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Females in Automotive Careers: Career Decision-Making Influences and Experiences During University Preparation and Beyond

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FEMALES IN AUTOMOTIVE CAREERS: CAREER DECISION-MAKING INFLUENCES AND EXPERIENCES DURING UNIVERSITY PREPARATION AND BEYOND

by

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Today, women fill nearly 50% of the jobs in the U.S. economy (U.S. Dept. of Labor, 2014). While women are making progress in many careers once considered male only, they are still underrepresented in the male-dominated Science, Technology, Engineering, and Math (STEM) careers, filling only 25% of available STEM jobs (Beede et al., 2011). The problem is not a lack of interest in STEM subjects, but a "leaky pipeline" that develops early in adolescence. By the eighth grade, half as many girls are interested in STEM careers as boys (National Science Foundation [NSF], 2007). Even after graduation from college, women with STEM degrees are twice as likely to leave a science or engineering job than men with similar degrees (NSF, 2007). Numerous studies have documented why women avoid or drop out of STEM education and careers, including lack of self-efficacy, lack of role models, lower behavioral persistence, family obligations, loss of self-efficacy, and gender stereotypes. However, there are very few studies about the experiences of women pursuing automotive degrees at a university or careers in the automotive industry.

To begin filling this gap in the literature, this qualitative study captured the experiences of women who chose a non-traditional career in automotive technology at one Midwestern university and sought to uncover what made them seek this career and persist in it despite the historical odds against their success. Lent, Brown, and Hackett's

(1994) Social Cognitive Career Theory was used as a lens for this study. Twelve comprehensive interviews with women in the automotive career pipeline were conducted. Three were current students in bachelor's degree automotive programs, and the remaining nine were graduates of such programs working in the automotive field. The resulting ten major themes and fifteen sub-themes detail the females' experiences from the time they chose automotive as a career until the present day.

Primarily, it was disclosed that almost all participants indicated an external factor influenced them to choose an automotive career in the first place, with a majority of the influencers being male family members. A bulk of the participants considered other career paths prior to ultimately choosing automotive. Once automotive was chosen, many changed their major within automotive, but remained committed to the field. Because automotive is a male-dominated field, many participants reported being the only female in their automotive classes or at their place of employment. There were many reports of participants having to prove to others their knowledge of and commitment to their automotive career. Some had difficulty with interviewing while seeking work, but a vast majority reported an overall positive view of their work experience. All participants said they received support from family, particularly fathers. Conversely, many reported that at least one or more of their parents was not supportive. There were accounts of support from faculty advisors at the university, and support from colleagues and supervisors in the workplace. While most experienced some degree of gender bias and/or discrimination either in school or at work, the vast majority said that they would choose an automotive career path again.

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Russell A. Leonard, Jr.

TABLE OF CONTENTS

Table of Contents—Continued

CHAPTER

Table of Contents—Continued

CHAPTER

Table of Contents—Continued

CHAPTER

Table of Contents—Continued

CHAPTER

Table of Contents—Continued

CHAPTER

Table of Contents—Continued

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

During World War II, my grandparents moved from the family farm on tribal land in North Carolina to work for the Arsenal of Democracy. My grandfather was a shipbuilder during the war, and my grandmother worked in a factory after the war, up through her retirement. As for my grandmother, she was part of the 57% of the workforce that women comprised during 1945 (Hill, 2013). Her daughter, my mother, worked as the first female school bus driver in our small Midwestern town while I was growing up in the early 1970s. Jobs were scarce for everyone because the local economy was hit hard by a recession. But, opportunities for women were even less so because women's acceptance in the workplace was not as high as it is today. During the 1970s, women accounted for only a little over 36% of the workforce (U.S. Department of Labor, 2014).

Since my grandmother's and mother's times, many women no longer work only out of necessity; now they also may follow their calling into careers that lead to personal fulfillment. Many have discovered that the pathway to a successful and gratifying career is through post-secondary education. Women's acceptance in the workplace has also changed significantly since my mother and grandmother started working outside the home. Today, women fill nearly 50% of the jobs in the U.S. economy (U.S. Dept. of Labor, 2014). While women are making progress in many careers once considered male only, according to the U.S. Department of Commerce, they are still underrepresented in the male-dominated Science, Technology, Engineering, and Math (STEM) careers, filling only 25% of available STEM jobs (Beede, Julian, Langdon, McKittrick, Khan, & Doms, 2011).

History also shows that the percentage of women enrolled in higher education has increased over the past 60 years to 58% (National Center for Educational Statistics [NCES], 2012). Likewise, the percentage of women in the labor force with a college degree has nearly tripled from 1970 to 2009 (U.S. Department of Labor, 2010). However, during that same time period, the percentage of women in STEM occupations remained relatively unchanged, in spite of the fact that women working in STEM careers earn 33% more than women working in non-STEM careers (Beede et al., 2011). So the problem does not appear to be a lack of college educated women, nor a lack of financial success for women in STEM careers vs. non-STEM careers. Furthermore, the problem does not seem to be a lack of interest in STEM subjects, given that, according to Bae, Choy, Geddes, Sable, and Snyder (2000), 66% of fourth-grade girls and 68% of boys indicated that they "like" science, which is nearly equal. But something happens later in young women's lives because by the eighth grade, girls are half as interested as boys in STEM careers (National Science Foundation [NSF], 2007). Indeed, in 2009, the percentage of women who were scientists and engineers was 24%, and in 2010, only 18.4% of engineering graduates were women (Beede et al., 2011; NSF, 2014). Even after graduation, women with STEM degrees are two times more likely to leave a science or engineering job than men with similar degrees (NSF, 2007). So at some point, a "leaky pipeline" (NSF, para. 1) develops whereby women drop their interest in science, and "leak out" of the pipeline of STEM careers.

Numerous studies shed light on why women leave STEM in general, including lack of self-efficacy (Heilbronner, 2013; Szelényi, Denson, & Inkelas, 2013), lack of role models (Buck, Clark, Leslie-Pelecky, Lu, & Cerda-Lizarraga, 2008), lower behavioral

persistence (Cech, Rubineau, Silbey, & Seron, 2011), family obligations (Glass, Sassler, Levitte, & Michelmore, 2013), loss of self-efficacy (NSF, 2007; Strenta et al., 1994), and gender stereotypes (Prives, 2013). Therefore, the leaks in the pipeline are well documented as to why women avoid or drop out of STEM careers.

This steady loss of potential female STEM talent is a concern because companies need a diverse workforce to develop creative solutions for problems in today's competitive global markets (Beede et al., 2011). The National Science Foundation (2003) has indicated that, "the national need for a larger, more science- and computer-literate and skilled, and diverse workforce is ever greater, as we progress toward an increasingly technological job market and a scientifically complex society" (p. vi). To this end, industry needs more women in STEM careers because their perspective lends a competitive advantage to the design and engineering of the products everyone uses. According to Page (2007), this is because "(t)wo people belonging to different identity groups, or with different life experiences, also tend to acquire diverse cognitive tools" (p. xiv). From this "cognitive diversity" standpoint, women both "belong to different identity groups" and have "different life experiences" than men, which leads them to have a diverse set of "cognitive tools." Therefore, women contribute in unique ways to solve problems that confound the exclusive brain power of gender homogeneous groups in the workplace. These cognitive tools are the "perspectives, interpretations, heuristics, and predictive models" that, through cognitive diversity, give teams with men and women a creative advantage over gender homogeneous teams (Page, 2007, p. 374). Given the value of cognitive diversity in STEM product design and development, the next big breakthrough might come from a diverse team with both men and women.

There are many studies that support the advantages and successes of diverse teams in groups, firms, schools and societies. For example, in their study of gender-heterogeneous work groups, Campbell, Mehtani, Dozier, and Rinehart (2013) found increases in attributes, such as performance, production, cohesion, collective intelligence factor, and high-ability problem solving, along with less conflict, when compared to gender homogeneous teams. In another study, Freeman and Huang (2014), in their study of ethnic identity of authors of over 2.5 million papers written by U.S. authors between 1985 and 2008, found that research papers with greater diversity among contributors are more often published in high-impact journals. In addition, other researchers more frequently cite the articles with greater diversity of authors than research papers from colleagues with similar backgrounds. This suggests that the overall quality of work from heterogeneous work groups is superior to their homogeneous counterparts, due to their inherent diversity of thought and experience.

As one example of a STEM career that could benefit from more diversification, automotive technology programs typically only graduate a handful of women in any given year. According to the National Center for Education Statistics (2009-2010), of the 330 students who graduated from automotive technology programs in the United States, only 13 were women. This is in spite of the fact that STEM jobs, which include automotive technology, have increased at a rate three times that of non-STEM jobs (U.S. Department of Commerce, 2011). This leads to numerous lucrative opportunities that await the few female automotive graduates. Indeed, the Midwestern university at which I am a faculty member has recently seen the number of women enrolled in its automotive technology programs double, from 5 to 10 during 2002-2012. This has captured my

interest as a researcher because, in the past, many students went to college to take classes in order to discover their career interests. Today, with the rising cost of higher education, it is more economical to have a career in mind before entering college to prevent wasting money and time taking courses that end up outside of the graduation requirements for a settled-on major. Because of this shift, the pressure is on young people to choose a career while in high school, and sometimes even before.

While there are many reasons why people choose careers, this research focused on capturing the experiences of women who chose a non-traditional career in automotive technology at a Midwestern university, and what made them seek this career and persist in it despite the historical odds.

Conceptual Framework

In order to understand the current state of women in STEM, the first look needs to be studies that shed light upon the aspects of choosing a career and the experiences of women in the STEM field. As a starting point, Bandura's Social Cognitive Theory (SCT) focused, in part, on the concept of self-efficacy, which Bandura (1986) and Harsh, Maltese and Tai (2012) describe as an individual's belief in their own competence. Self-efficacy affects an individual's choices of activities according to Hall (2003), and it has been applied to women's career development in explaining underrepresentation in male-dominated careers (Betz & Hackett, 1981). Following SCT, Lent, Brown, and Hackett (1994) continued exploring self-efficacy using Social Cognitive Career Theory (SCCT) as a means of illuminating more details about how individuals choose careers. Furthermore, Strenta, Elliot, Adair, Matier, and Scott (1994), as well as the National

Science Foundation (2007), found that loss of self-efficacy was attributed to the high volume of female attrition from careers in the sciences.

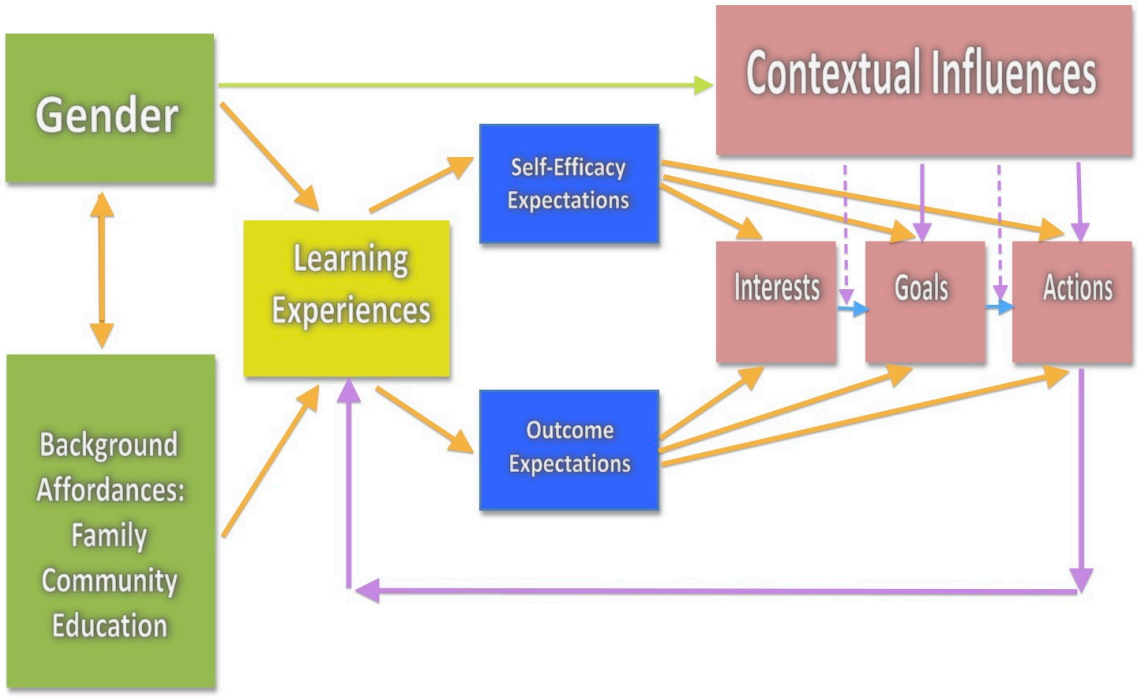

Figure 1. Conceptual framework for study.

As seen in Figure 1 (a simplified SCCT model), a person enters the framework with interplay from both who they are, which most importantly for a STEM career path is that they are women, and what their background affords them (i.e., because they are women, their families, communities, and educational systems may have norms that limit or augment their potential). These two factors feed into their learning experiences, including past performance and accomplishments, vicarious learning, social persuasion, and physiological reactions (e.g., test anxiety), with past performance being the most powerful of all learning experiences (Lent et al., 1994).

For example, generally speaking, when women see a work environment that is predominantly male, they might feel they do not belong due to background affordance (i.e., they were taught that women do and do not "belong" in certain careers) and choose not to pursue a STEM career. According to Sapna Cheryan, an expert in cultural and gender stereotypes, this might also be due to their vicarious learning from other women's struggles in male-dominated environments for promotion and work-life balance (as cited in Prives, 2013).

Likewise, a student's learning experiences, such as a prior performance on a math test, influences his or her belief and expectations that future performances in math will be similar. Therefore, if the results are positive, a student will choose to pursue and persevere in higher levels of math; however, if they are negative, a student might forego math altogether. On this point, female students of all ages differ than their male counterparts in that, when they receive a poor grade in a STEM subject, they tend to doubt their career choice and consider changing college majors (Heilbronner, 2013). Male students, on the other hand, are more likely to view the initial failing as practice, or a notice to try harder, and stay on the STEM career path (Cech et al., 2011).

These learning experiences feed into both self-efficacy (belief you can do it) and outcome expectations (what will happen if I do it). For example, a woman might say to herself, "I would not do anything that I would fail at doing." Indeed, Sax (2008) found that women have higher grades than men in STEM subjects, but think they cannot be successful in STEM careers and drop out. Sometimes poor grades in STEM subjects are not even part of the picture women paint for themselves and their abilities. It is interesting to note that Cech et al. (2011) found in their study of professional role

confidence in engineering students that SAT scores and high school grades of women and men were not significantly different, yet the men rated their math ability higher than the women rated their math ability. This demonstrates one way in which self-efficacy and outcome expectations have an influence on an individual's interests, goals and action.

Interests, goals, and action emerge from self-efficacy and outcome expectations in other ways, as well. For example, one would not be interested in something for which they believed they would, or would expect to, fail. Goals, then, are set based on an individual's personal interests, with input from their beliefs and experiences regarding success or failure. As depicted in Figure 1, it is from action that new experiences are created, which provide feedback to the learning experiences box. As for action, another viewpoint suggests the action of persistence stems from a "growth mindset" as Dweck (2006) describes or as Duckworth and Eskrels-Winkler (2013) calls "grit."

Also, if a woman "experiences" something negative in relation to STEM within the SCCT framework, she might choose not to pursue a STEM career. As noted earlier, girls are most interested in science during their lifetimes while in the 4th grade (Bae et al., 2000). After that, the "leaky pipeline" begins, and they begin dropping out one-by-one along the path to a STEM career, until only a handful remain when the time comes to graduate from college.

Using SCCT as a roadmap of the process for choosing and persisting in a career, one could look for such leaks all along the way to a STEM career. In my study, however, I focused on the experiences of the women who *did* make it through the pipeline into STEM careers, in order to better understand their experiences, what made them persist, and how they avoided the common leak areas identified in the literature.

Problem Statement and Research Questions

Industry needs more qualified women in automotive technology and, based upon my own personal experience as a faculty member at a university program placing women into automotive technology careers, career opportunities for women are abundant. STEM programs at colleges and universities want to increase female enrollment to meet industry's needs (Kennedy & Schumacher, 2005; Milgram, 2011). However, women are underrepresented in STEM because they do not choose STEM careers, or, if they do, they do not persist within them. The literature illustrates that many women do not choose STEM based on subject interest, aptitude, and career fit (Brainard & Carlin, 1998; Malgwi, Howe, & Burnaby, 2005; Matusovich, Streveler, & Miller, 2010; Sax, 2008; Seymour & Hewitt, 1997); and that they leave STEM careers because of lack of self-efficacy, family obligations and gender stereotypes (Buck et al., 2008; Cech et al., 2011; Glass et al., 2013; NSF, 2007; Prives, 2013; Szelényi et al., 2013; Strenta et al., 1994). Missing from the literature is the experiences some women have that draw them into, and keep them in STEM programs, such as automotive, where they are significantly underrepresented. Moreover, because American industry recognizes the value of a diverse workforce (Page, 2007), and actively recruits women from STEM programs to achieve a higher level of diversity, automotive programs need to better understand and appeal to current and potential female students.

The purpose of this study is to capture the experiences of women who chose a non-traditional career in automotive technology at a Midwestern university, and what makes them seek this career and persist in it despite the historical odds.

From this goal flow the following research questions:

1. What were female automotive students' experiences like before college, including who or what influenced these women to choose automotive technology as a career?
2. What are female automotive students' experiences like during their university studies and what helped them to persist?
3. What are female automotive professional's experiences like after graduation, while in the workforce, and based on their total experience, would these women choose an automotive career again?

Rationale or Significance

My research addresses knowledge gaps through a better understanding of the guiding influences for women currently enrolled in, or recently graduated from, a Midwestern university's automotive program. This was accomplished by drawing out the experiences of women at different points in their automotive career. I found what placed these women on this career path. I also discovered how they have experienced their automotive career journey. I paid close attention to their experiences before, during, and after attending a higher education automotive program. This study is significant because, it identified the needs of these women and the reasons they were attracted to, and persist in, an automotive program. The results could help education professionals influence program design and recruiting efforts to more effectively target and retain future female automotive students, and possibly students of other STEM programs.

Methodology Overview

The methodology for my qualitative study involved individual interviews with female students associated with an automotive program at a Midwestern university. The

individual interviews were conducted along with a female assistant, who observed the interview and debriefed with the researcher afterward. The interviews were transcribed and the transcriptions were shared with the participants for feedback and confirmation. The data from the individual interviews were themed. Some participants were asked follow-up or probing questions to clarify their individual interview.

I selected a purposeful sample of women in automotive technology that met the participant criteria, established contacts, and built a participant pool. There were participants at various stages of their career path, including current students (3), and those who have graduated and are working in the automotive field (9).

Chapter I Closure

STEM jobs in the U.S. grew at a rate of three to one when compared to non-STEM jobs from 2000 to 2010 (Langdon et al., 2011), and STEM jobs are projected to continue to grow by 1 million by 2022 (Vilorio, 2014). According to the U.S. Department of Commerce, the shortage of STEM workers hurts the nation's global competitiveness. Because of this, there is a critical need to develop a workforce in America that is prepared for STEM careers. Since women make up more than half of the labor force and over half of the earned college degrees, women are an untapped potential to this national crisis. The trouble is that girls begin losing interest in STEM subjects in school after the 4th grade, and so begins the "leaky pipeline" that lasts throughout their lifetime.

In automotive technology careers, some women at one Midwestern university are still in the STEM pipeline. I captured the experiences that brought them into STEM, and what happened to them while in the program and after graduation. I viewed these experiences through the lens of SCCT, particularly as it relates to gender. The findings

will be helpful to career counselors, pre- and post-secondary educators, program administrators, parents, and women at all stages of their career in the STEM pipeline.

In Chapter II, I explored the literature that establishes the foundation for understanding and interpreting the experiences of women in STEM careers. In doing so, a gap in the literature is exposed regarding the lack of research about the experiences of women in automotive technology before, during, and after their experiences at a Midwestern university.

CHAPTER II

LITERATURE REVIEW

In order to understand the current state of women in STEM, this literature review examines studies that shed light on the aspects of choosing a STEM career and some of the experiences of females in the STEM field. As a starting point, Social Cognitive Career Theory (SCCT) (Lent, et al., 1994) is a foundational theory about choosing careers. SCCT takes into consideration inputs to career choice, such as background and being female, which both funnel into learning experiences. These learning experiences give an individual self-efficacy (belief you can or cannot do it) and outcome expectations (what will happen if you do it). The beliefs of one's ability to do something and the outcome they expect from doing it set the stage for interests, goals and action that one will take moving forward in life. Having positive STEM learning experiences directly impacts an individual's self-efficacy (belief you can do STEM) and outcome expectations (what grades do you expect in STEM classes).

Indeed, girls' like of science begins its descent from its peak in the 4th grade (Bae et al., 2000), when their STEM related self-efficacy and outcome expectations begin a steady decline due to a shift from positive to negative learning experiences in STEM subjects. This is the beginning of what is known as the "leaky pipeline" throughout the pathway to a STEM career (NSF, 2007). Using SCCT as a roadmap of the process for choosing a career, and the literature to identify the leaks along the way to a STEM career, This study captured the lived experiences of women who successfully made it through the pipeline to better understand their experiences. The goal was to find out what made them persist and how they avoided the common leak areas for young women in STEM.

Self-Efficacy

To begin the discussion of self-efficacy, a definition is apropos. Bandura (1997) describes "perceived" self-efficacy as "a judgment of one's capability to organize and execute given types of performances, whereas an outcome expectation is a judgment of the likely consequence such performances will produce" (p. 21). In other words, self-efficacy is the belief you can do it, and outcome expectations are what you think will happen if you do.

In his Social Cognitive Theory (the forerunner to SCCT), Bandura identifies four main sources of input that help develop self-efficacy: enactive mastery experiences, vicarious (observational) experiences, social persuasions and physiological, and psychological states. Enactive mastery experiences are situations where the learner engages in the activity in a realistic manner, such as those found in laboratory activities and internship experiences. Vicarious (observational) experiences are settings where the learner watches others (novices watch masters) as they navigate their lived experience. Importantly, watching someone fail or succeed can influence self-efficacy negatively or positively relative to that task or experience. This effect is even greater if the learner identifies with the person they are observing, such as someone of the same gender (Bandura, 1986). Social persuasions are the encouragement or discouragement received from others when attempting to do something. This positive or negative persuasion can come from individuals or from society that says, for example, women have certain career paths (teaching and not engineering) that are socially acceptable. Lastly, physiological and psychological states influence self-efficacy, such as test anxiety or nervousness

surrounding a task or situation. Individuals with low self-efficacy tend to connect these states with their perceived lack of ability and avoid situations where this occurs. Those with high self-efficacy, however, minimize the influence these states have on their continuing through the experience and continue on to other similar experiences. In their meta-analysis of empirical literature about the role of students' self-efficacy in higher education, Van Dinther, Dochy, and Segers (2011) found that of the four inputs – enactive mastery experiences, vicarious experiences, social persuasions and physiological and psychological states – enactive mastery experiences are the most powerful in creating high self-efficacy.

Schaub and Tokar's (2005) study of 337 students at a private Midatlantic university looked at how personality influences vocational interests and the indirect effect personality has on the learning experiences that lead to self-efficacy and outcome expectations, as modeled by SCCT. They investigated relationships between SCCT and Holland's (1997) vocational interest themes: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC), and found that personality indirectly relates to some of the RIASEC vocational interest themes, and directly relates to others, such as Artistic. They also confirmed the SCCT theory assertion that relevant occupational learning experiences positively shape self-efficacy and outcome expectations. This means that experiences, such as internships and laboratory activities, have positive impact on career choice.

Later, Williams and Subich (2006) investigated whether gender differences in learning experiences are consistent with gender differences in career self-efficacy and outcome expectations, which ultimately lead to career choice. They separated the data

collected from 350 Midwestern university students by gender using Holland's (1997) RIASEC vocational interest themes and expected to find that men had more Realistic, Investigative and Enterprising learning experiences, leading them to enroll in technical careers, such as engineering, and that women had more Artistic, Social and Conventional learning experiences, leading to higher numbers of women in helping professions, such as nursing. They also used the Learning Experience Questionnaire (LEQ) (Schaub & Tokar, 2005) to confirm that learning experiences in each of the Holland codes leads to self-efficacy and outcome expectations in the related career areas as SCCT suggests. Indeed, they found that women indicated many fewer learning experiences in the Realistic and Investigative codes, and that men had fewer Social experiences. This suggests that the learning experiences of college students do shape the career interests that lead them to traditionally male or traditionally female careers. It is interesting to note that there were no gender differences in the Realistic code for vicarious learning, which Bandura identified as an input to the development of self-efficacy. One explanation is that the LEQ does not differentiate whether the gender of the demonstrator is similar to that of the observer. It is suspected that women observing men perform a task has less of an effect on their self-efficacy and outcome expectations than if a woman was the demonstrator, as theorized by Bandura (1986).

Inda, Rodríguez, and Peña (2013) tested SCCT's ability to predict students' interests and choice of major with a sample of 579 male and female sophomore engineering college students. They found the SCCT model accurately predicted the interest level of engineering and technology activities and the participant's level of academic persistence (action) regardless of gender. Again, for both genders, they also

found that the participants' outcome expectations influenced engineering interests and academic goals. Additionally, women were less interested in STEM activities and academics and had less confidence in successful completion of their engineering degree than men. They also found that teacher support increased women's self-efficacy and outcome expectations. Interestingly, for the women, family was reported as a barrier, but peers supported their academic goals. On the other hand, the men reported peers as barriers to outcome expectations. This could be because the women were fighting against traditional gender roles with their families, while those who stayed were able to find support from other women in STEM.

Harsh et al. (2012), in their longitudinal study of 1,829 practicing scientists and graduate students participating in Undergraduate Research Experiences (UREs), found that UREs provide positive experiences that "mediate intrinsic gender-based filters" (p. 1368) and act as a gateway for women entering STEM graduate school programs. Additionally, women reported that these experiences positively affected their self-efficacy, interest in science, and enthusiasm for practicing authentic research. Because of this opportunity to perform hands-on research, women were able to effectively dispel lack of confidence, reduce their undergraduate attrition rates and become more likely to pursue post-graduate education in a STEM field. This confirms an earlier study by the NSF (1989) that found UREs are effective at attracting undergraduate women to STEM graduate programs.

Some differences appear in undergraduate STEM research as opposed to graduate programs. Strenta et al.'s (1994) study of 5,320 undergraduate students investigated the causes of undergraduate student interest in and attrition rates for science and engineering.

They found that even with the same grades as men, women in science at highly selective universities lacked confidence in their ability and were more depressed with regard to their academic progress, in spite of the fact that the women were more conscientious about their homework. Strenta et al. also found that gender was not a factor in student's initial interest in science. This is because, as so many other researchers have pointed out, men and women have the same interest, attitudes and abilities prior to college. It is within the first two years that women begin to feel the need to leave. Interestingly, the study found women's interest in science to be more influenced by people, both in their lives and by how science can help them. This realization could be capitalized on through mentoring experiences as Heilbronner (2013) discussed and through undergraduate research experiences (Harsh et al., 2012).

Self-efficacy also plays a role in the reasons why women leave STEM careers, and another study looks to explain why. In a quantitative study of two waves of engineering students, 288 in 2003 and 332 in 2007, Cech et al. (2011) looked at three common explanations of why women leave male-dominated professions: math self-assessment, future family plans, and professional role confidence. As others have found, Cech et al. also found that men rated their math ability higher than women, even though SAT scores and high school grades of women and men were not significantly different. They found that during pursuit of their degree, young women's future family plans did not predict their persistence in engineering, and that men and women rated the importance of future family plans and intimate relationships equally. They did find, however, that professional role confidence was a significant factor for women's persistence in engineering, which led to more women leaving engineering than men,

creating "gender segregation" (p. 656) in the profession. Cech et al. broke down professional role confidence into two sub categories: expertise and career-fit confidence, which occurs when one feels confident in their ability to be successful in the execution of their professional role and enjoys and finds fulfillment in their career. The study's authors found that early professional role confidence predicted measurable persistence three years later, and suggested programs to develop student's professional role confidence with real-world career experiences, similar to what was found by Harsh et al. (2012) in their study of UREs. Cech et al. also found that men were more likely to persist in STEM than women because of men's higher levels of behavioral persistence. Men also reported higher levels of "intentional persistence" (p. 650), which is, they demonstrated greater intention to be an engineer in five years than women did. Interestingly, when women changed majors from engineering, they were twice as likely as men to choose another STEM major, while men more often chose a new non-STEM major.

Preckel, Goetz, Pekrun, and Kleine (2008), in their quantitative investigation of gender differences of 362 sixth graders in mathematics, found that boys rated themselves significantly higher in math ability, and earned significantly higher scores on a standardized mathematics test, even though there were no differences in grades between genders. As expected, the girls in this study rated themselves lower on math-related motivation, interest and self-concept. These results show the gender differences in self-concept, interest, and motivation in the STEM subject of mathematics, and could be explained by gender-role socialization and teacher and parent expectations that emphasizes cognitive ability for boys and de-emphasizes cognitive ability for girls.

Smith, Lewis, Hawthorne, and Hodges (2013) conducted a three-part study on belonging uncertainty, which they describe as, "when one feels unsure of his or her ability to 'fit in' within a given academic arena" (p. 131). In the first part of the study with 149 first-year STEM graduate students, female students perceived a higher effort of exertion for the successful completion of the degree than their male counterparts. This perception decreased their sense of belonging and motivation because of the belief that, for women, intelligence is associated with effort. They also found that a male-dominated field triggered the perception of higher effort expectations. Finally, they found that when effort for success was emphasized as normal, women's sense of belonging and future motivation was increased. This showed that women used perceptions of effort to determine their personal "fit" in a STEM field. In a similar vein, Seymour and Hewitt's (1997) study found lack of belonging often emerged as "less assertiveness" to ask for help, less "inner strength" to deal with academic obstacles and "set-backs," and reliance on "others" for reassurance (p. 242).

Heilbronner (2013), in her investigation of 360 college graduates of factors that influenced them to choose or not choose a STEM major, found that women reported lower self-efficacy in relation to STEM in college than did the men in the study. As noted by other researchers, fewer women choose an undergraduate STEM major. For both genders, interest was the most influential reason indicated for choosing a STEM career. As for leaving STEM, more women in their 30's cited leaving STEM career because of inflexible hours and family responsibilities.

Another aspect that could keep a woman in a non-traditional career is mindset. In her book about mindset, Dweck (2006) describes two types of mindsets: a fixed mindset

and a growth mindset. Individuals with a fixed mindset, believe they are born with a level of intelligence and ability that is fixed and cannot be increased. This means that if they are good at math, they are smart, conversely, if they are not good at math, they will never be in the future because a person cannot make themselves smarter (good at math). Individuals with a fixed mindset tend to avoid failure because it is an indicator of a lack of intelligence, so they stay in their comfort zones where they can be assured of success. For example, someone with a fixed mindset who is good at math, but struggles with writing would take math classes, but avoid writing. This strategy evades failure in writing and assures success because they stay in the comfortable, predictable corral of mathematics. On the other hand, growth mindset individuals believe that their traits, such as intelligence in a subject or ability, can increase and improve with effort. An individual with a growth mindset who is good at math, but struggles with writing, would take a writing class and believe they could learn to write well if he/she puts enough effort into learning this new skill.

In a similar vein, Duckworth and Eskrels-Winkler (2013) describes grit as the hard work and persistence necessary to accomplish a worthwhile goal. A “gritty” individual would be operating in Dweck (2006) growth mindset believing he/she can improve his/her abilities with effort (grit). From her research on grit, Duckworth and Eskrels-Winkler found that talent does not predict high levels of grit. In fact, she found it rare for a person to be both talented and gritty and that highly successful individuals often achieved their status by grit and not natural talent.

Gender Socialization and Career Choice

When a woman makes a career choice that is outside traditional gender roles, she has to answer to herself and society because both likely have a traditional view of gender roles that says women should choose a career that suits their gender. This makes it more difficult to choose a STEM career and persist in it. Sax (2008) found in her study of college students that women still gravitate toward gender stereotypical careers that have low pay. This runs counter to their reported concerns of financial freedom from getting a "good job" and indicates gender socialization is alive and well among certain career choices (p. 39). Let us examine some of these factors.

Family Influence

The Seymour and Hewitt (1997) study found that family pressure is strong for young women in terms of career aspirations. Many women often felt duty-bound to an engineering major, particularly when their father was an engineer. The same level of influence was true from professional mothers to their college-bound daughters, although the study reported this as occurring less often. Interestingly, when young women showed an aptitude for mathematics or science, family pressure was very difficult for young women to ignore, in spite of other proficiencies or aspirations. This rang particularly true for women of color. For both white women and women of color, the pressure often came from family who did not fulfill their own dream of a college degree or STEM career, or from advocates who wished to see young women, especially women of color, represent their ethnicity and/or gender in a positive way, or break out of their socio-economic class.

Seymour and Hewitt's (1997) study also identified "some critical qualitative differences" concerning the way family influenced a young person to choose a career. On

the one hand, family pressures can force a career that does not fit the individual. On the other hand, family that nurtured career choice based on personality, aptitude and inclination had the following consistent themes:

- play at science, math or technical problem-solving with their children
- discuss scientific and mathematical issues, and their applications, with their children as part of everyday family life
- include their children in a hands-on way with technical domestic tasks, and in aspects of their own work
- discuss what they do at work, what part their work plays in the world and what they like about it
- recognize and foster their children's interests and abilities in school without bias or pressure toward particular subjects or careers
- offer practical help with conceptual hurdles and emotional support through academic difficulties
- encourage their children to develop realistic aspirations, and (for girls especially) not to under-estimate their potential or options
- are active in ensuring that quality and level of high school science and mathematics are adequate for college preparation
- offer themselves as a source of information and advice, and give plenty of opportunities to talk out the options, clarifying the pros and cons of particular majors or career paths even-handedly. (Seymour & Hewitt, 1997, p. 65)

It is worth noting that the authors indicated these attributes were not all described by any one student. It was found that students who chose STEM initially and were satisfied with their choice discussed several of these attributes. According to Seymour and Hewitt (1997), the downside of choosing a STEM major because of family pressure had interesting outcomes, such as: lack of concentration or drive with regard to academic work, students just stop working; feeling unfulfilled by the rebuff of their other talents or interests, it is hard to concentrate when one's true calling grows louder each day; diminished confidence and self-respect, both erode from lack of empowerment over one's own destiny; and finally, because others are making an important life decision for them, uncertainty about one's own identity. This all culminates into the strongest desire found in the study to switch from a STEM major, which can include retaliatory behaviors, such as failing key courses in a STEM major, or failing to declare the STEM major.

