the classroom or anything like that.*

What also appeared to help in creating a positive attitude in the atmosphere and relax the participants was music. Participants indicated that after lecture and questions were done, the

class would put on music which helped them relax, feel more at home, and more comfortable to work on their projects. Neil stated how music affected him:

> *It was in our comfortable zones and I think music to this day, it helps me.*

The laid-back positive atmosphere made for a good learning environment in the Engineering Technology program. The atmosphere of the classes where everyone was helping each other made it easy for the participants to learn and help each other successfully complete their education.

The open and positive atmosphere of the classroom allowed students to be able to sit and talk to each other in class, go back over something they learned previously because nobody was afraid to say *"okay, I don't remember that."* Other participants were okay with going over it again because it would help strengthen their understanding. For participants in the study this made a big difference because they realized that if they attended the state university they would not have had the same type of experience. Joe describes the classroom environment in the following statement:

> *It's still very laid back atmosphere, very friendly, you could sit and chat and still manage to get work done easily. Very quiet too at the same time.*

By taking the stress out of the environment it created a positive atmosphere which a made a difference to the participants of the study.

The Engineering Technology Program and classroom had a great atmosphere. It is what kept most of the participants attracted and interested in the Engineering Technology Program. For some of the participants it was a life style they not only wanted in college, but wanted in their workplace. Matt explained how he considered his firms atmosphere with the Engineering Technology Program's atmosphere with the following statement:

> *I think it was a combination of the job I got offered and coming here and seeing how everybody worked together and at the same time the job I was working was with an architect that had the same atmosphere* [as the program], *everybody was working together and it was relaxed and it wasn't perceived as an office job where everybody running around in suits and ties.*

Most of the classes offered by the Engineering Technology Program were right after lunch and went into the evening, which worked out great for a lot of the participants because they had enough time to get a part-time job for the mornings or study for other classes. This gave participants time to not only work and go to school, but do other activities than just school and work.

These are the three mechanisms that captivated the participants to study the Engineering Technology Program at Ideal Community College. Interest attracted and lured the participants into the Engineering Technology Program while it appeared that the interaction with peers and the program's environment retained the participants in this study. In this particular instance it seems that these three mechanisms worked together to capture the participants and keep them transitioning through the program to completion. This experience was a lot of fun for the participants. Having similar interests and interacting with other students in the program created a relaxing environment and made an enjoyable atmosphere for the classes. The overall effect of these mechanisms working together created a comfortable situation for the participants to earn their education.

Significant Influences and Relationships

If anyone was to reflect on any major journey in their life, there would be a few individuals that would most likely come to mind as significant influences along that journey. And if anyone was to evaluate the scale of the influence it would more than likely be

proportionate to their strength of the relationship. In this study it appeared the stronger the relationship the bigger the influence on the participant.

Goals, achievements, accomplishments of individuals are rarely reached alone. While the participants were the main driving force most needed some form of support during their journey. At times the participants needed to turn to others for support, guidance, and encouragement to help them realize their potential, to share ideas, a shoulder to lean on, or a mentor who made the same journey and the same tough decisions. Significant influences and relationships is the third structure that emerged at various points along the participants' journey into the engineering workforce.

There were meaningful interactions that emerged over an extended period of time that made a difference in the participants' journey. These relationships were formed before and along the participants' journey into the Engineering Technology Program and then into the engineering workforce. Regardless where the relationships were formed, each interaction created an influence on the participant as they made their way of entering and graduating from the Engineering Technology Program at Ideal Community College and then transitioning into the engineering workforce.

The common thread was that the participants needed support, guidance, and encouragement or they might have stumbled and faltered without the significant influences and relationships of others. These interactions came in two different forms. The types of relationships that emerged as significant to the participants in their educational journey were family, advisers, and teachers. I will address these in order.

Family

When we evaluate our lives there is only one group of individuals that know us more than anyone else in the world. This group of individuals is our family. These are the individuals that play an integral part in our lives because they know us the longest and usually have the largest influence in our decisions. Our immediate family typically encompasses our parents, siblings, and spouse. For the participants of this study family was the main individuals that provided support, guidance, and encouragement in their educational journey. In any endeavor that we pursue in life, we habitually look to our parents first for support, guidance, and encouragement. This was especially true when it came to the participants and their education and career choices.

Some participants explained that their parents always showed their support by being interested in the activities the participants were doing in school. In return the participants were interested in showing their parents what they had learned and how they could apply it at home. Nate demonstrated this with the following statement:

> *My parents were always supportive of it. My dad thought it was a good idea. He's always been a type of manual labor guy being a mechanic. So doing engineering, I could help him with that from a different aspect that he didn't have before. I was able to find and figure out and design different ways that he could do something that would help him out. He's a truck driver, so I could help figure out how to mount boxes that were better on his truck.*

In showing interest in what the participants were doing at home and school provided support that many participants needed to pursue, especially in times of difficulty, the engineering profession.

When participants in the study had a difficult time deciding what to study for a profession, their parents were there to help guide them to reflect on what they enjoyed and how they might be able to have a career from that enjoyment. Other times the participants' parents were there to influence and encourage the participants into studying engineering. Neil expressed his father's influence in the following statement:

> *Luckily, when I decided to go to college I looked into going into art schools and also engineering and my parents were really big influences on that. My dad actually works in the oil and gas business and it pushed me toward going into engineering.*

While many parents were influential in the participants' lives, many others were inspirational in helping their children in deciding what to do for a living. Some of the parents worked on projects that inspired their children to study engineering. Brad stated how his mother inspired him to start studying aspects of engineering with the following statement:

> *Growing up with my mom, she was pretty creative and she's 'artsie' with her hands in building and frequently we would build wood projects together and I always wanted to draw and design things for my mom to build because she's really good in doing it. And in many cases we were a team and I would design something and she would build it and that was a lot of fun and started at a really young age and that started from there.*

Parents also encouraged the participants to study and pursue engineering by finding information that helped them make a decision to enter the Engineering Technology Program. Parents also motivated them through the program until they graduated from Ideal Community College. Erik stated how his mother was there for him in the following statement:

> *she* [his mother] *strongly encouraged me and was able to push me to go through the program and get where I am now.*

Many of the participants formed their decision to study the field of engineering by working and being inspired by their parents while working on projects around the house. In return some of the participants now share pictures and information about interesting and cool projects they are working on with their parents. But family goes beyond parents. Family encompasses siblings and spouses as well. For some of the participants' siblings and spouses were just important as their parents.

When the participants' parents were not there to push them, it was their sisters or brothers that encourage them to make that big leap. Some of the participants had siblings that encourage them and supported them in pursuing a career in engineering. Matt explained how his brother

helped him move from a laborious roofing career to the pursuit of engineering in college with the following statement:

> *I think my oldest brother was the one that made the most impact. He would tell me, he didn't understand what I was doing because he was computer illiterate. One of the best roofers in the state but he couldn't understand what I was doing or how I was doing it. He was just so happy that I was getting out of the roofing business and doing something else.*

It was Matt's brother that suggested he use his roofing background to get into engineering and designing roofs. Some participants needed that initial push to start studying engineering and it was their siblings that provided that initial nudge of support, guidance, or encouragement to start their educational journey when their parents were absent.

Spouses play a vital role in supporting the participants in the pursuit of engineering well. In some situations the participants' spouses were the sole reason and support for the participants deciding to study engineering. Rick's wife helped him decide to change from his past career to an engineering technology career. It is explained it in the following statement:

> *The reason that I went into it is because my wife had also the same Engineering Technology degree and had found herself in a very enjoyable position, and in the current field that fit her very well and I decided to follow in her footsteps and do the same thing.*

Val's wife not only motivated him to go back to school, she also supported him financially so he did not have to work and only focus on school. Val illustrates this with the following statement:

> *I will wholeheartedly admit to being very lucky that my significant other has means to basically support me going to school.*

The participants acknowledged that they probably wouldn't have been able to do it on their own and couldn't have succeeded without their spouses. Their wives not only supported and guided them mentally they were kind enough to let them just go to school and not have to work. Other participants' spouses have provided similar support as well. Sara illustrated her husband's support in the following statement:

> *My husband thought it was neat. He enjoyed you know, he knew I was enjoying myself and he was happy at what I was doing.*

It was apparent that the participants' spouses support was just as important as parental support. It is through these individuals that the participants found support, guidance, encouragement, and at times financial support in pursuing a career in engineering. Family is the primary instrument for support, guidance, and encouragement in any individual's journey. For a large number of the participants it was their family that gave them the initial confidence needed in their educational journey. Without parents, siblings, and spouses many participants would be going down an avenue in their life that they would not be enjoying or resent. These are the individuals that had the most influence in the participants' lives, especially when it came to studying engineering. But there were other individuals that played an important role in the participants' lives as well. These individuals are advisers and teachers. In a student's academic career the second most influential instrument is an adviser and teacher. These individuals are addressed in the next section.

Advisers and Teachers

While the participants of this study needed family for support, guidance, and encouragement, there were times the participants needed the guidance of an adviser to determine which direction to go for a career or a faculty member to provide constructive feedback. These individuals are the best source of information about a career or profession and are the best resource to develop students' knowledge, skills, and abilities in preparation of a career after their education. The reason these individuals are so important is that students must have trust in the guidance and support they provide. Advisers and teachers assist at critical times when decisions have immense effects in the participants' journey. Traditionally this relationship between teacher and student starts in high school. Out of all the relationships the participants acknowledged in

this study, this appeared to have the largest influential role in what and where the participants went after high school.

In this study high school teachers seemed to be the key constituent in providing support, guidance, and encouragement in helping the participants discover and pursue the field of engineering. Some of the participants explained that their high school teachers were the ones that started to give them a good look at engineering and how the software programs are used in industry. While trying to instill a perception about the engineering discipline to the participants of the study, the teachers motivated and encouraged the participants to excel and continue their education in the engineering field.

From the interviews of the participants in this study, it appeared that this relationship between student and teacher was strengthened with respect for one another. When the high school teachers treated the participants like human beings and paid attention to the participants' activities and everyday life, the participants in return respected their teachers by listening and following direction. The participants of the study clearly remember when their high school teachers made extra efforts to help them and give them guidance. Many of them remember their high school teacher pulling them aside and recommending they study engineering.

After high school teachers, the next important person to provide career and educational information in the educational process is an academic adviser for a college or university. Academic advisers are usually the gatekeepers that guide, direct, and facilitate students' transitions into college programs of study. But for Zack it was an experience that discouraged his desire so much that he did not want to continue his education. He explained his experience in the following statement:

> *That would have to be the first adviser I worked with at Ideal Community College. The gentleman wasn't very personable, and in trying to explain to him where I wanted to be,*

> *and what I wanted to do, instead of trying to help me, gave me a list of things I needed to accomplish, first. Then told me once I get the list of things accomplished come back and meet with him.*

The participant thought it was a bit ironic that his adviser wasn't more personable with people who wanted to join, pursue, and study a program in the college. Val had a very similar experience with a completely different academic adviser. Val explains his experience with his adviser in the following statement:

> *My academic advisor was Dr. Charles. He is no longer at this campus and I didn't find him very helpful.*

Val also indicated that his adviser was not very personable as well. But this was not the case with all the participants. For other participants of the study this transition did occur seamlessly. Brad explained his experience with his adviser in the following statement:

> *He was a mentor, a friend. He will help you out with different situations and in my case he was also my adviser.*

Some of the participants of the study explained that the Engineering Technology Program adviser made them feel comfortable and confident with his friendly openness. Having a good academic adviser helped the participants' transition into college and into the Engineering Technology Program. While academic advisers assist students into college programs and classes, it is the instructors that keep students attentions attracted toward programs of study in college.

In many cases it can be the instructor's personality that retains or loses the students desire to learn in the classroom. Some of the participants of the study described that while they were in their general education classes the teachers didn't seem to necessarily care about them. Zack explained his experience in a general education class in the following statement:

> *They* [the instructors] *don't really care what happens to them* [the student], *and their life as they go on, as they pass their class and continue on.*

To Zack it felt that the instructor didn't focus on the students. When an instructor projected a positive personality and paid attention to the participants of the study, the participants enjoyed class more. This was evident when the participants were able to ask questions or if they needed assistance, the instructors were always willing to help. This was expressed by Rick with the following statement:

> *I always felt like my instructors really knew their subject and they always answered my questions, and I never felt, while taking my classes, my instructors were seeking any condescending feeling. All the instructors were very positive when you asked questions and when someone needed help they would help them, help you, themselves or they would be able to get you someone who could help you at that time.*

In other instances the participants lost interest in the classes because the instructor could not convey the relevancy of course material to real world applications or the student's field of study or workforce. Jack indicated this with the following statement:

> *Certain other classes other than engineering classes became an issue when I had to start taking them and I didn't realize it. They tend to lack any transition or similarities or any kind of relevancy to engineering.*

The instructors who could convey the relevancy of course material to real world applications or the student's field of study, or the workforce were depicted as remarkable instructors by the participants. These remarkable instructors had the ability to make whatever the participants were learning interesting and pertinent to their program of study. When instructors showed where information was going to be used in a practical sense it made a big difference to the participants. Sara explained how it was important for an algebra instructor to relate how information could be used in the real world with the following statement:

> *If you're making something that absolutely makes no sense or you're learning something that 'here's a formula', okay where am I going to use that? You know making my cup of coffee in the morning is not going to require that. Tell me where I'm going to use it.*

Sara's algebra instructor was remarkable because she knew that when the students walked out her classroom they would probably forget about the information she taught. In order for the students to retain the information she taught the class by relating how students were going to use the information in the field that students were studying. The instructor was really good about trying to do this with all the students in the class. Having an instructor that was willing to make the extra effort built trust in the instructor and confidence in the participants. When the instructor evoked trust and confidence in the participants, the instructor became very influential in the participants educational journey.

The Engineering Technology instructors were influential in nearly all the participants' education and career paths. They were very helpful, made learning fun, and kept classes interesting. It made the participants of the study feel as though their instructors wanted them to succeed in life. One instructor was extremely helpful in many different ways, not just with engineering technology. He helped with math and other problem areas in other classes. Dan explained his experience with the instructor in the following statement:

> *Without the help of the instructors that I had at the school, I probably wouldn't have been able to make it. But I was able to find assistance when I needed it, and that's been a big factor in all of it.*

If the participants needed help, the instructor was there whether in the evenings, after class, before class, when there was no class, the instructor had time to talk and help everybody. The following statement by Doug demonstrated the instructor's willingness to help his students:

> *Like I said, the atmosphere of everything, the way they taught, made sure everybody was caught up and if somebody did fall behind the instructor took their time to help them out and get them up and the instructor had any time after classes if somebody needed help, the instructor was there for them.*

The instructor was willing to stay after class and took his time to help students out. If the participants had questions they could always ask and they never felt left out when they fell

behind. The instructor was always open and made sure the participants felt comfortable in what they were doing.

The instructor of the Engineering Technology Program along with other instructors from the college had a big influence and a big impact in the participants being able to complete their desire of finishing their education and completing their Associate of Applied Science degree. By the instructors instilling confidence in the participants, it built a stronger and more trusting relationship between participant and instructor. This made it easier for the instructor to give guidance and the participant more willing to accept instruction. In addition when the instructor could relate course material to real world applications or pertinent to the participants program of study it made a substantial difference to the participants' interests. When advisers are personable and willing to listen and guide the participants into their classes and through their programs of study, it built the participants faith in the educational process. If these influential instruments can function effectively, it could create meaningful experiences for students' journeys starting in junior high school and ending in the engineering workforce.

The relationships between the participants of the study and their families, high school teachers, college instructors, and college academic advisers had a critical role in the participants' decision making processes. But the magnitude of the relationship appeared to have an effect on the extent of the influence the participants were willing to accept. When these relationships were strengthened by confidence, trust, and encouragement the significance of their influences became greater on the participants. When these relationships were strained, the participants of the study considered leaving the academic arena or sought an alternate venue for their education. The stronger the influence the more the participants were willing to accept support, guidance, and

encouragement in their pursuit of their education. The significance of these relationships played a role in the amount of influence participants were willing to accept in their educational journeys.

Value of an Associate of Applied Science degree in Engineering Technology

When we hold something in high regard and believe that it is beneficial to our lives we consider it to be valuable. But when people consider the concept of valuable they typically associate the context of money to items of value. However value of something comes in many forms other than monetary. In general value can take the form of importance, worth, or usefulness of an item. For the participants of the study value was an instrument that brought meaning and justification to what they were doing and why they were doing it. Value came in the form of emotional feelings, wealth, and satisfaction in what they achieved by entering the Engineering Technology Program, graduating with an Associate of Applied Science degree, and transitioning into the engineering workforce. For many this was a long arduous journey, but the participants discovered these important values at the end of their journey.

Emotional Feelings

An emotion typically distinguishes the intensity of a feeling. For the participants of this study they expressed their value of an Associate of Applied Science degree in Engineering Technology through a variety of emotional feelings. They experienced the feelings of trepidation, accomplishment, relief, and sorrow. The emotions of fear and nervousness were triggered by the participants' high school experiences. Dan expressed his initial feelings when he entered the Engineering Technology Program in the following statement:

> *When I started there, I went into it with every intention of giving it everything I have, going at it 100 percent doing everything I could to accomplish it. From my experiences in school previous to that, I didn't think I actually could. But just because I think I can't do something doesn't mean I'm not going to try.*

Completing their education and obtaining an Associate of Applied Science degree was very meaningful because it was an accomplishment and gave them confidence that they could achieve their goals if they concentrated on it. For the participants it was definitely worth all the time they spent as a student getting their Associate of Applied Science degree. Being able to obtain a degree is an achievement that not many in people in the participants' lives were able to accomplish. Doug demonstrated his feelings for his achievement in the following statement:

> *To be able to complete, it's the first thing. I dropped out of high school back then, and to actually go through and complete the course and complete the associate's degree that meant a lot to me.*

To the participants their degree was their ticket to the next big step in their lives, to go out in the world and see what type of career they could build with their education. All the participants acknowledge that they were happy with their experience at Ideal Community College in the Engineering Technology Program and felt they accomplished a very important step in their lives by earning that degree.

These emotions not only affect the participants but the participants' families as well. When the participants graduated from the Engineering Technology Program at Ideal Community College all the participants knew their families were happy with their accomplishments. Nate remembered how his mom felt when he graduated from the program and stated it in the following statement:

> *I think my mom was happier than I was.*

Having their families happy with their accomplishment gave the participants of the study a sense of pride and made them proud. All the participants took pride in being able to get a college degree and completing the Engineering Technology Program. The participants felt their hard work brought happiness, satisfaction, and confidence in what they were studying and doing.

Robert explained how his education and degree gave him a sense of pride with the following statement:

I do something that is pretty cool. That's the big thing.

Even though the participants have feelings of pride and accomplishment, many had a huge sense of relief for two reasons. First they were relieved that they were able to obtain the degree in Engineering Technology and did not have to depend solely on a high school diploma to obtain a job. Secondly they could start working towards building a career in the engineering field and getting a stable job that would provide pretty good money.

While there were pleasures resulting from the participants' achievements, there were sad moments along the way as well. To many of the participants it was a tail of two stories. Even though the participants graduation brought moments of pride and accomplishment, it also brought a sad moment because they felt they were not only losing their classmates and support, they also finished studying something that they were passionate about. It was an ending to a very meaningful chapter of their lives. Mike reminisces about his experiences in the program all the time and summed it up with the following statement:

I still look back on it every once in a while and kind of miss it. It was really a good time.

Even though it was a conclusion to one of the chapters in the participants' lives, it brought great meaning through gratifying emotions and unforgettable lessons. The many lessons learned in the program about working with others have been very valuable to the participants of the study. Even if the lessons from the program are meant to be applied in the engineering profession, many participants believed these valuable lessons can be applied and have been applied to other parts of their life.

Wealth

When someone thinks about wealth, it is a concept that typically gets associated with financial value. While a large part of wealth involves financial value, wealth can be independent of monetary implications. Wealth is most known as a measure of materialistic possessions, but it can also be a measure of valuable resources that encompass varying degrees of finances and health care. For the participants of this study wealth came in a wide spectrum. The participants' wealth came in financial gains, health care, and work fulfillment. These will be addressed in the following sections in order.

In the beginning the largest motivation for the participants of this study was the financial aspect. The participants' previous income was much lower than what they receive now. Most were living from pay check to pay check and struggling to pay all of their bills creating mountains of debt. But their college degree provided financial wealth and allowed them to pay their bills and live comfortably. With the participants' new careers and well-paying jobs, they were no longer living pay check to pay check. They had economic stability to help pay their debts. Eric explained how his new career and job has helped him financially in the following statement:

> *I feel like it's been extremely meaningful. It's provided me a career that's allowed me to live a life I enjoy living. I don't struggle as much as a lot of people do.*

Participants realize that their education started paying off the day they started working. The participants were able to pay off their college loans in a short period of time. Zack indicated how his education helped him get a job with a pay check that allowed him to pay off his debt in a short period of time in the following statement:

> *But it also allowed me to enter the workforce right away, and whatever I had owed was easily paid off within the first month or two working in the real world.*

While the participants enjoy having the wealth of financial benefits, many sought a career for other benefits and securities. Many participants needed more than a good pay check. They needed the next most important benefit and security which was health care.

Many of the participants were trying to find a way into a better career that would provide them not only a good wage but a healthier work environment with a health care plan. Health was an important piece for many of the participants because under their previous circumstances their ailments were not being addressed. In order to address their health concerns the participants felt they needed to obtain their education and transition to a career that would provide that health care support. Dan explained why he started his educational journey with the following statement:

> *So I was having some health concerns and missing sinus cavities so the dust really, really hurts me. I couldn't work in the woodshop without constant headaches. So it was, on the whole, that I would be able to live and get back into the woodworking but on the drafting side so that I wouldn't meet the health effects that I was experiencing from the past.*

The participants' previous jobs did not offer retirement or a health insurance plan. By completing their education and obtaining their Associate of Applied Science degree in Engineering Technology they were able to address their health care concerns by finding a new career. In their previous jobs when the participants fell sick it was a loss of pay because there was no sick leave or any real benefits. Sara explains the kind of health care plan she gets now from her place of employment in comparison to what she used to get from her previous job in the following statement:

> *I just recently had surgery and because of the illness of my mom earlier in the year I didn't have enough sick leave. But my fellow employees donated sick leave. I wouldn't have that if I was working in a convenience store and I had to be out like I just was, I wouldn't have no income.*

The participants' current careers gave them the security of good healthcare along with many other benefits that help them enjoy their everyday life. These new careers provide the means for the participants to enjoy security of health care and fiscal prosperity.

All the participants enjoyed an increase in their wages after they had earned their degree and transitioned into the engineering workforce. For the participants it not only provided comfort of a new family home but provided big boy toys in the form of new cars, trucks, and recreational vehicles. Jack describes how his new career has affected him in the following statement:

> *It has economically, I want to say created a monster but that's not true. Economically it made me stable in cash wise and thoughts or knowledge of actual money, stuff that they don't teach you in college like your 401K.*

The biggest benefit that the participants conveyed about their new careers is not that they make pretty good money, but they enjoy their work. Many wanted to find a job that was not necessarily work, but more of a hobby. There is a fulfillment with their work and most of the participants did not realize that they were going to enjoy their work so much. Brad explains how he enjoys his work in the following statement:

> *My first project I was reverse engineering a lot of parts for mediastinal locomotive and before that point the only thing that I was able to bring to life was off the 3D printer and at the time which was very, very cool but it's even more cooler to have it laying apart and have it manufactured and you will be able to hold it and assemble it out of steel and has it function, it's very rewarding and made me want to pursue more and more design assembly, build something from nothing and make it do something else so to speak.*

The big thing for the participants was finding a job in a career that they would enjoy. It was a goal that all the participants wanted to achieve, making pretty good money doing something that they would consider a hobby. Not just work in which many people in the world resent going to everyday.

Satisfaction/Content

In our lives it is important to seek fulfillment and gratifications. This is especially true when it comes to our work that we do day in and day out. This is where many people of the world put their heart and soul to create meaning in their life. Some examples are solders who work hard and sacrifice to defend the country, firefighters who work exhaustively to control and stop forest fires, or teachers who work extensively with their students to develop knowledge in an attempt to ensure a promising future. For the participants in this study the profession of engineering provided a level of fulfillment and gratification. When they saw their work contributed to themselves, or more importantly others it generated satisfaction that continually fueled their work. Many of the participants could not see themselves doing their past jobs at an older age. There was just no satisfaction in what they were doing. There were certain disappointments that constrained their expectations and ultimately led to their dissatisfaction. Because they could not find satisfaction in their previous jobs, the participants began their educational journey to find a career that was in line with their passion and had the opportunity to bring fulfillment and gratification into their lives.

The participants of the study were very satisfied with their educational choices. They were very happy with Ideal Community College and the Engineering Technology Program. For some of the participants it was the best decision they ever made. There was never a second thought or any regrets about their decisions. Robert validates this sentiment with his statement:

the best choice I ever made was to go back to school and get this degree.

All the participants acknowledge they were very pleased with their decisions. They had very good experiences that they felt were not all that common. Zack explained his satisfying experience in the program in the following statement:

Really a very unique experience and something you don't come across, that's for sure.