Li and Kerpelman (2007) found in their study of the career aspirations of 304 female undergraduates that, even though young women believed they make their own career choices, both mothers and fathers influenced their daughter's career aspirations, and this could include pursuing a non-traditional career. On the other end of the spectrum, Bieri, Berweger, Keck, and Kappler (2013) found in their longitudinal, mixed methods study of 843 female academic high school students from Switzerland that parents in their study had stimulated their child's learning, which appeared to create the desire in their children to want to gain knowledge and explore STEM subjects. The study went on to describe the parents as emotionally supportive, and students reported that this parental support was one of the reasons they chose STEM as a major. This suggests that parental support increased the student self-efficacy related to math and science, and

created a strong and clear sense of identity as a scientists, which helped them choose and persist in STEM fields.

Teachers and Other Role Models

Role models are individuals whose lived experiences somehow influence another individual, and can even be depicted on a poster, as in the case of the famous Rosie the Riveter. As simple as it might seem, role models have characteristics that stand out to a person seeking a role model. This identifiable characteristic could be anything, such as gender, age or race (Bandura, 1986). When women and non-traditional careers are considered together, the role model is increasingly important because the lack of female role models is a barrier to women entering STEM (Nauta, Epperson, & Kahn, 1998).

Heilbronner (2013) found that mentors, high school teachers and counselors, college professors and advisors, and others, typically older students, help in the recruitment and retention of women in STEM. Mentors support new students academically with tutoring and study groups, are role models of expected behavior, and introduce them to networking with other professionals in the field. Mentors can continue to help throughout the career of a female STEM professional. Importantly, enthusiastic STEM teachers help attract and retain female STEM students. In a 2013 interview, Cheryan, found that female STEM role models can be male. (I also found this in my pilot study.) They help break the stereotype by talking about, being, or doing things that are outside the stereotypical mold.

Some women have been influenced into STEM by their boyfriends. For example a romantic day spent mud bogging with monster trucks was all it took for one woman in my pilot study to become hooked on automotive technology. Others in my study wanted

to know about the mysterious happenings under the hood of their car. This was often described as something that boys knew about and they did not, but wanted to know more about. They also wanted to fix their car when it broke down, so they would not be at the mercy of those who had knowledge they did not.

Bieri et al. (2013) found in their longitudinal, mixed methods study of 843 female academic high school students from Switzerland that students have role models outside of their core family. These important role models include parents' friends, neighbors, and siblings' friends who all served in some capacity to provide information or support to the women during the decision process to choose and persist in STEM.

Quimby and DeSantis (2006), in their study of 368 female undergraduates at a Midatlantic university, found that the presence of a role model increased the likelihood of career choice more than self-efficacy in all but one of Holland's six RIASEC types. "Thus, in addition to the indirect effect of role models on career choice (via self-efficacy), the results also indicate that role models have a small but significant direct influence on career choice" (p. 303). Also, what they found parallels social cognitive theory's conclusions of the interplay among role models, self-efficacy and career choice (Bandura, 1999, 2000), as well as the suggestion of a direct relationship between career choice and the presence of role models.

In their qualitative feminist study of 13 8th grade girls in sciences classes from an urban public school in the Midwest, Buck et al. (2008) hired eight female graduate student scientists in a fellowship to serve as role models for the STEM classes and ultimately for the girls in the study. They found that girls identify a role model as someone with whom they can have a personal connection with, but that their image of

scientist made them believe they were not worthy of a personal connection. The girls identified the scientists as “strange looking people” that “steal projects” (p. 702). In other words, scientists are not the type of people that these girls initially thought would make good role models. After relationships developed between the scientists and the girls in the study, the concept of a science role model developed, their image of a scientist improved. In the end, the girls believed that they could have a women scientist as a role model.

Zhu (2013) interviewed two high-level engineering women who volunteer their time to the For Inspiration and Recognition of Science and Technology (FIRST) program as judges of the South Jersey Robotics Competition. They noticed that almost every team had at least one girl and that many teams were all girls. They observed the smiles of the participants and the equating of fun with engineering. By being paid to solve puzzles, the participants learn what engineers do for a living. Solving puzzles is fun and it attracts girls into engineering. The other important element they found is the support needed to choose a STEM career, which girls do not often receive from family or other adults. However, in this competition, it was observed that many parents, including fathers of the girls, participated in support of their young engineers.

In the Seymour and Hewitt (1997) study, high school STEM teachers were also identified as critical to the influence of student choice of a STEM major. The ways in which they influenced were by awing the students with a particular STEM subject and providing a solid foundation in the subject for them to build upon. There were reports of fun and interaction within these high school STEM courses that, unfortunately, were never found again in their higher education settings. Indeed, the influence of these great

teachers, and the critical thinking that they sparked, kept many students trudging along through difficult academic times.

Seymour and Hewitt (1997) also found that for those who switch from STEM to humanities ("switchers"), the admiration of an influential STEM teacher's subject led to confusion for some, particularly women and minorities who were encouraged to "represent" in the male-dominated STEM culture. They discovered the lack of true deep desire of a STEM career after college entry when the teacher's "cult of personality" is no longer of influence. This can be the result of science fairs, camps and competitions that are fun for students, but the interest was extrinsic, dependent on the teacher, rather than intrinsic, a true desire from within. Conversely, poor teaching in a STEM subject motivated an occasional student to choose a career in teaching STEM. They believe they could teach the fascinating STEM subject in a more engaging manner. Additionally, STEM role models, often admired and emulated, influenced career decisions, which is considered good, with the exception of students whose desires outside of STEM remained dormant until college. Regardless of influencer, women were found to have chosen a STEM career because of the "active influence" (p. 77) of someone significant to them twice as often as men.

Lee (2002), in a longitudinal survey of 320 male and female participants in a summer Science, Math and Engineering (SME) program, found that for women, emotionally satisfying relationships in the context of SME increased the likelihood to see themselves in an SME career. They felt the SME environment was friendlier based on positive relationships with peers and instructors. As Cheryan (2013) indicates from her work, women are more likely to choose STEM careers when they know the career helps

people and society, and when a learning environment seems cold and unfriendly, women gravitate toward more people friendly career paths. On the other hand, males in the study appeared to have a strong "internal compass" that guided them toward an SME career. Positive personal relationships were found to be important to women when choosing a career in studies by Lee (2002) and Matusovich et al. (2010). The women revealed feeling they do not fit in STEM because of lack of positive personal relationships with peers and teachers in STEM courses.

Altruistic Desires

While men are more likely to be influenced to choose a STEM career by the associated technology and gadgetry, women tend to gravitate toward careers that help others and/or the greater society (Strenta et al., 1994; Sax, 2008). Sax (2008) also found that women were more likely to have a greater desire than men to improve the lives of others, and were more often found to volunteer and tutor lower division students. When women are shown how STEM careers make life better for others through inventions, designs, discoveries, and problem solving, they are more likely to choose a STEM career. In Seymour and Hewitt's (1997) study, altruism was indicated by 90.9% of women and minorities as a reason for choosing STEM majors. The altruistic themes most often cited in the study were: serving others, environmental service, and world peace. The study found women were motivated toward work that they care about, and were more likely to place altruism above the materialistic goals that men often choose.

As noted before, women look for careers that they believe help other people and society, the lack of positive personal relationships in the STEM major, and later in the workplace, lead to women avoiding STEM careers altogether. In other words, the women

felt they lacked the personal connection they look for as they choose and persist in a career that helps people and society. Similarly, Buday, Stake, and Peterson (2012) found in their quantitative study of 48 men and 33 women from the Midwest who were gifted in mathematics and science that, for both men and women, social support directly contributed to the participants' belief of themselves in a future STEM career.

Removal of Negative Stereotyping

Negative stereotyping is an issue in which women view the typical person in a STEM career as something they do not identify with, or do not want to be identified with, such as a "computer geek," "grease monkey" or "pocket-protector-wearing-science nerd." Research shows that when these stereotypes are broken, women begin to choose these careers (Prives, 2013).

In a 2013 interview, Cheryan, an expert of cultural and gender stereotypes, who's work focuses on why women do not choose careers in STEM fields, discussed her research into how the stereotype of a person in a particular field impacts women choosing that career. According to Cheryan, women do not identify themselves with the stereotypical person who is successful in the field, such as a "computer nerd," so they avoid the career altogether. She also noted that women receive cues from the workplace environment about whether they "belong." These cues can be decorations, such as movie posters and video games or plants and artwork. Once again, when women do not feel like they belong in the environment, they avoid the career. In other words, when women do not identify with the "stereotypical" individuals in a career, they do not believe they will be as successful in the career as the "stereotypical" individual.

Recognizing these career motivation differences between men and women could facilitate bringing women into the conversation. If young women understood STEM careers as opportunities for serving the greater good, they would be more likely to pursue them and persist. Similarly, highlighting the positives of STEM may help women not only come to STEM, but also stay in STEM majors. One way to encourage women who are in a male-dominated field, such as STEM, is to create student organizations at the university for women where they can see and interact with other women who share their interests and aspirations. This could help with retention, motivation, networking, and discovering role models (Sax, 2008; Seymour & Hewitt, 1997).

Why Women Choose and Leave STEM Majors

When it comes to choosing a college major, Malgwi et al. (2005) found in their study of 788 undergraduate students at a large Northeastern business school, that for both men and women, as incoming freshman, the most important factor was subject interest. However, for women, subject aptitude was the second most influential factor, that is, they chose a major that they were interested in, and for which they believed they had a talent. In contrast, men's second most influential factor was the job opportunities, career advancement and compensation associated with a particular major. They also found that the reasons for changing major were similar for each gender, but women were more influenced by difficulty of major, advice from college advisor, and discussions with peers than men. While women were more likely than men to leave a major due to a perceived lack of aptitude, men did not let a few poor grades deter them from keeping their sights on their ultimate goal.

Brainard and Carlin (1998) found in a six-year longitudinal study of 672 undergraduate women in engineering and science that the women in their study who entered college with very high confidence in their math and science aptitude reported their self-confidence plummeted during the first year. Interestingly, if for those who persisted, their self-confidence increased over the length of their studies, but never returned to their pre-college level. They also found that women who changed majors from science and engineering often did so in the first two years, citing low self-confidence and perception of low academic performance as some reasons, even though they had the same level of performance as women who continued in science and engineering.

Sax (2008) used research data collected over 40 years (1966 to 2006) by the Cooperative Institutional Research Program (CIRP) from approximately eight million male and female freshman students from over 1000 different institutions, as well as from longitudinal data from the College Student Survey (CSS), beginning with freshman in 1994 with a follow-up in 1998. She found that women underestimate their academic ability and view their academic success as coming from hard work, not intelligence. She found that the gaps between women and men in STEM majors widen throughout college. Conversely, survey data shows women study more hours than men, and earn higher grades than men, regardless of how often men study. Something happens to women in college that lowers their self-confidence, however, leading them to have a higher perception than men that they do not "fit." Sax also found in the study that women place a lower value on engineering concluding this perception from their lack of fit.

Similarly, Matusovich et al. (2010), in their qualitative, longitudinal case study of 11 students' motivational values, found that women lose interest in engineering careers more than men. They concluded that female engineering students do not identify with engineering on a personal level, that is, they cannot see a link between engineering and their everyday lives. This all happens despite the fact that the women in this study had higher GPAs than the men. In contrast, they did find a few students who persisted despite their low level of engineering self-identification because of other reasons, such as earning enough money to take care of their parents. These students, however, had to continually remind themselves of why they needed to persist with the engineering program, unlike their peers who had a higher self-identification with engineering and easily retained the motivation for the journey.

In their three-year, seven-campus landmark ethnographic study of 335 students, Seymour and Hewitt (1997) investigated the reasons why undergraduates at four-year institutions with above average ability left STEM majors for other non-science majors. In order to better understand why students may switch, these researchers felt it was important to take a look at the different philosophical conventions of program faculty. For example, faculty in the humanities often suggest that students experience numerous majors prior to a final commitment. STEM faculty, on the other hand, usually require commitment to the major immediately because of the stepping-stone learning, i.e., each step must be mastered before continuing on to the next. The downside of this is that STEM majors typically delimit themselves to a restrictive curriculum without the multiperspectivalism of thinking that stems from the interdisciplinary benefits of a broad general education (Gardner, 2008). However, this early indoctrination of STEM students

led them to believe they were “traitors” or “defectors” when they left STEM majors, especially for social sciences. What is interesting is that switchers from social sciences to STEM were viewed by faculty, family and peers as more positive than leaving STEM for the humanities. In spite of the entire stigma surrounding switching out of a STEM discipline, it bears noting that STEM had the highest rate of switching (44%) as opposed to humanities, social sciences, and education, which were around 30% each.

A majority of the 335 students interviewed in the Seymour and Hewitt (1997) study gave more than one reason as to why they choose a STEM major. Interestingly, switchers gave twice as many answers as the non-switchers because they had to reflect more on why they initially choose STEM while they were choosing a new major. Women who switched often cited the active influence of others as a key factor in their original choice of a STEM major, which was the highest degree of importance of a motivating factor in the entire study. This influence came mostly from family members and, in particular, ones who were financing the student’s education. There were other influencers, such as peers, teachers, counselors and advisors, but most of the pressure came from family and friends and focused on the attainment of success by choosing a prestigious, financially lucrative career. If that were not enough, there were warnings of low pay and status, or even unemployment, associated with non-STEM majors.

Seymour and Hewitt’s (1997) study revealed the best predictor of survival and success in STEM was to have intrinsic interest in the discipline or career. Female STEM non-switchers mentioned intrinsic interest as a primary reason for their choice of original major three times as often (31%) compared to women who switched from STEM (10%). Many STEM non-switchers also described the importance found in the freedom to choose

their major based on personal interest. They indicated it helped them develop a close bond with their major and gave them resolve to continue through tough times with a sense of direction that comes from commitment to the major. This level of commitment developed from thinking about what they are doing and why they are doing it. As time goes on, the STEM career picture became clearer for non-switchers, as opposed to some who choose the career based on romanticizing or fantasizing what a STEM career might be like, which is not a good way to choose a major because it lacks the deep commitment to endure the long haul. A similar experience was found by the under-informed who thought a childhood dream, such as becoming an astronaut or a veterinarian, led them to choose a STEM major. The individuals who switched had not developed their dream by reading, asking questions, or seeking experiences to expand upon their dream career.

Finally, Seymour and Hewitt's (1997) study revealed that men were two times more likely than women to report that they were good at math or science in high school. The men also indicated more often than women that their math and science abilities were one of the reasons they chose a STEM major. Women on the other hand, despite being equally prepared as men, perceived that they were unprepared to confidently take higher-level math and science in college. Among persisters and switchers, four aspects of the STEM undergraduate experience were identified in the Seymour and Hewitt study. The aspects of: "hardness" of science, the "weed-out" process, advising and counseling, and the teacher-learner relationship are all discussed in the context of how each effects persistence. Students used the term "hard" in reference to STEM programs in the Seymour and Hewitt study. What they were describing was feeling overwhelmed by volume of information and the fast-paced presentation of this volume, and feeling

frustrated by the struggle to understand concepts. The students pointed to their lack of high school preparation as the reasons for these feelings more often when they were early in the major and were prime candidates to switch from a STEM major. Interestingly, they found the same personal attributes among those who stayed in STEM programs and those who switched. Both had similar performance, abilities, attitudes, motivations and behaviors, such as study behaviors, dispersed evenly among switchers and non-switchers.

Women Specifically Choosing and/or Leaving Automotive Careers

Few women choose automotive careers and of the ones that do, their stories describe their interesting journey in this mostly male-dominated career. Maher and Atack (2011), in their mixed methods longitudinal study of 17 women in a women-only automotive service pre-apprenticeship program, found that participants had a positive perception of self-efficacy. They felt confident they could do what was required of them and based on the scores throughout the eight-month program, reported improvements of self-efficacy. The participants said they benefited from the coaching and mentoring the program provided, which helped them to prepare for the physical and mental challenges of the work. Interestingly the students liked the women-only program, but also said they would like more experiences working with men earlier in the program to prepare them for the "real world."

Hart (2004), in her qualitative study of three female automotive college graduates working as technicians in the field, found that the women in her study had to overcome the barriers of "sex-role stereotyping (girls should be nurturing)," as well as "occupational sex stereotyping (only boys should be pilots)" (p. 105). Family was both a barrier and a support mechanism. Fathers were found to be a barrier to the women in the

study, as parents generally desired to have their daughters in what they considered a safe and secure career. Conversely, sisters, brothers, and friends were mostly supportive. All of the women felt that they would have benefited from more hands-on lab experiences, which was also found beneficial in the later study about UREs by Harsh et al. (2012). They all had positive, supportive experiences at the community college they attended, saying the instructors and their mostly male classmates treated them fairly and expected them to perform the same as the men in the program. They also enjoyed helping customers solve their automotive problems, especially female customers, which corroborates Strenta et al.'s (1994) earlier finding that women want a career that helps people and society. In the field, however the women in Hart's (2004) study experienced heavy discrimination and marginalization from male customers who told them they did not want a "girl" working on their car, to male dealership employees who would place obstacles in their path, such as giving the women difficult repair jobs while saving the easier money-making jobs for the male technicians.

Research has also found that the work-life balance is also a struggle for women in STEM because the traditional STEM environment is not family-oriented nor supportive of career mothers. Bieri et al. (2013) found in their study that women who indicated they fit the description of "family-oriented" as opposed to "job-oriented" viewed STEM career negatively (p. 2). Szelényi et al. (2013) found in their quantitative study of data from the 2004–2007 National Study of Living Learning (L/L) Programs that women's participation in a coeducational STEM L/L program positively related with three of the outcome measures. The measures were overall professional outcome expectations, women's expectations to achieve career success, and to combine a professional career

with a balanced personal life. This indicates that including men in the L/L programs for women is effective.

Glass et al. (2013) studied 4,993 working women with four-year degrees who participated in the National Longitudinal Survey of Youth 1979 (NLSY79). This Bureau of Labor Statistics (BLS) study collected data from both men and women aged 14-22 in 1979, and reinterviewed them annually through 1994 and biennially from 1996 to present. The study compared STEM career women with non-STEM career women. They found women in STEM careers are more likely to leave their career field than non-STEM career women. This likelihood increased the earlier a women was in her STEM career. They found that family factors cannot account for the higher loss of STEM workers. They did find, however, that investments in training and high job satisfaction do not entice women to stay in a STEM career. Conversely, Sax (2008) found that women on campuses that employed more women faculty reported less desire to raise a family, and she suggests that this is caused by the role modeling of the female faculty, who many chose a career above having children.

Chapter II Closure

SCCT identifies areas that support and hinder career development regardless of gender. Inda et al. (2013), Lent, Brown, Talleyrand, McPartland, Davis, Chopra, et al. (2002), and Brown and Krane (2000) all suggest more research is needed to further understand and explain the support and barriers to both women and men in STEM careers. The literature shows that women begin loosing interest in STEM careers after the 4th grade, and that this trend continues through high school, college and into their STEM professions. This leaky pipeline is documented with studies related to engineering,

computer science, robotics, and the sciences. However, there is little written about the experiences of women currently in the automotive technology pipeline. Only two studies could be found where Hart (2004) looked at just three women automotive technicians who received a mechanics certificate and Maher and Atack (2011) studied 17 women in a women-only automotive pre-apprentice program. My study differs from both Hart's and Maher and Atack's work in that the women in my study are all pursuing or pursued a bachelor's degree in automotive technology, which is the next step after an automotive mechanic's associate degree or certificate.

The literature would benefit from an understanding and explanation of the rich description of a qualitative inquiry into the experiences of women in automotive careers. This inquiry looks deeper into the social support or barriers of family, peers, teachers and societal expectations and how they experienced gender, as an influential factor to career choice, relating to self-efficacy beliefs, outcome expectations, interests, goals, and actions.

CHAPTER III

METHODOLOGY

STEM careers, such as automotive technology, are not an oft-chosen career path for women. According to the Integrated Postsecondary Education Data System (IPEDS), there were a total of 330 students who graduated from a post-secondary automotive technology program in 2010. Of the 330, only 13 were women. Given my position as an educator in a post-secondary automotive technology program, I am specifically interested in women who enter automotive careers via post-secondary programs, and their experiences while pursuing a career in automotive.

There have been a number of studies that have examined the experiences of women in STEM careers (e.g., Goldman, 2010, Maggard, 2005, Watson, 2002), but only one study that captured the experiences of three female automotive technicians (Hart, 2004), and another that studied 17 women in a women-only automotive pre-apprentice program (Maher & Atack, 2011). In addition, current literature discusses Social Cognitive Career Theory (SCCT) in relation to STEM career choices. However, no studies could be found that specifically explored women's experiences that led them to choose an automotive program at a university, their experiences during that degree program, and their experiences after graduation working in the automotive industry. This qualitative study begins to fill this gap by describing these women's unique experiences in the automotive industry, and viewing these findings through the lens of SCCT. This chapter discusses the methodology chosen and the rationale behind that choice. Also included is detail about the setting and the subjects, along with sampling and recruitment.

Methodology Overview and Rationale

The research design is the plan to move the researcher from the questions to the data, through to processing the findings (Yin, 2009). The research questions for this study sought to explore and describe the personal experiences, and make meaning of, these women's experiences in the specific context of career choice (Creswell, 2009). Stake (2010) tells us that the research questions dictate the methodology. I chose the qualitative study method because it allowed the rich description and deep exploration needed to develop a better understanding of this complex situation (Marshall & Rossman, 2011). The design was cross sectional, in that I only captured data at one point in time, from two different groups of women: those currently in a university automotive degree program and graduates from this program who are working or have worked in the automotive industry.

Study Setting and Participants

The participants are all connected to the same Midwestern university, which was also the study setting, either by being a current student or a graduate.

Setting. The Midwestern university chosen for this study has a large technology college. According to American Society of Engineering Education's (ASEE) fall 2012 data, there were 1,849 students enrolled in various engineering technology programs at this university, with over 200 students enrolled in automotive programs. The automotive programs offered are a two-year A.A.S. in Automotive Service, a B.S. in Automotive Management, and a B.S. in Automotive Engineering Technology. The programs are housed in the Automotive Center, which is a 116,000 sq. ft. building solely dedicated to the three programs.

Participants. The participants were two groups of women. Three were currently enrolled in the university's automotive programs. The remaining nine graduated from the university, with degrees in automotive and are working in the automotive industry. All of the participants will take or have taken a large portion of courses that are found in an A.A.S. in automotive mechanics.

Recruitment and Consent Procedures

Recruitment and consent followed the guidelines of Human Subjects Institutional Review Board (HSIRB).

Participant Recruitment. Fliers were placed in the Automotive Building describing the study and asked interested individuals who met the criteria and wanted to participate in the study to contact me. Department staff sent e-mails with the same content to potential participants, including graduates. The entire participant pool had 12 total participants for this purposeful sample. Because there were two sub-groups to the total sample (those in their education and graduates of the programs), I interviewed three current students and nine graduates.

Sample Selection. This was a purposeful sample that, according to Denzin and Lincoln (2012), fits within the realm of qualitative research. Patton (2002) further specifies that qualitative research looks for rich information and illumination from a small select group, and not some generalization that requires only a sample population. For this research proposal, I interviewed 12 participants, which fits in the range of 5 to 25 participants that Polkinghorne (1989), as quoted in Creswell (2013, p. 81) says is a good range for number of participants in phenomenological study. The participant pool was female automotive students currently enrolled at or graduated from a Midwestern

university. They varied from sophomore, to fifth-year seniors, to working professionals. Age and ethnicity were not part of the selection criteria, and was not used to diversify the sample from the pool of volunteers.

Researcher Involvement. Engaging current students as participants in this research would have put me in double agency with them, meaning that I would have fulfilled both the professor role and researcher role with potential participants. As a professor in the program, I have power over my students and a fiduciary obligation to keep the best interests of students above my own research interests. With this in mind, there were no incentives tied to grades because I avoided potential candidates with whom I have current teaching responsibilities (Ferguson, Yonge, & Myrick, 2004). Also, all of the potential candidates are university students making them of adult age, which precludes the need for parental consent. Turning to recruitment, the risk in recruitment was that I might exert too much pressure on students to participate or to continue if they desired to withdraw. The pressure on students to participate could have been actual pressure or, in some cases, perceived pressure. Actual pressure would have depended on both my agents and I not pressuring students with multiple requests. A non-reply to participate was a refusal to participate. Thus, to minimize pressure to participate, there was an initial recruitment e-mail and only two follow-up e-mails for those whom did not respond. The potential candidates needed to feel free to refuse to participate and/or withdraw from the research process at any given time with no worry of recourse from the researcher.

Data Collection

The data was collected using the method of inquiry of individual interviews with female automotive students and graduates. I chose individual interviews because as Ferguson et al. (2004) say, individual interviews provide protection from self-disclosure above that of group interviews. The interview questions (see Appendix A), based on the research questions, were open-ended and allowed the participants to associate meaning to their experiences. According to Creswell (2009), Merriam (2009), and Seidman (2006), meaning is attributed to the participant's personal experience exploration, and interviewing allows the researcher to harvest the worth of an individual's stories (Seidman, 2006). These female automotive students' stories have worth to me in my role as an automotive educator because I wanted to learn more about the experiences of women in automotive career to better understand what led them to persist in this male-dominated field.

The individual interviews included myself, a female assistant, and the participant. The interview questions were read by the researcher and answered by the participant, while the female assistant took notes. Each individual interview was audio recorded, and lasted less than 60 minutes. The researcher's field notes and observations along with the assistant's notes and observations were compared during a 10-minute discussion after each interview.

Data Analysis

I used an inductive analysis approach as Patton (2002) describes by identifying themes or patterns that emerged from the data. This involved repeatedly comparing the

data from each of the individual interviews while looking for emerging trends that could be categorized into themes.

The coding process involved transcribing and coding the recordings of the participant interviews, and then comparing my own notes and the notes from the female assistant with the themes that emerged from the coded interviews (Saldaña, 2009). First cycle coding yielded paragraphs and phrases, and second cycle coding distilled into one, or two-word descriptions that captured the essence of the meaning conveyed in a section of the interview responses.

After the interviews, a pseudonym was created for each interviewee for confidentiality purposes. The pseudonym key was kept in a safe place and destroyed at the end of the research (Saldaña, 2009). The transcribed interviews were formed into participant profiles. The participant profiles were combed for themes that emerge from the data. The participant profiles were shared with the participants via e-mail to check credibility and to allow feedback (Mertens, 2010; Thomas, 2006).

Delimitations and Limitations of the Study

My choice to study only one Midwestern university is a delimitation because there are many other colleges and universities that have automotive technology programs with female students enrolled. Comparing findings from other institutions would be interesting, but beyond the scope of this study. I have narrowed the focus of this study to just the input of female automotive technology students, and excluded female students in other technology degree programs within the university. The one exception is the few students who transferred to the university from other automotive technology programs.

I excluded men from this study as a delimitation for the obvious reason that my interest as a researcher is in why women choose male-dominated automotive careers. Women from other technology programs at the university were also excluded as a delimitation of the study.

A key limitation could have been that the participants were not able to articulate their experiences if they lack self-awareness and self-reflection. Honestly, I would have been surprised if that had happened based on my experience with a pilot study, where dialog erupted from each question.

The Researcher

My experience with women in automotive goes back to my time as an undergraduate at Midwestern technical university where I observed low numbers of women in the classes. Later, while working in the automotive industry as a technician, the only woman I worked with was a service manager. She and I worked well together but, I saw on occasion, how others, mostly men but sometimes women, distrusted her in that position. She was tough inside and had many years of experience that helped her work through those situations. When I transitioned from being a technician to an engineer in the automotive industry, I instantly noticed an increase in the number of women with whom I worked. The automotive industry worked hard to diversify its workforce with women and the results were positive. As a professor of automotive technology, I see the small numbers of women in the automotive programs do not come close to matching the needs of industry. From my experiences, I believe I understand some of the issues women in automotive face, but when I conducted a pilot study, I discovered some of my ideas concerning women in automotive were wrong. For example, I discovered that the women

in automotive want to be in this career, and they were not as sensitive to leaving the profession as I had thought. I kept an open mind throughout the research process of the present study so I could see the truth and not imagine the findings.

As the researcher, my placement is a limitation. My role as a professor at this Midwestern university, and within the automotive programs for 12 years, means that I know nearly every female student in the programs, and have had, or will have, many of them as students. This means that I have had, or possibly will have a fiduciary relationship with many of the potential candidates, which puts me in a position of power over them. For this reason, I excluded any research on pedagogy, as Ferguson et al. (2004) advise against. However, I have confidence in the trust I have earned from my students for faithfully adhering to my role as a faculty member, which has led to a safe learning environment that lends itself to both learning and reflection. I believe the importance of discovering the knowledge from this research outweighs the purists' beliefs that you should not, under any circumstances, use your own students as subjects. I cannot do anything about my placement because in qualitative research, as Marshall and Rossman (2011) say, the researcher is the instrument.

I believe my life experience minimized any gender bias I might have, but I had a female assistant observe and report on what she experienced in the interviews, as well. After each interview, the female assistant and I discussed what transpired and compared notes along with her reviewing the codes and themes that emerged. I watched out for my interpretations being any different than my female assistant's. I relied on her perspective as a female to assist me in reflecting on my bias. To be totally effective at bias removal, I continually performed bracketing throughout the entire research process. I had to be

vigilant at setting aside my biases because what I think I know about the topic will taint the findings (Creswell, 2007; Marshall & Rossman, 2011).

Trustworthiness

One of the hurdles a qualitative researcher must overcome with a study is the level of trustworthiness. Marshall and Rossman (2011) use the term validity many times in their description of trustworthiness. Creswell (2013) agrees and continues with descriptions of trustworthiness that include the terms credibility, authenticity, transferability, dependability, and conformability. All of these terms sharpen the focus of trustworthiness to be more accurate and, therefore, make a qualitative study more easily duplicated.

The steps that I employed, and that Creswell (2013) suggests to increase the level of trustworthiness, were to check transcripts for obvious errors, and continually reference the meaning of codes, during the coding process, to minimize the drift of code meanings. I used member checking to ensure that the distilled information from the interviews reflected the meaning of the participants. Also, a "rich, thick description" of the details and the setting (p. 252) provides readers with a sense of immersion in the theme making it more realistic. Bias was identified and reflected upon in this research to show how my point of view integrated with all the aspects of the research, including the interpretations of the findings. I spent "prolonged time" during the research portion to develop the depth of understanding to accurately express the detail of the participants and the setting. Finally, as mention earlier, I used "peer debriefing" with a female assistant after each interview and throughout the process.

Chapter III Summary

The experiences of women who choose automotive careers are the foundation of this qualitative research endeavor. The path to the findings involved recruiting participants from a pool of female automotive students and graduates at a Midwestern university. Data collection began with individual interviews of the participants. After the individual interviews, the data was transcribed and participant profiles created. The profiles were presented to the participants in individual e-mails to check for validity and ensure trustworthiness (Mertens, 2010). The profiles were coded and emerged themes noted. The rich description of this qualitative analysis through the transformation of the data into findings is the subject of the next chapter (Patton, 2002).

CHAPTER IV

PARTICIPANT PROFILES

Chapter IV provides individual profiles of the study participants. The purpose is to elucidate how and why these women chose an automotive career, and how and why they chose a Midwestern university for their studies. They describe their personal experiences during their automotive education, including support and barriers along the career path. Additionally, for graduates of the program, they describe their experiences during hiring and while working at automotive positions. All participants reflect on if they would choose automotive as a career again based on their experiences thus far.

Pseudonyms were used to protect the identities of the participants. My sample involved one participant in her second year of school, two participants in their second two years of school, and nine participants in the career field. Table 1 offers demographic information on these 12 participants, including age, their class standing or time since graduation, in-state or out-of-state status, transfer status, degree program at this university, prior automotive education, parental STEM career status, parental involvement, and automotive internship or work experience.

Table 1

Participant Background Data

Participant Pseudonym in Order of Appearance	Age	Class Standing or Time Since Graduation	In-state or Out-of-state	Transfer or Non-transfer Student	Degree Program	Prior Automotive Education	Parent in STEM	Both Parents Involved	Internship or Work Experience
Melanie	19	Sophomore	Out-of-state	Non-transfer	Engineering Technology	Yes Secondary	Yes	Yes	No
Brandi	20	Junior	In-state	Non-transfer	Engineering Technology	Yes Secondary	No	Yes	Yes
Michelle	21	5th-year Senior	In-state	Non-transfer	Automotive Management	No	Yes	Yes	Yes
Elisabeth	29	4 Months	Out-of-state	Transfer	Engineering Technology	Yes Post-secondary	Yes	Yes	Yes
Alice	26	Over 1 year	Out-of-state	Transfer	Engineering Technology	No	Yes	Yes	Yes
Vanessa	26	2 Years	Out-of-state	Transfer	Engineering Technology	Yes Post-secondary	No	Yes	Yes
Dee	32	2 Years	Out-of-state	Transfer	Engineering Technology	Yes Post-secondary	Yes	Yes	Yes
Jane	29	4 Years	Out-of-state	Transfer	Automotive Management	Yes Post-secondary	Yes	Yes	Yes
Silvia	26	4 Years	In-state	Transfer	Engineering Technology	Yes Post-secondary	Yes	Yes	Yes
Sabrina	30	7 Years	In-state	Transfer	Automotive Management	No	No	Yes	Yes
Roxanne	30	8 Years	Out-of-state	Transfer	Engineering Technology	Yes Post-secondary	Yes	Yes	Yes
Karen	32	10 Years	Out-of-state	Non-transfer	Automotive Management	No	Yes	Yes	Yes

Melanie

Melanie is a 19-year-old sophomore in this university's automotive engineering technology program. She is an out-of-state student and came straight to this institution for all her coursework. Melanie's sister was the first person in their family to go to college.

Why Automotive?

The choice to go into automotive was not directly related to Melanie's immediate family's working history. Her mother works in the STEM field as an operating room tech and her father manages inventory at a hospital. What influenced Melanie to choose automotive was partly her high school automotive instructor. "I took [auto shop] as a safety net in high school to know how to change my oil, change a tire. My teacher really liked me and asked me to do competitions with them." In these troubleshooting competitions, Melanie became the first girl to qualify to go to the state competition in Illinois.

As a result of spending so much time in automotive, Melanie's group of friends changed during her time in high school. She was hanging out with a group that worked on their trucks and recreational vehicles. This was when Melanie began to take her automotive studies more seriously.

> I think my friend group kind of transitioned and then because they would work on their trucks and their four-wheelers and snowmobiles and that kind of stuff. And I think that's when I really got into it and I kind of wanted to take my auto class more seriously.

Melanie could not pinpoint one exact cause for her choice in automotive. She said, "It all kind of seemed to happen all at the same like time period. So I can't really say which influenced me more."

Choosing a Major

Melanie was accepted to a dance program at the University of Illinois, but decided to turn it down and go into automotive. The choice between automotive and dance came

down to future earnings. She explains, “I was between automotive and dance, and you don’t make money dancing.” Once Melanie decided on automotive, she had to choose a university to attend. Melanie said, “I was [choosing] between Southern Illinois [University (SIU)], [which] offers the technician four-year programs and this [university], [which] was engineering. I thought I could do more and have more of a choice when I graduated with jobs [at this university], not just be a tech [with a degree from SIU].” So Melanie choose this university’s automotive engineering technology program and has been in it ever since.

Experiences in Automotive Programs

Melanie’s experience at this university’s automotive program was better than she expected. “I would say better than I thought it would be because I didn’t know what to expect coming into this program.” The hands-on nature of the classes made them welcoming to Melanie, whose background is hands-on troubleshooting.

Support

Melanie found support with the students in her cohort. They studied together and supported each other through all of their classes. Melanie explains, “Probably the other people in my classes [are most supportive]. There’s a group of us who always would study last year together because we were all in the same classes. So it’s kind of like we’ve been each other’s support system.” As for family, Melanie’s mother was stunned with her decision to choose automotive as a career. When Melanie calls home to vent about something that happened in class, Melanie’s mother tries to be supportive and just listens. She doesn’t say much because she knows very little about automotive.

> Yeah, my mom was a little shocked. She doesn't really know much about [automotive], so she didn't know what to say about it or do about it. But if like I call her and start yelling about something that happened in class and I'm upset about it, she just kind of listens. She has no idea what I'm talking about. So she tries.

Melanie's dad just said okay when she broke the news of her career decision, but her uncle was very excited. She says, "Yeah. he's like, 'When can we can go shopping for tools?' Yeah. He was really excited about it." Melanie's friends in her high school automotive class were somewhat surprised with her decision to go into automotive, but they have been supportive. When asked about their reactions, she said:

> My friends in my automotive class were kind of surprised I was actually going to go into it. But everyone's kind of been supportive. I still talk to automotive students from high school. I don't talk to dance students anymore.

Melanie went to a women's only technology group, but did not have time for more involvement. She did, however, join a sorority where she finds support with their high level of academic achievement, but they do not relate on a technical level. "Yeah, they have no idea what I'm talking about." The high GPA requirement drives her to take advantage of their study hours. "GPA's really important [to the sorority], so study hours are a huge thing."

Barriers

The biggest barrier for Melanie is just being a female in a male-dominated career field. At the university, Melanie had to prove herself to her instructors and her peers. With that accomplished, things smoothed out for Melanie.

> I think coming in being a girl and being feminine is the biggest barrier. I've noticed after being here for a year and proving myself to professors and other students in my class, I gained respect. I'm not here for other reasons. I'm here for an education. This is what I want to do.

Now that she has earned respect from her instructors and classmates, Melanie feels like she is part of the family.

Would She Choose This Path Again?

Melanie would choose this path again because of the lifelong learning and the entire experience she has had. "Definitely. I love this whole experience. I love automotive because there's always something new to learn, and you're never going to know everything."

Brandi

Brandi is a 20-year-old junior in the automotive engineering technology program at this university where she began as an in-state freshman. Both Brandi and her older brother were the first in her family to go to college because they began their studies at the same time.

Why Automotive?

Brandi's family's work history has been very consistent. Her mother and her father still work at the same companies since their teen years. However, neither of Brandi's parents work in a STEM field.

> My dad has been working at a carpet store since he was 15, and he moved up to management, actually just recently. And then my mom, she works at a computer

desk and answers phones and all that at a shipping company, overseas shipping. She's worked there since she was 18.

Because there was nothing automotive in her family's work history, I asked who or what influenced her to choose automotive as a career. Brandi said, "Our hobby [racing cars], because my dad raced at Berlin Raceway [a local racetrack] starting in 2001. We are still [racing] with my brother now racing there. So I kind of just grew up around racing and cars."

Choosing a Major

When asked about how she chose her major, Brandi said, "I went to [a local high school career tech center]. I originally was going to go for art. But I didn't want to do graphic design on a computer. I wanted to do something with my hands. But they didn't have anything for that. And my second choice was auto. I've kind of just gone with it, because I liked it."

Experiences in Automotive Programs

Brandi's experiences in the male-dominated automotive program started rough initially, then smoothed out as she began to prove herself. Brandi said, "I mean, it was kind of nerve-wracking at the beginning. Because I'm, you know, in a class with all guys, maybe one or two girls." Brandi's tactic for getting to know an unfamiliar group was: "I would find, like, that one person that I knew, and then I'd sit by them and I'd kind of get to know everybody. I just kind of try to fit in. I mean, it's not hard to get along with them."

Support

Brandi has the support of her parents for her career choice. “Oh, I definitely have support from my parents, like 100%. Especially, you know, after talking to them about the Career Fair and all that, they’re excited for me.” Brandi also said she has support from her friends back home as well as people connected with the university. “Yeah, teachers, instructors have been really, really helpful. I don’t feel like they see me as a woman, I guess, if that makes sense. They kind of treat me like everybody else. Same goes for everybody else I’ve met here, like friends. Everybody that I’ve met here has just been real supportive too.”

Barriers

Brandi has had one negative experience in the automotive program. “Well, I guess I have had a negative, but I don’t know if it’s really, I think it was just his personality. I don’t think it was...it was one of my [automotive] instructors, actually. I think that’s just how he is. I’m not sure.” When asked what happened, Brandi said, “Just kind of making like sexist jokes sometimes. [laughs]” Brandi continued with, “I feel like he thought that I couldn’t really do it right just because I was, you know, a woman.” Brandi’s response to the sexist jokes was anger initially then acquiescence.

> He kind of made me mad. But at the same time, like I said, I don’t really know if that’s just his personality, or if he actually is being sexist? So I kind of would just laugh with him and then blow it off like it was nothing. Considering, he’s the only one that’s done it, I just, I mean, I really didn’t take it like it was anything ‘cause he was the only one.

When asked about other student's reactions when the automotive professor would say the sexist comments, Brandi said, "I mean other students definitely noticed it." The other students did not join in with the professor with their own sexist comments. In fact, Brandi said, "No. They were probably on my side more than his." In closing she said, "But that wasn't even that bad, like I, it didn't affect me at all. It didn't affect my grade really so...."

Employment Experiences

Although Brandi is still working toward her degree, she has worked in the field as an automotive technician and was recently hired for an automotive engineering technology internship for the summer of 2016.

Experiences while employed. Brandi is an independent and accomplished hands-on automobile technician. "I started in October 2012 as an oil-change tech." When asked about promotions, Brandi said, "I kind of got promoted. I got put under a technician as like a trainee and he kind of, you know, took me under his wing and showed me a bunch of stuff. So, I've done a bunch of different stuff. I don't really have like a specific title. I guess just a technician. I actually have my own mechanic number too." With her own mechanic number, Brandi is state certified in specific vehicle component areas and can legally perform her own repairs independently on a vehicle in those certain areas. "I have a couple [of state certifications]." Brandi is the go-to person at work.

> Even with some of the stuff that they have come through there, they go, 'Oh, I want you to do this. I don't want the other guy to do this, because he won't do it right.' With some of the recalls even, they'll go, 'Oh she'll do it, you know, she can do it in fifteen minutes. This guy it'll take him an hour to do it.'

Brandi's conscientiousness and attention to detail at work has created job security for her. In fact, the dealership she works at currently told her, "My boss has told me I'm welcome back anytime, which is awesome, because that's job security either way."

To sum up her independence at work, sometimes others do not see that and try to help her or do it for her. "At the dealership when somebody goes, 'Oh do you need help with that?' And I'm like, 'If I need help, I'll ask you for help.' Like, don't ask me if I need help. I like to be independent about some things."

Experiences while seeking employment. Brandi was not looking for a job when the position came to her.

> Well, I actually wasn't. I mean, I was looking for one in auto, but it kind of jumped out at me. Because my brother was working there at the time and there was an oil change position open. I was working at a different place, and I was only at the front desk, which I didn't want to be. I wanted to be back in the shop working. He knew that. So he texted me and said, "Hey, it starts at $8 an hour. Come and get an interview." I went in very shortly after that.

Brandi said the interview process was easy. "That was real[ly] easy, yeah. I'm pretty sure they hired me on the spot, if I remember right."

Brandi also interviewed for an internship position with Toyota for the summer of 2016.

> Well, I did not think at all that I was going to get an interview with them, considering that I was a junior and, you know, they only talk to seniors. When I got the call, I was so excited. I was beyond excited. I called my mom first and told her, and she was excited. [I] interviewed the next morning and then I waited. It

> was a Friday and [by] the next Wednesday, I kind of lost hope and I was like, "Oh they're not going to call me." Then they called me Thursday. I called my mom and my dad and my grandma and everybody and their mom or whatever. [Everyone was] really excited.

The interview with Toyota turned out well for Brandi. "I guess it went good. I told them my experiences. And they kind of asked me like the hardest part of being in this career. I told them because I'm a woman I feel like that's the hardest part." Brandi has since signed the offer letter. "Yep, I actually just signed the offer letter."

Would She Choose This Path Again?

> Brandi would also choose automotive as a career path again.
>
> Because it's, it's a different experience for a woman. It's fun to, you know, get along with all the guys, [laughs] be better than some of the guys actually. I guess it's a good feeling to know that when a guy says "Oh, you know, girls can't do this," I can go, "Yeah, I can [laughs]."

Michelle

Michelle is a 21-year-old, 5th-year senior, currently in the Automotive Management program in-state, at this Midwestern university. She began her studies at the university and did not transfer from any other school. She was not the first person in her family to go to college, her grandfather and both parents went to college; however, she was the first to go to a university.

Why Automotive?

Michelle's family has a history of working in the STEM field of automotive repair. After her grandfather graduated with an automotive degree from college, he went

to work at the shop that would eventually become the family's automotive repair business. When her grandfather retired, Michelle's father stepped up and began managing the business. Some time later, her mother came on to do all the bookkeeping and advertising, allowing her father to focus on working with customers.

> Actually my grandpa graduated from [this university's] automotive program [when it was just a college], and then he came here to work. [There] was as a job posting up on the board to come down to Lansing to work at [company]. Then, he left for a couple of years, went to a dealership, and came back and actually bought [company]. So then he ran it. My dad, once he left high school, he went into the Navy, and then he went to [local community college] for some automotive classes. He came and was working here [at company] as a tech. Then, when my grandpa retired, my dad stepped up and manages [company]. So it's been kind of a growing family thing.

Michelle grew up around automotive and only knows that business. She says she knows so much about the automotive business that it overshadows any other career path that she would remotely consider. Her long-term goals are to eventually run the family owned repair facility, but first see how other shops are run so that she can use the best ideas to run the family business.

> I've grown up around it. I really don't know much outside of it. And that's one of the reasons why, I see myself, you know, when [Dad]'s ready to retire, maybe come back and keep the shop running. But, after I graduate, I want to go out, see what else is out there, and bring those skills and stuff back to improve this. So that's my goal, instead of just coming straight out of [this university] and here. Go

> out and see other tactics and see how everyone else does it and see what we need to improve on here.

Choosing a Major

Michelle chose automotive as a major because, as she has said, it is all she knows. She grew up around the shop watching her parents and grandfather working. It was during this time that she learned how to interface with customers, the inner workings of the automobile, and how to do the financials and advertising.

Michelle's love for horses led her toward wanting to become a large animal veterinarian. As she approached high school graduation, she found that she did not have the grades that most veterinarian schools require. As discouraging as this was for her, the one thing that was in her from childhood was automotive. It was at this point she decided to look for something automotive related.

> A long time ago, I actually wanted to be a vet. Because that's my other half …I love horses, farm animals, the bigger animal vet. It's always [been] between vet or the shop. Cars or animals. So once it got closer to graduating [high school], it was kind of like, "OK, this one's like for your 4.0 super smarts, and this one I've been around it longer, so it's in me pretty much already. I just have to fine-tune or figure out what I've actually watched [in the shop] over the years.

Michelle initially wanted to do forensic-type auto accident reconstruction because at the time, she was hooked on the CSI TV shows. She thought that Automotive Engineering Technology would provide this path. The problem she says is the degree required chemistry, which she did not take in high school because it was always full, so she decided to try Automotive Management.

> So I wanted something automotive related and when I started in the Engineering, I actually wanted to do like forensic stuff, like fatality, you had to recreate what happened in the car. Because I like the CSI shows [and], at the time, I was hooked on them. So I wanted to do something along those lines But then as I looked more into some of the engineering classes, like all of the chemistry classes, that was the one science class I didn't take in high school. Because it was always full.

This was her first and only change of major. In Automotive Management, Michelle found that she did not struggle as much academically. The first class she took in that major was a public communications class in which she progressively performed well. This experience made her want to take more classes, such as advertising and public relations. She learned new ideas that she could not wait to implement into the family business, such as using Facebook and kiosk communications and advertising.

> [In engineering,] I was already keeping myself afloat, but I knew I could have done better. So I decided to try the management. Take one of the classes to see if that's something I could have went into. Because instead of struggling my whole career, let's find something that's still automotive related but I do good in. So I took public communications and that was my first class that I literally stayed an A 100%, all the way through the class. Never dipped down. So I was OK, maybe that's the route I need to be going in instead of just kind of keeping myself afloat struggling. So that's why I switched over to management. As it progressed, I wanted to take the marketing, advertising, public relations. So even though I'll have the management background, I'll be able to use the advertising stuff. Because that's like the biggest thing right now is getting yourself out there and

> keeping yourself out there. So that's why I want to take those classes and bring those new ideas in. So while I'm learning them, I can make the shop the guinea pig. Then once I'm out there, I can use them.

Experiences in Automotive Programs

Michelle was initially nervous when she started her automotive education at the university because she was the only female in most of her classes. Her automotive knowledge was questioned by the males in the program, but she held her own, owing to her vast experience working in the family-owned automotive repair shop and her experience racing cars at the track.

> I started nervous obviously because [I was] the only girl in the class. But I'm also kind of used to it. I know some girls will go in there and not really be familiar. I mean they've hung out with guys, but when they sit in a room full of guys, then it's something totally different. And I've kind of grown up around it. I mean this [family owned shop], I'm like everyone's little sister here. Everyone makes fun of me. And also racing. So I've been around guys more than girls pretty much. So it didn't bother me a whole bunch. I mean obviously you get some of the, "Are you sure you can do that?" kind of.... like, "I can do it. I'm fine." I mean I can wrench on a car just like [a guy], so I mean you get that little bit here and there. I mean it wasn't obvious, but just because I was looking out for it. But other than that, I enjoyed it.

When Michelle was questioned by some of the guys in class, she would show them her extensive knowledge about automotive and that would surprise them and make them back down. She easily proved herself with her racing and auto repair background.

Oftentimes, she knew more than most of the men in her classes. “Then you show them, or actually outsmart them and then they shut right up. Or when they sit there and talk about cars and you step right in and say, ‘Oh yeah,’ and then start throwing specs out there and they’re like, ‘What on earth? Weird.’”

Support

Michelle has her family and the family auto repair business as support. She has also found that because automotive is so ingrained in her DNA, she cannot help herself noticing automotive issues on vehicles and wanting to help educate the owner.

> Obviously the family business has kept me going because, one, you don’t want to see something you’ve grown up around sink. Also, the encouragement from being brought up in a garage. I’ve always known how to, you know, tinker. I’ve always had a pet peeve of preventive maintenance. It drives me nuts when I see, like, a flat tire or a burned out tail light. That bugs me so much. Like, I’ll walk through campus and I’ll see a flat tire on a car and I’ll say, “Really? You can’t see that flat tire you’re driving on?”

Michelle’s pet peeve is when women do not know how to check maintenance items under the hood, change a flat tire, or even know that a spare tire exists. Michelle has gone out in public to raise awareness of automotive maintenance every year in the only automotive booth at the Women’s Expo at the [local] Center. She and her mother are crusaders, destroying ignorance of car related issues with women through education, which helps them be safer on the road. At her first women’s expo, Michelle was reclusive. Then, her mother nudged her in to being more social. “I’m shy ‘til you push me out there, and then I’ll just talk your ear off like she does.” So Michelle’s mother forced

her to talk by making her go "out in the aisle with a bucket of candy and said, 'Talk to people.'" Then, as Michelle became more comfortable. "I came back into the booth and would start talking to people." Michelle was amazed to find out "how many people don't even know how to open their hood." She has heard funny stories from customers, checking in their vehicles at the family business, about how they did not know things about their vehicle, "Like they didn't know that a spare tire existed." She has heard customer's respond to the question, "When was the last time you opened your hood," with, "Well, I don't know."

> It's like [sighs]. Just some of the things that you hear [people] come in [and say] is humorous, but preventive maintenance was always a huge part of staying in the automotive [repair business], because it's just been a pet peeve of mine. It bugs me.

Michelle enjoys educating women of all ages about automotive related subjects. Girl Scouts have come to the family shop and were taught how to jump start a car, change a flat tire, know the fluids in a car, and roadside etiquette with a tow truck. "You don't get out and go walk across the street. Or if you're on the side of the road, you don't stand outside the car, you stay in the car until the tow truck gets there, and then you get in the tow truck."

She wants to educate people about how to be safer on the road, know what to do in case of an emergency. "Because I've been fortunate enough to not be in that predicament of getting off the side of the road and not know anything. Just be stranded. I can get myself cobbled together and limping along. But most people can't." This interest eventually turned into an advertising and marketing spin that not only educates people

about automotive, but also brings in customers to the family business.

Michelle has not only found encouragement from her family, but also from friends and fellow race car drivers. Michelle has grown up around racing, has been racing since she was ten years old, and is now in her twelfth season of car racing. She finds it a challenge to figure out what the race car needs to run better.

> [I have] been racing since ’03. And [also] being out in the garage helping Dad tinker on the [race] cars, knowing how to get it to work right. You know, if it’s too tight around the corner, what does it need? Figure it out. Put some turns in it or push a left front spring down, put more air pressure in it. So that challenge [of race car problem solving], I like to keep doing. That’s [what] encourages [me].

Michelle was also encouraged by one of the female automotive management instructors and is active in the automotive management student organization as the secretary. She has brought her race car to the car shows that the student organization sponsors as well.

> Definitely Mrs. [Name] in particular. She knows I’m shy [laughs]. So she knows I don’t like to go up and talk to people so she’ll start a conversation with me [in a group of people] standing next to her and then she’ll just walk away. Like oh, OK, thanks. How can I make this awkward? I joined the [student organization], and now I’m their secretary this semester. I have two race cars. I have an asphalt car, which is out here. I have a dirt car at home. The dirt car was actually at the [student organization] car show this spring.

Michelle suddenly remembers something else about her youth that encouraged her to go into automotive.

> When I was little, some of the car games, you know, the long ride games that parents make [you go on], we would listen to "Car Talk" [on NPR]. Yeah, and we had to figure out [the car problems]. I had to figure out what was wrong with the car and try diagnosing it before the guy who just kind of wings it.

The car games continued past the family vacations. In her youth, Michelle's Dad would take her out in a customer car and have her tell him what was wrong with the vehicle. "Like, I'd have to guess what's going on in the car or by listening to the customers, I had to try figuring it out. So, it is like that little challenge, that game, kind of." Now, whenever Michelle drives a vehicle, she cannot help playing the family game so each vehicle in which she rides or drives gets the ultimate diagnostic treatment.

> So I can get into a car and it's like, "This thing drives horrible." So it backfires in his face, because the smallest shake in my car, I'm like, "Dad, needs fixed right now." Just turn the radio up [he replies jokingly].

The car diagnostic games Michelle played with her father and sister in her youth have stuck with her into adulthood, making a great car diagnostician of Michelle. Never letting an opportunity to "score" a win for her diagnostic scorecard, Michelle continues the game with her sister. Michelle was driving her sister's car a couple weeks ago, and she noticed the brakes pulsating and the front end clunking around. "It was driving me nuts driving the thing, because it was just clunking, banging, shaking. I'm like "[Name], get your car fixed!"

Michelle's superb diagnostic skills and attention to detail continue to serve her in the family business. However, in the background, the diagnostic game is always being played. This time with her father and the technicians at the family shop. There was a

vehicle in the shop for a window that would not go up or down. It was diagnosed as a door module that needed to be "flashed" with updated software, which only the new car dealership was able to do. While driving the vehicle there, Michelle noticed a vibration in the front end and thought, "They [shop techs or dad] didn't look at this? There's was an obvious bounce in the right front." So Michelle asked her dad, "You guys didn't pick this up?" Her dad said, "What are you talking about?" She said, "Just go drive it!" He did, and Michelle followed behind him, and sure enough, he said, "Yeah, it was bouncing and I could feel the other three, but that right front in particular." Michelle was like, "Dad, that right front's blown out. Something's bouncing around. It's all loose." Sure, enough, the right front strut was leaking oil, a telltale sign of a blown out strut. Michelle was like, "Yes! Score."

Barriers

Michelle has experienced some barriers to her automotive career. It was noted earlier that the males in automotive classes would doubt her automotive knowledge until she proved herself knowledgeable. Sometimes customers would not want to talk to her at the family shop because she is female. Michelle points out that her "family" stubbornness and her ability to ignore the little let downs helps her to cope with them.

> The hard-headed stubbornness, which definitely helps sometimes being in automotive. You'll get just digs left and right, because I've gotten it. I've noticed it up front, customers, even on the phone, they'll automatically want to talk to Bill, the service writer. OK whatever, but I'll get treated kind of rudely. And then once I give it to him, they're totally fine. So I told him [Bill], "[This customer on the phone is] a little upset, a little grumpy." Something about getting a quote. And

> I told him [customer] that we couldn't get a look at it today because we go by first come first serve. So he was kind of getting, you know, impatient with me but as soon as Bill talked to him he was fine. And so the stubborn hardheadedness, it doesn't get to me. It irritates me more than anything, but I get it [sometimes] from customers.

Females who come in to the family shop, on the other hand, like to talk to Michelle. They find it comfortable to talk to another female about their car issues.

> I mean the females that come in, they'll come straight to me. I'm a magnet. But some of the older gentlemen, they'll go straight to [Bill]. They won't even give me a second glance. Whatever, I mean to each their own. But I also get that, I've always had that in racing. So before coming up there, I've already had that backbone from racing. So even from starting at ten, I had to fight myself against guys all the way up. So I was like "whatever." I've always grown up with the whole, be like a duck, let it roll off your back. So I, like whatever. If anything, I'll just laugh at it. Be angry for a few minutes, then just whatever.

Would She Choose This Path Again?

Michelle would definitely choose automotive again. She points out that it is not for everyone because of the gender-related issues, such as proving yourself to the men in the field and the digs that come with gender bias. For women who have the passion for automotive, this obstacle can be overcome and open up the pathways to exciting career opportunities.

> I would. I mean it's not for everyone. Because you do get the digs all the time. So you definitely have to have the backbone, dig your heels in to prove [yourself],

> because there's a lot of instances where you have to prove everyone wrong. And there's a lot of other opportunities where you can easily get ran over. So if you're not prepared to get the negatives, then it's going to be an upwards battle. So I would do it, just because I enjoy it. It's definitely something you want to enjoy doing before pursuing it. But I definitely don't think the automotive is for everyone. But if you can get past all of it, enjoy it, the sky's the limit for a female in the automotive. You've just got to get through the crud.

Elisabeth

Elisabeth is a 29-year-old graduate of this university's automotive engineering technology program. She graduated four months ago and has been working as a data analyst service engineer, which is a position that utilizes her degree. Elisabeth's work experience in automotive goes back to when she was 14 years old and worked in her parent's automotive repair facility in Canada. She was, "Born and bred into it." She worked part time between school from 14 to 16, and then full-time after 16, all the way up until 2009 when she was 24. After her parent's shop closed, Elisabeth "found a position with Midas Auto Service, and continued my work there." Elisabeth was promoted three times at Midas, but in her current position, after graduation, she has not been promoted yet.

Neither one of Elisabeth's parents finished any post-secondary education. Her parents owned three automotive repair facilities in Canada. Elisabeth's mother handled all of the office related affairs with the business and her father worked on cars in the back. One of the repair facilities flooded when Elisabeth was 24 and, because it was considered an "Act of God," the damage and subsequent rebuilding costs were not

covered. Her parents then made the decision to close the business and sell off the remaining locations.

Why Automotive?

When Elisabeth was completing her career programming after Canadian high school, she wanted to become a veterinarian. “Yeah. Then I spent two years at [a local Canadian university], but my grades weren’t good enough.” The poor grades at the university hit Elisabeth hard.

> The perpetual youth hit me where I thought I was stronger than everything else in the entire world. Uh, so I took a hard falling, education-wise, because [in] high school I was always [on the] honor roll, [with] anywhere from [a] 3.8 to 4.0 [GPA] all the time. But going into the university, [and] walking out with a 1.7, it hits the ego quite a bit.

Elisabeth regrouped. She stopped going to the university and began taking college courses “just to figure out what I wanted to do.” She also transitioned to working fulltime at her family’s repair facility (which was still open at that time). Elisabeth was not taking any automotive courses, nor was she considering an automotive career yet.

> It was about 2007 when I finally decided to get into automotive, because one day I was thinking, you know, I’m trying to figure out what I’m good at, what will I enjoy for the rest of my life? And I was sitting there wrenching, you know, I was sitting there fixing a car and I’m like, “Why am I not doing this for a living?”

This is when it clicked for Elisabeth. She said, “So then I enrolled in [automotive at] a [technology] school. The ball started rolling from that point.”

Choosing a Major

Elisabeth changed her major three times. She began at the local university's pre-veterinarian program, which was a four-year program. She wanted to specialize in "small domestic animals." Elisabeth summarizes.

> I wasn't a farm person, so I wanted to get into domestic [animals]. And University of [name] was the only one that offered it at that time, and you had to have like a 92% average to even be considered to get in. And I'm like barely getting Ds. I realized, it was the biology classes that really hit me hard, [and] the organic chemistries.

With her ego bruised, Elisabeth released her aspirations of being a veterinarian, and changed into a career exploration phase of her life by taking general education courses. Elisabeth said, "I was taking classes like philosophy, logic, how to read logic out of words, that one was an odd class." She was trying to find something that resonated with her; something she could turn into a career. "Just anything, you know."

In addition to taking general courses, Elisabeth's career search included working "many odd and end jobs trying to figure it out." She tried working security and culinary arts for a while, but nothing gripped her interest. Elisabeth's mother promoted the idea that she undertake different jobs to find a career. "[My mom] was like, 'You don't know what you want to do. Take jobs and see which one.'" Elisabeth even tried "data entry for the border in Canada." Something Elisabeth did discover was that she did not like data entry type work. After exhausting all other possible careers, Elisabeth said, "So I end[ed] up like falling right back to what I knew and what I liked." She immediately changed her major to automotive.

Experiences in Automotive Programs

Elisabeth received her automotive mechanics education at a trade school in Canada. While taking courses there, she did experience gender bias. “A lot of the older professors, the old tech mechanics did go easier on me.” Elisabeth fought with them not to go easier on her “because I didn’t want to just walk out and not know anything.” Another important reason that Elisabeth did not want to appear favored was that it weakened her academic accomplishments. Elisabeth explains, “So with some professors, some teachers, I did get treated [differently.] I got the easy way out. And I didn’t accept that. I’m stubborn in that sense.”

With her classmates, Elisabeth said, “I was one of the guys.” Owing to her experience at the family shop, “I have a pretty good experience on judging labor estimates.” Her knowledge became a valuable commodity for some of her classmates who perform auto repairs on the side. Even now, she still receives calls from some of them asking for guidance. A typical question is, “I’ve got this great [repair] job on this BMW” and want to know how much labor to charge. Elisabeth asks, “What year. And then I’ll give them an estimate.” Sometimes it will be a technical question such as, “I’ve got this problem. I don’t know how to figure it out.” She concludes, “So the guys are still treating me really well and as one of the guys. I’ve always been one of the guys.”

After transferring to this university, Elisabeth “had quite a few moments of wondering, ‘What the hay am I doing here? Why am I doing this?’” Elisabeth was homesick. She was alone and in a foreign country without her family. Elisabeth said, “I probably only knew about three of my classmates” and those three classmates were “the international students I came there with” from Canada.

As for the American students, “A lot of the guys did not want to interact with me or talk to me.” Elisabeth attributes this to “automotive cultural differences.” She explains.

> A lot of the automotive guys [at this university] are all about diesel. I don’t know much about diesel. In [western Canada], we’re mostly imports, so we’re the little turbo, the little pea-shooters that shoot around. That was my forte. You sit down and talk to me about a [Toyota] Supra, no problem. But all these guys are all about Ford F-350s or carbon black smoke. I didn’t understand any of that. I had to Google some of that stuff. So I was learning a whole different aspect of the automotive industry, because at that point I realized OK, I spent most of my life around import guys. And now I’m rolling in with the domestic guys [who are] all about trucks, mudding, 4x4'ing. And because I didn’t have an interest in that, I had no way to connect with those guys. So it was a lot harder to get along with them.

Elisabeth believed, “It was a lot harder going through [this university’s automotive program than it was at [the Canadian trade school].” She experienced, “a challenge educational-wise, academic-wise.” Previous Canadian students, who went to this university ahead of Elisabeth, told her, “Oh this will be easy.” She said it was a matter of national pride and that “they were basically stereotyping, saying that Canadians are smarter and their schooling was better.” Elisabeth reasons, Canadians study harder because they devote more time to studying instead of extracurricular activities. She said, “We just have nothing else better to do than to study.”

Experiences After Graduation

Although Elisabeth graduated three months ago, she has automotive experience from working at the family-owned repair facility and for two years after trade school while she was attaining her Canadian automobile technician licensure.

While seeking employment. One of Elisabeth's American classmates from this university recommended her current position to Elisabeth. During the hiring experience, a woman in human resources "absolutely loved me." Elisabeth describes the process.

> [The HR woman] didn't know much about cars and so as soon as she saw a female in the automotive industry, she just checked my personality and she was like, "You seem like you fit." I had an offer within 13 hours after my interview.

Elisabeth looks at this hiring process differently than the jobs she applied for earlier. She feels that this one was obviously different because someone referred her. The other applications were done by cold contacting the company.

Elisabeth goes back to discussing the jobs she applied for earlier. The positions she had applied to earlier, got back to her late in the summer. She said, "The jobs that I had applied for, I never got a response back until about July. And then at that point, I had four offers on the table." She blames herself for the late replies. She said, "I just don't know if I just was too slow, I should have sent it out faster or earlier than the Career Fair." She noted that many of the responses were, "from the Career Fair." It was perhaps bad advice about when to apply for positions. Elisabeth said, "Yeah, because that's what we were told is either apply at the Career Fair or like within the end of the week, and that's what I did. But I never got a response back until quite a bit later. Elisabeth was offered a position with a major import manufacturer, but it was too late. She explains, "I

got another [job offer] from Toyota. Which is my dream job, but I'm just like, I'm settled here. I have an apartment leased for a year, so I can't just take it."

Experiences while employed. Immediately after attending trade school in Canada, Elisabeth "decided to do another couple years of working and wrenching." Her goal was to earn "my license as a tech first." Elisabeth went to work at a Canadian Midas shop. While there, she said, "I worked my way up the chain from lube tech to service tech to assistant manager." The owner of the shop was disappointed when Elisabeth announced her departure from there to this university. The owner was so impressed with Elisabeth, he thought she would one day take over the shop when he retired.

In her current position, as a data analyst service engineer, she is subcontracted to Fiat Chrysler Automobiles (FCA). There is a possibility that she could get hired in direct to FCA, but there is no guarantee. Elisabeth interfaces between FCA engineers and dealership technicians using a web-based service manual. She is responsible for only the wiring diagrams. Elisabeth describes her position duties as, "I'm basically [an] interpreter between engineering language to tech[nician language], specifically with wiring." The process begins with the identification of an inaccuracy of a wiring diagram. Typically, a technician in the field identifies an inaccuracy. Then, the technician contacts FCA via email describing the problem. The problem is investigated with FCA engineers and, once a resolution is found, it is validated, then the wiring diagram is updated. Elisabeth's job is important because her work improves automotive technician's ability to successfully repair vehicles. She said, "[When a change] is updated on the web-based program, other techs don't run into that problem."

The office environment is a new experience for Elisabeth. She is trying hard to

understand the dynamics and adjust from the technician environment for which she is familiar. Elisabeth says, “I’m trying to learn the balance of an office dynamic.” She believes “There’s a big difference between being a shop person in a shop environment and an office environment.” In a shop environment, “it just seems more free.” Often the technicians will, “sit around and joke [during] down times. When it’s busy even they’ll still joke and stuff.” In the office environment, “everybody’s very serious 90% of the time because everything is always delayed or it should have been done two days ago, sort of thing.” In her current office environment, Elisabeth is always, “at a cubicle with a desk and a computer.” She works with engineers and says, “most of them are pretty friendly unless they’re really busy, then they’re really short, which is understandable,” because Elisabeth says, “There’s always time crunches, deadlines.”

However, Elisabeth feels a disconnect with her co-workers. She is younger and female and does not identify with them and, in particular, their hobbies. Elisabeth describes her co-workers as “all about 45 plus years old in age.” She says that, “they’re all [into] hunting, fishing, and I’m just like, I know how to seashore fish, that’s about it, you know.” Elisabeth struggles with the isolation she feels in the office. She says, “So I don’t really talk to them very much, but at the same time, I’m trying to learn the office dynamics and get to know them. So it is a struggle right now.” Elisabeth summarizes, “I don’t base that purely on being female. It’s just because I don’t know how to work in an office environment.”

Support

When Elisabeth was working with her dad in the family shop, “I always had that safety net, so I never had to deal with any sort of labeling or anything negative towards

me." However, when she was working independently at Midas, she experienced some gender bias. Elisabeth recalls an experience.

> I specifically remember this one German fellow, he was like 65 years old coming in with a Dodge Intrepid and he wanted an oil change. And my boss was busy in the back. I was the only one up front. So I started talking to him, and said, "What kind of a package? Are you looking for an oil change, maintenance package?" And he was like, "No, I want to talk to a man." And I'm like, "I'm more than capable of helping you." And he was like, "No, I want to talk to a man. Where's that man that's here all the time? I know he's here all the time." So my manager came up front, and he told that gentleman to leave his shop.

The Midas manager with 14 years of experience said, "I didn't want anybody like that as a customer base." Elisabeth, "was astounded at the fact that he actually threw the customer out." This was the first time Elisabeth realized, "that I was going to have it hard." Conversely, the two licensed technicians at Midas helped Elisabeth pass her technician license exam. Elisabeth never "had any problems with any of the technicians." They were very helpful and supportive. Finally, when Elisabeth told her manager at Midas that she was leaving to go to this university, she said he "was pretty upset, because he thought I was eventually going to take over his business."

Barriers

Elisabeth describes a cultural barrier that she had to overcome. She describes her ethnicity.

> My dad is Asian, and he has a strong Asian culture where men have their place, women have their place. My mom is not. She's aboriginal, First Nation, Native

> American. So my mom gave me that balance between my father being the strict gender role to my mom saying do whatever you think you're good at, whatever you'll enjoy. And so when I went to my dad and said, "Hey dad, I want to become a mechanic," my dad told me no. Being at that rebellious age as I was, I did it anyways. [Laughs] So my dad told me, "You know, no woman should be in the shop, blah, blah, blah." And I was like, "I've been in the shop since I was little," you know. But he didn't think it was a career [that was] right for me, and I was gung-ho in proving him and anyone else that ever told me that a girl shouldn't be in a shop wrong. I would say that was the final push for me.

At the auto technician trade school in Canada, Elisabeth's main barrier was her instructors being too lenient on her academically. She fought back against the leniency and the males in her classes "saw me fighting [back]." Elisabeth did not "want the easy way." She wanted to be "treated equally with everybody else." She did not want to be "passed just for the sake of being female." Elisabeth's male classmates respected her for not accepting leniency in her schooling.