The participants felt their academic career prepared them for their professional careers. They also found out their education diversified their career opportunities. Without the education they obtained and received from the Engineering Technology Program, they would not have the careers they have now. In the following statement Neil considers what kind of working conditions he would be in if he did not have his degree:

> *I'm so glad that I went to college. I don't have to worry about working in the cold wind in the winter time. It was the best decision of my life.*

The participants were able to land many jobs due to their Engineering Technology degree. Their education and associate's degree allowed them to enter the workforce right away. Many feel that their education and degree got them much further than they thought. The participants of the study were not getting just any positions in engineering firms, but some positions that would normally require a bachelor's degree. The participants not only found careers that paid pretty well, provided a good health care plan, and a comfortable living, but careers they really enjoy and love. Joe's statement illuminates how he feels about his job:

> *I love what I do. I love the person I have become due to the choices I have made in the field. I love what I do for work. I love being able to come home, me being the absolutely unorganized person that I am.*

The participants were happy with their journey of getting their associates degrees and transitioning into the workforce. The participants felt very fortunate with the path they navigated through to obtain their education and career. Rick expresses his gratitude toward the program with the following statement:

> *I have to say that I'm very grateful to have gotten my degree and have succeeded in my current field of work.*

This journey that the participants started was an important step in their lives. For nearly all of them it was their chance at redemption and to prove to themselves that they could set a goal and achieve it. In the end many were happy with themselves for accomplishing their goals. Doug shows how big of bearing his college education has played in his life with the following statement:

> *I'm the only one in my family that dropped out of high school and now I'm the only one in the family that's got a degree.*

By taking this second chance with their education and career the participants discovered a prosperous gateway in their lives. This gateway offered satisfaction that was not available in the participants' previous places of employment. This satisfaction made them grateful for what they achieved. All the participants conveyed that they would change very little if anything at all in their experience. Sara stated the following:

> *Oh absolutely, I would do it again.*

If ever given the opportunity to talk to perspective students, they would recommend the program enthusiastically. Jack indicates this in the following statement:

> *They helped me through classes that didn't necessarily pertain to engineering technology. There are other instructors in the building that made the classes more enjoyable but altogether it was enjoyable experiences, I would recommend it.*

Overall it was a phenomenal journey and a wonderful experience for all the participants of the study. They indicated they enjoyed and were satisfied with their educational experiences in the Engineering Technology Program in their journey through Ideal Community College. They found their passion had a place in the engineering workforce and it brought a magnificent windfall of values. This windfall of values gave them the belief they made the right choice. The participants love their work and their work provides a comfortable living with benefits for them and their families.

Transition to the Workforce

In life we go through many transitions where we leave one stage of our life to go on to the next. A transition is a natural evolution that must occur if we want to improve ourselves. If we never evolve we are destine to become extinct or obsolete. This passage of going from one stage to next constantly reiterates in our lives as we try to improve ourselves and support those in our lives. The participants of the study transition there were three key themes. The first theme was the ability to develop and improve. In this study this theme came in the role of education where the participants developed their skills, knowledge, and ability in preparation for their next stage which was working in the engineering workforce. The second theme was opportunity, a condition that made it possible and provided a chance for the participants to grow and move on to that next stage in their life. In this situation it was the chance of employment in the engineering workforce for the participants. The last theme which was the most cumbersome of any of the themes was obstructions. In one's journey there will always be something, whether big or small that impedes or gets in the way of a special journey, and for these participants it was no different.

For the participants successful transition all these themes had to take their course. If there is an opportunity but the participants skills are not developed and their ability is not prepared it becomes a wasted opportunity. If there is no opportunity but someone continues to develop their skills then there is a good possibility they can become over prepared or even over qualified. If challenges are encountered and easily addressed with no obstructions, it will make it difficult for the participants to address adversity in the future. How participants handle adversity is an indication how successful they will be in the next stage of their lives. As participants transition to

the workforce from their academic career, these three mechanisms emerge in this structure. I will address these mechanisms in order.

Role of Education

In any time where someone is evolving from one stage to the next there has to be development and growth. For the participants of this study development came in the form of their education which created knowledge while it advanced their skills and abilities in preparation for their approaching profession. The participants in this study wanted a program that would prepare them for a career opportunity. They wanted to find employment that they were prepared to do and would enjoy as a hobby in their everyday lives. Many of the participants already had in mind what they wanted to do when they entered the engineering workforce, but the Engineering Technology Program helped the participants become competent in many diverse fields of engineering.

The way the Engineering Technology Program's curriculum was arranged at Ideal Community College was not really different from the way the participants experience work in their current jobs. The participants felt they had a very fluid transition from their academics to the engineering workforce. According to the participants the educational path that they took with the class work and the program made it a very easy transition into any engineering firm. They felt the college and the Engineering Technology Program prepared them for the stresses, challenges, and deadlines they encounter in their jobs. Brad found he was using the information he learned from the program every day at his work. He indicates this in the following statement:

> *Because the first day of my job they handed me a handful of different kind of parts to start drawing and designing and it was just the skills that I learned. The mechanical engineering and manufacturing where I learned to design threads and the tolerances and things that I didn't think that I would really use when I was in the program that turned out to be everyday trait, skill that I use every single day.*

A large portion of the participants just jumped straight into their jobs with hardly any problems because they felt that they were prepared. Erik describes his experience when he first entered his job in the following statement:

> *Yeah, when I started I wasn't surprised by anything. Really it was smoother than I anticipated that it would be. I thought I would be intimidated, but I wasn't, I was really comfortable doing what I was doing within the first week.*

The participants believed the program provided them the basic knowledge, skills, and abilities they needed for their jobs. Because of their backgrounds and experiences some participants were bumped into unexpected positions in their firms. Matt thought he was just going to be a detailer and drafting technician in the architectural firm when he graduated, but the firm promoted him once he was done with college. He explains his promotion in the following statement:

> *While I was going to school I was hired as a drafter. Then as I got through my engineering degree they bumped me up to a project manager and roofing consultant for the firm.*

According to the participants when it came to the work they were doing, it wasn't much of a transition because what they were doing in their jobs was exactly what they did in the Engineering Technology Program at Ideal Community College. For the participants it was only a change of location, from the college to their work. Now they feel great about their work. Having the ability to help people and make contributions to their firms makes them feel their education prepared them for the opportunities in the diverse engineering workforce.

Opportunity

The Engineering Technology Program opened the participants' eyes that even though they may not want to be a doctor or a lawyer, they could have a chance to design the next big technology or assist in creating the next modern marvel. The participants believed that the engineering technology field seemed to offer more opportunities than any other field of study.

The industry is constantly changing, evolving, and a little bit different every day. Brad explains his perception of the engineering technology field in the following statement:

> *It will never ever stop growing -- I don't think it will ever die out because there's always the next bright idea and somebody's going to think of it and somebody's got to design it and I think of that as big motivation for everybody that is involved with it because they could be that person who could design the next trillion dollar idea that would change the future as we know it.*

In addition many of the participants got a boost of confidence from their Engineering Technology instructor because he would invite various engineering firms to come out to the college and speak to the students. Sometimes the firms even asked students to apply for positions right there on the spot. This gave the participants encouragement because it introduced them to various fields of engineering and also showed them there was diverse opportunity in the field of engineering.

The participants remembered having classes in the fields of architectural, mechanical, and civil engineering. The program showed the participants there were possibilities out there they might not have considered. Majority of the participants thought it was probably good that they had some experience in all of those areas of engineering so they would have the ability to switch to a different field of engineering if needed. But what it truly demonstrated to the participants was their education did not narrow the possibility of what they could do instead it demonstrated there were more opportunities in different engineering fields. Nate's statement explains what he determined about the engineering profession:

You can work in pretty much most industries with some type of engineering degree.

Because there appeared to be more opportunities in the engineering technology field, there would be opportunity for more money. Since there are so many professions that could fall under engineering technology, the participants perceived that there were plenty of jobs all over the

world. The participants felt that with an Associate of Applied Science degree in Engineering Technology they could end up anywhere from civil engineering to the medical field, telecommunications to manufacturing in any part of the world. The degree provided a diverse, but promising future for the participants of the study.

They realized that they could enjoy plenty of other fields that engineering falls under and duties that go along with that occupation. The most important skill the participants needed was the ability to be creative. If they had the ability to be creative the participants felt they could fit into any field of engineering. Dan explains his insight in the following sentence:

> *You need a lot of creativity to be able to figure out ways to make something work or to even draw it up.*

What became apparent to the participants of the study was that people in society are always going to need places to live, shop, eat, vehicles for transporting goods and supplies, roadways and bridges to get the supplies. Society will always have a need and there has to be somebody there to help design a solution for that need. Doug describes his discovery with the following statement:

> *Somebody's got to design it, somebody's got to be the one to buy it. There's always going to be a market out there.*

The participants knew that by going through with their decision to study engineering technology they might end up working for a state government agency, but they were comfortable with it because the government offered decent salaries with very good benefits. When the economy had its big down turn, many of the participants found their positions to be recession proof. While businesses laid off employees and didn't fill vacant positions in an attempt to reduce the company's workforce, the participants of the study found themselves fortunate and kept on

working in their positions. Rick describes his experiences during the big down turn in the economy with the following statement:

> *I did not lose my job. And I would say it's merely recession proof, but I know that some businesses didn't fill positions when they were lost even to this day during the recession.*

A perception by some of the participants of the study is that there is more opportunity as a full time designer. The participants' current perception is that when an individual who has earned a bachelor's degree in engineering and becomes an engineer working in design, they don't design for long if they are good at it. The firm typically moves these individuals into social and project engineer positions in an attempt to win projects for their firms. This leaves the design position vacant. If technicians can develop knowledge, skills, and abilities about design they can remain in the designer position. Participants of the study believe more engineering technicians will start entering design positions in the near future illustrating another opportunity.

Even though the participants believe there are great opportunities in the engineering workforce and their education helped them transition from college to their engineering career, many encountered obstructions in their journey. In any journey there are always obstructions that arise and ensue. The participants of the study faced different forms of obstruction. The first form was a complete overwhelming feeling when they first entered their work. The second form of obstruction comes from awkward colleagues they work with in their firm. And the last form of obstruction comes from work itself. These issues will be addressed in the next section.

Obstruction

While many of the participants had a seamless transition from college to the engineering workforce, others were not ready for the high demand of their position. At the beginning it seemed their jobs were fast and furious with not enough time in the day. Many struggled to keep up with the workload and found themselves working at all times of the day. Robert explains how

he found himself driving home and coming back to work at unusual hours of the day in the following statement:

> *So there were a lot of nights I was driving home 3 or 4 o'clock in the morning and coming back at like 9 or 10.*

When the participants first entered work they found a mountain of drawings that they had to work on and complete. Nate found he got a whole bunch of drawings thrown at him that all had the same deadlines. The following statement expresses how Nate was frustrated at the start of his job:

> *They were like 'Here, make this.' which was pretty much a 2D drawing of half a boiler, and I had to figure out how to make it 3D without the necessary information given, and then they didn't tell me how much time I had to work on it.*

In the beginning it was frustrating for many of the participants because they were not familiar with the company's or industry's conventions. Because of their unfamiliarity with the industry, they depended on colleagues for information and help. Brad's statement demonstrates how he depended on his colleagues for help when started:

> *I'm fortunate enough to have some guiding hands when it comes to that because I do work with a lot of cold welders and ultimately they tell me what they need.*

At first it appeared that the participants were not ready for the high demand of their work and they felt their transition was not turning out as well as they hoped. In addition the participants found themselves picking up past projects from previous employees which made it very difficult considering there usually was a time span in between. Some of the participants found themselves working with 50-year-old plans that were barely legible. Redrawing the structures based on older plans they discovered the measurements do not add up. Dan describes his experience with older projects in the following statement:

> *So they didn't know that what they are putting down doesn't work, until I get it, fifty years later and try and draw it up and go, no, if they built this the way this drawing says*

> *to, then they never got that bridge built because it is not possible. There's no way you can fit 53 feet worth of stuff in 52 feet, which just doesn't work.*

To this day Dan regrets not calling it quits for his position. He is currently doing everything he can to try and find a different position at the state transportation department. These initial career experiences were a bit of a setback and made some of the participants question if it was really worth all their hard work. For the first couple of weeks the participants were hesitant about continuing in their positions, but this appeared to be one of the rough patches the participants encountered when they entered their jobs. But as time passed the participants became comfortable with their jobs. Another rough patch the participants of the study ran into was dealing with awkward colleagues.

Awkward colleagues not only create uncomfortable situations, it also creates an uncomfortable work environment. Participants found themselves dealing with colleagues that can challenge every bit of their common sense along with every bit of their professionalism. There are times when engineers do not see eye-to-eye and working with a group of engineers that are not getting along can be very challenging. Matt describes his difficulties with some of his colleagues in the following statement:

> *There's been a couple instances that made me want to just walk away. Most of them were personal with other people in the office. None of it ever had to do with my job, it was personal conflicts with other employees.*

Because this awkward situation is with people they worked with it creates an uncomfortable work environment where the participants did not enjoy their job. It creates a bad atmosphere at work because of the conflicts and disagreements between employees. This atmosphere gave the participants the feeling that somebody was always looking over their shoulder ready to point out they were doing something wrong. When the participants found a good working atmosphere, the environment usually consisted of good co-workers that had fun together and a supervisor that

provided a relaxing atmosphere. This is when the participants of the study truly came to like their positions in their new careers and enjoyed what they were doing.

The last form of obstruction comes from the work environment itself. Many engineering firms and organizations are having funding issues. According to some of the participants there seems to be a smaller workforce because of funding restrictions and many technicians retiring. Also there has been a big decline in interest in the engineering field. Joe has been at the state department since he graduated from the Engineering Technology Program six years ago, but he still finds himself being the youngest technician in his area. He validates this with the following statement:

I am 99% sure I am the youngest person in my department, if not in my building.

In addition because of the advancements in computer hardware and software there are some of the engineering technicians that have expressed concern that new programs are going to make their jobs obsolete. There is concern that technology is going to replace a lot of technicians and belief industry is going to need half as many engineers because in the future all that will be required of an engineering technician is to check the work of the new software program. Some people feel the way the drafting programs are evolving engineers will be able to input the applications into the computer and plans will be created. Only a couple of engineers will be required to check over the plans for any errors or problems.

The participants believe that as technology advances, the role of the engineering technician will change. Technology may require less people in the field to manage projects and less people sitting in front of the computer screens to create projects, but there will be an increase in manpower in other areas to manage the technology. Rick expresses where he believes technology will take the workforce in the future with the following statement:

> *I think maybe there will be a demand for more technicians, because the engineers will gonna spend more and more time in the office.*

Rick believes there will be a demand for more technicians to operate the technology in the office as well as the field. There is also belief by many people that the engineering technology profession can be shifted overseas by outsourcing since it is inexpensive and more efficient. But based on some of the participants' experiences they do not belief this will be an effective way to conduct projects. Currently many of the consultant firms utilize engineers as detailing technicians and sometimes the engineers are not necessarily detailing the same projects they engineered. Joe describes his experiences with consulting firms in the following statement:

> *I don't know that you can affectively master both areas, just because the focus is so different. I really feel that dedicated draftsmen will provide a much better quality product than someone trying to do both.*

The participants questioned why projects were outsourced to consultants because much of the time it would have been faster if they did the work themselves. Other participants believe it is not possible to effectively construct a project by outsourcing it. There are too many different aspects that need to be considered like soil types and seismic activity in the area. There is all sort of information that needs to be considered for every project. For the participants who worked on these types of projects it doesn't seem possible that a computer would be able to take so many variables into account or a consulting firm to effectively conduct a project at a distance. Sara explains why it is difficult for projects to be outsourced in the following statement:

> *You can't fix a bridge here from China. You have somebody here to do it, to draw it up, and go look at it and see what's wrong.*

For large projects companies are going to want engineers and technicians that are local and know what they're doing. Be available for site visits, questions, and inspections. When distance is

added into the equation of a project it creates time delays and in the end means greater cost which is not an incentive for outsourcing.

In order to perform their jobs effectively the participants had to go beyond the obstruction of beliefs and perceptions about the future of the engineering technology industry. The participants had to overcome these obstructions in order to follow their desire to work in the engineering workforce. Some of these obstructions even made some of the participants question their resolve and dedication to their desire to be in the engineering industry. But all of these participants withstood the storm of obstructions and it made them stronger with industry awareness and prepared them for the future. There will always be obstructions along any journey, but now the participants of this study have weathered these obstructions they have the knowledge, skills, and abilities to deal with future obstructions better.

Part 4

Transformation

As the participants of the study made their educational journey into the engineering workforce their logic, intellect, ability, along with many other characteristics changed with their experiences. The changes were the development of their characteristics and the transformation of the participants. In their journeys each of the structures interweaved to create transformation of the participants needed in order to enter the engineering workforce. The nature of transformation is it creates story lines of change from one stage of the participants' life to the next. In this study the transformation occurred several times in the participants' educational journey to the engineering workforce. As the transformations occurred the participants were able to refine the

direction of their journey. The longer the participants experienced the transformation the better idea they had of where their educational journey was going to lead them in the end.

While it was clear that the structures effected the participants' transformation, there were three scenarios that appeared to initiate and perpetuate the participants' transformation to enter the engineering workforce. The first scenario for the participants' transformation was the aspiration of a better future. The second scenario was the desire to be in a particular engineering field. And the last scenario was the diversity of engineering. The transformation scenarios are addressed in order in the following sections.

Aspiration of a Better Future

In any journey in life we need a special person to help us realize our potential and tell us we can do better in life. Generally a family member helps ignite our passion to improve ourselves. This is where the journey for the participants of the study begins. Most of the participants found themselves completely unsatisfied in their previous jobs. They were working long hours with little pay, no benefits, no sick leave, and no vacation. The participants were struggling financially and had difficulty making ends meet and paying bills. Through the help of their family many recognized that if they wanted a better financial future for them and their families they needed to go back to school and get a degree. Dan indicates this first form of transformation with the following statement:

> *I was trying to find a way to actually be able to make a decent living instead of just not even really sneaking by. I wasn't really even making enough to pay my bills at that time. So I felt like it was kind of my last chance of something I might want to do. To might actually be working well for me as far as finances and everything. So it was a big part of my motivation was the financial aspect, trying to get into a better career, something that would make me a better living.*

Other participants were looking for a change in their jobs because of health concerns. They could not continue working in their past positions with their health issues, so the participants knew they

needed to go back to school for a better work environment that offered good benefits. Doug states why he needed to transform his career in the following statement:

> *I kind of went down to a couple places and checking into it but like I said when I got out of school I basically went straight into the Army and never really pursued it until I started coming down with an illness and I thought well it's time to take something a little bit easier on my body and that's when I decided to go back into architectural drawing and take a CAD class.*

These individuals knew they wanted to go to school to create a better future for themselves and their families, but they did not know what programs they wanted to study. Transformation was initiated by individuals with significant influences that had strong relationships with the participants. Their transformation did not start until an individual they trusted influenced their decisions to change their job and career in order to have a better life. The most important individuals that initiated this early transformation in the participants' lives were family and high school teachers. For Val it was his spouse that initiated his transformation. He indicates this in the following statement:

> *My significant other after watching me trying to get out of bed in the morning after being a plumber all week basically looked at me and said ' What are you doing? It's time for you to go back to school. You are too good for this.'*

The participants seemed to need that significant influence from a trusting relationship to tell them they needed change in their lives. The acknowledgment of needing an education is the first form of transformation for the participants. They knew they needed to go back to school to transform their lives and make it better, but for some of them had no idea of what to study. In Robert's situation he explains how he wanted to get back to school to improve his situation in the following statement:

> *I honestly I just wanted to get a degree at first. I didn't know where I wanted to go. I just needed to have a degree.*

Robert originally wanted to study radiography, but decided it was not really for him after he experienced some of the classes. This was not uncommon for other participants of the study as well. For some it was a miss until they hit what captivated their interest and they believed would provide a future. This is where the structure of captivation of engineering technology plays into the guidance of the participants into the Engineering Technology Program at Ideal Community College. This the second form of transformation for many of the participants. Sara was studying a different subject in college but needed a class to make her a full time student. She explains how one class captivated her interest in engineering technology in the following statement:

> *Because I've taken some other classes and I took that drafting class and I loved it. And I knew then if I ever got the chance to go to college full time, that's what I was going to do. So I got the chance and that's what I did.*

In this study it appeared that the initial transformation was started by trusting relationships that had significant influences on the participants. It was these events and interactions that started the participants on the educational journey to improve their future. But it was captivation that started to direct the participants toward their desire to be in the engineering profession.

Desire to be in an Engineering Field

The participants admit that once they discovered the field of engineering, they wanted to be part of the profession. The participants had a particular field of engineering they wanted to study and have as careers. When many of the participants started on their educational journeys into the engineering profession, they believed they had a good perception of what they were studying. But as the participants became more immersed in their educational journeys into the engineering profession, some found out that it was not quite what they expected. The participants who decided to study at the state university found that the study of Engineering Science did not

meet their perception of engineering. Due to the fact that the state university Engineering Science Program did not meet the participants' perceptions, this initiated the next stage of transformation, the desire to be in the engineering field. Erik along with other participants of the study started their academic careers at the state university studying mechanical engineering but after experiencing some of the engineering classes changed their minds. They still wanted to be in the engineering field. Erik explains his desire for the profession in the following statement:

> *Other than going into this career field, I felt kind of at a loss about what to do. Any other job or style of job just didn't appeal to me and this one did.*

The other participants expressed the same perception frustrations about the university Engineering Science Program and also felt at a lost on what to do next. For the participants the perception frustrations led to poor grades and the eventual departure from the university. Because the participants were still working toward a better future they transferred to Ideal Community College.

This perception problem did not only occur at the state university level, it also occurred at Ideal Community College. Participants in the Engineering Science Program at Ideal Community College were experiencing similar perception problems. Zack explains his experience in the Engineering Science Program with the following statement:

> *When I jumped in at Ideal Community College my first year all I took was "pre-reqs" and kind of had no clue what I was going to do, but I had an interest in engineering and that's the way I was leaning.*

Zack became so discouraged that at one point he did not want to have anything to do with engineering at Ideal Community College. Many of the participants believed that the Engineering Science Program was the only way for them to learn about the engineering profession and obtain an engineering career. This is where the participants experienced a transformation. Having the desire to be in the engineering workforce, somehow they found the Engineering Technology

Program at Ideal Community College and an alternate avenue into the engineering workforce. With the exception of two, all the participants discovered the Engineering Technology Program on their own. Prior to discovering the program the participants indicated that they had not heard of the program nor had any idea there was an engineering technology part to the engineering profession.

Once the participants started experiencing the Engineering Technology classes they found that the curriculum was more of hands-on and not theoretical learning. For the participants it was easier for them to learn by working with realistic problems instead of taking notes, reading, and applying theory to unrealistic problems. Nate explains his experience between the state university Engineering Science Program and Ideal Community College's Engineering Technology Program in the following statement:

> *The professors were very knowledgeable about their field but they weren't instructors and teachers. Most of them, they'd get up in front of the class and just write on the board and they expected you to take notes the whole time, and then send you out to do homework. It was very hard for me to learn that way. I was more of a hands-on learner. I have to do something to learn it instead of just taking notes or reading about it. So I came back to ICC. I got to do more hands-on and actually do the work on CAD instead of just writing notes about it and hoping for the best on my homework.*

The participants' perceptions about engineering transformed with the projects they constructed in the Engineering Technology Program. Their education was made easier with the way the projects built upon each other and allowed the participants academic freedom in building, designing, and creating their projects with the equipment available in the program. The hands-on learning and academic freedom in their projects transformed the participants' educational experiences. Brad explains how his experiences were transformed in the following statement:

> *My favorite was the more hands on classes, that's probably the constructing or more out of the box anyway like robotics and manufacturing. The manufacturing really sticks out to me with the laser engraver and sort of the contour cutter and the 3D printer that*

> *boosted more and more interest and started new adventures for me that I really didn't foresee or I have any aspirations to deal before with them so those are my favorite.*

This type of learning style and environment also transformed the participants' enthusiasm for their education. It was not so much that it was going to school for class, but for the participants it was a hobby that everybody was interested in and enjoyed doing. This influenced and changed how the participants felt about their previous educational experiences. Zack expresses how his success influenced his educational experiences in the following statement:

> *I would say my experience at Ideal Community College was good. I would contribute that success to the Engineering Technology Program.*

With these experiences transforming the participants their confidence developed and they were more willing to explore other areas of engineering. Participants started studying other areas of engineering that were not of interest originally. They started to see another perspective to engineering, how diverse the field of engineering had become with modern technology.