Elisabeth was entirely "willing to get down with the guys and wrench with them." She even asked her male colleagues, "Did I ever challenge you in anyway or anything like that? They said, In the beginning I did because they didn't know what I was like." Later on, "they realized it wasn't because I was female, it was just because I was knowledgeable already and walking in because of my background [in automotive]."

Another barrier Elisabeth identifies is "with the boys here [in America]. [Laughs]" She believes her "biggest challenge is not, I guess, essentially fitting in [with her male classmates at this university]." Elisabeth is haunted by not being a part of her

environment socially. She said, “Because human nature we’re companions, social by nature, and so I did have quite the struggle.” Elisabeth says she only knew the three international students she came with to this university. Elisabeth finishes up by saying, “A lot of the guys did not want to interact with me or talk to me [at this university].”

Currently, Elisabeth is looking for something to do in her free time. “Even here now, I’m here by myself trying to find something, you know, a hobby or something aside from [work].” She found out the hard way that she cannot repair her vehicle in the parking lot at her apartment. “Because I got yelled at for doing my brakes last weekend.” On the brighter side, Elisabeth and a friend were considering renting a shop “and just doing repairs there and fixing stuff.”

Would She Choose This Path Again?

When asked if she would choose this career path again, Elisabeth said, “Yes.” Initially Elisabeth “wanted to impact people’s lives right from when she was in kindergarten.” She says that as an automotive engineer, she can impact peoples lives, particularly the automobile technician, in designing a vehicle that is easier to repair. Elisabeth also recognizes from her experience working with customers, that complex repair procedures increased the cost of a repair. She explains that “the number one clientele that you receive are the single mothers or the single fathers or the one-income families where they have to decide rent or their brakes, you know.” Elisabeth knows that people “need your car to go to work to make money for your rent, right?” She continues with, “That’s why I like what I do. I like where I am and I would choose it again because I feel like I am impacting social, economics, environmental if I can.”

Elisabeth shares why she wanted to participate in this study. She said, “because I thought it would help other females out there.” Elisabeth talks about her one niece who follows her around and, “she can name off cars with me.” When her niece rides around at night with Elisabeth, “I’ll point headlights and she’ll name off [the vehicle.] Elisabeth’s niece is hesitant about liking cars. Her niece said, “Is it OK that, you know, I like cars?” Her niece’s fear of being an “auto girl” motivated Elisabeth to help, “introduced more women to the concept that there are more females going in the automotive industry, and that it’s not out of necessity but out of choice.”

Alice

Alice is a 26-year-old graduate of this university’s automotive engineering technology bachelor’s program. She graduated just over a year ago and has been working in the automotive field in a capacity that utilizes her degree for one year, two months. Alice began working at Autoliv, a Swedish-American safety technology company, as an intern, then was offered a full-time, direct-hire position once she completed her internship.

Alice’s mother has a degree in accounting and has worked as an accountant. Her mother has transitioned from accounting to sales and, besides selling Mary Kay, is a realtor currently. Alice’s father has been working as an engineer for approximately 28 years. He currently works for AT&T in cellular phone engineering. He was involved with cellular back when it was an emerging technology, and has worked at IBM and Motorola. Additionally, Alice has a cousin who works in software for Hewlett-Packard in California.

Why Automotive?

Alice did not get her interest for automotive from her parents. Her interest developed, "when I started driving" and then, she wanted to know more about her car. It started with little questions such as: "I want to know what makes the engine go? You know, why is there only certain types of gas that are allowed to go in the engine?" Her fascination continued with wanting to perform her own maintenance on her vehicle. Alice says, "I want to do my own oil. I want to change my own tires." Alice is also a fan of the original British version of the TV show *Top Gear.* She says, "*Top Gear* was my favorite show."

Choosing a Major

Alice has "always had a fascination with cars." However, Alice's parents discouraged her from going to school for automotive. Her parents would say to her, "You need to pick something that's not being a grease monkey underneath a car."

Alice's true passion is automotive, but she chose criminal justice to appease her family. It was the most tolerable career that her parents would approve. The appeal of criminal justice for Alice was, "I like investigating. I like figuring out what the problem is and why the problem is there and what's the root of it in a sense." So Alice compromised and earned an associate's degree in Criminal Justice. After completion of this degree, Alice was still interested in automotive. Alice's parent's response was for her to continue her education. They said, "OK well find something more [in criminal justice]." Alice decided on a highly regarded school to further her education in criminal justice. She says, "I was trying to go to John Jay in New York. It's a full-blown Criminal Justice College." She wanted to specialize in computer forensics. Alice says, "My main

goal at the time [was] Forensics or deviant behavior. However, for some unknown reason, John Jay College kept losing her applications. Alice explains, “I applied there at least three times. And they were like, ‘Well, nope, we’re not getting [your application].’” To Alice, she interpreted this as, “a sign that I should go back to what I wanted to do,” which was automotive. Alice searched the internet and found this university’s bachelor’s degree in automotive engineering and sold her parents on it. In the end, her parents compromised. Alice says, “It’s technically an upgrade from what I wanted in my mind,” because she originally chose a trade school for auto mechanics. For Alice and her parents, the decision to go to this university “made me happy and it made them happy.”

Experiences in Automotive Programs

Aside from the fact that Alice found the automotive program “was definitely interesting, seeing as there were few girls in the program.” What Alice really liked about the program was that it taught her a complete automotive knowledge. “Yeah, this filled in a lot of the blank spots.” For example, Alice “understood brakes and how they worked,” but the details like “this is what that little piston does to stop the brake, you know, when you push it up against the brake pad.” Alice said, “that’s what I liked about coming here since I [had] learned [some of the] basics.”

Alice explains that after the first two years of learning the basics of the car, the automotive engineering technology degree, spreads out into manufacturing, thermodynamics, and CAD. These engineering courses have helped Alice in her current position as a test engineer. She says that when she described the quality of the degree to her coworkers “that a few of the engineers I mainly associate with, were like really surprised on how much I learned for this degree.” Her colleagues, some of whom are

mechanical and electrical engineers, were impressed that she knew how to conduct a Design of Experiments (DoE). Alice says, “I could sit and talk to them about DoE all the time, and they’re like, ‘Oh you’re understanding?’ I’m like, ‘Yeah, I know what a DoE is. I know what the process is and what you’re trying to do.’ And they’re like ‘That’s amazing.’” Alice enjoys the practical application of her position at Autoliv. She says, “I’m more of a hands-on type person than book smart.” The type of work that she does at Autoliv “helped reinforce a lot” of what Alice learned at the university.

Experiences After Graduation

Experiences seeking employment. Alice thought seeking employment after graduation was difficult. She applied at many different companies and did not receive any responses. She says, “No phone calls, no e-mails saying, ‘Oh hey, we’re interested in an interview.’ It was hard.” Then her faculty advisor told her about Autoliv. Alice says, “In my mind, I thought it was just going to be another crap shoot. I thought it was just here’s another one that I have to put in. I’ll probably never hear back from them. And they actually called me back.” Alice interviewed and was offered an internship, which turned into a direct-hire position.

Experiences while employed. During her training at Autoliv, Alice found it “a little scary at first because there was only one other girl working in the lab.” She was, “working with a bunch of other guys” and her new coworkers all seemed to “have their own stuff to worry about.” They did not interact much with her initially. Alice felt she was she inconvenienced the engineers who had to “train this, you know, like child to do [their] job, in a sense.” Alice says, “That’s what it felt like at some points of the intern[ship].” Though she may have felt she was a burden being trained during her

internship, only one person treated her in a condescending manner. She explains, "because the [engineer who ran the Tensile Lab] felt like it wasn't his job to train me." He treated Alice flippantly.

The man who runs the vibration lab, who is retiring next year, took her under his wing and said, "I'm going to show you everything and I'm going to teach you." He was very pleased with Alice's work. When Alice was finishing her internship, her supervisor and manager said, "OK, we do want to bring you on full-time. We don't know how or when." Then, "the guy who runs the Tensile Lab, the one that I told you that didn't feel like he needs to train someone, put in his two weeks [notice]." The vacancy in the Tensile Lab created an open position that the company filled with Alice's direct hiring. Alice initially had doubt about her ability to perform in the Tensile Lab because she worked there at the beginning of her internship and then rotated to other departments. While she was in the tensile lab rotation, the man who worked there did not feel it was his job to train someone so, "he was just putting me on little baby stuff here and there and [only] part of the processes." Alice admitted that the Tensile Lab "was the last thing I ever had on my mind." Now that she had to go back there and run the lab, "I had to catch on. And they were really happy that I was able to just basically take the reins on my own and get to work." Alice "got shoved into there" and told, "you need to learn this. Figure it out." So Alice stepped up and became proficient at running the Tensile Lab.

Alice said her employer "Didn't have any trouble with me. Not yet at least." Alice describes herself as "self-sufficient," and gives this example:

> We have test engineers in our lab that write the test plans and put them out on the floor for us to do. And I can do that whole process myself. I can take a test from

> start to finish all on my own. I don't need the test engineers. Because there is so much work, I do rely on them. But, if I ever needed to do anything on my own, if they're like a [person] short, and I need something to do, I can do it. They don't ask me to do work; I just find work to do.

Support

Alice's husband is very supportive, and he encouraged her to follow through with her position after she fulfilled the requirements of the internship and was continuing to work without being hired in full-time. He would say, "You want to do this. You're going to go for it," because Alice often "missed home and wanted to go [back to her] home [state]." Alice's father wasn't very supportive initially, "but when my dad, you know, saw what I was doing, he ended up changing his tune." Her mother, uncle and grandmother were all very supportive. Those family members said, "As long as you're happy with what you're doing, then we'll support you."

While in the first two years of the program at the university, Alice and Michelle, who's interview was earlier in this study, developed a friendship. Alice says Michelle was very helpful. Michelle knew so much from being involved in her family's shop that she was able to help Alice "with like little stuff that I didn't understand." Alice stays in contact with Michelle after graduating. While she was at the university for this interview, Alice was trying to coordinate a visit with Michelle.

Alice's faculty advisor was also very supportive. As she was getting close to graduation, "I was getting frustrated and tired. I had all these classes I have to take." Her advisor helped Alice with the transfer of credit from another college, which "cut back three college classes [that] I had to take here." Alice was trying to finish as fast as she

could to return to her hometown in Florida. He encouraged her by saying, "You just need to finish. You're almost there." Alice's did not think she would stay in Michigan after graduation. "But you know, things change." Her advisor was the one who told her to apply at Autoliv. The rest is history.

The retiring Vibration Lab engineer saw Alice's potential. After working with Alice for a while and watching her progress, he had some positive observations.

> "You're smart. You're catching on very well. You're being cautious and asking questions." He's like, "I like that. That's what someone needs to be like in a lab. They keep asking questions, and not just say, "Here, I'm going to push a button."

Alice's said of her supervisor and manager, "they've been awesome. They've been super flexible with me," Alice's manager is a female. To that, Alice said, "I think that is a big thing in my opinion. Because she is a female, she understands what we go through a lot, and so she tries to cut [gender related issues] out." Alice describes her male supervisor.

> My supervisor was super happy to have me. He was really excited. He's like a very big advocate on having females work in auto. His wife works in the auto industry, too. I don't remember what she does exactly, but I ended up lucky in my mind that I've had very good supervisors and managers that understand what some women actually have to go through.

Another female engineer was recently hired at Autoliv. Alice describes how they became friends. They knew each other for less than a year, "We were just talking on and off whenever I had testing for her. She's become one of, one my close friends." She asked Alice to be one of her bridesmaids for her recent wedding.

Barriers

Alice found a barrier with the degree she has earned, not because she is a woman, but because most people do not take the time to understand what her automotive engineering technology degree is all about. Alice said, "I've mentioned it to engineers, and they're like 'What kind of degree?' Like oh, 'An automotive engineering? Oh well, it's probably like just a fancy auto service degree.' And I'm like, 'No, it's much more than that.'"

When the engineer who did not feel it was his responsibility to train her comes up, Alice says, "He was just annoyed with work in general. He was a very interesting guy. But he was all right." Alice did not let him bother her. Alice's demeanor is even-keeled. Not a lot rocks her boat. She adds to this description.

> I'm very chill. There's things that do upset me a lot and they happen at work, but it's just like, you know it's not my problem. That's basically on them and I just mind my own business, kept my head down, nose clean, and just keep working. In the end, that's why they trust me more than some of the other techs, you know. Try to make a good impression.

One of the barriers to Alice's career choice came from her family when she "compromised" and earned a criminal justice associate's degree. This was not Alice's dream career. Alice never gave up hope that she would end up in automotive. The two years in criminal justice may have slowed her down a bit, but it did not stop her. Alice describes how she deals with barriers, "[I] Just kept thinking positive that something was out there, you know."

Would She Choose This Path Again?

When asked if she would choose automotive as a career, Alice said, "Yeah. It's fun. It's, it's different. I mean I love the work that I do." She says there are some "days where I'm just like, 'Oh I have to go back to work?' And there's days where like, 'Oh! I get to go back to work.'" Alice says, "I would definitely pick it all again."

Vanessa

Vanessa is a 26-year-old graduate of this university's automotive engineering technology program. She graduated two years ago and has been working in the field during that time in a capacity that utilizes her degree. Vanessa has held two different positions since graduating and is currently transitioning to a management position which would be her third position, and a promotion. Until that happens, she has not been promoted.

Why Automotive?

Vanessa's parents did not work in the automotive industry. She says her choice of automotive came out of nowhere. In fact, she states her parents did not influence her career choice at all.

> My mom was stay-at-home and my father was a business consultant. So he's done everything from marketing to business development, all like big money Lockheed Martin stuff. So he was not in automotive at all and neither was my mom. Kind of came out of left field. I'd say what they did didn't really influence me at all.

Vanessa admits that she always had a liking for trucks and cars. In particular, monster trucks and race cars like NASCAR. She spent some time with friends mud bogging and with her uncle at NASCAR races. Once she purchased her own truck, then

had to work on it, she wanted to learn more about how cars worked. She was officially hooked on automotive.

> I think I always to a degree was kind of attracted to vehicles a little bit. I went to a monster truck show and then I also went to a NASCAR event with my uncle and got to do the ride-along and stuff like that. They're really big into NASCAR, so I kind of got introduced a little bit more into like cars and stuff like that. I think that's kind of what triggered it.

One of the things that Vanessa credits with kick starting her automotive interest was mud bogging, which is an off-road motorsport where a vehicle is driven through a mud pit.

> Then my friend took me mud bogging, right? So every Sunday people would all gather in this one area and like mud bog and drink beer and cause trouble, right? I loved it! It was so fun to me. From there, I ended up buying a truck because I wanted to do it myself. And then it just kind of evolved from there. So like I was at the point where, like, I understood I was replacing the alternator, I could figure out how to do it, but I didn't understand why. So it's kind of just, it's little tidbits of being exposed to it, and just kind of snowballed.

The experience of not knowing how a part on her truck worked created the desire to learn more about automotive.

Choosing a Major

For Vanessa, choosing a major was easy. She wanted automotive and decided to go all in and go to Universal Technical Institute (UTI). UTI is a for-profit transportation school that offers training in specialty areas of automotive mechanics, auto body repair,

NASCAR mechanics training, diesel mechanics, marine and motorcycle mechanics. Vanessa chose both the automotive mechanics program and NASCAR school, plus she completed courses in diesel mechanics. “So I decided to go to automotive school. I wanted to move away from my parents, so I found one in North Carolina that looked pretty good.” Vanessa went to the NASCAR Technical Institute in North Carolina, then continued her mechanics training at the UTI campus in Arizona. Once Vanessa graduated, she could have been a technician anywhere in the country, but Vanessa wanted something more than to be a technician, so she began to look at her options. After much internet research, she found that this university was the only university that would accept transfer credit for her automotive courses from UTI. So Vanessa decided to go to college. At first she was doubtful. “I didn’t think I would be able to do it at all because I, like, failed Algebra II in high school. Like, I was a terrible student…so yeah. So I was like, ‘You know what? I’m going to try it. I’m going to give it 110, and I got nothing to lose.’ I took one semester, got straight As, and it’s just kind of history from there.”

Experiences in Automotive Programs

Overall, Vanessa’s experiences in the automotive program were positive. During her time at UTI, everyone was young and far away from home, so they pulled together and supported each other.

> UTI was pretty OK. I didn’t have any issues there. Everyone was pretty cool because, there, everyone was a lot younger and a lot of the people there were fresh from high school. So for a lot of people, it’s their first time away from home, which I’m sure it is like a lot of colleges, too. So, like, we kind of, a lot of us bonded a lot.

Vanessa stayed connected with most of her UTI classmates. She observed that a high number of her fellow UTI automotive peers do not even use their automotive training. “[After] UTI, half the guys even don’t even [use their degree], like one of my friends is a police officer. So many people went to school for automotive and I barely know any of them who are actually in it [currently]. Isn’t that crazy?”

When Vanessa began at this university, she noticed some cultural differences between the East Coast and the Midwest. “The students were great. I’ve had worse experiences other places. I think because a lot of people came from Michigan, and they are kind of raised differently than the East Coast.” She found the education gave her an understanding of different areas of automotive engineering, but felt like none of them tied together with the other classes in the program like they should.

> It was a pretty good experience. I didn’t do a lot of the hands-on stuff [at this university], but I think with [classes] being so theory [based], that sometimes it’s hard to actually apply. I think, I was pretty prepared [for the automotive industry]. I feel like it was almost more of experiencing different areas of the industry to really understand where you wanted to go.

Vanessa felt the exposure to different areas of the automotive industry a positive for her to decide where in the industry she wanted to pursue. “So it was like automotive and engineering, but it wasn’t too far in-depth that like you’re siloed.” However, while she appreciated the overview to automotive, she felt program’s framework seemed somewhat “scattered” and lacked “structure.”

> Because it was, like, oh, you have statistics, oh, you have dyno[mometer], but they don’t play together, into each other. So like a lot of times, with the

> engineering classes, you might take kinematics and that might flow into something else. Where this was just kind of like fragmented.

Besides the classes not intertwining very well, Vanessa also found the classes lacking in their application in the real world. According to Vanessa, "As far as relating it to actual industry usage, I think there's a bit of a disconnect. But I think it's with every degree though. I mean real life compared to school is very different."

Experiences After Graduation

Vanessa's experiences after graduation ranged from very negative as a vehicle repair technician to positive in her current professional engineering position.

While seeking employment. Searching for a job was not easy for Vanessa. Notably worse was when she was looking for work as a heavy truck technician; markedly better was her experience seeking an automotive engineering technology position.

> And when I applied for a position at a Kenworth dealer in New Jersey, they literally told me, "When I look at you, I see my daughter, and I can't imagine her or you under a dump truck. I'm not comfortable with that." Yeah, so. But, you know, I mean, it is what it is. I mean, it's, I'm being honest, you know.

Nearing graduation from this university, Vanessa was panic stricken because she did not find an internship until the last possible minute.

> I struggled finding an internship. I didn't understand why to be honest with you. I applied for anything and everything. I could not get an internship anywhere. I had a good resume, like, and then [FCA] called me and then, you know, I scored that.

Vanessa graduated in May and began fulfilling her internship with Fiat Chrysler Automobiles (FCA) immediately. She was offered a full-time, direct-hire position with

FCA with the same group and team once she completed the internship.

Experiences while employed. Vanessa's experiences were not as positive when she worked as a vehicle repair technician. She was ridiculed a lot and told she was going to make lots of mistakes. "It was terrible. They would just make fun of me nonstop to the point where I mean I had absolutely no confidence in anything." This lack of confidence made her nervous and more prone to making a mistake.

> So, you know, if you're really nervous, you're going to screw up, right? Like, they thought it was funny, and they were grown men, which was kind of [absurd]. They owned and ran the shop. I would say that was by far the worst experience.

Vanessa's experiences after graduating with her bachelor's degree were substantially better. She was still working in the male-dominated automotive career at FCA, but in a much more professional environment. Long gone are the humiliations and expectations of failure by males at her previous workplace.

> Yeah, I've had very good experiences after [graduating from this university]. Even right now, I'm currently in a very technical role. And I'm with all guys, like normal, you know, you just kind of get used to it. I mean it's been good. I think because I have the ability to see things a little bit differently. I think it's going to help me more in like a managerial standpoint for the future, but I've had very positive [experience]. I mean every now and then you get a dealer that's an a-hole, but that [happens to] everyone, it doesn't matter if it's me or Dan next to me, you know. So nobody's really said anything rude. But I also think that because you're in a professional environment, I think that kind of helps in that no one is going to come up to you and be like, "Oh you can't do anything." But if I

> was to go work in an independent shop, you know, in a small town, things might be very different.

Vanessa reflects on her experiences with extreme gender bias at work places and compares it to her current experience in a professional environment. She points out how when everyone is working toward a common goal, there is no gender bias and the work environment is much more comfortable and supportive.

> Everybody's kind of there for a common goal, like you're always going to have some level of maybe competition or something, but you know, like I said, I've had all positive experiences [at FCA]. I mean all the guys are, you know, we're spinning technical talk back and forth all the time. If I don't know something, I'm still very new in my role, they'll tell me. They're awesome.

Vanessa describes her current position at FCA like "something exploding in space and it just continuously goes out in different directions and there's shit everywhere." To her, "it is a disastrous mess that makes no sense." She is continually asking, "Why do we do that? Why is that there? Why are we not communicating with this other team that is wrongfully doing stuff?" Vanessa tries hard to "connect things where they make sense." In pursuit of a solution, she often asks, "Why don't we come up with a better way of, you know, of doing this and make this more efficient?"

Support

Vanessa's family was very supportive of her going into an automotive career. They did not give her a difficult time at all. "No. In fact, they're probably just happy I was going to school. Seriously. After all, because I was a big troublemaker." Vanessa moved from a small town in New York state to a big city in New Jersey. She describes

the people in her new town as being mean. As it turned out, Vanessa had a hard time fitting in, so she ran with a crowd of misfits. “So I can’t be mean to fit in. So I ended up, like, hanging out with the reject kids, died my hair, just trying to fit in somewhere.”

Vanessa had positive experiences at this university. She does not recall anything negative happening. “There wasn’t really that much negative. I think if there ever was, I just didn’t deal with it.”

Barriers

Vanessa’s friends sometimes thought she was strange with her interest in automotive. She explains.

> They treated me kind of weird when it came to working on cars and stuff sometimes, but, obviously I don’t hang around those types of people anymore. But for a majority, I don’t normally get any negativity. If I do, it’s usually peer-wise. Usually more people my age or like social media.

“Push back” is a term often used by the participants to describe resistance or obstacles from individuals or groups. Vanessa explains that while being in automotive, she has observed other women struggle with push back from, of all people, other women.

> I’ve seen others [have] significant [issues]. I’ve seen a lot of it, like on Facebook… people are bashing people, the girls are some of the worst… It’s bad. But for [the] majority [of people], [it has] been pretty good, but like I said, mainly peers [give push back].

Because of all the push back women interested in automotive receive, Vanessa has created a non-profit organization to help educate women about automotive topics in a supportive environment.

> I created this organization [as] a safe haven, you know. If you want to understand how a battery works, come talk to us. No one's going to make fun of you for not knowing something… It's just women in the industry getting together and helping each other succeed in their goals and stuff like that.

Later this month, the organization has an event with a high level competitive female truck puller. The event will include a meet and greet, a presentation with tips and tricks for women interested in the sport of truck pulling.

Vanessa points out that in a professional setting, it's easier to work with men than it is sometimes with other women. "Yeah, absolutely. Especially if they're like catty or [have an] attitude, it can make [women] terrible to work with." Vanessa is a happy person while the women she is describing are miserable. "They're like, 'Can you stop being so happy all the time?' I'm like, 'I'm sorry you're miserable.' [For] some people, hey, you enjoy being miserable. I'm not. [laughs]"

Vanessa identifies her biggest barrier is her education. FCA is a company where an engineering degree is highly respected, while an engineering technology is not. Vanessa has observed that one needs a mechanical or electrical engineering degree to move around in FCA and is concerned about being gridlocked in her career. "[FCA] doesn't recognize [the] automotive [degree], especially ours [from this university]." She is considering an engineering management master's degree, but ultimately, she wants to be her own boss and own her own business.

> So a lot of the positions, even moving within Chrysler, I would have to have a mechanical engineering degree. So pretty much, I would have to go do a four-year degree all over again. So, I don't qualify for a lot. I want to say I am relatively

> stuck where I am within Mopar in service because of that. So I can't go to any engineering at all because I'm just not qualified enough. I'm not educated enough. And, like, yeah, we had CAD and stuff like that, but not to the degree of which I would have to perform. So I, I'm very, very limited.

When asked if there is still a career trajectory for her in the aftersales division of Mopar, Vanessa explains that her career might become "gridlocked."

> I might get gridlocked. Because what happens is even when you get to a certain point of, maybe say, like, a senior manager, right? You know, even that level of hopping around, they all have mechanical engineering degrees and they all have master's in mechanical engineering. All of them. It doesn't matter if you're doing engineering or not. So it's like even if I got to the director level of Mopar, you don't stay there forever. So you go to another director and that's engineering, engineering, engineering, branding, you know what I mean? So, it may be a very big problem for me. So I might have to go back for mechanical engineering. I mean, that's tons more schooling. Or I could go back into the engineering management degree that I started to do, which it's like, it's an engineering degree, but not so, it's kind of more of like management, I guess. So, I want to say at some point in time, if I do stay corporate, which I have a big feeling I probably won't forever, I really want to do my own thing eventually. Kind of be my own boss. Whether it's owning a shop, performance shop or something. We'll see.

Would She Choose This Path Again?

Vanessa's answer is both a no and a yes. "I would not." Vanessa would not choose the technical side of automotive. She believes the engineering technology degree

will not take her career as far as she would like to go. As for the yes, she would choose to work for an automotive company, but with a business degree. Vanessa still would be a vehicle enthusiast in her business role, and teach herself whatever technical things she wanted to know.

> I would go to school for something else, whether it was finance or accounting or something. But I would take my interests and use that as a bit of a motivator and kind of compass for positions. So, if was in finance or business or something, I could work for an automotive company, because that's my passion. But I would have a better, more well-rounded educational background.

Vanessa gives an example of one of her friends, who is a Mustang enthusiast, has a business degree, and works for an automotive company in marketing.

> One of my girlfriends works for Roush Performance. She's in marketing. She has a huge Mustang network from all her car shows. I mean she's a huge, huge, huge enthusiast. And she works for an automotive company. It's not that I don't like the technical, I love the technical stuff. And I love the education. I just feel that I could have done that on my own.

Dee

Dee is a 32-year-old graduate of this university's automotive engineering technology program. She graduated two years ago and has been working in a capacity that utilizes her degree. Dee has worked as a mechanic, and an automotive engineering internship at an automotive company. She has been working as a designer for General Motors after graduation. Dee has held two different position since graduation, essentially being promoted twice. She went from associate designer to designer.

Dee's mother has, "always been a realtor, buying real estate." Dee tried to follow her mother and actually did real estate "once in my early 20s and it wasn't for me." Dee's father has been an electrician for 20 years and, "he's always been into like older vehicles and that sort of thing." So that is how Dee became interested in automotive. She said, "I guess my interest started when I was little and Dad would be outside working on the car." Dee said, "Yeah, he's actually going to give me his '71 Blazer pretty soon, so I'm pretty excited about that one."

Why Automotive?

Dee's father influenced her to go into automotive. She said, "Yep, that's where my interest came from." Dee graduated with an associate's in automotive mechanics. After working an internship for the city of Oxnard, she said, "It was a lot of fun and everything, but I just didn't want to be under a vehicle 24/7, you know, as a job." Dee wanted to "work at an office building and be clean and just maybe get dirty on the weekend, you know, on my own vehicle." Dee's internship experience as a mechanic motivated her to continue her education. She said, "I decided that I wanted to continue on with my education, and that's when I found [this university] online… I just took it on my own to look into it and take that big step. Never even been to the [Midwest] whatsoever and just left." She wasn't exactly 100% sure what graduates would do in the workforce with that degree, But, "I knew I would be in the right state and I knew I would be able to work my way somewhere in the auto field going to that school."

Choosing a Major

Automotive was not Dee's first college major. "My very first college experience in South Dakota, I went for psychology." However, Dee found psychology "just didn't

work out" for her and, "that's when I continued [on with my education] and went to college in California for the mechanic's degree." Dee describes automotive as a major that "was something that was little bit easier and it kept my interest." Dee always had an interest in automotive, "even from just looking at magazines or watching car shows on TV." It took a while for automotive to "click in my head like oh, you know, I can do a job with this stuff." Dee said, "So that's what really set it off was just my little interest in it."

When Dee began at this university, she initially "liked the program" and knew that it would help her get the career she wanted." What Dee discovered while going through the automotive program at this university was that she yearned to work in automotive design or CAD. As Dee completed classes and performed engineering technology internships, she realized she, "was looking for something more than automotive I knew that I wanted to do CAD work, but I wasn't sure of the steps I needed to do to get there." Dee explains, "Honestly I probably would have [embarked] on a product design [degree] if I knew that was something. I didn't even know that was [a program]. Dee did not have a "mentor or anyone to talk to me about it or anything."

Experiences in Automotive Programs

Dee completed an automotive associate's degree in California. It was there Dee declared, "Once I started, I was really into [automotive]." Dee knew she was moving in the right direction. She was "going to be in the auto industry and I'm going to just love it." Once she progressed further into her coursework, Dee began taking CAD classes, which modified her career direction further. She said, "I knew that was where I wanted

my career to, you know, start and end pretty much." So Dee focused on automotive design after that.

Dee discussed her coursework at this university. She said, "Some of the [classes] had a lot of information." She found it, "harder for [her because] there was so much information." She would have liked "the most important stuff we should know, like in bold letters, rather than everything in bold letters." Dee found a lot of the information was irrelevant to her and what she experienced in the automotive industry. She said, "Deciphering what's the most important or what am I going to use later on in life? You know, I'm not really a history person, so knowing the history of vehicles, I wasn't really interested in."

As for being a female in the automotive courses, Dee said, "Well, of course, you know, like, you stand out because you may be one woman in a class of 30 boys, you know." Nevertheless, Dee said, "I felt like I fit right in." She claimed to not "have any issues with that." In summary, Dee said, "Yeah, I just think that you do get a little bit more attention, but I don't think it's like bad attention." Specifically, at this university, Dee said, "It was nice that I actually felt very welcomed when I first got there." Dee was far away from family and everything. She was by herself. "So that was really wonderful when I first got there."

Experiences After Graduation

Experiences seeking employment. While Dee was seeking employment, she found the "job interviews very nerve wracking." In fact, she, "wasn't sure if I was going to get one." Initially, Dee got hired as a contractor for GM at the Milford proving

grounds. Dee describes the situation as, “I actually said yes, but then the next day I said no.” She said, “It wasn’t what I wanted to do and I wouldn’t have been happy.”

Dee was feeling pressure because she had five weeks left on her current apartment lease. She needed to find a job to know where she needed to live. Dee was called in for an interview with GM as a direct hire at the Warren Tech Center. She “was, of course, very nervous” because so much was hanging in the balance. Dee said, “They were very nice and welcoming and they were very straightforward with the questions.” At the end of the interview, Dee told them, “I needed to have an answer within the next couple weeks and then I apologized for being very straightforward, but I really thought I lost my chances right there.” Dee needed to know where should she live. She wondered if, “I needed to sign another year’s lease or not.” For Dee, “that was the scariest part. Because I did need a job.”

Prior to this, Dee interned at two separate Toyota facilities. The first one was with Toyota Motor Sales in California. They came to a career fair at this university. Dee describes.

> So with the Toyota Motor Sales it was nice. The people that came in were very straightforward and again they were very into knowing details of how I understand an engine or go through the process of [diagnosing] one. They were more into that kind of knowledge, but I think I had a few people put in a good word for me, that’s how I’m going to guess on how I got it.

Dee’s second Toyota internship, at a Michigan prototype build facility, she found online. Dee said, “Oh yeah, their interview process very in-depth as well.” This facility was, “more interested in hands-on type stuff.” They asked about her familiarity with tools

and if Dee had a basic knowledge of vehicles. Dee gained confidence from working there. She said, “So, I mean, after all that practice of building a vehicle, I feel pretty comfortable on putting one together, you know.”

Experiences while employed. Dee worked as a mechanic for the city of Oxnard in California. She worked there prior to attending this university around the time she was receiving her associate’s degree in automotive mechanics.

The first of two internships she completed at this university was with Toyota Motor Sales in California. Dee said of that internship, “That one was not my favorite only because, yes it was an office job, but it was doing more along the lines of spreadsheets, Excel type stuff.” Spreadsheets are “definitely not Dee [considering] it was a lot of numbers.” The job lacked “hands-on with vehicles, and it wasn’t for me,” Dee declared.

Reflecting on the office environment there, Dee responded, “Yeah, actually everyone was great.” If she would have chose to take the full-time equivalent of that position, “They would have given us a vehicle that you can change out all the time.” Dee continued, “That’s one of the little perks [with that position]. It’s kind of nice.” She pointed out, it was “very businesslike there,” she had to, “dress up really nice all the time for office meetings.” Sometimes the meetings were as late as “6 or 7 [o’clock] at night because we need to talk to Japan, which is bright and early for them,” Dee said. Her schedule had to be flexible.

Dee’s second internship with Toyota was in their prototype build facility in Michigan. She said, “I actually still talk to a lot of those people. They’re a lot of fun.” Dee liked that position. She enjoyed, “building vehicles,” it was, “very hands-on, but it wasn’t dirty because everything was brand-new.” Dee liked the pace of the work. She

said, “Still you’re moving a lot, but you get to talk with everybody at the same time, which is a lot of fun, of course.” The work was assembling a pilot-production vehicle, looking for issues, and reporting any trouble they suspected would be a problem in regular production to the engineers.

At her current position with General Motors, Dee is a designer. She said of that position.

> There’s actually quite a bit of women at the job where I’m at now. I would say maybe a third, but it’s still quite a bit more than I’m used to. And I can tell that they’re bringing in more and more, which is great, and that we are moving up in position and that equality feels, it feels like everyone’s equal there, which is great. And they don’t put up with like any diversity issues or, or just stuff like that. Which is nice. Therefore, I don’t have to worry about anything. At least I don’t feel like I have to worry about anything.

When Dee’s interest turned to design, she “thought I would want to do like clay molding, because I’m a little on the artsy side.” Dee is glad she did not end up in clay modeling because she found out it “is very tedious work, and you’re always dirty.” Dee said in the end, “Doing the CAD work is really what I’m happiest with.” Dee wished that she had completed “more CAD classes at [this university].” General Motors does not use the same CAD software as what she learned in the classroom. Dee had to learn a new CAD software, so her company enrolled her in their own corporate specific CAD classes, enabling Dee to learn at a faster rate.

Dee talked about how designers at the automotive company where she works do not need to know anything about automobiles. “As for being a designer, I don’t

necessarily have to know anything about a car actually. It's kind of funny." The designers interface with engineers and Dee said, "The engineer will know everything about it or what it can and can't do, and you just need to make what the part that they tell you to make pretty much." Dee knows a lot of designers "that aren't even interested in cars at all. [They] just like doing the CAD system."