Diversity of Engineering

The participants had an idea of what field of engineering they wanted for a career. Some were taking their experiences and knowledge from their previous jobs and attempting to utilize it with their engineering technology education to help them further their career. For those participants this previous knowledge and experience became a benefit. Matt explained how his roofing experience helped him when he started working for the architectural firm in the following statement:

> *I think it was very beneficial because I knew how to do it and then when I entered engineering and started designing it, I knew how to design what I could build. I knew that if I couldn't build it then you have to watch your design and make sure that everything is actually buildable when you're doing it.*

While some participants realized they could use their previous knowledge and experiences to propel them further into the engineering workforce, others did not. It came as a surprise to Val

that he could use his previous work experience to help him get into the engineering workforce. He indicates this with the following statement:

> *When I started, no, towards the end, yes, I thought so. I was going to use my years and years of plumbing experience and dog tail it into Engineering Technology. Apparently, that is a pretty rare commodity to use both plumbing and CAD and Revit.*

This ability to use their previous knowledge and experiences helped the participants enter the engineering workforce and transformed their perception of the engineering profession. But to the other participants the Engineering Technology Program could offer a diverse background, they were just unsure of how diverse of background it could offer. Rick always new that an Engineering Technology degree would be a good degree to take out into the workforce because he would be competent in diverse career fields and he would be able to find employment without any problems. Rick demonstrated this with his following statement:

> *I should say, that I knew that it would be able to provide me with a career opportunity and I didn't necessarily have in mind what field I would end up in, but I knew that this would be a good degree to take out into the work force and I would be able to find employment and hopefully would be able to find employment that I'd enjoy.*

The participants discovered that their education in the Engineering Technology Program diversified their career opportunities. Many of the participants found out that if they choose not to stay in their current positions they could enjoy other engineering profession because engineering is such a broad field. Brad describes what he believes an individual can do with an Engineering Technology degree in the following statement:

> *You can honestly do anything with an Engineering Technology Degree except hand out medication. There's not a whole lot you can't do.*

There are plenty of other fields that engineering falls under and nearly all the participants found another field of engineering they enjoyed. The knowledge, skills, and abilities the participants gained from the Engineering Technology Program transformed their perceptions of engineering

and helped them transition into a diverse engineering workforce while providing values they can appreciate.

In their educational journey the participants went through many transformations on their way to a career. The transformations were necessary for the participants to successfully transition into the workforce. If no transformation occurred then the participants would not have changed and possibly not be ready for a job. The purpose of education is to transform and develop student's knowledge so they can be prepared for a career, put situations into perspective, and be able to cope in difficult situations. But in the case of these participants there were greater transformations that created more opportunity. When there is more opportunity there is no telling where their journey will go or how it will end.

Introduction to the Essence

The unexpected journey emerged as the essence of this study as I reflect on the lived experiences of the participants on their educational journeys to the engineering workforce. Reflecting on the participants' interviews each had a specific destination prior to starting their endeavor. As their journeys weaved through the higher education system and their experiences transformed, there were more avenues to pursue and more destinations for the participants to venture and enjoy. In arriving at the essence of the participants' experiences, there was an initial sense that the participants believed there was only one road to the engineering workforce. But given the events that transpired along their journey, they discovered there were other choices, other avenues that led to different fields of engineering that could provide career fulfillment as well. Given the perspective of the participants' educational journey, I arrived at the essence of the unexpected journey. In the following section I will develop the unexpected journey because

their educational path took them places they never thought about. I will develop the unexpected journey as the essence of the participants' experience in their educational journey.

Part 5

The Unexpected Journey

The participants considered their Associate of Applied Science degree from Ideal Community College their ticket to their future. But what most of the participants discovered was their ticket had the capability to take them anywhere they wished in the engineering workforce. Nate explains how his degree was an open ticket to any engineering profession with the following statement:

You can work in pretty much most industries with this type of engineering degree.

The unexpected journey describes the essence of the study. It represents how fifteen participants entered higher education and navigated their way to their engineering profession destination. Participants planned for specific destination in the engineering workforce. They planned and wanted to be in the architectural, mechanical, industrial, or manufacturing engineering profession. But what the participants discovered was in their journey there were other fields of engineering they enjoyed as well. For the participants of the study they entered higher education seeking a specific engineering career, but along their way the participants educational goals transformed along with their career aspirations. The participants indicated that they were in the Engineering Technology Program to study a specific field like architectural. But the participants of the study discovered a new passion after experiencing other fields of engineering. Their focus transferred to another field of engineering. A large proportion of the participants found themselves working in engineering career fields they never thought about before. Even though the participants never thought about these other fields of engineering, they

found their new careers rewarding in the aspects of it being more of a hobby and creating pleasure in their work.

In the beginning the participants were captivated and lured by the complexities and organization of blueprint drawings. It was through the significant influences by trusted individuals, mostly family and high school teachers, which started the participants in their educational journey. As the participants' perceptions, knowledge, skills, and abilities transformed during their educational journey, their determination to achieve their goal of getting into the engineering workforce was not altered, but their academic and career goals did change. The more the participants experienced transformations in their educational journey the more the participants' perceptions about the field of engineering became reformed. As their perceptions transformed the further they immersed in their engineering educational journey, the more the participants discovered other fields of engineering. This variety of opportunity created a seamless transition for the participants into the diverse engineering workforce.

The unexpected journey represents the destination the participants found after their transformations in their educational journeys. While the participants started their journey to find a better life doing what they believe they would enjoy for an engineering profession, many discovered that there was not just one engineering profession for them but many others that were enjoyable to have as a career as well. As the participants progressed through their transformations and progressed into the engineering workforce, the participants matured, gained confidence, and discovered the value of an Associate of Applied Science degree in Engineering Technology. Money, health, and gratification have also gone through a transformation as the participants worked to improve their position in life and create a new life style for them and their families. The participants' transformation into the various fields of engineering occurred because

of the five structures discovered in this study. The participants' transformation aided in the participants' transition into the engineering workforce. All five structures interweaved together to create the unexpected journey into the diverse engineering workforce.

CHAPTER 5: DISCUSSION

Overview

Chapter 5 is a discussion of *The Lived Experiences of Applied Science Engineering Technology Graduates.* In this study I investigate the lived experiences of individuals who entered the Engineering Technology Program at Ideal Community College, graduated from the program, and transitioned into the engineering workforce. The following are the research questions that guided this study:

1. What experiences influenced these participants to study Engineering Technology at a rural community college?
2. How did these participants make meaning of their experience in an Engineering Technology Program at the rural community college?
3. How did these participants make meaning of their experience as they transition into the local and regional engineering workforce?

I used interpretative phenomenology to explore the participants' experiences in their educational journey to the engineering workforce. To address these research questions I conducted 30 in-depth interviews with fifteen participants who had completed their Associate of Applied Science degree in Engineering Technology and then transitioned into the local and regional engineering workforce. The data was the participants' voices from interview transcripts. I employed the Moustakas' (1994) modification of the Stevick-Colaizzi-Keen method to organize and analyze the data. Analysis involved the phenomenological reduction, imaginative variation, a synthesis of meanings, and essence (Moustakas, 1994). In the analysis I identified five structures from the data that framed the participants' experiences on their educational journey into the engineering workforce. The structures were Perception and Experiences of

Engineering Technology, Captivation of Engineering Technology, Significant Influences and Relationships, Value of an Associate of Applied Science degree in Engineering Technology, and Transition to the Workforce. These five structures interweaved to form the structural synthesis of transformation which occurred along the graduates' journey into the engineering workforce. From that information the textural structural synthesis of the unexpected journey emerged as the essence of the phenomenon.

Chapter 5 has 3 parts to it. The chapter begins with part 1 addressing the findings in relation to the three research questions that guided the study. Part 2 of the chapter discusses the findings of the study in the context of the literature. I conclude the chapter with recommendations for practice and research in part 3 of the chapter.

Part 1

Findings Related to the Research Questions

In this section of the chapter I present a discussion of the findings in relation to the research questions. The findings of the study were detailed in chapter 4 as I developed the phenomenological structure and essence. In that chapter I explain how the five structures interweaved to create the textural structural synthesis of transformation. From the textural structural synthesis the essence of the phenomenon emerged as the unexpected journey. This essence emerged as the participants pursued their educational journey into the engineering workforce. The unexpected journey illustrates and portrays the road the participants traveled to find their careers in the engineering workforce. There were many twists and turns that the participants needed to navigate in order to find their current engineering careers. The unexpected journey captures the lived experiences of the participants who made their educational journey to

the engineering workforce. I will discuss how the participants were influenced and made meaning of their journey in the following section.

The first research question explored the experiences that influenced these participants to study Engineering Technology at a rural community college. It examined what attracted the participants to the Engineering Technology Program. In this study the participants indicated that there were three main influences that attracted them to the Engineering Technology Program at Ideal Community College. The three influential factors were captivation in the form of interest in engineering, faculty support in high school, and family support.

One of the most influential factors that attracted the participants to the Engineering Technology Program was the complexity and organization of blueprint drawings. A large portion of the participants of this study came from an art background, but they realized it would be difficult to make a living in the art industry. When the participants saw these complex blueprint drawings hanging on the school hallways it captivated their interest in engineering. To them it was another form of art. They wanted to know what the drawings meant and how to create the different types of blueprint drawings. Whether the participants created the drawings by hand or computer, they had great pleasure in creating the drawings and knew it was something they wanted to pursue for a career.

The second influential factor that attracted the participants to the Engineering Technology Program was faculty support in high school. Teachers were a big influence for the participants because they made the subject very interesting. They were the individuals who motivated and encourage the participants to excel and continue their education in the engineering field. Some of the participants' high school teachers even told them what companies they could

be working for and what they would be doing if they continued their education in engineering. This helped the participants focus on what to study for the engineering workforce.

Family was the third influential factor that supported the participants in their journey into engineering technology. In this study it was family members that provided initial push that started the participants on their educational journey into the engineering workforce. It was family members that helped participants discover their passion and supported their endeavors. In other ways it was family members that helped participants realize there were more opportunities and a better living to be made in the field of engineering. In the beginning it was family members that helped the participants recognize their potential and encourage them to change for the better.

It was through these three influential factors that the participants of this study headed toward the study of engineering and found their way into the Engineering Technology Program at Ideal Community College. In evaluating the participants' interviews, it was not one particular factor that acted alone. It was the combination of these three factors that influenced the participants into studying the engineering technology field. Once the participants entered the Engineering Technology Program, there had to be an explanation or a reason for the participants to continue their educational journey. This is where the participants' experiences in the program are examined and discussed.

The second research question explored the participants' experiences in the Engineering Technology Program. It examined how the participants made meaning of their educational experiences in the program. In examining the participants' interviews, three main parts materialized to help the participants create meaning from their experiences in the Engineering Technology Program at Ideal Community College. These three parts were how the Engineering

Technology curriculum built student competencies, real world projects, and friendships created in the program.

In the interview process participates' expressed they had a meaningful experience with how the Engineering Technology curriculum was arranged to build their competencies. They felt every one of the projects built upon each other and the curriculum was setup in such a manner that all the courses created knowledge within each other. Since the courses appeared to be intergraded with each other it made the participants transition between the classes seamless. Some of the participants indicated that the curriculum felt like one long class that focused on different objectives each semester. This gave them academic freedom and helped them feel more comfortable in the Engineering Technology courses.

The second piece that helped the participants create a meaningful experience in the Engineering Technology Program was working on real world projects. Once the participants starting working with real world projects and understood how their knowledge would be applied in industry, it gave the participants the belief they would be able to do the work once they were hired in the engineering workforce. It also gave them the confidence that if they knew the subject and industry, they would be able to make a living doing it.

The last piece that helped the participants create a meaningful experience in the Engineering Technology Program was the friendships created in the program. For the participants it was one of the most important experiences in their educational journey. According to the participants the friendships they created were significant since they spent hour after hour, day after day, and week after week in the same room learning, working, and helping each other with their projects. They felt they gained valuable friends and possible colleagues for the future.

For many of the participants this became a reality because many of them found themselves working with each other quite frequently.

These three parts created meaningful experiences for the participants in the Engineering Technology Program. The real world projects and curriculum helped the participants create understanding from the lessons and create meaning form the program. The friendships created in the program helped the participants create meaningful relationships that supported each other through the program and transition into the engineering workforce. These meaningful experiences helped create the participants gateway into the engineering workforce.

The last research question explored the participants' meaningful experiences as they transitioned into the engineering workforce. There were many meaningful experiences in the participants' transition into the engineering workforce. The three most meaningful experiences were the feeling of accomplishment, relief, and the seamless transition to the engineering workforce.

When the participants graduated from the Engineering Technology Program and found their first job in the engineering workforce they had feelings of accomplishment, which was great. All their hard work and many sacrifices helped them feel accomplished in achieving their goals of graduating and entering the engineering workforce. Their hard work they invested into the Engineering Technology Program paid off with them securing a position in the engineering workforce that paid pretty well.

The other feeling the participants encountered when they accepted their first job was relief. There was a huge relief because once they obtained their Engineering Technology degree they no longer needed to rely on their high school diploma. They now had the credentials and the knowledge to work in the field of engineering. This provided them with additional earnings and

allowed them to pay their bills. All the participants felt a huge relief when their education and degree provided them benefits that many participants did not experience previously.

The participants' last meaningful experience was their seamless transition into the engineering workforce. When it came to the participants' work, they felt there was not much of a transition since the Engineering Technology Program prepared them for their new jobs and careers. The participants jumped straight into their positions and were not surprised by the work. Some participants indicated they were doing the exact same work that they were doing in the Engineering Technology Program, it was just at a different location. Being able to make the transition from academia to the engineering workforce seamlessly created a meaningful experience for the participants. Because of their seamless transition the participants believe they were moving in the right direction for their careers.