Support

Dee's parents were "always so happy for me, no matter what I do." They are very supportive, and of course, very proud of Dee. She said, "They've always been there for me, [and] my wife [Brittany] has always been there for me." This is great from Dee's perspective because her wife had to make a sacrifice for Dee. [Brittany]'s given up the area that she loves to live, you know, to come live here in Michigan with me."

Dee also, enjoyed the support of the instructors at this university. She thought it, "was really nice to have them go out of their way and try to help [me] look for positions." Dee continued with, "If I needed anything, I know I probably still can give them a call and ask them something."

Barriers

Dee did not recall any barriers along the way. She said, "It's been pretty smooth actually." Dee does not get bothered by much. She just goes with the flow. She said, "It takes a lot to bother me. Yeah, but I'm trying to think, throughout all the automotive, yeah, it's all been pretty smooth."

Would She Choose This Path Again?

When asked if she would choose this path again. Dee said, "I definitely would." Dee wished she "would have stumbled upon this [program] like right out of high school

or even in high school. Dee said, “I didn’t really know how vehicles were put together or anything like that or what it actually took.” Dee had thought engineering was great. It put her into the position that she has currently, but “I didn’t have to do exactly automotive engineering.” Dee could have done product design engineering, CAD or something along those lines. Her pathway to being a designer “could have been a little different.” Dee looks back and said, “I think the first step would have been knowing this information in high school.” She thinks recruiting would have helped her choose her career sooner.

Jane

Jane is 29-year-old graduate of this university’s automotive management bachelor’s degree. She graduated four years ago, and has the same amount of time working in the automotive field that utilizes her degree. Jane has held four different positions and has been promoted once during the four years.

Why Automotive?

In Jane’s family, both parents are employed; her father was an engineer and her mother worked on an automobile assembly line.

> My father *was* a mechanical engineer, but then he was laid off. He did that for about 15 years, and [during that time, he] was also a janitor. When the mechanical engineering job laid him off, he still kept the janitorial one. And so he’s been doing that for 35 years. And my mom basically just works on an assembly line, and she’s putting together like bits and pieces of a transmission.

Jane’s family’s work history had a major influence on her decision to go into the automotive field. When asked, Jane said:

> I know that I originally wanted to go into the Automotive Engineering program because my father was a mechanical engineer. I was basically being Daddy's little girl. That's where I would bond with my father the most is in the garage. So I spent a lot of time in the garage with my dad. And that's where I learned how to wrench on some cars and got into the passion for the automotive industry.

Jane also took auto shop class at her high school. "I mean all through high school, luckily where I went to high school, they offered the auto shop program. So even in high school, I did autos."

Choosing a Major

Working on cars with her father and taking auto shop in high school lead Jane to choose automotive service as a major at a local community college. After earning her Associate's Degree in Automotive Technology, Jane choose the automotive engineering technology bachelor's degree program at this university because her father was an engineer. However, Jane found that the automotive engineering technology program was too academically difficult. "I personally felt that the engineering program was a little too hard for me." She also was concerned about securing an internship at the end of the program. Some upperclassmen she knew in automotive engineering technology were having difficulty finding and internship. That also influenced Jane to switch her major.

> There were a few students that I knew, like, upperclassmen that didn't get an internship. And it freaked me out, just because I was worried at the time, like, if I don't get an internship how am I going to graduate? And I wasn't about to go back home to Mom and Dad with no job and a boatload of student loans.

So Jane decided to leave the automotive engineering technology program, yet remain in a program that was automotive. “I still wanted to stay within the automotive major. So then I switched my major from Automotive Engineering to Automotive Management.”

Experiences in Automotive Programs

Overall, Jane described her experiences in automotive programs as fun. “I don’t know. I thought it was fun.” She pointed out that she was the only girl in the class and that focused attention on her, but the guys treated her well mostly. Some of them however, thought she might not know what she was doing in class. “I mean, I understand it. It’s just kind of, you know, when you’re the sore thumb sticking out, it’s like, yeah, you get that kind of attention. Some of the guys would automatically think you did not know your stuff, but that didn’t bother me.”

Experiences After Graduation

Seeking employment. Jane describes her employment seeking experience as easy. “I got picked up at our Career Fair. Toyota Financial Services was there, and they just interviewed me the same day at the Career Fair. Then, I was hired I think like within two months because they knew I was graduating.”

Experiences while employed. Jane felt like work was similar to school in that she was the only female in the office. “I don’t really feel it’s much different than my classroom experiences. After I graduated, I worked in our insurance department, where I was handling mechanical claims all day. So I was also the only girl out of 115.” In this male-dominated office environment, Jane had to know automotive because she would often be put to the test in her position.

> So I was kind of, you know, dealing with that. I mean you have to understand the mechanical aspect of it, of why things break and what happens. Because if you don't really understand how engine components work, any dealer can keep yanking on your leg basically. So you have to understand when you're buying things for the right price and the right time, like labor.

Like Vanessa, Jane also experienced push back often when performing her duties.

> Oh, constantly. Yes, it happens often. I've noticed a lot of times the ones that do the push back don't know much. So I would challenge what they were trying to say. Like, you know, "How does that make sense to you?" If they can walk me through it, then "OK, let's have this conversation." But it's like, "Are you saying it's legitimate, like I am wrong, which is possible, or is it just because it's a girl on the phone, and you're like, "I need another person's opinion." Yeah, I mean, I've had, like, service advisors say that they want to talk to a guy—not someone better or more qualified or anything. Just simply, "I want to talk to a guy." So it happens. I will transfer the call to a [male] co-worker and tell them what's happening and they'll just say verbatim what I just said, and now all of a sudden it's real or it's the truth because a guy said it.

Jane has switched from the insurance side of the business, which is more technical, to the finance side, which is less technical, has more women working there and, ultimately, she experiences less push back.

> I mean, most of my experiences I'd say where it was a challenge was only when I was in that insurance department, which was the very first department I was in, and I was there for two years. But ever since, after that insurance department, I

> moved into our finance side. So there wasn't much of a push back. It isn't the technical side anymore. It's now the finance side of it. So there are plenty of women in the finance aspect of it.

Support

Jane has support for her career decision from family, friends, peers and instructors.

> Major supports? Definitely would be my family, primarily my dad, because with that automotive aspect of it. But I think the other thing too has to do with the brand, because my family has always owned Toyotas. So growing up, you know, between driving Toyotas and working on Toyotas, I've always wanted to work for Toyota. So, when they were at [the university] Career Fair, I just jumped on [Toyota].

Jane bonds with her father through automobiles. She likes to talk with him about cars and what is going on in the industry.

> Like when new stuff comes out or new technology and I tell him, he's just so mind-blown. My father still talks about like those classic cars and I'm, like, you know, all the technology that's in there right now?

Jane found a mentor in [Name], a woman who took Jane under her wing. This mentor inspires Jane to follow her career footsteps and helps her prepare for each new position and subsequent interview.

> She has been very inspirational for me because she's done pretty much every single position that I have. She's been at this company for ten years, and I've been here for four. Every single position I've had, she's been in [before]. And so I

> would like to move to where she is, as in up the ladder. She's made it pretty far up there. So she's been very inspirational. She helps me because she knows exactly what I want, and because of what she's been doing, she walks me through it. We talk quite often just to make sure that all the goals are still there and any means or ways or anyone she can talk to help get me in that position, she does. It's been very helpful.

Barriers

Jane has experienced barriers along the way both in college and at work. While earning her associate's degree in automotive technology, Jane worked as an automotive technician at an independent repair facility. Initially, she was hired by the service manager while the owner was out of town. He hired Jane because he thought, "'Oh, you know, you're a girl, so you're going to be really able to help our female customers, you know, feel more comfortable.' And, you know, because they'll be able to talk to me instead of other guys thinking that they're just taking them for a run basically."

When the owner returned, Jane said, "It seemed that he did not like having a girl in his service shop." All of the sudden, "everything I did needed to be double-checked." Jane explains her frustration with what the owner did.

> So I remember it was just so tedious, and it's annoying. It was frustrating just because, you know, your boss doesn't support you or believe in your work, basically. My boss and my service manager always got into fights over like the littlest things that I would do; just either it's an oil change or I changed wiper blades. It was like, good gracious. Everything gets double-checked.

Not only was Jane's work continuously called into question, now her diagnostic methods were questioned also.

> I would also get into, like, just talks about diagnosis procedures and if one of my co-workers, if he says it's this way or this is what's wrong and this is why, the owner will always believe him over me.

Jane suspected it was because she was female, but the owner would say, "Well, he has more experience than you." Jane did not agree with this statement because she had automotive repair experience and coursework, so she would reply, "But I still know my stuff." Unfortunately, it would fall on the owner's deaf ears. For Jane, "It was too, too stressful" being second guessed and double checked. As much as she liked being an automotive technician, Jane decided to leave. She said, "I only lasted six months because I didn't want to deal with that."

The barriers Jane experienced were associated with the automotive mechanical areas of the business. The experience with being a mechanic frustrated Jane and surprised her that the level of discrimination was as deep as she experienced.

> Oh yeah, I mean, I was frustrated. I was frustrated more so with his ignorance than anything. But I felt that it was … it's quite common. So it's not, like, it wasn't surprising. It wasn't, you know. I guess I just didn't expect it to be that extreme. But yeah, I mean, it was just frustrating, you know, just I would want to leave as soon as possible. But yeah, I mean that's exactly why it didn't last long.

Jane did not let this stop her from staying in automotive, but she did notice a difference when she moved into finance.

> With the auto mechanic side of the business, the tension usually comes in. I think it just changed my aspect of it, because I didn't, I never went back to being a technician again. But I just thought I'd try, let's try the engineering aspect; let's try the management/finance aspect. But I still stayed in the automotive industry.

Would She Choose This Path Again?

Jane, when asked if she would choose the automotive career path again, said, "I would still stay in it because it's my passion. It is definitely something that I find enjoying. It's also another way of bonding with my father, and keeping up with the automotive industry."

Silvia

Silvia is a 26-year-old who graduated four years ago from this university's automotive engineering technology program. Including prior work, she has been working in the automotive industry for eight years. Silvia currently works in a capacity that utilized her automotive degree. She was hired into Toyota for an internship immediately after graduation and has worked there since. Including her internship at Toyota, Silvia rotated through three different positions and has been promoted once. Prior to coming to this university, Silvia was an automotive technician and had worked for an automotive parts distribution company. She was promoted twice each in those two positions.

Silvia's parents, as well as her sister, work, or have worked, for the automotive industry. Her father was in manufacturing as a die setter, her mother is an office manager for a fastener company that supplies nuts and bolts to the automotive industry. Silvia's sister does automotive testing.

Why Automotive?

Even though her family mostly works in the auto industry, Silvia says that did not influence her career choice. She attributes it to social reasons. “A majority of my friends growing up in the neighborhood were males. And the majority of them would tinker with ‘toys’— four wheelers, motorcycles. So I got an interest from watching them.” This interest carried Silvia to begin working at an automobile dealership. First as a technician apprentice, and eventually working her way up to full technician.

Choosing a Major

Silvia describes her later high school years and her career thinking. “I didn’t have a full scope of the direction that I saw my life going in. I didn’t know if I was going to go to college, university, or not pursue either one of those paths.” However, Silvia’s automotive influence from her friends set her on the path of an automotive career. Unfortunately, her high school did not have an automotive class. Indeed, Silvia said in regards to her automotive knowledge, “Everything I learned was outside of school.” That was about to change when she saw a “flier that had gone around that was for the GM ASEP [General Motors Automotive Service Educational Program].” This automotive technician education program was offered at a local community college as an associate’s degree. Silvia explains, “Once I saw the flier, and I researched that even further, then it seemed like it was the type of program that was a good fit for me at my maturity level, and the commitment of the direction to my future.” While earning her associate’s in automotive service, Silvia worked as an automotive technician. However, this was not the last automotive degree Silvia would earn.

While working as a dealership technician, Silvia realized, “manual labor may not be for me for the rest of my life.” So, she “decided to go back to school.” Silvia wanted to stay in the automotive industry, then she found out about this university and its automotive engineering technology program. It was there where Silvia, “realized that the engineering side was where my passion was.”

Experiences in Automotive Programs

As noted previously, Silvia completed her associate’s degree in automotive service at a community college prior to transferring to this university for a bachelor’s degree. Silvia compares and contrasts the two schools. The “social environment” between the university and community college was “different, because you are away from home [at the university] compared to being at [the local community college where] everyone stayed in their own social environments or worlds, and we just went to school together.” Silvia was in a cohort at the community college, for the entire program. She describes her college cohort experience.

> I was the only female in the program. And within that program, we were together for five semesters, same students. Nobody new came in at any point and people did not leave. So we really became close with that group because you spend 40 hours a week with them for eight weeks. And then you go off to work for eight weeks, and you come back and start a new semester.

The cohesiveness Silvia found in college was absent at the university, “where you make your own schedule.” She notes that, “Most students probably try to have their friends in their classes, but it doesn’t always work out that way.” Silvia found the scheduling differences created, “much more change and diversity being at university,” when

compared to her college experience. Silvia describes how she had to make new "study buddies" in each of her university classes.

> I felt that, once again with college, we were very close-knit, but you had multiple study buddies per se. And at the university, we had to [make new] friends as you evolve into your classes and your semesters and you evolve into branching out and meeting more people. So that, really, I think as a student, makes you have to grow more and helps you out in your future careers, because you have to branch out, learn, and grow.

Silvia pointed out that there was more ethnic and age diversity at the university when compared to her college experience. "Yeah, at the university, it was more diverse because there was a large group of foreign students." The other point of diversity was age. Silvia observed that there were many non-traditional students. "You had people that were in their late 20s and even in their 30s. [The] students, they were older than the normal demographic of being [in their] early 20s, late teens."

Experiences After Graduation

Experiences seeking employment. Silvia felt that the process for "finding an internship was difficult." She could not tell if it had anything to do with "being female or just not being the best candidate for that job." However, Silvia did find an internship with Toyota. "But after the internship, I moved back to Michigan, and we—all of us from that internship—had to wait for future phone calls to find out if we got the positions or not." While waiting for a response from Toyota, she "interviewed with some other manufacturers and was offered positions." All of her offers came in at the same time and she chose to continue with Toyota as a direct hire.

Experiences while employed. As an automotive technician, Silvia found, when she first started there, that she had "to kind of prove myself at the beginning." For example, if she was fixing a vehicle, "sometimes they [the male technicians] would come over and kind of watch. And I could feel that they were watching." There were other instances where the male technicians "would come over and offer to help me when personally, I didn't feel that I needed the help." As time went on, and the male technicians felt comfortable with her, they would confide in her with "conversations that they were having problems within their life." Silvia did not know exactly why "they felt more comfortable talking [to her] about [relationship issues] or about their children, and asking for advice" more than they would to each other.

Silvia points out that being an automobile technician is "kind of a lifestyle and anybody that works as a technician understands that." Vehicle technicians commonly work for what is called flat rate. Flat rate means that you only get paid for the fixed standard labor time that a job is supposed to take under ideal conditions. If a repair job is easy, and you can finish it in less time than the labor time allotted, you are money ahead. If the repair job takes longer than the labor time allotted, the technician loses money for the time they take. This can be frustrating for a technician. As Silvia points out, "there's the hardship between the older technicians and then the younger people coming in that the older technicians want the better jobs." Better here meaning jobs where they commonly can beat flat rate time. "If the younger technician gets the better job, there's that animosity. And I think that's not a [gender issue]. That's an adversity [issue]." Silvia said.

Silvia currently works for the same company that she interned for her bachelor's degree. During her internship, she said, "It really opened eyes as to how few females are in the auto industry. Within my building of engineers, there's probably less than five females in a building of three to four hundred people." This was shocking to Silvia because she works for a large automobile manufacturer and thought there would naturally be more women employed in her building.

Silvia is familiar with being in the minority, "of being the only female in this industry." She was the only woman in her automotive cohort in college and the only female technician at the dealership. In fact, Silvia said, "I was the only female technician that I'd say the majority of those men had ever worked with." She was also one of a few females in automotive at the university. For Silvia, she had already been through the experiences of how to hold herself to a "higher standard in a male-dominant profession." At Toyota, Silvia did not experience any gender bias. She says, "It's corporate. So there's, you know, a level of professionalism that is always about." Silvia believes that regardless of gender, she says, "The respect for your work comes from your work ethic and what you show to your management. If you have an A plus project and you're a female and you have an A plus project and you're a male, from my experiences, they've been treated the same."

Support

As Silvia reflects back on her automotive career, she mentions that she "had a mentor for each level of the process that I've taken to get where I am today." At community college one of her male teachers would spend "extra time if I had questions and would work one-on-one with me." When she started out as an apprentice automobile

technician, “I was working under a more senior technician. And he kind of became my mentor throughout the rest of my two years.” When she transferred to this university, “I also clicked with a specific faculty [member], and if I was having struggles or trouble, then he would also help and support me.” In Silvia’s current position, she “strives not only to better myself and better my career, but to basically help my team or my group out.” Because of her drive to improve herself, the team, and her company, “My [male] assistant manager takes extra time to sit down and discuss future items and how we can make the process better.”

Barriers

Back when Silvia was a technician, her mentor at the dealership “told me to get out of the technician world.” This mentor never mentioned going back to school, what he said was, “Go to the sales side, the service writer, [the] service manager side.” This advice was not because Silvia could not handle being a technician, it was because of the ergonomics of being an automobile technician. Silvia said this of her dealership mentor, “He was 20 years older than me and would tell me how much his body would hurt.” He could see that for her own sake, Silvia should get out before she could no longer do anything else and barely have the physical ability to be a technician.

Family and friends, meaning well and looking out for her best interest, would tell Silvia that, “I was making a poor career choice.” This was spoken at a time when the auto industry was experiencing a downturn and negative press. She says, “Back in 2007 is when GM and Chrysler went bankrupt and, in 2009, 2010, Toyota had their recalls.” Silvia surmises, “So at the time that I started in the auto industry, there was a lot of negative outlook on the auto industry as a whole. And that there wasn’t a lot of promise.”

Silvia grew up in the metro Detroit area and saw firsthand the negative impact caused by the near collapse of the automotive industry.

> There was a lot of people being laid off. There was a lot of people losing their homes in foreclosure. So when I was making the choice of going into the auto industry, there was a lot of push back from people saying that I'll never be able to find a job. "The auto industry's a dying industry. You're going to have to go back to school for a different career once you're graduated because there's not going to be a career there for you."

Silvia's response was always the same to those who told her to stay away from the auto industry.

> It might not be the same industry that it is today or was at that time, but people are always going to need some sort of transportation. And that's essentially what the auto industry is. It's providing transportation for not just America, but the world. So there's always going to be some forward movement in this industry.

Silvia says, she "did not know where I was going to end up," but she always "had a strong vision that I knew I wanted to be in the automotive industry." Silvia cannot identify why she "had that strong opinion toward the industry." She associates her opinion with her personality.

> I like to fix things, not just cars, but relationships, anything I would just want to fix. I want things to be better. So maybe at the time that the auto industry was going through hardship, I don't know if that had an influence of why I also wanted to continuously pursue it, because I wanted to fix it. I wanted to make a difference.

When asked if she believes she is making a difference, Silvia said, “I do. Because of the line of work that I do, I feel like I get to make a difference with our customers on a whole that now I don’t fix one car at a time, I fix millions of cars at a time.” Silvia is now the ultimate technician!

Would She Choose This Path Again?

When asked of she would choose and automotive career again, Silvia said, “Yes.” The main reason is, as Silvia says, “I’m very happy with my career. I think that I’ve been able to accomplish a lot in the short time that I’ve been with [Toyota]. Silvia believes that she is employed at “one of the best companies in the world to work for,” which significantly influences why she is so happy. Silvia believes that there is incredible “technology that’s growing in the auto industry,” and it’s an astoundingly “uplifting experience to be a part of that movement.”

Sabrina

Sabrina is a 30 year-old who graduated seven years ago with a bachelor’s degree in automotive management program from this university. She has changed her major four times, and is now embarking on an entirely new career path in psychology. The same day as this interview, Sabrina put in her two-weeks notice at Fiat Chrysler Automobiles (FCA). She is quitting her automotive career altogether and going full-time in a master’s program in psychology. She has been working in the automotive field for all of the seven years in four different positions and has not been promoted at all. Each movement Sabrina made was lateral only. Sabrina says that her current position does not utilize her automotive degree. “I work in supply chain. So I have to know what parts are, but nothing technical.”

Why Automotive?

Sabrina took an odd path into automotive because she says her parents did not influence her to choose automotive as a career. "[My parents had] zero influence on my career choice. I mean my dad doesn't know anything about cars." Oddly enough, Sabrina's path to automotive came through working on lawnmowers. Sabrina learned how to repair lawn mowers while working at a summer position at a state park. She worked with the maintenance crew and, when work was slow, she would teardown, cleanup, and reassemble the lawnmowers. "We had like nine push mowers, and one worked. So I just tore them all down, cleaned them up, and they magically worked. So I figured cars were just lawnmowers without blades."

Choosing a Major

Initially, Sabrina began studying athletic training at Grand Valley State University, but then health problems made her reconsider her choice. The next major Sabrina switched to was anthropology, but it did not hold her interest. She recalls, "Then I got really bored 'cause the professors [had] very monotonous lectures."

At this point, Sabrina changed universities and her major at the same time. She decided to pursue an AAS in automotive service from this university. Sabrina describes her decision making process.

> Then I started looking through the program list at [this university], and I was like, "You know, I can work on cars. I know how to fix lawnmowers. I can work on cars. Why the hell not?" That was mysteriously my reasoning.

However, once she was in the automotive service program, she found her health issues did not allow her the ability to be a mechanic long term. "Then, in the [automotive]

service program, I realized I have bad knees and a bad back." With the health issues, Sabrina decided to try another automotive career path and changed her major to automotive management. Sabrina says, "I cannot do [automotive mechanics] for my entire life. And that's why I decided to go into [automotive management]."

Experiences in Automotive Programs

Sabrina was older than her classmates because she had changed majors twice. She notes, "I was older than other people in my class 'cause I started over, so I noticed a lot of like immaturity." Right away, Sabrina realized she had less basic vehicle knowledge than her male classmates. She felt lost the first semester.

> I noticed that most of the guys had done, like, career centers and tech centers in high school, so they kind of already knew what was going on. And all I knew how to do was change spark plugs and oil when I got there. So I felt like I was a little bit behind. Because sometimes the teachers, you know, they just assumed that you knew some stuff.

In true tortoise and hare manner, she studied hard in each automotive class while her male classmates barely applied themselves. Sabrina eventually passed by her classmates who thought they knew everything and slacked off. Sabrina says, "I knew I didn't know anything; I had to learn." Sabrina played catch-up for the first semester, but "I kind of realized that a lot of the guys were pretty cocky from having gone to those career centers and thought they knew more than they did." Because Sabrina studied intensely, her knowledge showed in the classroom and lab. She had a sense of assuredness from her effort. "So it was really fun to show them up."

Sabrina tells of another experience in an automotive service class taught by "a

pretty good teacher," who loved talking about helicopters.

> I remember specifically irritating him in one class though. It was like an 8:00 a.m. suspension and steering class. What the guys in that class loved to do was get him on a tangent talking about helicopters, so then they didn't have to learn anything. And that just drove me nuts. I'm like, "I got out of bed for this? And I'm paying for this? No." I was, like, in the middle of the classroom and I just raised my hand. He was like, "Yeah?" "Mr. [name], I would like to learn something about suspensions or steering today." It was already like 20 minutes into the class. "I'm paying for this. I'm not here to learn about helicopters."

Experiences After Graduation

Experiences seeking employment. Sabrina has experienced the hiring process of many different companies and has usually been hired within a few days of interviewing. She does not believe her hiring experience was anything but normal in comparison to others. "Seeking employment never really seemed to be a big issue. I had a pretty good resume. I never really had problems. Like FCA hired me like after two days." This timing was also true for contract positions. Once, she was offered a contractor job an hour after she left the building. "Yeah, so that wasn't a difficult job to get at all."

Sabrina did notice after she had some work experience, the interviews were more competitive. The competition was from new graduates and she was more expensive because she had more experience. "If you're more experienced, you're more expensive than other people. But that's a pretty common issue, you know." To sum up, Sabrina said, "I don't know if I had any issues, because I was a woman. I either got a job or I didn't."

Experiences while employed. Sabrina's experiences while employed were not

positive. In automotive-related positions, she was undermined and not taken too seriously because, as she says, "'you know, females don't know anything about cars or trucks." Sometimes it was from customers of the company for which she worked and sometimes it was from people within the department of the company. Sabrina gives an example of an experience from a customer at one company. She was a warranty and customer service representative.

> Meritor was definitely the worst for that when I was in customer service and warranty. Nothing like 40 to 50-year-old guys that work in shops yelling at you, saying they've been doing their job for twenty years. They don't like the warranty decision you just made. Oh, I had guys that demanded to speak to a man because they didn't agree with my decision. My response was "OK, I'm going to transfer you over to [name], and he's going to tell you the exact same thing I just told you, but if you want to waste more of your time, go ahead."

At the same company, Sabrina worked with a male team leader, who was less qualified than her. "He didn't have an automotive background. Like, he had a liberal arts degree." He also had very little industry experience as Sabrina notes, "I think he spent like a few months working at a trailer shop, like welding or something." He did receive some company training, but Sabrina said, "He really didn't understand it." According to Sabrina, the team leader had a problem with her being more knowledgeable than he was while working under him. He did not like a woman knowing more than he did and being assertive enough to back it up with logical argument. This became a problem, particularly when he made decisions that did not make any technical or logical sense. "I would argue with him on decisions." One example in particular, Sabrina's team leader told her to deny

a warranty claim with no justification.

> There was a transfer case issue on a tractor and nobody could figure out what was wrong with it. And they were filing a warranty claim. And the team leader said, "Deny it." I said, "Why am I denying it?" He replied, "Well, because we don't know what's wrong with it." I said, "That's not a valid reason to deny a warranty claim. If we don't know what's wrong with it, we should pay for it, and have them send it to us [for inspection]."

Sabrina refused to call the dealer unless her team leader gave her a reason to deny the claim. The team leader did not like this and had her reprimanded. "I got pulled into a conference room with him and our manager and told that I was being insubordinate."

After this incident, Sabrina had a sexual harassment complaint filed against her by another woman. She was talking shop with her male coworker and a female secretary overheard their conversation in which Sabrina made reference to "oral sex."

> She filed a complaint against me. The next week, I got taken into a conference room and like discussed it and everything. And they were like, you know, "This is a warning. If it happens again, we're going to have to let you go." And I just looked at them and said, "Are you fucking kidding me? Do you know how many inappropriate comments go on with like the 35 men that work here?" I was like, "I could file a sexual harassment complaint several times a day, but I don't because I know it's joking. Like, this is ridiculous. Like, I can guarantee that same secretary has heard tons of stuff from the guys on a daily basis, but no one else gets sexual harassment claims filed against them."

Sabrina was in trouble at work and decided to transfer to another position within

the company, while the team leader was promoted. “He got promoted, and I was on the verge of being fired, before I found a job at supply chain.” Sabrina “jumped from warranty and customer service right into supply chain, completely unqualified, but they needed somebody who understood what the parts were and how important they were.”

Sabrina did not find the environment any more welcoming in the supply chain part of that company. The male manger over her in supply chain did not like Sabrina and another woman on the team, and he was sabotaging their careers. This manager also did not have an automotive background nor a supply chain background. Sabrina and another woman on the team did not always agree with this manager, and he felt threatened by women who were more knowledgeable than him. “We didn’t always agree with him. There were like four of us that reported to him, and two of us spoke our mind and actually knew what we were doing. He was threatened by both of us.” Sabrina and the other woman took their complaint about this manager up the chain of command and received zero action including from the director, who was a woman. “The other two women just did whatever he said, and didn’t question anything. And they were fine. And we went to HR and our director, and nobody did anything. Our director was a woman.” Strange as it may seem, the other woman who had the same problem with the manager was fired while on maternity leave. “He fired her on maternity leave, and she sued the company.” The manager left the company during the lawsuit, but not before he pressured Sabrina to leave for another company. “If I didn’t find a job at [company], I would have been fired shortly.”

Sabrina then moved to a Behr, an automotive supplier, as an associate warranty engineer in a department of only four people, and was the only female on the team. Her

male supervisor there had a problem with personal space. Sabrina felt he was creepy.

> He sat down next to me in a quarterly meeting and crossed his ankles and spread his legs wide and had his, like, thigh and ass cheek resting on me. And then he would come up and stand behind me so close that I could feel his breath on my neck. And he would watch what I was doing. Very, very creepy.

At her exit interview, Sabrina reported the harassment to HR, and they were horrified, but he is still there and still the manager of that team. Sabrina found out that other females in that position before her all quit for the same reason.

At her last place of employment, FCA, Sabrina was hired as a forecast and demand analyst but ended up doing inventory management. Sabrina was responsible for parts in South Africa and Dubai at the time. Prior to that, she "was handling Argentina and Brazil." As exciting as that may sound, Sabrina says, "there's just no personal fulfillment from it. I stare at numbers all day. It's not really making a whole lot [of difference]." Then she admits, "I mean it makes some difference because people in South Africa are getting parts to fix their cars."

There were no outright sexual harassment situations, just some nepotism and favoritism of the males in the department. The two women in the office carried much of the workload and, in Sabrina's case, had the job duties they were hired in to perform taken from her and given to a non-qualified male. This individual's background is Spanish language and literature. Sabrina says, "He got hired because his dad used to be a manager at Mopar." According to Sabrina, "He's like the boss's favorite. Like, he and the manager have, like, similar, like, bro personalities. So they're all, like, buddy, buddy. I think, like, the manager sees, like, a younger version of him in this, like, uber douche."

He spends most of his days watching YouTube videos or just absent from his desk. According to Sabrina, He can't do anything wrong, even though "he, like, screws entire systems up all the time." Sabrina and this man were hired in as contractors at the same time. Sabrina explains the situation in detail.

> I was hired to do forecast and demand planning. And I never got to do it because it was given to him right after I was hired. And then I suddenly was managing warehouse inventory. And then when I was hired direct, he and I were hired direct at the same time, and again I was hired to do forecast and demand planning. And again, it was given to him. Like we were hired to do different jobs, but each time, my job responsibility, the whole reason I even wanted to work there, was given to him.

Having her position given to a less qualified male embittered Sabrina. She quips, "And that was the beginning of me hating Chrysler." For two and a half years, Sabrina says, "I've never done what I was supposed to be doing. And it was something that I actually had experience doing, and he didn't."

Having her job duties given away was not all of what Sabrina suffered. There was one other woman on Sabrina's team and they both experienced a different standard than their male coworkers.

> And she and I would get, like, just overloaded with work while [1st male coworker is] sitting there watching YouTube videos, [2nd male coworker is] doing nothing, [3rd male coworker] isn't doing all that much. And then just [female coworker] and I would be overwhelmed with work. It was pretty clear what was going on there.

At first, Sabrina and her female coworker would acquiesce about the workload, but after a long enough time, it became clear that the men in the office were under-loaded and that the two women were performing the majority of the work for the team.

> And it is, like, I mean it's easy to say, like, "Oh, I have more work than the other person." But [female coworker] and I were always at our desks constantly working while the three guys would be standing at one person's desk socializing most of the day. So it was pretty clear that they didn't have anything to do.

Sabrina has just put her two-week's notice in at FCA. She plans to go full-time to graduate school, leaving automotive entirely. Her new career will be in psychology.

Support

Sabrina did not receive support for her automotive career decision from her immediate family. In fact, she said, "My parents were wondering what the hell I was doing." As for friends, she said friends have come and gone, and that their support was negligible. "I don't even know if I have any friends that have lasted this entire time."

Sabrina has "been pretty active in training people in most of my jobs" at the various companies she has worked. She says those she has trained are grateful, noting that many have said, "Oh my god, I couldn't get good training from anybody else." Sabrina describes some of her colleagues from former positions as "in it for themselves." However, Sabrina's recent colleagues are supportive of her choice to switch careers from automotive to psychology. "I have peers and colleagues that are supporting me into going to psychology." Many of them understand Sabrina's situation. "Colleagues that work with me at Chrysler are just like, 'Yeah, you need to get the hell out of here. It's awful.' It seems like just about everybody at Mopar is miserable."

Sabrina found the university somewhat supportive, she found the career fair held at the university helpful as she received her first automotive position from an on-campus interview at a university sponsored career fair. She says her advisor "was supportive during school," but that she has not had any contact with the university nor its professors since she graduated.

Barriers

When asked to describe any major barriers or experiences working against her career choice, Sabrina said, "Having a vagina," and she half-jokingly continues with, "Walk in with a strap on. 'Now you going to take me seriously, assholes? Mine's bigger than yours.'"

It comes as no surprise that Sabrina felt her employers were not supportive of her. She describes them more like a barrier than helpful. Sabrina says her employers were "falsely supportive" and they would commonly say, "Oh, we really want to develop you and blah, blah, blah." However, Sabrina often found, "When there's opportunities, they just make sure you stay in the same spot." She finishes up by calling them a "bunch of liars."

Sabrina dealt with the issues at her positions by changing jobs. She says, "I just job jumped." The reason she did this was because she quickly discovered the glass ceiling for women in automotive. Sabrina explains, "I mean it was made very clear in every position that there was not going to be any opportunity for advancement. And there might not even be opportunity to continue employment." She pins some of the blame on her desire for continuous improvement. She says, "All for wanting to make things better."

Sabrina is moving on to another chapter in her life. She is closing the book on her

automotive career and going full-time as a graduate student in the subject of psychology. The day we conducted her interview, she had just put in her two weeks' notice. She describes how the end of her automotive career was moved up by a few weeks.

> I was actually not going to put in my notice for another two weeks. I was basically going to have my last day be the Friday before school started. So like school starts on a Wednesday, I think. So I was going to be done Friday, have a couple days off and then start school. And I just got so pissed off last week. And my supervisor he was pushing work that YouTube guy was supposed to be doing onto me. I said, "This is bullshit. He has all the time in the world to do this. Why are you telling me to do his job?" And I was just like in a rage for two days. And being so miserable at work has actually been making my health problems a lot worse. Like, I was on disability twice in the last year. And so I was just like, you know what? My last paycheck if I do that is going to come in September where I've already budgeted student loans to be covering expenses. I'll miss out on that last paycheck. That's fine. One paycheck is worth my sanity.

Sabrina says her "mental health and physical health" problems were being aggravated by her job. She describes her relief from her health problems after making the decision to quit.

> I feel better already, like probably 30% of my pain went away as soon as I made my decision last week to put in my notice this week. I just, like, I felt better and I went to physical therapy. And my physical therapist noticed that, like, my muscles weren't as knotted up. Like, she could actually move my shoulder blades, which she couldn't before. She hasn't been able to make my shoulder blades

budge in months. Yeah, basically Chrysler was trying to kill me.

Would She Choose This Path Again?

Sabrina would not choose automotive as a career path again. She says she has received "no benefit" from working in the industry. Sabrina admits to learning "a lot of good information" because she enjoys learning, "but it hasn't gotten me anywhere." She believes that "all that would happen if I stayed in the industry is that I would have like entry-level/lower-level professional jobs for the rest of my life." Sabrina says, "there's just no personal fulfillment from it. It's very difficult to get promoted in the automotive industry as a female." She caps off the interview by saying, "Yeah, having a vagina's unfortunate [in the automotive industry]."

Roxanne

Roxanne is 30 years old and graduated from this university's automotive engineering technology program eight years ago. Even though she recently switched to working in the aerospace industry, she has been working in a capacity that utilizes her degree since graduation. Roxanne has held five different positions and has been promoted twice. Roxanne's parents work in the medical field. Her mother is a nurse and her step-dad is an x-ray and vascular technician.

Why Automotive?

Because Roxanne's parents were both in the medical field, the talk around the dinner table was, "Like everything about the gross stuff." Roxanne "was so turned off by the dinner conversation [about] her parent's [daily medical encounters at their jobs]." Roxanne said, "I was super rebellious." So medical careers were not high on the list. Roxanne wanted something different. She preferred a career where, "I wasn't sitting

down all the time."

What influenced Roxanne the most was her stepfather's interest in cars. Roxanne said, "So he always rebuilt like old Mercedes and things like that." When Roxanne was in high school, "she took a bunch of accelerated courses" in her freshman and sophomore years. Once she reached her senior year, Roxanne had only a few classes she needed to complete her diploma. She said, "I had to take one English and one gym just to stay in school." Roxanne "didn't want to take like an advanced math class." Her reasoning was that her high school didn't have "any AP courses," and "I just wasn't interested in it because I knew I was going to go to community college." Roxanne said, "Just like let me take a basic automotive class." She reasoned, "And, you know, everybody needs to know about their cars." Roxanne did not have an idea of what she wanted to do before she took the auto class, but she knew she didn't want to be a doctor or nurse. Roxanne found that she absolutely loved the automotive class at the Vo-Tech center. She said, "It was still kind of nerdy, you know." Roxanne viewed automotive as "an application of science and math." What appealed the most to Roxanne was "it didn't seem like I would be boxed into being like, at a desk all day."

Then, a counselor at the Vo-Tech center mentioned to Roxanne that the local community college "had a really good automotive program." Roxanne looked further into the community colleges auto programs and found a Toyota Technician & Education Network (T-TEN) program. She said, "Oh, that's awesome. That's what I want to do." So Roxanne completed the T-TEN program, but while she was there, one of the community college counselors suggested this university to continue her education. Roxanne said of the counselor, "I've always wanted to try and send a student there. I want these guys to

go and get advanced degrees and not just stop at the technician level." Roxanne began looking into the automotive programs offered at all of the nearby universities and said, "I don't want to do anything management related because I don't want to manage people or anything like that because I'm young." Roxanne chose this university's automotive engineering technology program because she wanted "to get more into the math and science of it," and "I really liked the idea of it being like an engineering focus." Also, Roxanne said, "[this university] was that kind of the closest," and "every other program was management-focused."

Choosing a Major

When choosing a major, Roxanne said, "I took this vocational [automotive] class and I saw, OK, like, I could be a technician." That class lead her to automotive in a community college, and while there, she said, "I started thinking about, you know, car companies need engineers." This thought "kind of opened the door to get into [this university]." Then, Roxanne said, "I always wanted to work for Toyota since I had worked at a Toyota dealership [while I went to the T-TEN program]." She thought Toyota made "awesome cars." To summarize, Roxanne said, "Just the allure of working for Toyota," created the desire to "learn more and more about it as I went along and it sounded better and better."

Once Roxanne chose automotive as a major, she stayed with automotive through three post-secondary degrees. She completed an associate's in automotive technology and her bachelor's degree in automotive engineering technology, then went on for an MBA at a different university while working in the field.

Experiences in Automotive Programs

As for her experience in this university's automotive program, Roxanne said, "I don't think it was any different than any other program to be real honest with you." Roxanne does not recall "anybody treating me any more special," and said that "nobody was ever rude to me." She just was "in a class and there happened to be a lot more guys than women." For her this was not unusual. She said, "I was in vocational school, a dealership, and the Engineering technology program and it was [all mostly male]." So, at the point of this university's experience, Roxanne "was kind of already used to it." Roxanne continues by describing the number of females in the MBA program she completed as, "I think my class had 30% females and that was like high."

Experiences After Graduation

Experiences seeking employment. As for seeking employment, Roxanne said, "I got lucky because I got the internship right after graduation." However, after she finished her internship, Roxanne was not offered the full-time position for which she interned. There was a male on the interview team who did not like her. He spoiled the required consensus by refusing to support her hiring on account of a small technical error Roxanne had made during the interview. (The complete story is in barriers.) She was offered a trainee position within Toyota. However, Roxanne, "had some interest in [the] logistics area as well." So within the company, she "interviewed for [a] logistics trainee position, and got that position."

Roxanne additionally interviewed outside Toyota, at Land Rover Jaguar and was offered a position on their tech line, but Roxanne always had her heart set on Toyota. She said, "Well, do I work for a company that I don't really like, which is Land Rover and

Jaguar? Or do I work for a company that I really like in a [logistics] field I have no clue whatsoever about?" So Roxanne went with the logistics position at Toyota. She declared, "So I just kind of think the powers that be, you know, were looking out for me."

Roxanne felt this way because she ended up in a supervisory role in logistics, at 23 years old. She pointed out, "I had like 84 people that were twice my age that I had the direct supervision over." This was a huge responsibility for Roxanne, that she recalled was "very trying at times." Roxanne pointed out the reason for it being so arduous. "I was managing teamsters to a collective bargaining agreement, [and] it wasn't a very easy union to deal with." Indeed, Roxanne attained "a lot more experience out of that role than I would have gotten if I [had] stayed in the automotive engineering role." Eventually, Roxanne returned to the automotive engineering side of Toyota when she accepted a position in product training. She was offered the transfer because "I had so much people experience on the other side, [in logistics.]" Roxanne's people experience enabled her "to go to press events and talk to different people over the company." Her personality and experience equipped Roxanne with the aptitude to, "you know, instantly kind of get along with everybody." It was during this time, that Roxanne was able to earn an MBA.

Roxanne left Toyota for a defense contractor. The experience was eased because Roxanne "had somebody who was basically like championing me coming over." Roxanne was "really nervous because my whole job experience was at Toyota." Roxanne was anxious considering she did not know how her Toyota experience was going to translate over to Honeywell. Nevertheless, Toyota's production system has a good reputation and Honeywell uses a similar system. Indeed, Roxanne had experience in that area.

In comparison, Roxanne said, “It was harder for me getting back into the automotive role from logistics and warehouse operations at Toyota.” This she reasoned was because “it was harder for me to figure out how to spin [the logistics] experience into being relevant for that [automotive] product training role.” In the end, a manager looked over her resume and observed her automotive engineering technology degree and that Roxanne still had current Automotive Service Excellence (ASE) technician certification. After Roxanne interviewed with the manager, she was like, “Oh yeah, this is the person that we need hands-down.” Roxanne did really well in that department.

Experiences while employed. Roxanne began working in an auto parts store when she was in high school. She worked part-time at night and full-time in the summers. Later, Roxanne changed to a position working at a dealership and continued working on breaks from her education at community college and this university. After graduation from this university, Roxanne held five different positions. First, she was an intern at Toyota. Then she hired in full-time at Toyota as a logistics trainee. Her third position was operations leader. Roxanne transitioned back into automotive engineering side of Toyota as a senior product trainer. In her current position at Honeywell, Roxanne is a supplier development engineer. Roxanne describes each position she held after graduation in detail.

Roxanne was at Toyota for about seven years. She started out in logistics operations in Boston. Then, Toyota moved her to Los Angeles Parts Distribution Center (LAPDC) where she was supervisor for a while. From there, “I made it back into like into automotive specific stuff.” Roxanne got into Toyota’s product training department. “I was doing product training on all the new vehicles.” One aspect of her position was

creating launch training materials, which Roxanne would begin development two years prior to production release. After the materials were developed, Roxanne and her team would, “hold events” where they “train the trainers.” Those trainers, “would go out and train the sales people.” Her team “also did a lot of media press events like the L.A. Auto Show.” At the press events, Roxanne’s team would “bring in a whole bunch of reporters and we’d present all the new features on the car.” Roxanne declared, “That was really fun. I kind of got, like, bit by this.” She thoroughly enjoyed her duties in this position. This first-shift position enabled Roxanne to earn an MBA at night, for which Toyota paid 50% of her tuition. Conversely, Roxanne had vocalized earlier in life, “I don’t want to do anything management related because I don’t want to manage people or anything like that because I’m young.” Now, after some time working in the field, Roxanne has an MBA.

After Roxanne received her MBA, she said, “I loved Toyota, but there were not as many opportunities once you [earn and MBA].” Roxanne found out that she could have just moved up the traditional way without the need for an MBA. Roxanne observed Toyota’s recruitment of “graduates from [MBA] schools into graduate management associate positions.” Roxanne describes why and how she left Toyota.

> So I was going to [MBA] school with people that graduated in the same class as me, and [Toyota] was recruiting them. But [Toyota] didn’t allow internal candidates to apply for that position. So I was a little bummed about that, and I just said, “You know what? Let me take a chance. Let me go out on this interview and learn some more about it.” And I went over and interviewed with Honeywell

> Aerospace and it's a cool job. It's supplier development. So I go out [of automotive, but stayed in the transportation industry].

Roxanne's former boss, "[who] worked with me in operations at Toyota, had moved to Honeywell Aerospace." This former boss kept asking Roxanne for a few years, "Hey, if you ever want to come over, you know, I have a perfect spot for you. It's a great job. And you'd really like it and you'd be good at it."

In her new position, Roxanne has 36 aerospace suppliers that all make parts for her new company. She "helps them with quality and delivery issues." Roxanne "likes the idea of doing something that helps our local [California] economy." Roxanne says another positive with her move from Toyota to Honeywell was that "[Honeywell] made me the offer the day after [Toyota] made the announcement that they were moving to Texas. So I didn't have to worry about that." Roxanne did not want to move to Texas for Toyota. She explains:

> I'm from the East Coast, and I love being by the water, and Texas is really hot. I heard Dallas is up and coming and everything, but it's, from what I understand, it's very flat. There's just not any versatility there. I wouldn't have been too happy to go there. So I probably would have ended up leaving Toyota anyway. I mean, I liked Toyota. I really, like, lived and breathed the company for a long time. But I also needed to get out and get some experience at somewhere else, you know. I couldn't stay at Toyota for 35 years, you know.

Roxanne describes her experiences being employed as "always very positive." She also thinks that "because it's a male-dominated industry, that you have to jump in and be like very assertive from the get-go." Roxanne describes her level of assertiveness.

> Not assertive like being in, you know, like voicing your opinion all the time. But knowing when to just listen and kind of learn and then making sure that when you state your opinion or when you make a decision that you're very assertive, like, not wavering at all, right? So it's a very calculated, I'm listening and I'm kind of forming my opinion here, and I'm thinking that this next thing I'm going to say is a great idea. So let me just make sure that I word it correctly and that I state my opinion and I'm just very unfaltering in the kind of the way that I put it out there. And that's worked well, I guess for me. So.... And I just try to be as educated I can in anything that I talk about so it sounds like I know what I'm talking about. [Laughs]

Roxanne brings to light an example, something she learned from an interview, when she was asked how to diagnose a misfire and forgot to include a procedure. She said, "As soon as you say something wrong, even if you made a mistake, people immediately discredit everything else that you have to say, especially if it's the first few times they're meeting you." Roxanne was really frustrated by the interview, after her internship, for the full-time position at Toyota "because I was like, at the end of the day, nobody is going to know, people know that off the top of their head, but you can go to a repair manual and it'll list out all the steps." If Roxanne is working in a technician call center, "I'm sitting behind a computer, and I'm looking at 16 different repair manuals at once and that's the advantage, that's why people call the tech line, because you have more access to more information." She says, "It's not because they can't figure out the steps to do something, it's because you've been answering the phones for the last 30 days, [and know] that this is common with this vehicle." Another scenario is that, "you

have access to a database of other similar cases. I mean that's why they call, right?" That male manager, from the team who interviewed her, was just another example of gender bias. Roxanne continues, "He wanted to find a reason. But I don't know if it came from that. Maybe he did it subconsciously."

Support

Support from Roxanne's family grew slowly. She said, "At first my family was like you're crazy and this is like not the right way to go." Roxanne "was a little bit rebellious when I was in high school and I moved out right when I was 17." So her parents, "thought that this [automotive career choice] was a continuation of that [rebelliousness]." As time went on and Roxanne proved herself to the world, her parents are "now so proud of me and so happy." They have now asked Roxanne "to tell my little brother who's 18, what to do and give him some advice." So Roxanne said, "it took them maybe like a year or two years to get used to the idea [of her automotive career choice], I would say."

Roxanne said of her friends, "They all were supportive." Her friends knew Roxanne to be the type of person "that I'm always doing something and I always have something in my back pocket." For example, when she was getting her associate's degree, Roxanne said, "Oh I'm going to go here and get my bachelor's degree. When I finally got off of night shift, I went and got my master's." So her friends have always been very supportive. Roxanne added, "Career-wise, I've always had very supportive bosses and managers. I don't think I've ever had anybody who I directly reported to that wasn't supportive." She also adds, "I mean everybody has been super supportive, you

know, so even my friends that I met through the automotive program, were very supportive as well."

Barriers

Roxanne came upon a barrier right after she finished her internship with Toyota and was interviewing with them for a full-time position. Roxanne describes.

> So after the internship, I had to do an interview with three folks at Toyota. And it's basically, you interview with three people, and they all have to give consensus that yes, you're good, we want you in this program. So I interviewed and I had one with like more of an HR person, one with some guy who's in what's called the parts, quality, and service support department, and one with another guy who was like the head of the engines area. And I kind of felt like this guy didn't really like me to begin with. I got an impression that he felt like I shouldn't really be there. He asked me some questions, and I definitely answered one wrong. He asked me something about what happens if there's a misfire in a cylinder, take me through the steps that you would advise a technician to go through. And I think I forgot like boy, it's been a long time since I worked on a car, pressure tests? So and, you know, because I was just kind of like running it through it in my mind. And I think that was the question that kind of sealed it for him and said, "You know what? She doesn't know what she's doing, so I'm not going to recommend her for this position."

As was said before, Roxanne took a position over in logistics and warehousing. Roxanne eventually made it back to the automotive side in product training, which was technically under the marketing umbrella at Toyota. There, Roxanne interacted with a lot

of people in the automotive department. Interestingly, “It turns out that I moved up higher in the logistics organization that any of my fellow automotive trainees had moved up in the parts/quality/support organization.” When she went over there, Roxanne realized it would not have been the right place for her anyway. “Because it was very desk oriented and it is a lot of answering the phones.” Over in the group Roxanne was turned down in an interview for, she observed, “these guys were true engineers at heart. They were reserved, very quiet, like every time you walk over there, it was really super quiet. So I just know that I probably wouldn’t have done well there anyway.”

And to this day, when Roxanne, “asks people about that manager who didn’t hire me, like he’s still in the same position.” And everybody was like, “Oh you interviewed with him? Oh man, he’s like the worst person to interview with.”

Roxanne believes, “You have to know somebody to get an interview.” For example, “When you apply for a job on a job site, nobody’s going to look at it. You have to know somebody who knows you and says, “Hey this person applied for this job. You want to take a look at her?”

Roxanne struggled to figure out where she wanted to be and what she wanted her career to be. “I’m still trying to figure that out a little bit.” She thought operations was cool, but she did not want to do operations forever. When she went to the automotive part she said, “you know, I really like it, but there’s something missing.” It was a really good job and Roxanne wouldn’t have left, but there was “still something missing.” Even now, “I’m still always wondering where is this going to lead me next?” So Roxanne is, “still trying to figure that out.”

Would She Choose This Path Again?

When asked if she would choose this path again, Roxanne said, "Yes, I would. Every single thing that I've done has been incredibly interesting and made me grow as a person." Roxanne points to the future and said, "What is cool about the automotive industry is that it is so exciting [with] all the changes, like driverless cars and all the technology surrounding that, and the hydrogen fuel cell vehicles."

Roxanne believes the automotive industry is diverse. She said, "You can get a very well-rounded profile." No one is stuck in one spot Roxanne explains, "You don't have to be just a technician. You don't have to be just an engineer or anything, you know." In a large company like Toyota, "There's a lot of movement and a lot of opportunities if you want to go internationally, if you want to travel. So absolutely."

Karen

Karen is 32 years old and graduated 10 years ago from this university with a Bachelor of Science in Automotive Management. Since then, she has been working in the automotive field in a capacity that utilizes her automotive degree. Over the years, she has held positions at five different companies, and has been promoted four times during that time.

Why Automotive?

Karen describes her immediate family's work history as, "Nothing automotive – my mom was a librarian and my dad was a high school chemistry teacher, and I'm an only child." In fact, her parents did not influence her at all to go into automotive. According to Karen, "I can't remember why I chose what I chose, but I can remember being 5-years old and wanting to go look at cars. My dad knows nothing about cars; he

has no interest in cars; my mom neither, no one in my family, it was completely out of the blue." Though unable to recall exactly what inspired her interest in automotive, Karen's curiosity with cars continued to grow during her youth. "I used to sit in the front yard and watch cars go down the street and would try to name what kind of car it was and I was under 10 [years-old]," Karen said. "I would always want to collect Matchbox… and Hot Wheels cars. …I loved Barbies [dolls], but the Barbies, they had to have the latest Ferrari or Corvette [car (accessory)]," she said. Karen embraces her femininity and makes it clear that she is a woman who loves cars. She describes herself as "a thin, blonde, blue-eyed girl" not "a butchy, mechanic girl."

Choosing a Major

When choosing a college, Karen said, "I was 95% sure I wanted to do automotive, the other 5% was to be veterinarian because I also really love animals." However, she did not feel comfortable knowing that she would have to put animals down, and she was very intimidated by the prospect of performing surgeries. "So the decision making process was pretty quick for me. I only looked at [this university], which is geographically between the family summer home and her parent's home, and Southern [Illinois University] for [automotive] schools because I knew I wanted a four-year-degree." Karen had to go through mechanics training as part of the four-year degree, but "never wanted to be a mechanic. [I went through it] because I wanted to learn how cars worked mechanically." While her father did not influence her career choice, he did influence her to pursue a four-year degree rather than a two-year automotive service degree. "My dad has a very strong work ethic, so I think wanting to get a bachelor's degree came from my dad." According to Karen, she wanted to "do more than just a trade job."

Initially, Karen began her automotive schooling in the Chrysler Apprenticeship Program (CAP) at this university. “I actually started in Chrysler CAP program because I loved Dodge Vipers,” Karen said. CAP is a factory sponsored two-year automotive technician program that alternated dealership technician work experience with automotive courses. After completing her automotive technician training, Karen went on to the automotive management bachelor’s degree.

Experiences in Automotive Programs

Overall, Karen looks back fondly on her experiences in the automotive program, but describes her experiences during her first two years in the CAP auto mechanics program as “difficult.”

> I loved it, but the [first two years in automotive mechanics] was difficult. I had some gender-related setbacks. I was shy and I think that a lot of the guys sort of took advantage of that. I would get kind of made fun of a little bit.

Karen’s experiences on the first service floor was with a partner who did not like her and would not let her do any of the work on cars. “My partner on the service floor, for the first semester was very arrogant, I could not stand him, and I think the feeling was mutual. I recall he would never let me do much work on the cars, and I was only allowed to clean up after him and watch him. I was too shy to stand up for myself, but I did ask the teacher to switch partners which they declined.”

Karen was picked on by a class clown who was so disrespectful, he would push her in class. Karen found it hard to confront him so she acquiesced.

> Another time, I don’t remember quite as well, but I know there was one student who was very loud, class clown type, and he would make fun of me a lot. Exactly

> what he said I can't remember, but I know a couple times he pushed me out of the way when he was going by, not hard, but hey, a push is a push, and it's not right. I did not have the guts to confront him so just kinda had to deal with it internally.

The class clown humiliated Karen because she could not drive a manual transmission vehicle.

> I know when word got out that I did not know how to drive a manual transmission (embarrassingly because we were allowed to drive around a Viper that was donated, and one guy was like 'Karen go ahead that's your favorite car', and I had to decline because I didn't know how to drive it... queue a roar of laughter), he had a field day with that information and made fun of me. I remember asking if anyone would teach me how and they did not. Ugh, annoying. I ended up learning on my own because I was so frustrated.

Through all of the harassment, Karen kept on going, but she did consider quitting altogether. "There were a few times when I considered dropping out just because I felt homesick, but also just like I wasn't fitting in. I think [name] was the only other girl in most of my classes. There were some tough times." Karen said.

Karen could not find a position as a Chrysler dealership technician. "The dealership in Naperville (an urban area) did not feel comfortable hiring a female, which I think might be illegal." This was a problem because the university required the internship. "I was not able to find an internship with the CAP program, so they had to move me out of it. And the reason I couldn't find an internship was because no dealership was willing to hire me. That was kinda a negative experience," Karen said. After giving

up hope of finding an internship at a Chrysler dealership, Karen was casually offered a technician position near her parent's summer home.

> [Interestingly,] we have a summer house near Petoskey [MI]. And the service manager at Brown Motors in Petoskey had said, 'Oh, I would have hired you.' Because my dad has a Jeep and he had taken the car in. And he is like, 'We would have let her work no problem.' I actually though about getting an apartment up there because our summer home is not winterized, but then I was like, geez, do I want to live in northern Michigan work as a tech by myself in Petoskey? I just couldn't do that. The big cities would not hire a girl, but the country guys were willing to is kinda interesting. You think it would be the opposite.

As a result of not finding an internship at a Chrysler dealer, Karen was moved out of CAP and into the general automotive service program. The general automotive service program also leads to an Associate's degree in automotive service. The automotive technician internship for the general program is in-house internship called the "Service Floor." The Service Floor is a class that meets on campus, in the morning, for 18 hours a week the entire semester. Functioning as a full-service automotive repair facility, the Service Floor provides real-world automotive technician experiences while under the supervision of automotive faculty.

Once Karen started the four-year Automotive Management degree program, she began to enjoy her automotive education experience more. "Once I was in management I was golden," she said. Karen continued coming out of her shell by joining the executive board of the student organization for automotive management. While participating on the executive board, Karen noticed a higher level of professionalism and respect from her

peers in the second two years of her schooling. She said, “I got along really well with the management guys.”

Experiences After Graduation

Karen’s experiences after graduation were positive and professional. Lacking was the immature, gender-related undertone she experienced during automobile mechanics training.

Seeking employment. At a university-sponsored career fair, Karen interviewed with DiamlerChrysler for a District Manager’s position. Karen explained, “It did take them almost four months to hire me, which may have been their process, so I worked at a Toyota dealership back at home as a lube writer waiting for them to finish the process. I never had any issues with that [hiring process].” Within two months after graduation, Karen began working at DiamlerChrysler as a District Manager. This was Karen’s dream job.

Unfortunately, when the economic recession hit in 2008, the automotive industry took a turn for the worse, and Karen along with many others at the time, were let go. “I did lose my job when they went bankrupt.” So, after just three years, Karen lost her dream job.

> Chrysler gave me a good package [because] they let like 6000 people go, so I was able to live off what they gave me. They also gave me car. You could pick anything you wanted except a Viper or a Challenger [of course]. I had a car; I had some money that they’d given me, so I was doing OK, but it took a while to find another job.

A condition of this severance package was that she had to sign a clause that prevented her from ever returning to the company.

Times were tough for anyone looking for jobs in the auto industry at that time. “I actually was getting pretty discouraged with not being able to find work during that time, [so] I went and looked at a veterinarian school. Because I was like, maybe my time with this [automotive] is done. But I never pursued it beyond looking.” It took her six months to find another automotive position. Karen eventually found work as a warrantee administrator at a BMW dealership for 60% of her former pay. She was glad to finally be working again.

Experiences while employed. At the BMW dealership, Karen worked under a female office manager. “The [BMW] office manager was female …no issues. I loved my boss. We would go out after [work]…good social life with co-workers. It was a good experience there.” Through her work and continued emergence from her shell, Karen began to get along with all the male technicians at the dealership. “By then I was more comfortable. I worked well with all the technicians. We were friends. It was fun. I actually really liked that job. It just wasn’t enough money.” It was here where she met her future husband. They did not want her to leave when she moved on for more pay at a company that sold website applications for dealerships. She found this job on the Career Builder website.

> [I] never had any like problems with the people I worked with or the hiring process, but … I was not good at being pushy with people on selling them stuff so when someone says no, I’m like ‘OK, thanks, bye.’ It’s not for me. [When the owner] would listen to my phone calls when I was trying to pitch this thing and he

> was like, 'You sound nervous, like a deer in the headlights,' he's telling me. I am. I don't like this. So we parted ways quickly. I was only there a couple of months.

Afterwards, she met an old Chrysler employee on Linkedin who sold her on the idea of being a corporate representative for Midas dealers. "He's like, 'I'd love to hire you to be like a rep for corporate owned Midas dealerships.' I was like, perfect! Being a rep is my favorite thing. I loved being on the road and meeting with dealers. It seemed like a good fit. Unfortunately, his promise did not come to fruition." Karen's experience at Midas started out just fine, but it did not put her in the position she wanted fast enough. It started with her old friend convincing her to take an entry level position.

> "First I want you to work in a Midas [store] for a couple months, just to get a feel for what we do." I said, no problem. So I was a [service] writer, I had [some] oil changes, I kinda just did the job. A couple of months turned into four and then he moved me to a different store to work, now I'm at seven months and I'm still just working at Midas. Which was not…I didn't sign up to work at an independent shop you know. So by then I was assistant managing a corporate owned Midas after six or seven months, and Midas sold the corporate owned store to a franchisee, and they had their own staff so they fired us. So I kinda got screwed. I kept applying to corporate jobs within Midas because I wanted to be corporate, I never wanted to work retail. I even applied for a training position, and they turned me down for corporate jobs, so that was that.

Karen eventually ran into an old university acquaintance who worked at Ally, and began working there in their claims center. "I've been with Ally Financial for four years. I started in their claims center in Illinois and received two promotions within the [field]

office. Then a field representative opportunity [opened up in] Michigan and I've always wanted to live here, so I jumped on it [because] I wanted to be in the field again." So within three years, she was promoted to a field representative position.

Support

Karen found the support she needed to persist all throughout college and her career. Karen explains, "I joined a sorority, which has nothing to do with automotive, but that is [one of] the reasons I made it through because I found girlfriends, which I didn't have my first year." Things continued to improve for Karen because on the second Service Floor, her new male partner had plenty of mechanical background and was willing to let Karen develop her mechanical skills. "My second semester on service floor, I had a great partner, who let me do more of the lion's share and I took advantage of it." Karen said. Her experiences in the automotive program were beginning to look up. Another reason Karen did not quit was because she had a very supportive male faculty advisor. She could "download" on him about her frustrations related to the program. "My advisor was awesome, he was the CAP coordinator and I felt comfortable talking to him…If I was having a rough day, I could talk to him about it.…he was funny and was one of the reasons why I stayed." He encouraged her to continue in automotive field.

Karen's father has always been very supportive of her in her career choice. He went with Karen to all of the technician interviews and even wrote a letter to an automobile manufacturer on her behalf. "So my dad actually sent a complaint [letter] to Chrysler because I had gotten kicked out of the CAP program." Karen also had a good male boss at DiamlerChrysler. "I had a great boss at Chrysler. That was really good support. Honestly, a majority of men I worked with as peers have been great." A female

supervisor at Ally became a mentor to Karen and "would always sit with me before promotion interviews and she would pep talk me."

According to Karen, "[Part of the] reason why I made it through [was] I knew that it was not every guy that was [mean], just certain people." She also said, "I had a social life outside of school, and once I was in management, I was golden. I was on the [student] board, I got along really well with the management guys. I think I just had a hard time with the tech only guys. They're a little different."

Barriers

As mentioned earlier, Karen experienced many gender-related obstacles during her first two years of university education. While searching for an internship as an automobile mechanic, Karen said:

> I did have a service manager tell me and my dad, because he was with me for the interviews, that they just didn't feel comfortable hiring a female. They said, "Oh, well, we don't have a locker room, we don't have a separate female tech area for you to be in, and I just think it would disturb the shop too much." So my dad actually tried, not to sue, but he sent a complaint to Chrysler because I had gotten kicked out of the CAP program. He sent a complaint to them…nothing ever happened from it [complaint letter], but that was kinda a negative experience.

This barrier meant Karen had to take the Service Floor class because could not find an internship at a Chrysler dealer, and the first Service Floor experience was full of gender bias.

Karen explained, "So then I was on the Service Floor and my first partner [male] wouldn't let me do anything. He would only let me clean up after him." Karen wanted to

gain experience actually working on the cars and not by watching her partner, so she "told the teachers and they wouldn't let me switch partners. They were like, 'This is something you need to kinda work through.' Oh, well." When asked if this was the only situation in which she experienced gender bias at the university, Karen said:

> Yeah, I would say so. Usually, like in classes and labs, it was fine. It was more Service Floor. There were some hot heads in that group that first semester, and I just didn't stand up for myself, which I kinda regret. I shoulda been a little bit more outspoken, but I felt so out of my league.

It was during this tumultuous time that Karen felt like quitting automotive altogether. Karen pointed out when asked if she felt her kindness was taken for weakness, "I was always nice. Most of the guys that belittled me did not go past auto service." In other words, they did not further their education beyond the associate's degree. When asked if she thought the male students felt threatened by a female, Karen said, "That could be part of it. This is kinda, I don't know if this is sexist or not, but I am not ugly. I was a thin blonde, blue-eyed girl in this pack of, you know, [wolves]. I'm not full of myself by any means. I wasn't like a butchy mechanic girl. You know what I mean?" On a positive note, as Karen said, "I think that is also why I gotten over some of my shyness because I had to go through all that. So it all worked out, but there were some tough times."

Would She Choose This Path Again?

Karen said "Yes. I don't regret my choice. There were times where I did, but overall it's been rewarding. I think going through what I went through has helped me get over personal issue of being introverted and kinda being more low self-esteem is how I would put it. I meet some great people. I met a future partner."

Karen stayed in the automotive program for many reasons. She had a supportive male faculty advisor; she had joined a sorority and did not want to leave her sorority sisters; and the change from the two-year auto technician program to the four-year auto management program opened more opportunities for her to express herself positively through leadership opportunities.

Chapter IV Conclusion

All twelve participants shared very unique and interesting stories of persistence. They had courage to pursue their dreams in environments that were sometimes discouraging. Next, in Chapter V, we will look at the themes and sub-themes that were the product of inductive analysis.

CHAPTER V

DATA ANALYSIS AND FINDINGS

Although it would appear that my research questions would lend themselves to themes in a deductive manner, because the questions tie in to the conceptual framework and goals of the research, I utilized an inductive approach to analyze the data. Patton (2015) described qualitative inductive analysis as "generating new concepts, explanations, results, and/or theories from the specific data of a qualitative study" (p. 541). I found patterns through content analysis, by searching the transcriptions for recurring words or themes. These patterns, when enough similar ones appeared among the transcriptions, became the basis for the themes in this chapter. In this manner, the "findings emerge out of the data" (Patton, 2015 p. 542).

Major Theme Narratives

The major themes and sub-themes distilled from the twelve interviews are disclosed in this chapter.

Theme 1: All Participants Have Varying Demographic Backgrounds

All 12 participants are current or former female automotive students at a Midwestern university and revealed a variety of background affordances related to family, community, and education.

Sub-theme 1.1: A majority reported being out-of-state students. The communities where the participants originated led to a geographically diverse group. Participants reported growing up, not only in the Midwest, but on the east coast (New Jersey), the west coast (California), the south (Florida), and as far north as Canada. In total, eight participants reported being from out-of-state.

Sub-theme 1.2: A majority indicated that they were transfer students. Educationally, eight participants had accrued credits and/or degrees from other post-secondary institutions. It is interesting to note that some of the transfer participants were not yet committed to an automotive career. Case in point is Alice, who earned an associate's degree in criminal justice prior to changing her career to automotive. Another example is Elisabeth and Dee, who began their post-secondary education in pre-veterinarian and psychology respectively.

Sub-theme 1.3: A majority reported participating in formal automotive education prior to attending this university. Within this theme, eight participants reported participating in automotive education from high schools, trade schools, and/or community colleges prior to attending an automotive program at this university.

Sub-theme 1.4: A majority had at least one parent in a STEM career, but they are not always the influencer. Despite the nine participants having a parent in a STEM career, it is interesting to note that having a parent in a STEM career did not always influence the participants to pursue automotive as a career. For Melanie, her mother was in the medical field, and it had no influence on her career decision. "Yeah, my mom was a little shocked. She doesn't really know much about [automotive], so she didn't know what to say about it or do about it."

In some cases, the STEM parent discouraged the automotive career path. Alice's father is an engineer for a phone company, but he discouraged her from choosing an automotive career. Alice has "always had a fascination with cars," however, her parents discouraged her from going to school for automotive. Her parents would say to her, "You need to pick something that's not being a grease monkey underneath a car."

Sub-theme 1.5: A majority chose Automotive Engineering Technology as their major at this university. Three degree programs exist at this university: an Associate's in Automotive Service, a Bachelor's in Automotive Management, and a Bachelor's in Automotive Engineering Technology. Of those three degree programs, eight participants in this study chose Automotive Engineering Technology, four chose Automotive Management, and none identified with a sole purpose of earning the associate's degree at this university.

Sub-theme 1.6: A majority performed an internship or a related automotive industry work experience. Eleven of the twelve participants worked in the automotive industry either before, during, or after their education at this university. Nine performed an automotive industry internship for one of this university's automotive bachelor's degree. However, Michelle and Brandi, worked in a family-owned repair facility or worked as automotive technician in the field respectively.

Theme 2: A Vast Majority of the Participants Indicated an External Factor Influenced Them to Choose Automotive

The data revealed that 11 participants evinced one or more external factors influenced their attraction to an automotive career path. Some of these factors were: family influence, influence from friends, or some life event that sparked enthusiasm for an automotive career. A few of the participants described unique avenues taken to their automotive career choice. Some of those unique stories are also described in this section.

Melanie indicated multiple partial influences that lead her to choose an automotive career. Melanie was partly influenced to choose automotive by her high school automotive instructor. "I took [auto shop] as a safety net in high school to know

how to change my oil, change a tire. My teacher really liked me and asked me to do competitions with them." In these troubleshooting competitions, Melanie became the first girl to qualify to go to the state competition in Illinois. As a result of spending so much time in automotive, Melanie's group of friends changed during her time in high school. She was hanging out with a group that worked on their trucks and recreational vehicles. This was when Melanie began to take her automotive studies more seriously.

> I think my friend group kind of transitioned and then because they would work on their trucks and their four-wheelers and snowmobiles and that kind of stuff. And I think that's when I really got into it and I kind of wanted to take my auto class more seriously.