The participants graduating and transitioning to the engineering workforce provided a great feeling of accomplishment. With the transition it also brought a huge sense of relief because they realized they were going to be able to use their education and degree to advance their earnings. But one of the most meaningful experiences the participants reflect on is their seamless transition into the engineering workforce. The participants were gratified that their education prepared them for a career that they would be able to earn good wages and enjoy doing every day.

Part 2

The Findings in the Context of Literature

In this section of the chapter I position the study and its findings in the context of existing literature. This discussion is organized around three topics: US Engineering Corporations

Required Employment Qualifications, Community Benefits of a Quality Workforce, and Student Benefits of a Rural Community College Education. I will address these topics in order.

US Engineering Corporations Required Employment Qualifications

Many corporations that responded to the study by Gereffi et. al. (2007) indicated that they did not mandate that job candidates possess a four-year engineering degree. Approximately 40 % of the corporations hired engineers who only attained two or three year degrees. Georgetown University Center on Education and Workforce predicts that 60 % of US jobs will require some form of postsecondary education by 2018 (Lumina Foundation, 2012). But there is growing recognition that some high-paying technological careers require less than a four-year baccalaureate degree. This demonstrates the need for a sub-baccalaureate degree.

In this particular study there were participants occupying positions that normally would require a four year bachelor's degree but the companies were willing to accept an individual with an Associate of Applied Science degree in Engineering Technology. Zack's position as a project manager and estimator would typically require a bachelor's degree in Construction Management, but with his education, degree, and experience he was able to fill the position and perform the required tasks. Matt found himself being the only project manager at the architectural firm where he is employed that does not have a master's or bachelor's degree. Other participants find themselves having the same responsibilities as coworkers with bachelor degrees in engineering. They do a lot of the same tasks on the computer that the engineers will do by hand. Dan explains how the work has shifted from engineers to engineering technicians in the following statement:

> *I believe that the engineers' workload has, some of it has shifted to the draftsman. But like I said, in most cases I can understand why, because it is easier for us to figure practically, because it just makes sense to.*

Because it is quicker and easier to employ technology from a practical sense, engineering technicians are becoming design specialists or junior engineers. They use the technology to help

estimate, size, and confirm calculations for projects. The participants of this study recognized that technology is driving the engineering industry. As technology continually advances, there will be the need to learn new information for a career that can be supplemented by certificates and not additional degrees.

While formal collegiate credentials are still mainstay of higher education and community colleges, it is technological knowledge, skills, and abilities that are playing an increasing larger role in the engineering industry. The economy has a strong influence on students seeking noncredit offerings, especially when they know employment is waiting for them after they have completed their certificates (Van Noy, Jacobs, Korey, Bailey, & Hughes, 2008). As technology advances for every facet of the engineering profession, industry will need individuals with these skills, knowledge, and abilities to operate and employ technology in the firm. Rick explained a small hint of the technology that he uses in his current job in the following statement:

> *I have a set of plans that I can look at through Beam and I can invite people to help me review it. And I don't have to leave the office. We can sit down in a highlight area on a set of plans that are on our computer screens and I can invite three other people to participate in the review. We can message each other back and forth in our software system. We can see each other through views and... boy... talk about time saving, talk about saving money, talk about making construction much easier for you to actually get to the job site.*

As explained this is just a small hint of the technology that Rick had to go back to college to learn after he graduated from the Engineering Technology Program. But there are greater technologies that deal with surveying, mechanical, planning, manufacturing, and designing that are being implemented in industry today that need people with knowledge to operate. The participants indicated that each of these technological areas influences industry and people will need training as these areas advance. The best way to address these technological facets of the engineering industry is through certificates of completion. Community colleges can help train

technicians to fill these positions. Community colleges are uniquely positioned for the local sub-baccalaureate labor market and their mission enables them to contribute and support this important segment of the engineering industry and economy (Jacobs, 2001). Community colleges play a vital role in preparing today's dynamic workforce (Boggs, 2010), especially when it comes to the latest technologies.

Community Benefits of a Quality Workforce

Community colleges are positioned to play a critical role in the process of upward mobility for individuals of any age because it is the main point of access, exit, and reentry to higher education in American society. Community colleges help individuals learn what they need to know to be effective and responsible members of their society. They also make it possible for people to move between social classes.

This was true for all the participants of this study. They choose Ideal Community College because of its location, access, and the available programs of study it provided. The college and the Engineering Technology Program helped the participants develop their skills, knowledge, and abilities which were needed in the local and regional engineering workforce. The educational opportunity allowed the participants to stay close to home and work in their community.

About 66 % of Americans spend most of their working careers in their childhood states while over half spend most of their working careers in their home metro areas. Approximately 40 % of Americans with a college degree spend the bulk of their career in their childhood metro area (Bartik, 2009). This was true for the participants of this study as well. When the participants were provided an opportunity to attain their education and support the local engineering industry, majority of the participants stayed and worked in their community. By these individuals attaining

an education and staying close to home to work, these individuals were less likely to be welfare recipients and make claims for unemployment benefits.

A primary reason why individuals pursue a college education is to boost future earnings. Over a lifetime a worker with an associate's degree will earn nearly $500,000 more than someone with no education beyond a high school diploma (Brock, 2010). As the participants graduated from Ideal Community College and transitioned into the engineering workforce, this reduced the potential number of welfare and unemployment recipients in Pleasantville. Many of the participants were struggling financially before their educational journey into engineering technology. Sara explained where she would be if she did not have her education or degree with the following statement:

> *I wouldn't own my home. I can guarantee I wouldn't own my home, I wouldn't have the job I have so I wouldn't have that financial stability. So it would be back to the retail stuff, home day care whatever making ends meet barely. Probably on public assistant of some sort.*

Other participants indicated that due to their health if they did not find another form of work through their education they would be forced to apply for disability benefits. But in this study all the participants were able to find employment they enjoyed in the engineering workforce and were well paid. All the participants' wages increased after they earned their degree. Many of the participants' wages increased drastically while others doubled which was in line with a report by Alssid, Goldberg, and Schneider (2011) that indicated graduates from a Massachusetts community college more than doubled their full-time annual earning potential from $21,200 to $42,600. The additional earnings improved the participants' socioeconomics. Robert expressed how his economics changed after he got his degree and started working in the engineering workforce in the following statement:

> *I did not have to live pay check to pay check anymore and I could actually start building a life and start thinking about buying a house and a car that was descent and it was great.*

The participants of the study were able to get new housing, vehicles, recreation vehicles, and take vacations. Items they would have great difficulty in obtaining with their earnings from their previous employers. The additional earnings vastly improved their socioeconomics as well as the community's economy. The additional earnings and recent purchases by the participants of the study created a larger tax base for the community that affected the finances of the state and region. However all of these rewards and benefits the participants and the community receive come through the benefit of a rural community college and the education it provides.

Student Benefits of a Rural Community College Education

There are four preeminent types of benefits that can come from a rural community college education. The first and foremost is access to education. The second benefit is learning efficiency. Community colleges help students receive specific career level-training for jobs in high demand and allow students to upgrade their skills for work reentry, for advancement, or for the transfer of credits to a four-year institution to earn a bachelor's degree. The third benefit to individuals entails enhanced earnings. The fourth and last benefit is the "option value." For the students who do not exercise the option of completing college and leave after a few classes still enjoy a small wage increase over traditional high school graduates. In this case college education can still be described as being worthwhile since the returns are large enough to justify the public and private investments (Kane & Rouse, 1995). The participants of this study experience these benefits, but these benefits come at the expense of the affordability and schedule flexibility of community college.

Community colleges offer more flexible class hours to help meet the diverse needs of their students. Whether a student is working during the day, has family commitments, or desires a more flexible schedule, students are likely to find the classes they need at the times that work best for them since community colleges offer both day and evening sessions.

The flexible scheduling of the Engineering Technology Program helped many of the participants of the study. The course scheduling allowed the participants to keep focus on other parts of their life while they were going to college. Neil describes his experience with the Engineering Technology Program's flexible scheduling in the following statement:

> *Most of the classes were right after lunch and they went into the evening, which was great. I had enough time to get a part-time job for the mornings. That gave me enough time for studying for all my other classes, from engineering to everything else within the syllabus and everything to the courses. I also had enough time in my life to, not only work and go to school and still be very consistent with my grades and studying time, to have a life other than that.*

But flexible course scheduling was not the only benefit the participants enjoyed from the community college environment. Rural community colleges usually have smaller class sizes that allow students greater classroom interaction and one-on-one opportunities with other students as well as the instructor. The participants of this study found the smaller classes very beneficial in their educational journey. The smaller classes provided a better experience for the participants because it was easier to get into class discussions and everybody had the same interest in engineering so everybody was willing to help each other.

In this study Ideal Community College was able to help the participants create, develop, and sustain a quality engineering workforce that provided many benefits to the community of Pleasantville. In addition it appeared that US engineering firms were willing to accept an associate's degree in lieu of a bachelor's degree. The rural community college allowed the participants to stay close to home and work in their community while reducing the number of

welfare and unemployment recipients in the community. Through the participants' new earning increases and purchases it created economic development in the community and created a larger tax base. The study also demonstrated that by these participants completing their associate degrees they were able to find employment that provided improved earnings for a higher income and greater financial stability which aligns with Grubb's research (2001).

Part 3

Recommendations for Practice and Research

In this section of the chapter I discuss the findings in relation to the study. The context provides the opportunity to suggest recommendations of practice for faculty and advising. It also gives the opportunity to suggest future research. This section begins with implications of findings for practice. I then progress to recommendations for future research that has the potential to build on this study's findings. I conclude this section by sharing the challenges encountered while researching the Engineering Technology graduates.

Implications of Findings for Practice

In this section I observed how the findings of this study could help two significant influential instruments in a student's journey to a career. These two influential factors are faculty and advising. In order for students to have a seamless transition from education to career these two influential factors need to work in harmony to help students discover a career they are passionate about, find fulfilling, and can earn a living doing every day. The following are implications for faculty and advisers who have the responsibility to mentor, guide, and advise students.

Teachers and instructors are traditionally the individuals that work the most with students in the educational system. Since teachers and instructors spend the largest amount of time with students it would be beneficial if the faculty took a personal interest in student's extracurricular activities, academic successes, and challenges to help build a good rapport. By building a good rapport it can help faculty develop strong foundations of knowledge and continually build skills and abilities upon that existing knowledge. Engineering faculty can help in this undertaking by implementing four strategies in their pedagogy. These strategies are creating real world course projects that build upon each other, a curriculum with a clear connection between courses, and small cohort base training. These strategies are addressed in order.

One of the most important aspects for the participants was recognizing what they learned in class would be used in the workforce. Faculty can assist with this aspect by connecting class projects to real world scenarios to create relevance between information learned and needed workforce skills. By implementing this strategy it will help improve students' perceptions of a profession while providing students with the expectations of the type of work required in the careers students intend to enter. In addition if realistic projects could be constructed in such a manner that either a project or the lessons from the original project are continually used to develop and further knowledge throughout the course can help students strengthen their skills and abilities. When a bridge was constructed between lessons it helped the participants' transition from one class objective to another seamlessly. If faculty can develop lesson plans to incorporate this strategy it will keep students engaged in their educational path and persist until they complete their education.

It is also important for the participants to see a connection between the courses they were studying. When students are able to comprehend how one class interacts, connects, and relates to

one another it can strengthen the students' engagement. This is especially important when considering math and engineering classes. If classes can intergraded with each other it can make the students' transition between classes more fluid while providing students' more comfort in their area of study. This strategy can help faculty keep students engaged in their educational path and persist until they complete their education as well.

The last strategy that faculty can employ is small cohort base training. One fact about human nature is that humans learn better in groups. Learning in a group can provide interactive and dynamic situations for students to develop their knowledge, skills, and abilities. In this study there was an established informal cohort among the participants in the Engineering Technology Program that provided help, support, and encouragement when they needed it. However small cohort base training is not the traditional paradigm of cohort learning where the professor-teaching-student model is absent, but a model where the cohort of students are able to work, help, encourage, and engage each other not only in their class but in their program of study as well. Students will still need the leadership of a teacher for class demonstrations and program material but the support from peers interested in learning the same information. For many students it is easier and less intimidating to talk to a small group of peers instead of their instructor. It is important to put an emphasis on group size because it is easier for students to contribute, interact, and engage in a small group rather than a large crowd. If faculty can implement a form of small cohort base training, students will help keep each other engaged in their educational path and persist until they complete their education.

These three strategies can help faculty recruit and retain students in demanding programs of study. Through these initiatives students can relate what they are learning in class to the workforce. Students can also relate how each class integrates and relates to each other to create a

stronger understanding. However it will be through the small cohort base training that students will learn by helping each other, and in this process develop a better understanding of the information along with creating a more meaningful experience in their journey to the workforce.