Melanie could not pinpoint one exact cause for her choice in automotive. She said, "It all kind of seemed to happen all at the same like time period. So I can't really say which influenced me more."

Unlike Melanie, Silvia's peer group was the only influencer for her choice of an automotive career. Even though her family mostly works in the auto industry, Silvia says that did not influence her career choice. She attributes it to social reasons. "A majority of my friends growing up in the neighborhood were males. And the majority of them would tinker with 'toys'— four wheelers, motorcycles. So I got an interest from watching them." This interest carried Silvia to begin working at an automobile dealership. First as a technician apprentice, and eventually working her way up to full technician.

A small number of participants reported that no person influenced them in their automotive career choice, instead they had a latent interest that came to the surface with personal automotive-related experiences. Alice did not get her interest for automotive

from her parents, other family members, or friends. Her interest developed, “when I started driving” and then, she wanted to know more about her car. “I want to know what makes the engine go? You know, why is there only certain types of gas that are allowed to go in the engine?” Alice wanted to perform her own maintenance on her vehicle. Alice says, “I want to do my own oil. I want to change my own tires.” Alice also fueled her passion for automotive as a fan of the original British version of the TV show *Top Gear*. She says, “*Top Gear* was my favorite show.”

Sabrina took a different path into automotive. “[My parents had] zero influence on my career choice.” Oddly enough, Sabrina’s path to automotive came through working on lawnmowers. Sabrina learned how to repair lawn mowers while working at a summer position at a state park. She worked with the maintenance crew and, when work was slow, she would teardown, cleanup, and reassemble the lawnmowers. “We had like nine push mowers, and one worked. So I just tore them all down, cleaned them up, and they magically worked. So I figured cars were just lawnmowers without blades.”

Only one, Karen, was unable to recall exactly what inspired her interest in automotive, Karen stated that “no one in my family [had any] interest in cars, it was completely out of the blue.” Karen continued, “I can’t remember why I chose what I chose, but I can remember being 5-years old and wanting to go look at cars.” Karen’s curiosity with cars continued to grow during her youth. “I used to sit in the front yard and watch cars go down the street and would try to name what kind of car it was and I was under 10 [years-old].”

With the exception of Karen’s experience, the data suggests that exposure to automotive-related experiences can have a powerful influence on one’s career path.

Sub-theme 2.1: A majority had a family member influence them to choose automotive as a career. Seven participants indicated that some member of their family influenced them to choose automotive as a career. For many, this social persuasion formulated from enactive mastery experiences, such as working on cars with family members, and/or vicarious (observational) experiences, such as watching family members work on cars, race cars, or interact with customers in a repair facility.

For Vanessa, her interest in automobiles expanded with a trip to a NASCAR race with her uncle.

> I think I always to a degree was kind of attracted to vehicles a little bit. I went to a monster truck show and then I also went to a NASCAR event with my uncle and got to do the ride-along and stuff like that. They're really big into NASCAR, so I kind of got introduced a little bit more into like cars and stuff like that. I think that's kind of what triggered it.

Elisabeth's mother promoted the idea that she undertake different jobs to find a career. "[My mom] was like, 'You don't know what you want to do. Take jobs and see which one.'" After exhausting all other possible careers, Elisabeth began taking college courses "just to figure out what I wanted to do." She also transitioned to working fulltime at her family's automobile repair facility. Elisabeth was not taking any automotive courses, nor was she considering an automotive career yet.

> It was about 2007 when I finally decided to get into automotive, because one day I was thinking, you know, I'm trying to figure out what I'm good at, what will I enjoy for the rest of my life? And I was sitting there wrenching, you know, I was sitting there fixing a car and I'm like, "Why am I not doing this for a living?"

This is when it clicked for Elisabeth. She said, “So then I enrolled in [automotive at] a [technology] school. The ball started rolling from that point.”

It is important to note that Elisabeth’s father played both a negative and a positive role in her choice of an automotive career. Elisabeth had worked in the family shop on cars next to her father, who taught her how to repair automobiles, but he discouraged her from choosing automotive as a career because of his strong cultural beliefs in gender roles.

> And so when I went to my dad and said, “Hey dad, I want to become a mechanic,” my dad told me no. Being at that rebellious age as I was, I did it anyways. [Laughs] So my dad told me, “You know, no woman should be in the shop, blah, blah, blah.” And I was like, “I’ve been in the shop since I was little,” you know. But he didn’t think it was a career [that was] right for me, and I was gung-ho in proving him and anyone else that ever told me that a girl shouldn’t be in a shop wrong. I would say that was the final push for me.

Unlike Elisabeth, the following participant’s fathers had a positive influence and encouraged them to pursue their automotive interest.

Sub-theme 2.2: One-half of the participants indicated that their father or step-father influenced them to choose automotive. Fathers played an important role in nudging six of the participants into an automotive career. For example, Brandi said that what influenced her to choose automotive as a career was, “Our hobby [racing cars], because my dad raced at Berlin Raceway [a local racetrack] starting in 2001. We are still [racing] with my brother now racing there. So I kind of just grew up around racing and cars.” This is a social persuasion and a vicarious (observational) experience.

As another example, Michelle had a longer and more involved influence from her father. She had the social persuasion coupled with both enactive mastery experiences and vicarious (observational) experiences. She grew up around her family's auto repair business. She said, "I've grown up around it. I really don't know much outside of it. Also, the encouragement from being brought up in a garage. I've always known how to, you know, tinker."

> When I was little, some of the car games, you know, the long ride games that parents make [you go on], we would listen to "Car Talk" [on NPR]. Yeah, and we had to figure out [the car problems]. I had to figure out what was wrong with the car and try diagnosing it before the guy who just kind of wings it.

The car games continued past the family vacations. In her youth, Michelle's Dad would take her out in a customer car and have her tell him what was wrong with the vehicle.

For Jane, her father was an engineer and her mother worked on an automobile assembly line. Jane's family's work history had a major influence on her decision to go into the automotive field. When asked, Jane said,

> I know that I originally wanted to go into the Automotive Engineering program because my father was a mechanical engineer. I was basically being Daddy's little girl. That's where I would bond with my father the most is in the garage. So I spent a lot of time in the garage with my dad. And that's where I learned how to wrench on some cars and got into the passion for the automotive industry.

Roxanne's stepfather's interest in cars influenced her the most, as she noted, "So he always rebuilt like old Mercedes and things like that." So, when Roxanne was in high school, she said, "Just, like, let me take a basic automotive class." She reasoned, "And,

you know, everybody needs to know about their cars." Roxanne found that she absolutely loved the automotive class at the Vo-Tech center. What appealed the most to Roxanne was, "it didn't seem like I would be boxed into being like, at a desk all day."

Finally, Dee's father influenced her to go into automotive. Dee said of her father, "he's always been into like older vehicles and that sort of thing." So that is how Dee became interested in automotive, she said, "I guess my interest started when I was little and Dad would be outside working on the car."

From this, it is plain to see that some fathers, with an interest in cars, have sway with their daughter's career choice. However, it is important to note that these fathers all included their daughters in their car-related interest during their childhood.

Theme 3: A Majority Considered Another Career Path and Settled Their Career Decision to Automotive

Eight participants disclosed that they considered, in varying degrees of commitment, other career paths prior to choosing automotive. It can occur before or after post-secondary education begins. The following examples illustrate this theme.

Melanie, who was accepted to a dance program at the University of Illinois, decided to turn it down and pursue automotive instead. The choice between automotive and dance came down to future earnings. She explains, "I was between automotive and dance, and you don't make money dancing."

For Brandi, her career decision was made while in high school. Brandi said, "I went to [a local high school career tech center]. I originally was going to go for art. But I didn't want to do graphic design on a computer. I wanted to do something with my hands.

But they didn't have anything for that. And my second choice was auto. I've kind of just gone with it because I liked it."

Elisabeth began at the local university's pre-veterinarian program, which was a four-year program. She wanted to specialize in "small domestic animals." Elisabeth summarizes:

> I wasn't a farm person, so I wanted to get into domestic [animals]. And University of [name] was the only one that offered it at that time, and you had to have like a 92% average to even be considered to get in. And I'm like barely getting Ds. I realized, it was the biology classes that really hit me hard, [and] the organic chemistries.

With her ego bruised, Elisabeth released her aspirations of being a veterinarian, and changed into a career exploration phase of her life by taking general education courses. While struggling to figure out her career path, Elisabeth returned to working as a technician at the family's automotive repair business. Elisabeth said, "So I end[ed] up like falling right back to what I knew and what I liked." She immediately changed her major to automotive at the local trade school.

Alice went so far as to earn an associate's degree in another field. Alice's true passion is automotive, but she chose criminal justice to appease her family. It was the most tolerable career that her parents would approve. The appeal of criminal justice for Alice was, "I like investigating. I like figuring out what the problem is and why the problem is there and what's the root of it in a sense." So Alice compromised and earned an associate's degree in Criminal Justice. After completion of this degree, Alice was still interested in automotive. Alice's parent's response was for her to continue her education.

They said, “OK well find something more [in criminal justice].” Alice decided on a highly regarded school to further her education in criminal justice, but while Alice was searching the internet, she also found this university’s bachelor’s degree in automotive engineering and sold her parents on it. In the end, her parents compromised. Alice says, “It’s technically an upgrade from what I wanted in my mind” because she originally chose a trade school for auto mechanics. For Alice and her parents, the decision to go to this university “made me happy and it made them happy.”

When choosing a college, Karen said, “I was 95% sure I wanted to do automotive, the other 5% was to be veterinarian because I also really love animals.” However, she did not feel comfortable knowing that she would have to put animals down, and she was very intimidated by the prospect of performing surgeries. “So the decision making process was pretty quick for me.”

Overall, some of the participants knew they wanted an automotive career, but for various reasons, tried other careers, but those careers did not fulfill them. Others had no initial desire to pursue automotive and circumstances drove them toward an automotive career path.

Sub-theme 3.1: A vast majority changed their major within automotive. Ten participants, once on an automotive career path, reported changing their major within the automotive career umbrella. For most, it was a change from a trade school certificate or associate’s degree in automotive mechanics to a bachelor’s degree. There were some who changed their automotive major by virtue of academic issues.

Michelle initially wanted to do forensic type auto accident reconstruction because at the time, she was hooked on the CSI TV shows. She thought that Automotive

Engineering Technology would provide this path. The problem she says is the degree required chemistry, which she did not take in high school, because it was always full, so she decided to try Automotive Management.

> So I wanted something automotive related and when I started in the Engineering, I actually wanted to do like forensic stuff, like fatality, you had to recreate what happened in the car. Because I like the CSI shows [and], at the time, I was hooked on them. So I wanted to do something along those lines, but then as I looked more into some of the engineering classes, like all of the chemistry classes, that was the one science class I didn't take in high school. Because it was always full.

Automotive was not Dee's first college major. "My very first college experience in South Dakota, I went for psychology." However, Dee found psychology "just didn't work out" for her and, "that's when I continued [on with my education] and went to college in California for the mechanic's degree." Dee describes automotive as a major that, "was something that was little bit easier and it kept my interest." Dee always had an interest in automotive, "even from just looking at magazines or watching car shows on TV." It took a while for automotive to "click in my head like oh, you know, I can do a job with this stuff." Dee said, "So that's what really set it off was just my little interest in it."

For Jane, working on cars with her father and taking auto shop in high school lead her to choose automotive service as a major at a local community college. After earning an Associate's Degree in Automotive Technology, Jane choose the Automotive Engineering Technology Bachelor's Degree program at this university because her father was an engineer. However, Jane found that the Automotive Engineering Technology

program was too academically difficult. “I personally felt that the engineering program was a little too hard for me.” She also was concerned about securing an internship at the end of the program. Some upperclassmen that she knew at the time, in automotive engineering technology were having difficulty finding and internship. That also influenced Jane to switch her major.

> There were a few students that I knew, like, upperclassmen that didn’t get an internship. And it freaked me out, just because I was worried at the time, like, if I don’t get an internship how am I going to graduate? And I wasn’t about to go back home to Mom and Dad with no job and a boatload of student loans.

So Jane decided to leave the Automotive Engineering Technology program, yet remain in a program that was automotive. “I still wanted to stay within the automotive major. So then I switched my major from Automotive Engineering to Automotive Management.”

While earning her Associate’s in Automotive Service, Silvia worked as an automotive technician when she realized, “manual labor may not be for me for the rest of my life.” So, she “decided to go back to school.” Silvia wanted to stay in the automotive industry, but then she found out about this university and its Automotive Engineering Technology program. It was there where Silvia, “realized that the engineering side was where my passion was.”

All 10 of these participants stayed on the automotive career path. Most followed the progression of associate’s degree in automotive to a bachelor’s degree in automotive. There was some shuffling between the two bachelor’s degrees this university offers, mostly in the direction of Automotive Engineering Technology to Automotive Management because of the difficulty of the engineering technology degree. The

remaining two, Melanie and Brandi, began their automotive secondary education as freshman in the Automotive Engineering Technology program and have not switched programs.

It is important to note that two participants, Sabrina and Roxanne, after earning their automotive degrees and working in the field, left the automotive field entirely to either earn a non-automotive degree or to utilize an earned non-automotive degree. Sabrina quit her automotive career and switched to a master's degree in psychology, while Roxanne, earned an MBA while working at Toyota and left for the aerospace industry.

Theme 4: A Majority had to Prove to Others Their Knowledge Of, and Commitment To, Automotive

In the male-dominated environment of the automobile industry, nine participants experienced various situations where they had to prove their automotive knowledge and/or commitment to their career choice. Adding to this, there were reports of men offering help when the women were fully capable of the task or knowledgeable of the subject. Many expressed that they were every bit as competent as a man in this field, and do not like to feed into the stereotype of women being weaker or less competent in the automotive field.

Brandi has been offered help when she did not want or did not need help at the time. Brandi expresses herself as an independent woman, who likes to do things herself as she notes: "At the dealership when somebody goes, 'Oh, do you need help with that?' And I'm like, 'If I need help, I'll ask you for help.' Like, don't ask me if I need help. I like to be independent about some things."

Michelle's automotive knowledge was questioned by the males in the program, but she held her own, owing to her vast experience working in the family-owned automotive repair shop and her experience racing cars at the track. Like Brandi, Michelle has been offered help with things that she can easily do and has competence doing.

> So it didn't bother me a whole bunch. I mean obviously you get some of the, "Are you sure you can do that?" kind of.... like, "I can do it. I'm fine." I mean, I can wrench on a car just like [a guy], so I mean, you get that little bit here and there.

When Michelle was questioned by some of the guys in class, she would show them her extensive knowledge about automotive and that would surprise them and make them back down. She easily proved herself with her racing and auto repair background. Oftentimes, she knew more than most of the men in her classes. "Then you show them, or actually outsmart them and then they shut right up. Or when they sit there and talk about cars and you step right in and say, 'Oh yeah,' and then start throwing specs out there and they're like, 'What on earth? Weird.'"

Elisabeth had to prove to both her instructors and her classmates, at the auto technician trade school in Canada, that she was there for the same reason as her classmates, to actually learn. She wanted the same challenges everyone else was receiving. Elisabeth's believed her instructors were being too lenient on her academically. She fought back against the leniency and the male classmates "saw me fighting [back]." Elisabeth did not "want the easy way." She wanted to be "treated equally with everybody else." She did not want to be "passed just for the sake of being female." Elisabeth's male classmates respected her for not accepting leniency in her schooling, and she was entirely "willing to get down with the guys and wrench with

them." She even asked her male colleagues at the trade school in Canada, "Did I ever challenge you in anyway or anything like that? They said, in the beginning I did because they didn't know what I was like." They did not know she was interested in cars and wanted to learn more about cars. Later on, "they realized it wasn't because I was female, it was just because I was knowledgeable already and walking in [being accepted to the school] because of my background [in automotive]."

Jane told of some of the guys expressing that she might not know what she was doing in class. "Some of the guys would automatically think you did not know your stuff, but that didn't bother me."

As an automotive technician, Silvia found, when she first started there, that she had "to kind of prove myself at the beginning." For example, if she was fixing a vehicle, "sometimes they [the male technicians] would come over and kind of watch. And I could feel that they were watching." There were other instances where the male technicians "would come over and offer to help me when personally, I didn't feel that I needed the help."

Karen looks back fondly on her experiences in the automotive program, but describes her experiences during her first two years in the CAP auto mechanics program as "difficult."

> I loved it, but the [first two years in automotive mechanics] was difficult. I had some gender-related setbacks. I was shy and I think that a lot of the guys sort of took advantage of that. I would get kind of made fun of a little bit.

Karen's experiences on the first service floor were with a partner who did not like her and would not let her do any of the work on cars. "My partner on the service floor, for the

first semester was very arrogant, I could not stand him, and I think the feeling was mutual. I recall he would never let me do much work on the cars, and I was only allowed to clean up after him and watch him. I was too shy to stand up for myself, but I did ask the teacher to switch partners which they declined." Karen was actually picked on by a class clown who was so disrespectful, he would physically push her in class. Karen found it hard to confront him, so she acquiesced:

> Another time, I don't remember quite as well, but I know there was one student who was very loud, class clown type, and he would make fun of me a lot. Exactly what he said I can't remember, but I know a couple times he pushed me out of the way when he was going by, not hard, but hey, a push is a push, and it's not right. I did not have the guts to confront him so just kinda had to deal with it internally.

The class clown humiliated Karen because she could not drive a manual transmission vehicle.

> I know when word got out that I did not know how to drive a manual transmission (embarrassingly because we were allowed to drive around a Viper that was donated, and one guy was like 'Karen go ahead that's your favorite car', and I had to decline because I didn't know how to drive it... queue a roar of laughter), he had a field day with that information and made fun of me. I remember asking if anyone would teach me how and they did not. Ugh, annoying. I ended up learning on my own because I was so frustrated.

Through all of the harassment, Karen kept on going, but she did consider quitting altogether. "There were a few times when I considered dropping out just because I felt

homesick, but also just like I wasn't fitting in. I think [name] was the only other girl in most of my classes. There were some tough times." Karen said.

Overall. being taken seriously as a female in automotive professional requires resolve on the part of these participants. Often, the males in the profession question the reasons that a female is in the industry. They imply that the females are weaker or less competent by offering help when no help is needed or wanted. For some men, the offering of help may be well-meaning, but for the female, who has dealt with the contempt of other men along their career path, the help is viewed as another jab to their ability and commitment to the profession.

Theme 5: A Majority of the Participants Reported Being the Only Female in Class or in the Workplace

For eight participants, they were the only female in class and at work, which made some feel isolated. This was true for Michelle, who was initially nervous, when she started her automotive education at this university because she was the only female in most of her classes.

> I started nervous obviously because [I was] the only girl in the class. But I'm also kind of used to it. I know some girls will go in there and not really be familiar. I mean they've hung out with guys, but when they sit in a room full of guys, then it's something totally different. And I've kind of grown up around it. And also racing. So I've been around guys more than girls pretty much. So it didn't bother me a whole bunch.

Jane pointed out that she was the only girl in the class and that focused attention on her, but the guys treated her well mostly. "I mean, I understand it. It's just kind of, you

know, when you're the sore thumb sticking out, it's like, yeah, you get that kind of attention." Jane also felt like work was similar to school in that she was the only female in the office. "I don't really feel it's much different than my classroom experiences. After I graduated, I worked in our insurance department, where I was handling mechanical claims all day. So I was also the only girl out of 115."

As for being a female in the automotive courses, Dee said, "Well, of course, you know, like you stand out, because you may be one woman in a class of 30 boys, you know." Nevertheless, Dee said, "I felt like I fit right in." She claimed to not "have any issues with that." In summary, Dee said, "Yeah, I just think that you do get a little bit more attention, but I don't think it's like bad attention."

Silvia is familiar with being in the minority, "of being the only female in this industry." She said, "I was the only female in the [college automotive] program," and the only female technician at the dealership. In fact, Silvia said, "I was the only female technician that I'd say the majority of those men had ever worked with." She was also one of a few females in automotive at this university. For Silvia, she had already been through the experiences of how to hold herself to a "higher standard in a male-dominant profession." Indeed, Silvia currently works for Toyota, during her internship there, she said, "It really opened eyes as to how few females are in the auto industry. Within my building of engineers, there's probably less than five females in a building of three to four hundred people." This was shocking to Silvia because she works for a large automobile manufacturer and thought there would naturally be more women employed in her building.

Sabrina was typically with a small number of women at school and in the workplace. However, when Sabrina worked at Behr, an automotive supplier, as an associate warranty engineer in a department of only four people, she was the only female on the team.

Roxanne described this phenomenon as being "in a class and there happened to be a lot more guys than women." For her this was not unusual. She said, "I was in vocational school, a dealership, and the engineering technology program and it was [all mostly male]." Roxanne "was kind of already used to it."

Karen consider quitting altogether because many times she was either the only female in class or with one other female. "There were a few times when I considered dropping out just because I felt homesick, but also just like I wasn't fitting in. I think [name] was the only other girl in most of my classes. There were some tough times."

Being the only female in class or at work focused attention, sometimes unwanted, on the participants. This attention made some of them nervous, isolated and alienated. For some, being the only female took them by surprise, but eventually, each participant accepted this truth about the career they chose.

Theme 6: A Majority of Those Who had secured an Internship, Reported Difficulty with Interviews

Ten participants out of twelve said that they had secured an internship and while seeking such an internship, seven of them reported difficulty with the process of obtaining employment. The other two had not sought an internship at the time of interview.

The positions Elisabeth had applied to during the career fair, got back to her late in the summer. She said, “The jobs that I had applied for, I never got a response back until about July. And then at that point, I had four offers on the table.” She blames herself for the late replies. She said, “I just don’t know if I just was too slow, I should have sent it out faster or earlier than the Career Fair.” She noted that many of the responses were, “from the Career Fair.” It was perhaps bad advice about when to apply for positions. Elisabeth said, “Yeah, because that’s what we were told is either apply at the Career Fair or like within the end of the week, and that’s what I did. But I never got a response back until quite a bit later. Elisabeth was offered a position with a major import manufacturer, but it was too late. Elisabeth had accepted a contract position working for one of the Detroit three in southeast Michigan. She explains, “I got another [job offer] from Toyota. Which is my dream job, but I’m just like, I’m settled here. I have an apartment leased for a year, so I can’t just take it.”

Alice thought seeking employment after graduation was difficult. She applied at many different companies and did not receive any responses. She says, “No phone calls, no e-mails saying, ‘Oh hey, we’re interested in an interview.’ It was hard.” Then her faculty advisor told her about Autoliv. Alice says, “In my mind, I thought it was just going to be another crap shoot. I thought it was just here’s another one that I have to put in. I’ll probably never hear back from them. And they actually called me back.” Alice interviewed and was offered an internship which turned in to a direct-hire position.

Searching for a job was not easy for Vanessa. Nearing graduation from this university, Vanessa was panic stricken because she did not find an internship until the last possible minute.

> I struggled finding an internship. I didn't understand why to be honest with you. I applied for anything and everything. I could not get an internship anywhere. I had a good resume, like, and then [FCA] called me and then, you know, I scored that.

While Dee was seeking employment, she found the "job interviews very nerve wracking." In fact, she, "wasn't sure if I was going to get one." Initially, Dee was hired as a contractor for GM at the Milford proving grounds. Dee describes the situation as, "I actually said yes, but then the next day I said no." Dee said, "It wasn't what I wanted to do and I wouldn't have been happy." Dee was feeling pressure because she had five weeks left on her current apartment lease. She needed to find a job to know where she needed to live. Dee was called in for an interview with GM as a direct hire at the Warren Tech Center. She "was, of course, very nervous" because so much was hanging in the balance. Dee said, "They were very nice and welcoming and they were very straightforward with the questions." At the end of the interview, Dee told them, "I needed to have an answer within the next couple weeks and then I apologized for being very straightforward, but I really thought I lost my chances right there." Dee needed to know where should she live. She wondered if, "I needed to sign another year's lease or not." For Dee, "that was the scariest part. Because I did need a job."

Karen's struggles to find work began after a layoff. Unfortunately, when the economic recession hit in 2008, the automotive industry took a turn for the worse, and Karen along with many others at the time, were let go. "I did lose my job when they went bankrupt." So, after just three years, Karen lost her dream job at DiamlerChrysler as a District Manager.

> Chrysler gave me a good package [because] they let like 6000 people go, so I was able to live off what they gave me. They also gave me car. You could pick anything you wanted except a Viper or a Challenger [of course]. I had a car; I had some money that they'd given me, so I was doing OK, but it took a while to find another job.

A condition of this severance package was that she had to sign a clause that prevented her from ever returning to the company. Indeed, times were tough for anyone looking for jobs in the auto industry at that time. "I actually was getting pretty discouraged with not being able to find work during that time, [so] I went and looked at a veterinarian school. Because I was like, maybe my time with this [automotive] is done. But I never pursued it beyond looking." It took her six months to find another automotive position. Karen eventually found work as a warrantee administrator at a BMW dealership for 60% of her former pay. She was glad to finally be working again.

Overall, seeking a position was a nerve wracking ordeal for most. The issue here is the apparent lack of responses and timing of offers from employers. Employers did not respond promptly to resumes submitted. Indeed, employers need to be aware that peoples' lives do not freeze in time and unthaw when a company decides to offer a position. Some participants were already committed to another positon when the one they dreamed of called them back leaving them with the uneasy thought of "what if."

Theme 7: A Vast Majority had an Overall Positive View of Their Work Experience

I would like to preface this theme with a summary of where these women have worked in the automotive field: 11 have worked in the automotive field and eight have

worked as automotive repair technicians. Nearly all have had a positive view of these work experiences.

Brandi is an independent and accomplished hands-on automobile technician. “I started in October 2012 as an oil-change tech.” Currently, Brandi has moved up in position, she said, “I [am] a technician. I actually have my own mechanic number too.” Brandi is the go to person at work.

> Even with some of the stuff that they have come through there, they go, “Oh, I want you to do this. I don’t want the other guy to do this, because he won’t do it right.” With some of the recalls even, they’ll go, “Oh she’ll do it, you know, she can do it in fifteen minutes. This guy it’ll take him an hour to do it.”

Brandi’s conscientiousness and attention to detail at work has created job security for her. In fact, the dealership she works at currently told her, “My boss has told me I’m welcome back anytime, which is awesome, because that’s job security either way.”

Elisabeth embraced her automotive career by acquiring as much skill as possible and the certifications to display her mastery of the subject. Immediately after attending trade school in Canada, Elisabeth “decided to do another couple years of working and wrenching.” Her goal was to earn “my license as a tech first.” Elisabeth went to work at a Canadian Midas shop. While there, she said, “I worked my way up the chain from lube tech to service tech to assistant manager.” When Elisabeth told her manager at Midas that she was leaving to go to this university, she said he “was pretty upset, because he thought I was eventually going to take over his business.” In her current position, as a data analyst service engineer, she is subcontracted to Fiat Chrysler Automobiles (FCA). Elisabeth interfaces between FCA engineers and dealership technicians using a web-based service

manual. Elisabeth believes her job is important because her work improves automotive technician's ability to successfully repair vehicles. She said, "[When a change] is updated on the web-based program, other techs don't run into that problem."

When Alice was finishing her internship at Autoliv, her supervisor and manager said, "OK, we do want to bring you on full-time. We don't know how or when." Then, a vacancy in the Tensile Lab created an open position that the company filled with Alice's direct hiring. Alice admitted that the Tensile Lab "was the last thing I ever had on my mind." Now that she had to go back there and run the lab, "I had to catch on. And they were really happy that I was able to just basically take the reins on my own and get to work." Alice, "got shoved into there" and told, "you need to learn this. Figure it out." So Alice stepped up and became proficient at running the Tensile Lab.

Vanessa's work at Fiat Chrysler Automobiles (FCA) has been positive. She reports the following:

> Yeah, I've had very good experiences after [graduating from this university]. Even right now, I'm currently in a very technical role. And I'm with all guys, like normal, you know, you just kind of get used to it. I mean it's been good. I think because I have the ability to see things a little bit differently. I think it's going to help me more in like a managerial standpoint for the future, but I've had very positive [experience]. I mean every now and then you get a dealer that's an a-hole, but that [happens to] everyone, it doesn't matter if it's me or Dan next to me, you know. So nobody's really said anything rude. But I also think that because you're in a professional environment, I think that kind of helps in that no one is going to come up to you and be like, "Oh you can't do anything." But if I

was to go work in an independent shop, you know, in a small town, things might be very different.

Overall, the vast majority of women, in this study, who have worked in the automobile industry reported positive experiences. They are successful working in the automotive industry because it is their passion. They can fix cars and corporate problems with consummate ease. These women's track records speak for themselves. They are self-actualized.

Theme 8: All Participants Reported They Received Support For Their Automotive Career

All 12 participants reported that they received support for their automotive career. Support came in many different forms, such as family, the university, work, and other organizations, but the most support came from family. The sub-themes of support are brought out bellow.

Sub-theme 8.1: A vast majority indicated they received support from their families. Families provide a substantial amount of support to 10 females in my study. Here are some examples of families whom supported their female in an automotive career.

Brandi has the support of her parents for her career choice. "Oh, I definitely have support from my parents, like 100%. Especially, you know, after talking to them about the Career Fair and all that, they're excited for me."

Alice's husband is very supportive, and he encouraged her to follow through with her position after she fulfilled the requirements of the internship and was continuing to work without being hired in full-time. He would say, "You want to do this. You're going

to go for it," because Alice often "missed home and wanted to go [back to her] home [state]." Her mother, uncle and grandmother were all very supportive. Those family members said, "As long as you're happy with what you're doing, then we'll support you."

Dee's parents were "always so happy for me, no matter what I do." They are very supportive, and of course, very proud of Dee. She said, "They've always been there for me [and] my wife [Brittany], has always been there for me." This is great from Dee's perspective because her wife had to make a sacrifice for Dee. "[Brittany]'s given up the area that she loves to live, you know, to come live here in Michigan with me."

For some, it was a non-parent relative who was the most supportive family member. Melanie's uncle was very excited about her career decision. She says, "Yeah. He's like, 'When can we can go shopping for tools?' Yeah. He was really excited about it."

Vanessa's family was very supportive of her going into an automotive career. They did not give her a difficult time at all. "No. In fact, they're probably just happy I was going to school. Seriously. After all, because I was a big troublemaker." Vanessa's experience with family support came also from her uncle. She said, "I went to a NASCAR event with my uncle and got to do the ride-along and stuff like that. They're really big into NASCAR, so I kind of got introduced a little bit more into like cars and stuff like that."

Overall, parents and other family members can plant the seed of an automotive career, or support the choice of an automotive career. Families provide the background

affordances for females in automotive careers, such as the family norms that allow a female to even consider a male-dominated career.

Sub-theme 8.1.1: All participants indicated that both parents were involved in their lives during the career decision making process. As a similarity rather than a difference, all 12 participants acknowledged both parents during the interview. Regardless of whether parents were biological or step, all participants illustrated two parents involved in their lives during the career decision making process.

Sub-theme 8.1.2: A majority indicated that their father was supportive. Fathers played an important role in the female automotive career choice for seven of these participants. Growing up, girls can look up to their fathers and if the father shares his automotive interest with his daughter(s), it can lead to a career choice.

Michelle's father was supportive in a unique way. He challenged Michelle by playing a game with diagnosing broken vehicles on family vacations.

> When I was little, some of the car games, you know, the long ride games that parents make [you go on], we would listen to "Car Talk." Yeah, and we had to figure out [the car problems]. I had to figure out what was wrong with the car and try diagnosing it before the guy who just kind of wings it.

The car games continued past the family vacations. In her youth, Michelle's Dad would take her out in a customer car and have her tell him what was wrong with the vehicle. "Like, I'd have to guess what's going on in the car or by listening to the customers, I had to try figuring it out. So, it is like that little challenge, that game, kind of."

Jane has support for her career decision from family, friends, peers and instructors. She said, "Major supports? Definitely would be my family, primarily my dad,

because with that automotive aspect of it." Jane bonds with her father through automobiles. She likes to talk with him about cars and what is going on in the industry.

Karen's father has always been very supportive of her in her career choice. He went with Karen to all of the technician interviews and even wrote a letter to an automobile manufacturer on her behalf. "So my dad actually sent a complaint [letter] to Chrysler because I had gotten kicked out of the CAP program."

Overall, the fathers were supportive in actual automotive activities with their daughter. Meanwhile, most of the supportive mothers, when mentioned, were more of a background support.

Sub-theme 8.1.3: Half of the participants reported one or more parent was not supportive. Six participants reported resistance or lack of support from one or more parents. Melanie's mother was stunned with her decision to choose automotive as a career. She said, "Yeah, my mom was a little shocked. She doesn't really know much about [automotive], so she didn't know what to say about it or do about it." Melanie's dad was more neutral when it came to her career announcement. He just said okay when she broke the news of her career decision.

Elisabeth's father, was not supportive of her decision of an automotive career.

> And so when I went to my dad and said, "Hey dad, I want to become a mechanic," my dad told me no. So my dad told me, "You know, no woman should be in the shop." He didn't think it was a career [that was] right for me.

On the other hand, Elisabeth's mother was very supportive. Elisabeth's mother promoted the idea that she undertake different jobs to find a career. "[My mom] was like, 'You

don't know what you want to do. Take jobs and see which one.'" This was the deepest reported involvement of a mother in support of her daughter's career choice in this study.

Alice's parents discouraged her from going to school for automotive. Her parents would say to her, "You need to pick something that's not being a grease monkey underneath a car." Alice's father wasn't very supportive initially, "but when my dad, you know, saw what I was doing, he ended up changing his tune."

Silvia experienced family and friends, meaning well and looking out for her best interest, would tell Silvia that, "I was making a poor career choice." This was spoken at a time when the auto industry was experiencing a downturn and negative press.

Sabrina did not receive support for her automotive career decision from her immediate family. In fact, she said, "My parents were wondering what the hell I was doing."

Support from Roxanne's family grew slowly. She said, "At first my family was like you're crazy and this is like not the right way to go." Roxanne "was a little bit rebellious when I was in high school and I moved out right when I was 17." So her parents, "thought that this [automotive career choice] was a continuation of that [rebelliousness]." As time went on and Roxanne proved herself to the world, her parents are "now so proud of me and so happy." So Roxanne said, "it took them maybe like a year or two years to get used to the idea [of her automotive career choice] I would say."

Overall, some parents were awe struck while others flat out did not support their daughter's automotive career choice. The women persevered. The bright spot for some was the turning of the tide of their parent's feelings toward their career. For these parents, it was hard to see the masterpiece of a career when it was a rough stone, but once shaped

into the final product, when the women proved themselves successful, it was recognized for its greatness. In the end most parents were pleased when their daughter was happy and fulfilled in a rewarding career.

Sub-theme 8.2: A majority indicated they received support from their post-secondary institutions. Beyond family support, seven participants noted specific support they received from their post-secondary school. Dee voiced the support of the instructors at this university. She thought it "was really nice to have them go out of their way and try to help [me] look for positions." Dee continued with, "If I needed anything, I know I probably still can give them a call and ask them something."

Silvia mentions that she "had a mentor for each level of the process that I've taken to get where I am today." At community college one of her male teachers would spend "extra time if I had questions and would work one-on-one with me." When she transferred to this university, "I also clicked with a specific faculty [member], and if I was having struggles or trouble, then he would also help and support me."