While faculty plays a large role in students' futures, it is the career and academic advisers that play the monumental role of putting students in the right place, at the right time, studying the subject that best matches their personalities. This is probably one of the most difficult tasks in helping students transition into careers. There are two types of advisers. Career advisers are generally students' source of information at the high school level about careers and educational options at higher education institutions. Academic advisers are usually students' source of information in higher education. I will try to address potential strategies for each of these advisers in order.

Career advisers in high school have a fundamental role in students transitioning to a career after their education. If absent students are forced to assume and speculate about careers and the type of education required for those careers. The price for higher education has continually risen creating a greater importance for career advisers to not only advice students' about careers and educational options, but to perform this service sooner in the educational pipeline. The ideal place to start advising students about careers is in middle school. As students discover interesting careers in middle school, high school career advisers can guide students to beneficial classes that will help students transition into the workforce or into higher education upon graduation. For students' transitioning into higher education, having this source of information from career advisers can help students have an accurate perception of a career and save students' money in tuition, time spent looking for an interesting career at college, and the frustrations of a directionless endeavor in higher education.

Academic advisers in college are important leaders in student journeys through higher education. A student's first year at college is an important step in determining whether they have the academic capability to complete classwork as well as the program of study. The amount of student success, frustration, and interferences are a determining factor in whether a student will persistent in their education. This is why it is important that academic advisers guide students in selecting classes that are relevant to the student's program of study and avoid selecting classes out of their academic capabilities which can lead to frustration. One of the beneficial ways for academic advisers to obtain this information is by getting to know the students.

Although it may be difficult for many academic advisers, it would be beneficial to take a personal interest in student's academic successes and challenges. By taking personal interest academic advisers can build a rapport creating trust once students feel their academic advisers are invested in their success. Students would be more willing to accept academic guidance and pursue their education.

In addition academic advisers should be aware of all the available academic routes to an industry or profession. For students to find career satisfaction they have to find a field they are passionate about and inspires fulfillment. While there are main classifications of positions in any profession, there are many other positions that can provide support in the same industry as well. Good examples are a surgeon works with surgical technicians, dental hygienists work with dentists, architects work with interior designers, and project managers work with engineers. Even though a particular position in an industry might be unattainable due to student's limitations, it does not mean there is not another avenue into that same industry. Academic advisers should be aware of these alternate avenues leading to the same destination.

These strategies can help career and academic advisers recruit and retain students in demanding programs of study as well. By career advisers helping students discover their interest earlier in the educational pipeline, it leaves more time for students to develop knowledge about a profession prior to entering higher education. This can save students money, time, and frustrations in college. By academic advisers providing clear, but distinguishable routes to professions will keep students engaged in their educational path and persist until they complete their education.

Recommendations for Future Research

This qualitative study was exploratory in examining the lived experiences of fifteen Applied Science Engineering Technology graduates that transitioned into the engineering workforce. These participants provided thick rich detail that helped us begin to understand what experiences attracted and retained the participants in the Engineering Technology Program. It also helped us understand the participants' experiences as they transitioned into the engineering workforce. However in providing us a better understanding of the participants' experiences it has also provoked and brought other areas of interest into light. The areas of interest that come to the forefront are the type of curriculum high schools are employing to prepare students for engineering careers, how are career advisers in high school guiding students to potential careers, and how effective are small cohort base training in an engineering curriculum. These potential areas for future research will be addressed in order.

In examining the participants' interviews, many had very different perceptions about the various engineering fields and the types of opportunities available in the engineering industry. After graduating from high school many of the participants headed off to higher education to study engineering. After experience engineering classes in college they discovered it was not

what captivated them in high school. The participants who studied engineering classes in high school indicated that when they graduated from high school believed they knew all they needed to know to continue their engineering education at college. In reflecting on their experiences their preconceived notions of engineering from high school were very limited. The participants did not realize they could use their education and associate's degree in so many different fields of engineering. Because there appears to be a slight disconnect between high school and higher education engineering programs a closer examination would be beneficial.

Again in examining the participants' interviews I discovered that out of fifteen participants only two had ever spoken to a career counselor or adviser in high school. In both instances the participants stated their interactions with the career counselor or adviser were superficial and did not provide any true guidance. High school career counselors and advisers play a critical role in students' transitioning to careers and professions after their education. But in this pool of participants there seems to be a noteworthy absence of career counselors and advisers in their high school experiences. While the pool of participants may not be a representative sample of the population of high school graduates, the high number of absent career counselors and advisers in this study brings an interest in how career counselors and advisers are guiding high school students to potential careers.

The last area of interest is how beneficial of impact will small cohort base training have in recruiting and retaining students in demanding programs of study. In this study there was an established informal cohort among the participants that transcended generations of students in the Engineering Technology Program. This informal cohort was a vital institution for the participants' journey through Ideal Community College's Engineering Technology Program. This institution provided the participants help, support, and encouragement when they needed it.

This created an environment that was conducive to their learning and most importantly their success. Based on the participants' experiences with the informal cohort in the Engineering Technology Program, it will be advantageous to study how beneficial a small formal cohort base training technique will be in a high demand program.

Research Challenges

While this study was a major undertaking, I felt very fortunate that there were many participants willing to share and explain their meaningful experiences in their educational journey to the engineering workforce. I was solely interested in the participants' positive meaningful experiences that pulled them in and pushed them through the Engineering Technology Program at Ideal Community College then propelled them into the engineering workforce. In interviewing the participants I did not realize that with the good also come the bad experiences. In looking for good there were times that I found bad and bottled up experiences that poured out harsh and sometimes painful emotions. And when it became too disheartening and grief materialized some of the participants withdrew and requested to opt out of the study.

My intention was not to bring the negative to the surface, but to bring light to the positive experiences. I had the full expectations of hearing all the great accomplishments the participants achieved in this study. But I was not quite prepared to hear about the disappointments, frustrations, and grief that came with painful emotions. What I discovered from this pool of participants is that it is difficult to have one type of experience without the other.

The reason I bring this to light is the individuals who wanted to opt out of the study had rich data. By the time the individual notified me and requested they be removed from the study I had already transcribed the interview and started to analyze the data which consumed time and resources. I believe it would be beneficial to future researchers if the consent form for the study

contained an “approval to use data” section allowing an individual to opt out of the study while providing the researcher the ability to request to use the data but not include the individual in the study. By considering this option it will help future researchers preserve rich data for the study and the future. In this study these were the challenges that I encountered in my research.

REFERENCES

Adelman, C. (1992). *The way we are: The community college as American thermometer.* Washington, DC: Office of Educational Research and Improvement, US Department of Education.

Adelman, C. (1998). *Women and Men of the Engineering Path: A Model for Analysis of Undergraduate Careers*. Washington, D.C.: U.S. Government Printing Office.

Alexander, W. (2005). Agency, teleology, and world state: A reply to Shannon. *European Journal of International Relations, 11(*4), pp. 589-598.

Allen, R. (2002). Teacher education at the community college: Partnership and collaboration. *Clearinghouse for Community Colleges.* LA, CA.

Alssid, J.L., Goldberg, M., & Schneider, J. (2011). *The case for community colleges: Aligning higher education and workforce needs in Massachusetts.* Boston, MA: Boston Foundation.

American Society of Civil Engineering. (2009). *Report card for America's infrastructure 2009.* Washington, D.C.: ASCE Office.

American Society of Civil Engineering. (2013). *Failure to act: The impact of current infrastructure investment on America's economic future.* Washington, D.C.: ASCE Office.

Appelbaum, R.P., Gereffi, G., Parker, R., & Ong, R. (2006*). From cheap labour to high technology leadership: Will china's investment in nanotechnology pay off?* Paper to the Annual Conference of the Society for the Advancement of Socio-Economics, Trier, Germany, 30 June – 2 July.

Bartik, T.J., (2009). What proportion of children stay in the same location as adults, and how does this vary across location and groups. *Upjohn Institute of Employment Research, 14(5).*

Bartik, T.J., (2011). Why investing in kids make sense for local economies. *Upjohn Institute of Employment Research, 18(*1).

Berthoff, E. (1987). The teacher as researcher. In D. Goswami & P.R. Stillman (Eds.), *Reclaiming the classroom: Teacher researcher as an agency for change.* Upper Montclair, NJ: Boyton/Cook, pp. 28-48.

Board, N. S. (2004). *Science and Engineering Indicators 2004*. Washington, D.C.: National Science Foundation.

Board, N. S. (2010). *Preparing the next generation of stem innovators: Identifying and developing our nation's capital*. Washington, D.C.: National Science Foundation.

Bogdan, R.C., & Bilkin, S.K. (4th ed.). (2003). *Qualitative research for education: An introduction to theories and methods.* New York: Pearson.

Boggs, G.R., (2010). *Democracy's college: The evolution of the community college in America.* Prepared for the White House Summit on Community Colleges, Washington, D.C.: American Association of Community Colleges

Bragg, D.D. (2001). Opportunities and challenges for the vocationalism in American community colleges. *New Direction for Community Colleges, 115(*1): San Francisco, CA: Jossey Bass, pp. 1-15.

Brand, B. (1997). *Community colleges and economic development.* Waco, Texas: Center for Occupational Research and Development.

Brock, T., (2010). *Community college as a pathway to higher education and earnings*. Prepared for the White House Summit on Community Colleges, Washington, D.C.: MDRC

Carnevale, A.P. (2000). *Community colleges & career qualifications*. Washington, DC: American Association of Community Colleges.

Carnevale, A.P., Smith, N., & Jeff Strohl. (2009, June 16). Help wanted: postsecondary education and training required. *New Directions for Community Colleges*, 146(09), 21-31.

Carnevale, A.P., Smith, N., & Jeff Strohl. (2010, June). Help wanted: projections of jobs and education requirements through 2018. *Center on Education and the Workforce*, Georgetown University, Washington DC.

Choy, S. P. (2002). *Access & Persistence: Finding from 10 years of longitudinal research on students*. Washington, D.C.: American Council on Education Center for Policy Analysis.

Chubin, D.E., May, G.S., & Babco, E.L. (2005). Diversifying the engineering workforce. *Journal of Engineering Education*, 94 (1), 73-86.

City-Data.com. Retrieved March 5, 2013 from http://www.city-data.com/us-cities/The-West

Cohen, A.M., & Brawer, F.B., (5th ed.). (2008). *The American community college.* San Francisco, CA: Jossey-Bass

College Board. (2009). *Trends in college pricing: 2009.* Washington, DC: Author. Retrieved May 31, 2012, from http://www.trends-collegeboard.com/college_pricing/pdf/2009_Trends_College_Pricing.pdf

Competitiveness & innovation on the Committee's 50Th Anniversary with Bill Gates: Hearing Before the Committee on Science and Technology House of Representatives. 110th Cong. (2008).

Crabtree, B.F., & Miller, W.L. (2nd ed.). (1999). *Doing qualitative research.* Thousand Oaks, CA: Sage Publications.

Creswell, J.W. (3rd ed.). (2009). *Research design: Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks, CA: Sage Publications.

Creswell, J.W., (2nd ed.).(2007). *Qualitative inquiry and research design: Choosing among five approaches.* Thousand Oaks, CA: Sage Publications.

Crotty, M. (1998). *The foundation of social research: Meaning and perspective in the research process.* Thousand Oaks, CA: Sage Publications.

Denzin, N. K. (1989). *Interpretive biography*. Newbury Park, CA: Sage.

Dossani, R., & Kenney, M., (2006). Reflections upon "sizing the emerging global labor market". *Academy of Management Perspectives*, 20, pp. 35-41.

Dougherty, K.J., & Bakia, M.F. (2000). Community colleges and contract training: Content, origin, and impacts. *Teachers College Record 102,* pp. 198-244.

Esterberg, K. (2002). *Qualitative methods in social research.* Toronto, CA: McGraw Hill.

Gereffi, G. (2006). The new offshoring of jobs and global development. *Institute of International Labor Studies,* International Labor Organization, Geneva, Switzerland.

Gereffi, G., Wadhwa, V., Rissing, B., & Ong, R. (2008). Getting the numbers right: International engineering education in the united states, chine, and india. *Journal of Engineering Education, 97*(1), pp. 13-25.

Gereffi, G., Wadhwa, V., Rissing, B., & Ong, R. (Spring 2007). Where the engineers are. *Issues in Science and Technology*, pp. 73-84.

Grubb, N.W. (1995). Post-secondary education and sub-baccalaureate labor market: Corrections and extensions, *Economic of Education Review, 14.*

Grubb, N.W. (1997). The returns to education in the sub-baccalaureate labor market, 1984-1990. *Economics of Education Review, 16(3*), pp. 231-245.

Grubb, N.W. (1999). The economic benefits of pre-baccalaureate education: Results from state and local studies, *CCRC Brief, 3,* New York: Community College Research Center, Teachers College, Columbia University.

Grubb, N.W. (2001). From isolation to integration: Postsecondary vocational education and emerging systems of workforce development. *New Directions for Community Colleges, 115(*1), pp. 27-37.

Grubb, W. N., Badway, N. Bell, D., Bragg, D., & Russman, M. (1997, June). Workforce, economic, and community development: The changing landscape of the "entrepreneurial" community college. *The National Center for Research in Vocational Education,* The League for Innovation in the Community College, The National Council on Occupational Education.

Harris, S. (2012, July 24). Central piedmont community college: Blazing a path on employer partnerships. *United States Department of Labor.* Retrieved January 17, 2013 from http://social.dol.gov/blog/central-piedmont-community-college-blazing-a-path-on-employer-partnerships/

Honeyman, D.S., Wattenbarger, J.L., & Westbrook, K.C. (1996). *A struggle to survive: Funding higher education in the next century.* Thousand Oaks, CA: Sage Publication.

Hurley, K.S. (2002). High-tech partnering leads to learning-centered curricula for individuals with disabilities. In M.S. Spangler (Ed.), *Developing successful partnerships with business and the community, New Directions for Community Colleges, 119,* San Francisco, CA: Jossey Bass, pp. 69-76.

Husserl, E. (1970) trans D Carr *Logical investigation.* New York, Humanities Press.

Husserl, E. (1982). *Husserl and Intentionality: A study of mind, meaning, and language* (D.W. Smith, Ed.). Dordrecht, Holland: Reidel Publishing Company.

Information Technology Association of America (2002). Jobs, skills, and the continuing demand for IT workers. *Community College Journal, 73(2*), 32-35

Jacobs, J. (2001). What is the future of postsecondary occupational education? *Journal of Vocational Education Research, 26(*2), pp. 172-205.

Kane, T.J. & Rouse, C.E. (1995). Labor-market returns to two-and four-year college. *American Economic Review, 85(*3), pp. 600-614.

Karcher, R. (2011). Variables related to academic success in pre-engineering for students at risk. *ProQuest,* UNI Dissertation Publishing. (UNI No. 3333134)

Kasper, H.T. (2003). The changing role of community college. *Occupational Outlook Quarterly, 46(*4), pp. 14-21.

Katsinas, S.G. (1994). Is the open door closing? The democratizing role of the community college in the post-coldwar era. *Community College Journal*, *64(*5), pp. 24-28.

Kisker, C.B., & Carducci, R. (2003). UCLA community college review: Community college partnerships with the private sector-organizational contexts and models for successful collaboration. *Community College Review Winter, 31(*3), pp. 55-74

Lacey, T.A., & Wright, B. (2009, November). Occupational employment projections to 2018. *Monthly Labor Review*, 132(11), pp. 82-123.

Lane, E., (2005, May 27). India's push for technology lures foreign r&d centers. *Press Release.* Washington, DC: American Association for the Advancement of Science. Retrieved 04/28/12 from http://www.aaas.org/news/releases/2005/0527india.shtml

Lather, P.A. (1992). Postmodernism and the human sciences. In S. Kvale (Eds.), *Psychology and postmodernism.* London: Sage, pp. 88-109.

Lincoln, Y.S., & Guba, E.G. (1985). *Naturalistic In quiry.* Beverly Hills. CA: Sage Publications.

Lumina Foundation. (2012, March). *A stronger nation through higher education.* Indianapolis, IN: Retrieved August 14, 2013, from http://www.luminafoundation.org/publications/A_Stronger_Nation-2012.pdf

Lynch, R. (2000). High school career and technical education for the first decade of the twenty-first century, *Journal of Vocational Education Research, 25(*2), pp. 155-198.

Mattis, M.C., & Sislin, J. (2004). *Committee on enhancing the community college pathway to engineering careers*. Washington, DC: The National Academic Press.

Maxwell, J.A. (2nd ed.). (2005). *Qualitative research design: An interactive approach.* Thousand Oaks, CA: Sage Publications.

Merriam, S. B. (2002*). Qualitative research in practice: Examples for discussion and analysis*. San Francisco, CA: Jossey-Bass Publishers.

Merriam, S.B. (2009). *Qualitative research: A guide to design and implementation*. San Francisco, CA: Jossey-Bass Publishers.

Miles, M.B., & Huberman, A.M. (2nd ed.). (1994). *An expanded sourcebook: Qualitative data analysis.* Thousand Oaks, CA: Sage Publications.

Moustakas, C. (1994). *Phenomenological research methods.* Thousand Oaks, CA: Sage Publications.

Orr, M. T., (2001). Community Colleges and Their Communities: Collaboration for Workforce Development. *New Directions for Community College*, 115, pp. 39-50

Osterman, P. (2008). College for all?: The labor market for college educated workers. *Center for American Progress.*

Patton, M.Q. (2002). *Qualitative research and evaluation methods*. London, UK: Sage Publications.

Polkinghorne, D.E. (1989). Phenomenological research methods. In R.S. Valle & Halling (Eds.). *Existential-phenomenological perspectives in psychology*. New York: Plenum, pp. 41-60.

Pollak, M. (1999, May). Counting the s & e workforce-it's not easy. *Division of science Resources Studies Issue Brief*. Washington DC: National Science Foundation, Directorate for Social, Behavioral, and Economic Studies.

Provasnik, S. & Planty, M. (2008). Community colleges: Special supplement to the condition 2008. *Statistical Analysis Report. Department of Education, Institute of Education Sciences, National Center for Education Statistics*. Washington, D.C.: US.

Regional technology Strategies, Inc. (2001). *Hagerstown community college: Building a high tech base.* Retrieved May 20, 2012, from http://www.rtsinc.org/benchmark/cstudies.shtml

Regional technology Strategies, Inc. (2011). *Cultivating successful rural economies: Benchmark practices at community and technical colleges.* Retrieved May 27, 2012, from http://rtsinc.org/benchmark/overview.shtml

Robottom, M., & Hart, E.P. (1993). *Research in environmental education: Engaging the debate.* Victoria, Australia: Deakin University Press.

Scheurich, J. J. (1994). Social relativism: A postmodernist epistemology for educational administration. In S. J. Maxcy (Ed.), *Postmodern school leadership: Meeting the crisis in educational administration*. Westport, CT: Praeger, pp. 17-46.

Schwandt, T. (2000). *Three epistemological stance in qualitative inquiry: Interpretivism, hermeunties, and social constructivism.* In N. Denzin and Y. Lincoln (eds.), Handbook of Qualitative Research. London: Sage, pp. 189-214.

Shaw, K.M., Valadez, J.R., & Rhoads, R.A. (1999). *Community college as cultural texts: Qualitative explorations of organizational and student culture.* New York: State University of New York Press, Albany.

Soares, L., (2010). Community college and industry partnerships. *Prepared for the White House Summit on Community Colleges*, Washington, D.C.: Center for American Progress.

Stake, R.E. (1995). *The art of case study research.* Thousand Oaks, CA: Sage Publications.

Stamps, D. (1995). Community colleges go corporate. *Training, 32(*12), 36-43.

Sunberg, L.L., (2002). Building partnerships with business that make a difference. *New Directions for Community Colleges, 119,* pp. 13-20.

Swindle, J. (1999). Industry/community colleges: Allies in the war for talent. *Community College Journal, 69(*6), pp. 16-19.

Texas Higher Education Coordinating Board. (2008, April). *Strategic Plan for Texas Public Community Colleges 2009-2013, 25.*

The Knowledge Net. (2000). A report of the new expeditions initiative: Connecting communities, learner, and colleges. *American Association of Community Colleges*. Washington, DC: Community College Press.

Townsend, B.K. (2001). Blurring the lines: Transforming terminal education to transfer education, *New Directions for Community Colleges, 115(*1), pp. 63-71.

United Nations Conference on Trade and Development. (2006). *Trade and development report: Global partnership and national policies for development.* New York: United Nations.

US Department of Commerce, United States Census Bureau. Retrieved March 5, 2013 from http://factfinder2.census.gov

Van Manen, M. (1990). *Researching lived experience: Human science for an action sensitive pedagogy.* London, Ontario, Canada: The Althouse Press.

Van Noy, M., Jacobs, S., Korey, T., & Hughes, K. (2008). *The landscape of noncredit workforce education: State policies and community college practices,* Community College Research Center, Teachers College: Columbia University.

Wadwa, V., Jasso, G., Rissing, B., Gereffi, G., & Freeman, R. (2007, August 22). Intellectual property, the immigration backlog, and a reverse brain-drain: american's new immigrant entrepreneurs, part III. *Ewing Kauffman Foundation,* Durham: Duke University School of Engineering.

Weiss, R.S. (1994). *Learning from strangers: The art and method of interview studies.* New York, NY: The Free Press.

White, S., & Walsh, J. (2008). *Greener pathways: Jobs and workforce development in the clean energy economy. Madison*. WI: Center on Wisconsin Strategy, The Workforce Alliance, The Apollo Alliance.

Wilson, D., & Purushothaman, R. (2003). Dreaming with brics: The path to 2050. *Global Economics Paper 99.* Golden Sachs, New York.

Wkipedia.org. *Central Piedmont Community College.* Retrieved January 14, 2013 from http://en.wikipedia.org/wiki/Central_Piedmont_Community_College

Wkipedia.org. Retrieved March 5, 2013, from http://en.wikipedia.org

Wulf, W. (2005). Globalization and engineering. *National academy of engineering of the national academies, 35(*3), pp. 28-33.

Yin, R.K. (2003). Case Study Research: Design and methods (3rd ed.). Thousand Oaks, CA: Sage Publications.

Yin, R.K. (4th ed.). (2009). *Case study research: Design and methods.* Thousand Oaks, CA: Sage Publications.

Yurtseven, H.O. (2002). How does the image of engineering affect student recruitment and retention? A perspective from the usa. *Global Journal of Engineering Education, 6(*1), Retrieved June 27, 2012 from http://www.nova.edu/sss/QR/QR 13-4/baster.pdf

Zandnipour, L., & Conway, M. (2001). Closing the Gap: How Sectoral Workforce Development Programs Benefit the Working Poor. Washington, D.C.: Aspen Institute.

Zeiss, A. (2000). Community/workforce development: A mandate for relevancy. *Community College Journal, 70,* pp. 47-49.

APPENDIX A

Initial Interview

Pre-College Influences

Describe to me what influenced you and made you interested in studying Engineering.

Tell me about the process you used when deciding to attend Ideal Community College and the Engineering Technology Program.

Perceived Experiences of the Engineering Technology Program and Ideal Community College

When you first decided to enroll in the Engineering Technology program, describe how you felt about your decision.

Walk me through the decision to major in Engineering Technology.

Tell me about your experiences in the classroom during your Engineering Technology Program.

Tell me about the courses you took in the Engineering Technology program and at Ideal Community College.

Describe your experiences at Ideal Community College.

Perceived Experience of Transitioning from Academia to the Engineering Workforce

Tell me about your current job.

I would like for you to try and remember when you entered the engineering workforce after graduation. Describe that moment to me.

Tell me about your transition from the community college to the engineering workforce.

Describe what experiences reinforced your desire to enter the engineering field.

Describe what experiences altered your desire to enter the engineering field.

What skills do you think would have strengthened your transition into the engineering workforce?

Tell me where you see your career field going in the next 10 years.

Reflections of your Journey from Education to Workforce

When you think back on your educational journeys, who are the people that stand out as significant in your experience?

What obstacles did you have to overcome to obtain your education and earn your AAS degree?

Looking back at your path to the associate's degree, what feelings do you connect to your journey?

How did this experience affect others in your life?

What has this experience meant for you?

What would you change on your educational pathway if you had the opportunity?

How might your life be different if you had stopped or not completed your AAS degree?

Closing the Interview

Is there anything else about your AAS experiences that you would like to share?

APPENDIX B

Stake's Critique Checklist for a Study

1. Is the report easy to report? _____
2. Does it fit together, each sentence contributing to the whole? _____
3. Does this report have a conceptual structure (i.e., themes or issues)? _____
4. Are its issues developed in a serious and scholarly way? _____
5. Is the case adequately defined? _____
6. Is there a sense of story to the presentation? _____
7. Is the reader provided some various experience? _____
8. Have quotations been used effectively? _____
9. Are headings, figures, artifacts, appendixes, indexes effectively used? _____
10. Was it edited well, then again with a last minute polish? _____
11. Has the writer made sound assertions, neither over or under-interpreting? _____
12. Has adequate attention been paid to various contexts? _____
13. Were sufficient raw data presented? _____
14. Were data sources well-chosen and in sufficient number? _____
15. Do observations and interpretations appear to have been triangulated? _____
16. Is the role and point of view of the researcher nicely apparent? _____
17. Is the nature of the intended audience apparent? _____
18. Is empathy shown for all sides? _____

19. Are personal intentions examined? _____

20. Does it appear individuals were put at risk? _____