Sabrina found the university somewhat supportive, she found the career fair held at the university helpful as she received her first automotive position from an on-campus interview at a university sponsored career fair. She says her advisor "was supportive during school," but that she has not had any contact with the university nor its professors since she graduated.

Another reason Karen persisted in her automotive studies was that she had a very supportive male faculty advisor. She could "download" on him about her frustrations related to the program. "My advisor was awesome, he was the CAP coordinator and I felt comfortable talking to him…If I was having a rough day, I could talk to him about

it.…he was funny and was one of the reasons why I stayed." He encouraged her to continue in automotive field.

Overall, support from higher education centered around faculty academic advisors at this university. However, support at high schools and community colleges focused more on teachers at those levels. Career fairs were also helpful, but contact from the university after graduation is lacking for some.

Sub-theme 8.3: A majority indicated they received support from work. Support at work came from coworkers and supervisors for seven of these participants. Examples of this mentoring and apprenticeship follow.

The two licensed technicians at Midas helped Elisabeth learn enough automotive experiences to pass her technician license exam. Elisabeth never "had any problems with any of the technicians." They were very helpful and supportive.

The retiring Vibration Lab engineer saw Alice's potential. After working with Alice for a while and watching her progress, he had some positive observations.

> "You're smart. You're catching on very well. You're being cautious and asking questions." He's like, "I like that. That's what someone needs to be like in a lab.

They keep asking questions, and not just say "Here, I'm going to push a button." Alice's said of her supervisor and manager, "they've been awesome. They've been super flexible with me" Alice's manager is a female. To that, Alice said, "I think that is a big thing in my opinion. Because she is a female, she understands what we go through a lot, and so she tries to cut [gender related issues] out." Alice describes her male supervisor.

> My supervisor was super happy to have me. He was really excited. He's like a very big advocate on having females work in auto. His wife works in the auto

> industry, too. I don't remember what she does exactly but, I ended up lucky in my mind that I've had, very good supervisors and managers that understand what some women actually have to go through.

Jane found a mentor in [Name], a woman who took Jane under her wing. This mentor inspires Jane to follow her career footsteps and helps Jane prepare for each new position and subsequent interview.

> She has been very inspirational for me because she's done pretty much every single position that I have. She's been at this company for ten years, and I've been here for four. Every single position I've had, she's been in [before]. And so I would like to move to where she is, as in up the ladder. She's made it pretty far up there. So she's been very inspirational. She helps me, because she knows exactly what I want, and because of what she's been doing, she walks me through it. We talk quite often just to make sure that all the goals are still there and any means or ways or anyone she can talk to help get me in that position, she does. It's been very helpful.

When Silvia started out as an apprentice automobile technician, "I was working under a more senior technician. And he kind of became my mentor throughout the rest of my two years." In Silvia's current position at Toyota, she "strives not only to better myself and better my career, but to basically help my team or my group out." Because of her drive to improve herself, the team, and her company, "My [male] assistant manager takes extra time to sit down and discuss future items and how we can make the process better."

Roxanne added, “Career-wise, I’ve always had very supportive bosses and managers. I don’t think I’ve ever had anybody who I directly reported to that wasn’t supportive.”

Karen had a good male boss at DiamlerChrysler. “I had a great boss at Chrysler. That was really good support. Honestly, a majority of men I worked with as peers have been great.” A female supervisor at Ally became a mentor to Karen and “would always sit with me before promotion interviews and she would pep talk me.”

Overall, it is important to note that in this male-dominated field, many participants shared experiences of male coworkers and supervisors, mentoring and advising. This is a positive experience that needs to spoken to every female considering an automotive career. The next theme, is unfortunately, gender bias and discrimination.

Theme 9: A Majority Reported that They Experienced Gender Bias/Discrimination

Ten participants reported gender related barriers. Some of the incidents occurred during their education while most happened at the workplace. The severity ranged from a subtler gender bias, in either attitude or atmosphere, to extremely blatant gender discrimination. The participants’ accounts of these situations are exhibited below.

The biggest barrier for Melanie is just being a female in a male-dominated career field. At the university, Melanie had to prove herself to her instructors and her peers. With that accomplished, things smoothed out for Melanie.

> I think coming in being a girl and being feminine is the biggest barrier. I’ve noticed after being here for a year and proving myself to professors and other students in my class, I gained respect. I’m not here for other reasons. I’m here for an education. This is what I want to do.

Now that she has earned respect from her instructors and classmates, Melanie feels like she is part of the family.

Brandi reported one negative experience in the automotive program. **"**Well, I guess I have had a negative. It was one of my [automotive] instructors actually. He [was] just kind of making like sexist jokes sometimes. [laughs]" Brandi continued with, "I feel like he thought that I couldn't really do it right just because I was, you know, a woman." Brandi's response to the sexist jokes was anger initially then acquiescence.

> He kind of made me mad. But at the same time, I don't really know if that's just his personality, or if he actually is being sexist? So I kind of would just laugh with him and then blow it off like it was nothing. Considering, he's the only one that's done it, I just, I mean, I really didn't take it like it was anything 'cause he was the only one.

When asked about other student's reactions when the automotive professor would say the sexist comments, Brandi said, "I mean other students definitely noticed it." The other students did not join in with the professor with their own sexist comments. In fact, Brandi said, "No. They were probably on my side more than his." In closing she said, "But that wasn't even that bad, like I, it didn't affect me at all. It didn't affect my grade really so...."

Michelle has experienced some barriers to her automotive career. It was noted earlier that the males in automotive classes would doubt her automotive knowledge until she proved herself knowledgeable. Sometimes customers would not want to talk to her at the family shop because she is female. Michelle points out that her "family" stubbornness and her ability to ignore the little let downs helps her to cope with them.

> The hard-headed stubbornness, which definitely helps sometimes being in automotive. You'll get just digs left and right, because I've gotten it. I've noticed it up front, some of the older gentlemen, they'll go straight to [Bill]. They won't even give me a second glance. Even customers on the phone, they'll automatically want to talk to Bill, the service writer. OK whatever, but I'll get treated kind of rudely. And then once I give it to him, they're totally fine. It irritates me more than anything, but I get it [sometimes] from customers. I've always grown up with the whole, be like a duck, let it roll off your back. So I, like whatever. If anything, I'll just laugh at it. Be angry for a few minutes, then just whatever.

Elisabeth describes a cultural barrier that she had to overcome. She describes her ethnicity.

> My dad is Asian, and he has a strong Asian culture where men have their place, women have their place. My mom is not. She's aboriginal, First Nation, Native American. So my mom gave me that balance between my father being the strict gender role to my mom saying do whatever you think you're good at, whatever you'll enjoy. And so when I went to my dad and said, "Hey dad, I want to become a mechanic," my dad told me no. Being at that rebellious age as I was, I did it anyways. [Laughs] So my dad told me, "You know, no woman should be in the shop, blah, blah, blah." And I was like, "I've been in the shop since I was little," you know. But he didn't think it was a career [that was] right for me, and I was gung-ho in proving him and anyone else that ever told me that a girl shouldn't be in a shop wrong.

However, when she was working independently at Midas, she experienced some gender bias. Elisabeth recalls an experience.

> I specifically remember this one German fellow, he was like 65 years old coming in with a Dodge Intrepid and he wanted an oil change. And my boss was busy in the back. I was the only one up front. So I started talking to him, and said, "What kind of a package? Are you looking for an oil change, maintenance package?" And he was like, "No, I want to talk to a man." And I'm like, "I'm more than capable of helping you." And he was like, "No, I want to talk to a man. Where's that man that's here all the time? I know he's here all the time." So my manager came up front, and he told that gentleman to leave his shop.

As for the American students, "A lot of the guys did not want to interact with me or talk to me." Elisabeth attributes this to "automotive cultural differences." She explains:

> A lot of the automotive guys [at this university] are all about diesel. I don't know much about diesel. In [western Canada], we're mostly imports, so we're the little turbo, the little pea-shooters that shoot around. That was my forte. You sit down and talk to me about a [Toyota] Supra, no problem. But all these guys are all about Ford F-350s or carbon black smoke. I didn't understand any of that. I had to Google some of that stuff. So I was learning a whole different aspect of the automotive industry, because at that point I realized OK, I spent most of my life around import guys. And now I'm rolling in with the domestic guys [who are] all about trucks, mudding, 4x4'ing. And because I didn't have an interest in that, I had no way to connect with those guys. So it was a lot harder to get along with them.

Vanessa experienced gender discrimination when she applied for a repair technician position. She gives the following account: “And when I applied for a position at a Kenworth dealer in New Jersey, they literally told me, ‘When I look at you, I see my daughter, and I can’t imagine her or you under a dump truck. I’m not comfortable with that.”

After Jane graduated, “I worked in our insurance department, where I was handling mechanical claims all day.” Jane experienced “push back” often when performing her duties. Push back is a term often used by the participants to describe resistance or obstacles from individuals or groups.

> I’ve noticed a lot of times the ones that do the push back don’t know much. So I would challenge what they were trying to say. Like, you know, “How does that make sense to you?” If they can walk me through it, then “OK, let’s have this conversation.” But it’s like, “Are you saying it’s legitimate, like I am wrong, which is possible, or is it just because it’s a girl on the phone and you’re like, “I need another person’s opinion.” Yeah, I mean I’ve had, like, service advisors say that they want to talk to a guy—not someone better or more qualified or anything. Just simply, “I want to talk to a guy.” So it happens. I will transfer the call to a [male] co-worker and tell them what’s happening and they’ll just say verbatim what I just said, and now all of a sudden it’s real or it’s the truth because a guy said it.

Roxanne came upon a barrier right after she finished her internship with Toyota and was interviewing with them for a full-time position. Roxanne describes:

> So after the internship, I had to do an interview with three folks at Toyota. And it's basically, you interview with three people and they all have to give consensus that yes, you're good, we want you in this program. So I interviewed and I had one with like more of an HR person, one with some guy who's in what's called the parts, quality, and service support department, and one with another guy who was like the head of the engines area. And I kind of felt like this guy didn't really like me to begin with. I got an impression that he felt like I shouldn't really be there. He asked me some questions, and I definitely answered one wrong. He asked me something about what happens if there's a misfire in a cylinder, take me through the steps that you would advise a technician to go through. And I think I forgot like boy, it's been a long time since I worked on a car, pressure tests? So and, you know, because I was just kind of like running it through it in my mind. And I think that was the question that kind of sealed it for him and said, "You know what? She doesn't know what she's doing, so I'm not going to recommend her for this position."

Karen experienced many gender-related obstacles during her first two years of university education. While searching for an internship as an automobile mechanic, Karen said, "I did have a service manager tell me and my dad, because he was with me for the interviews, that they just didn't feel comfortable hiring a female. They said, 'Oh, well, we don't have a locker room, we don't have a separate female tech area for you to be in, and I just think it would disturb the shop too much.' That was kinda a negative experience." This barrier meant Karen had to take the Service Floor class because could not find an internship at a Chrysler dealer, and the first Service Floor experience was full

of gender bias. Karen explained, “So then I was on the Service Floor and my first partner [male] wouldn’t let me do anything. He would only let me clean up after him.” Karen wanted to gain experience actually working on the cars and not by watching her partner, so she “told the teachers and they wouldn’t let me switch partners. They were like, ‘This is something you need to kinda work through.’ Oh, well.” When asked if this was the only situation in which she experienced gender bias at the university, Karen said:

> Yeah, I would say so. Usually, like in classes and labs, it was fine. It was more Service Floor. There were some hot heads in that group that first semester and I just didn’t stand up for myself, which I kinda regret. I shoulda been a little bit more outspoken, but I felt so out of my league.

It was during this tumultuous time that Karen felt like quitting automotive altogether. Karen pointed out when asked if she felt her kindness was taken for weakness, “I was always nice. Most of the guys that belittled me did not go past auto service.” In other words, they did not further their education beyond the associate’s degree. Karen explains how her philosophy help her get through the rough spots, “[Part of the] reason why I made it through [was] I knew that it was not every guy that was [mean], just certain people.”

Overall, the contextual influence of the bias and discrimination that some of these women experienced was plainly based on their gender. The women, who experienced these social situations did not let it ultimately affect their interest and goals. They looked at the problem as temporary and not permanent, something they could move through or work through.

Theme 10: A Vast Majority Would Choose Automotive as a Career Again

Overall, ten participants specifically noted that if they had to do it over again, they would still choose automotive as a career. Melanie would choose this path again because of the lifelong learning and the entire experience she has had. “Definitely. I love this whole experience. I love automotive because there’s always something new to learn, and you’re never going to know everything.”

Brandi would also choose automotive as a career path again.

> Because it’s, it’s a different experience for a woman. It’s fun to, you know, get along with all the guys, [laughs] be better than some of the guys actually. I guess it’s a good feeling to know that when a guy says, “Oh, you know, girls can’t do this,” I can go, “Yeah, I can [laughs].”

Michelle would definitely choose automotive again. She points out that it is not for everyone because of the gender-related issues, such as proving yourself to the men in the field and the digs that come with gender bias. For women who have the passion for automotive, this obstacle can be overcome and open up the pathways to exciting career opportunities.

> I would. I mean, it’s not for everyone. Because you do get the digs all the time. So you definitely have to have the backbone, dig your heels in to prove [yourself], because there’s a lot of instances where you have to prove everyone wrong. And there’s a lot of other opportunities where you can easily get ran over. So if you’re not prepared to get the negatives, then it’s going to be an upwards battle. So I would do it, just because I enjoy it. It’s definitely something you want to enjoy doing before pursuing it. But I definitely don’t think the automotive is for

everyone. But if you can get past all of it, enjoy it, the sky's the limit for a female in the automotive. You've just got to get through the crud.

When asked if she would choose this career path again, Elisabeth said, "Yes." Initially Elisabeth "wanted to impact people's lives right from when she was in kindergarten." She says that as an automotive engineer, she can impact people's lives, particularly the automobile technician, in designing a vehicle that is easier to repair. Elisabeth also recognizes from her experience working with customers, that complex repair procedures increased the cost of a repair. She explains that, "the number one clientele that you receive are the single mothers or the single fathers or the one-income families where they have to decide rent or their brakes, you know." Elisabeth knows that people "need your car to go to work to make money for your rent, right?" She continues with, "That's why I like what I do. I like where I am and I would choose it again, because I feel like I am impacting social, economic[al], environmental if I can."

When asked if she would choose automotive as a career, Alice said, "Yeah. It's fun. It's, it's different. I mean I love the work that I do." She says there are some "days where I'm just like, 'Oh I have to go back to work?' And there's days where like 'Oh! I get to go back to work.'" Alice says, "I would definitely pick it all again."

Jane, when asked if she would choose the automotive career path again, said, "I would still stay in it because it's my passion. It is definitely something that I find enjoying. It's also another way of bonding with my father, and keeping up with the automotive industry."

When asked of she would choose and automotive career again, Silvia said, "Yes." The main reason is, as Silvia says, "I'm very happy with my career. I think that I've been

able to accomplish a lot in the short time that I've been with [Toyota]. Silvia believes that she is employed at "one of the best companies in the world to work for," which significantly influences why she is so happy. Silvia believes that there is incredible "technology that's growing in the auto industry," and it's an astoundingly "uplifting experience to be a part of that movement."

When asked if she would choose this path again, Roxanne said, "Yes, I would. Every single thing that I've done has been incredibly interesting and made me grow as a person." Roxanne points to the future and said, "What is cool about the automotive industry is that it is so exciting [with] all the changes, like driverless cars and all the technology surrounding that, and the hydrogen fuel cell vehicles.

Roxanne believes the automotive industry is diverse. She said, "You can get a very well-rounded profile." No one is stuck in one spot Roxanne explains, "You don't have to be just a technician. You don't have to be just an engineer or anything, you know." In a large company like Toyota, "there's a lot of movement and a lot of opportunities if you want to go internationally, if you want to travel. So absolutely."

Karen said, "Yes. I don't regret my choice. There were times where I did, but overall it's been rewarding. I think going through what I went through has helped me get over personal issue of being introverted and kinda being more low self-esteem is how I would put it. I meet some great people. I met a future partner."

When asked if she would choose this path again, Dee said, "I definitely would." Dee wished she "would have stumbled upon this [program] like right out of high school or even in high school. She said, "I didn't really know how vehicles were put together or anything like that or what it actually took." Dee had thought, engineering was great. It put

her into the position that she has currently, but "I didn't have to do exactly automotive engineering." She could have done product design engineering, CAD or something along those lines. Her pathway to being a designer "could have been a little different." Dee looks back and said, "I think the first step would have been knowing this information in high school." She thinks recruiting would have helped her choose her career sooner. Dee articulated that she would choose this path again, but it is important to note that the path she took led her to become a designer. Once she became aware that she enjoyed designing, she did imply that she would have liked to have taken a shortcut to becoming a designer and not necessarily the long route that she took.

Vanessa tells a different story as her answer was both a no and a yes. Vanessa would not choose the technical side of automotive, since she believes the engineering technology degree will not take her career as far as she would like to go. As for the yes, she would choose to work for an automotive company, but with a business degree instead. Vanessa still would be a vehicle enthusiast in her business role, and teach herself whatever technical things she wanted to know. She likes working on cars as a hobby, not as her full-time job.

> I would go to school for something else, whether it was finance or accounting or something. But I would take my interests and use that as a bit of a motivator and kind of compass for positions. So, if was in finance or business or something, I could work for an automotive company, because that's my passion. But I would have a better, more well-rounded educational background.

Vanessa gives an example of one of her friends, who is a Mustang enthusiast, has a business degree, and works for an automotive company in marketing.

> One of my girlfriends works for Roush Performance. She's in marketing. She has a huge Mustang network from all her car shows. I mean she's a huge, huge, huge enthusiast. And she works for an automotive company. It's not that I don't like the technical, I love the technical stuff. And I love the education. I just feel that I could have done that on my own.

On the other hand, one participant, Sabrina, had such a negative experience in the automotive industry, that she left in the middle of her career to go back to graduate school for something totally different than automotive. Her career experiences are detailed in her profile. She notes she would not choose automotive as a career path again. She says she has received "no benefit" from working in the industry. Sabrina admits to learning "a lot of good information" because she enjoys learning, "but it hasn't gotten me anywhere." She believes that "all that would happen if I stayed in the industry is that I would have like entry-level/lower-level professional jobs for the rest of my life." Sabrina says, "there's just no personal fulfillment from it. It's very difficult to get promoted in the automotive industry as a female." She caps off the interview by saying, "Yeah, having a vagina's unfortunate [in the automotive industry]."

Overall, a vast majority of these women would not change their actions. They are still fixed on their original career goal of working in the automotive industry.

Narrative Theme Summary

This chapter detailed ten themes that distilled from the 12 female participants interviewed in this study. Table 2 offers a summary list of all themes and sub-themes, and the participants to which each applied.

Primarily, it was disclosed that the participants had varying background affordances. Almost all, indicated an external factor influenced them to choose an automotive career however, a majority of the influencers were male family members with half reporting a father or step-father influenced them. A bulk of the participants considered other career paths prior to ultimately choosing automotive. Once automotive was chosen, many changed major within automotive. There were many reports of participants having to prove to others their knowledge of and commitment to their chosen automotive career. Because automotive is a male-dominated field, many participants said they were the only female in their automotive classes or at their work. Some had difficulty with interviewing while seeking work, but a vast majority reported an overall positive view of their work experience. All participants said they received support from mostly family, particularly fathers. Conversely, there were many who said at least one or more of their parents were not supportive. There were accounts of support from faculty advisors at the university and support from people and supervisors in the workplace. Many experienced gender bias and/or discrimination, but a vast majority said they would choose this career path again.

In the next chapter, I will discuss the findings in relation to the conceptual framework, recommend future research, and the implications to higher education.

Table 2

Major Themes and Sub-themes

Themes and Sub-themes	Melanie	Brandi	Michele	Elisabeth	Alice	Vanessa	Dee	Jane	Silvia	Sabrina	Roxanne	Karen
1. Varying demographic backgrounds	X	X	X	x	X	X	X	X	X	X	X	X
1.1 Out-of-state student	X			X	X	X	X	X			X	X
1.2 Transfer student				X	X	X	X	X	X	X	X	
1.3 Prior formal automotive education	X	X		X		X	X	X	X		X	
1.4 At least one parent in STEM career	X		X	X	X		X	X	X		X	X
1.5 Automotive Technology major at this University	AET	AET	AM	AET	AET	AET	AET	AM	AET	AM	AET	AM
1.6 Internship/related automotive experience		X	X	X	X	X	X	X	X	X	X	X
2. External factor influenced automotive career decision	X	X	X	X	X	X	X	X	X	X	X	
2.1 Family member influenced		X	X	X		X	X	X			X	
2.2 Father or step-father influenced		X	X	X			X	X			X	
3. Considered another career path first	X	X	X	X	X		X			X		X
3.1 Changed path within automotive			X	X	X	X	X	X	X	X	X	X
4. Had to prove knowledge of and commitment to automotive	X	X	X	X				X	X	X	X	X

Table 2 – continued

Themes and Sub-themes	Melanie	Brandi	Michele	Elisabeth	Alice	Vanessa	Dee	Jane	Silvia	Sabrina	Roxanne	Karen
5. Only female in class or the workplace			X		X		X	X	X	X	X	X
6. Difficulty with internship job interview				X	X	X	X		X		X	X
7. Positive view of work experience		X	X	X	X	X	X	X	X		X	X
8. Received support for their automotive career	X	X	X	X	X	X	X	X	X	X	X	X
8.1 Received support from family	X	X	X	X	X	X	X	X			X	X
8.1.1. Both parents involved in decision-making process	X	X	X	X	X	X	X	X	X	X	X	X
8.1.2. Father supported	X	X	X			X	X	X				X
8.1.3. One or more parent *not* supportive	X			X	X				X	X	X	
8.2 Support from post-secondary school	X	X			X		X		X	X		X
8.3 Support from work				X	X			X	X	X	X	X
9. Experienced gender bias/discrimination	X	X	X	X		X		X	X	X	X	X
10. Would choose automotive career again	X	X	X	X	X	X	X	X	X		X	X

Note: AET = Automotive Engineering Technology; AM = Automotive Management

CHAPTER VI

DISCUSSION AND RECOMMENDATIONS

This final chapter offers an analysis of results for each of the three research questions. In addition, the relationship of results to existing studies is explained and suggestions for future research are given.

Analysis of Research Questions

Research Question 1

My first research question centered around exploring what the female automotive students' experiences were like before college and discovering who or what influenced them to choose automotive as a career.

To consider this, let us look at what is known from Social Cognitive Career Theory (SCCT). SCCT (Lent et al., 1994) takes into consideration inputs to career choice, such as demographics including being female, which funnel into the participant's learning experiences. Previous learning experiences can give an individual self-efficacy (belief you can or cannot do it) and outcome expectations (what will happen if you do it). Having positive STEM learning experiences can directly impact an individual's self-efficacy (belief you can do STEM) and outcome expectations (what grades do you expect in STEM classes). The data showed that the women in my study had diverse background affordances (Theme 1). In fact, a majority were out-of-state students (Sub-theme 1.1), and a majority were transfer students (Sub-theme 1.2). Because a majority were transfer students, many had some form of formal automotive education prior to this university (Sub-theme 1.3). The participants reported going to high school auto shop, and/or trade schools and/or community colleges for formal automotive training.

As for their reasons for choosing automotive, we need to look at their families. In (Sub-theme 1.4) I found that a majority of participants had a parent in a STEM career. This included many in the medical fields, a chemistry teacher, and multiple engineers. Contrary to what might seem logical, a parent in a STEM career did not automatically lead to support for the participant's choice of automotive as a career. As a matter of fact, some of the loudest objections to an automotive career came from parents working in STEM fields (Sub-theme 8.1.3). Despite some reservation to their career choice, all participants reported both parents and step-parents being involved in their lives during the career decision making process (Sub-theme 8.1.1).

The participants also had positive automotive-related learning experiences while in their formative years (Theme 2). As we know from chapter II, the NCES (2000) identified the peak for girls to like science is 4th grade, and from there it begins its descent due to a shift from positive to negative learning experiences in STEM subjects. This is the beginning of what is known as the "leaky pipeline" throughout the pathway to a STEM career (NSF, 2007). Because a vast majority of the women in my study had positive STEM experiences during this common leaky pipeline timeframe from family influence (Sub-theme 2.1), influence from friends, or some life event that sparked enthusiasm for an automotive career, this may explain why these women persisted in their automotive STEM career. Some of these STEM experiences came from sharing in their father's passion for automotive, whereby I found that half of the participants reported working on cars with their father or step father or sharing in their father's automotive passion in some way (Sub-theme 2.2). However, it was not always clear from the beginning that automotive was their career path, in that I found that a majority of

participants tried other career paths before settling in on the automotive career path (Theme 3).

Research Question 2

My second research question explored the participants' experiences during their university studies and what helped them to persist in their automotive-related major. I found that a majority of participants chose automotive engineering technology out of the three degree programs offered at this university (Sub-theme 1.5), and while attending this university, a majority of participants performed an automotive internship type experience (Sub-theme 1.6). For some, they worked in their family auto repair facility, others participated in a formal internship course for credit at this university. I found that a vast majority of the participants changed their majors within automotive (Sub-theme 3.1), with some changing from automotive service (auto mechanics) to a bachelor's degree, or someone in a bachelor's degree switching to another automotive bachelor's degree.

I also found that the participants had to prove their knowledge of and commitment to automotive (Theme 4). At this university, it meant fending off challenges to their technical knowledge as well as being offered help when they did not need any. Also, a majority of the participants reported being the only female in class or in the workplace (Theme 5). Though most became "used to it," some felt isolated or that they stuck out like a sore thumb. On a positive note, a majority described receiving support from their post-secondary schools (Sub-theme 8.2). The various forms were instructor and academic advisors acting in the best interests of these women. In some cases, the term mentor came up revealing the impact that such instructors and advisors had on these women. With

most of their post-secondary faculty and staff members being male, it bears testament to the progressive thinking and attitudes of these males.

Research Question 3

My third research question examined that given these female automotive professionals' experiences after graduation, while in the workforce, and based on their total experience, whether these women would choose an automotive career again.

I found that for the women who secured an internship, a majority of them reported difficulty with interviews (Theme 6). This theme mostly came from the length of response time from employers, in that many participants pointed out that their plans after graduation hinged upon receiving confirmation or rejection from employers for which they applied. Some participants reported complaints of employers not responding to applicants, but such difficulty did not rise to the level of overt gender bias/discrimination. On the other hand, there were two reports of outright gender bias during an interview and a report of a heavily veiled gender bias during an interview.

Overall, I found in that a vast majority of participants viewed their work experiences in the automotive field as positive (Theme 7). Given that a majority of participants experienced some gender bias/discrimination (Theme 9), this speaks volumes to the resilience and positive attitudes of these women. I found that these women are very much "gearheads;" automotive enthusiasts with a dedication to their passion. I can see why employers seek these women out to work in their companies. They solve problems and do not give up. They keep going regardless of condition because at their core is a clear career focus.

All the participants indicated that they received support for their automotive career (Theme 8). For a vast majority, this came in the form of support from their families (Sub-theme 8.1). Interestingly, in this study of females in a male dominated industry, a majority of the women reported support from their fathers (Sub-theme 8.1.2). This shows the strength of the father-daughter bond and also that these father-aged males are progressive in their views of the modern work environment. Nevertheless, not every family member was supportive of the participants' automotive career choice whereby, half of the women reported at least one family member not supporting their career choice (Sub-theme 8.1.3). This did not discourage these women and in fact, some parents came around to being supporters once they witnessed the success of their daughters.

A majority of these women also received support from their workplace (Sub-theme 8.3). The support was from both males and females and from co-workers and supervisors, and in many cases came in the form of mentoring. On the negative side, a majority reported overt gender bias and discrimination (Theme 9), and most of the reports happened in the workplace. Many of these incidents in the workplace were associated with the repair side of the business. There were reports of this occurring in the professional ranks, but in all but one case it was associated with a repair technician contacting a call center. There appears to be more ignorance at the lower education levels of this career field. This could be why the women who experienced this in the workplace continued their education beyond the two-year associate's degree/trade school certificate in auto mechanics. It is important at this time to note that all of the women in my study earned or are pursuing a bachelor's degree. This moves them away from a majority of the bias and discrimination.

The good news is that a vast majority would choose an automotive career again citing the ever-changing automotive industry as an opportunity to learn new things (Theme 10). Once again, this reveals the resilience and dedication to their career choice.

Relationship of Results to Existing Studies

Self-Efficacy

Bandura (1997) described "perceived" self-efficacy as "a judgment of one's capability to organize and execute given types of performances, whereas an outcome expectation is a judgment of the likely consequence such performances will produce" (p. 21). In other words, self-efficacy is the belief you can do it, and outcome expectations are what you think will happen if you do.

In his Social Cognitive Theory (the forerunner to SCCT), Bandura identified four main sources of input that help develop self-efficacy: enactive mastery experiences, vicarious (observational) experiences, social persuasions and physiological, and psychological states. Enactive mastery experiences are situations where the learner engages in the activity in a realistic manner, such as those found in laboratory activities, internship experiences. I found one of the major contributors to these 12 women choosing automotive was an enactive mastery experience of working on automobiles with family members (Sub-theme 2.1), in particular, fathers (Sub-theme 2.2). In other words, these participants worked on cars alongside family members strengthening their mechanical aptitude. It is interesting to note that Van Dinther et al. (2011) found that of the four main sources inputs, enactive mastery experiences are the most powerful in creating positive self-efficacy, which adds to the explanation of why these women persisted. In this vein, Schaub and Tokar's (2005) study found that personality indirectly and directly relates to

some of the RIASEC vocational interest themes. They also confirmed the SCCT theory assertion that relevant occupational learning experiences positively shape self-efficacy and outcome expectations. This means that the enactive mastery experiences, such as internships, mentoring and laboratory activities, have positive impact on career choice.

Vicarious (observational) experiences are settings where the learner watches others (novices watch masters) as they navigate their lived experience. Importantly, watching someone fail or succeed can influence self-efficacy negatively or positively relative to that task or experience. This effect is even greater if the learner identifies with the person they are observing, such as someone of the same gender (Bandura, 1986). I found this both true and false in my study. There were some women in my study who were introduced by their family members and friends to automotive, whereby they initially watched as their family and friends raced cars or worked on cars as their vicarious experience. A few even worked as a technician apprentice under a master technician such as Silvia, Elisabeth, Michelle and Brandi. However, they identified with their male friends and male family members even though they were not the same gender (Theme 2, Sub-theme 2.1, & Sub-theme 2.2).

In Chapter II, the literature stated that social persuasions are the encouragement or discouragement received from others when attempting to do something. This positive or negative persuasion can come from individuals or from society that says, for example, women have certain career paths (teaching and not engineering) that are socially acceptable. There were examples of negative persuasion in my study (Theme 9). There was Elisabeth's father who, "has a strong Asian culture where men have their place, women have their place." He said to Elisabeth, "You know; no woman should be in the

shop." In this, Elisabeth's negative persuasion came from both an individual and from cultural norms (society). Alice had both parents who said, "You need to pick something that's not being a grease monkey underneath a car," when she told them she wanted to go to school for automotive (Sub-theme 8.1.3).

Lastly, physiological and psychological states influence self-efficacy, such as test anxiety or nervousness surrounding a task or situation. Individuals with low self-efficacy tend to connect these states with their perceived lack of ability and avoid situations where this occurs. Others with higher self-efficacy, however, minimize the influence these states have on their continuing through the experience and continuing on to other similar experiences. Eight participants mentioned being the only female in class or at a workplace (Theme 5). Many of them mentioned this made them feel like "a sore thumb" or as Michelle put it, "nervous." I believe the women in my study had high self-efficacy because they never quit because of their ability to work past the nervousness of being the only female in a school or workplace.

Schaub and Tokar's (2005) study confirmed the SCCT theory assertion that relevant occupational learning experiences positively shape self-efficacy and outcome expectations. This means that experiences, such as working on cars with others, internships and laboratory activities, have positive impact on career choice. The data from this study confirmed this with fathers working on cars with their daughters (Sub-theme 2.2). The students all experienced automotive classes that have a laboratory component, such as the service floor, which is more reinforcement of career choice. It is important to point out that 11 of the participants worked in an automotive capacity (Sub-

theme 1.6), furthering reinforcement of career choice and supporting the position of Schaub and Tokar.

Later, Williams and Subich (2006) investigated whether gender differences in learning experiences are consistent with gender differences in career self-efficacy and outcome expectations, which ultimately lead to career choice. They separated the data by gender using Holland's (1997) RIASEC vocational interest themes. Indeed, they found that women indicated many fewer learning experiences in the Realistic and Investigative codes, and that men had fewer Social experiences. This suggests that the learning experiences of college students do shape the career interests that lead them to traditionally male or traditionally female careers. In my study, the learning experiences of all the participants during their time at this university did not sway them to leave automotive.

Inda et al. (2013) tested SCCT's ability to predict students' interests and choice of major with male and female sophomore engineering college students. They found the SCCT model accurately predicted the interest level of engineering and technology activities and the participant's level of academic persistence (action) regardless of gender. A vast majority of the participants in my study performed an internship type experience (Sub-theme 1.6), which was a technical activity. They all are either continuing or have completed their education in automotive which indicates academic persistence.

Again, for both genders, Inda et al. (2013) furthermore found that the participants' outcome expectations influenced engineering interests and academic goals. Additionally, women were less interested in STEM activities and academics and had less confidence in successful completion of their engineering degree than men. In my study, I did not find

any evidence to support this claim. They also found that teacher support increased women's self-efficacy and outcome expectations. In my study, a majority of participants indicated they received support from high schools, colleges and this university (Sub-theme 8.2). Support came from mostly from faculty academic advisors at this university. However, participants reported that teachers also supported them at high schools and community colleges.

One way to encourage women who are in a male-dominated field, such as STEM, is to create student organizations at the university for women. This helps with retention, motivation, networking, and discovering role models (Sax, 2008; Seymour & Hewitt, 1997). Additionally, Buday et al. (2012) found that, for women, social support directly contributed to the participants' belief of themselves in a future STEM career. Silvia's friends at post-secondary schools supported her academic interest by studying with her in study groups. Both Melanie and Karen joined sororities that encouraged them to study as part of the requirement of being a member of the group.

Inda et al.'s (2013) study also found that for women, family was reported as a barrier, but peers supported their academic goals. My study findings agreed, in that half of the participants reported one or more parent was not supportive (Sub-theme 8.1.3), and a majority had at least one parent in a STEM career, but they are not always the influencer (Sub-theme 1.4). A good example of this was Alice's father who is an engineer for a phone company, but he discouraged her from choosing an automotive career. I did find support for peers supporting the participant's goals, though it did not rise to the level of a theme.

Furthermore, Inda et al. (2013) found in their study that the barrier caused by families could be because the women were fighting against traditional gender roles with their families, while those who stayed were able to find support from other women in STEM. In my study, for example, Elisabeth described a cultural barrier from her father that she had to overcome because he had strong belief in gender roles. He believed strongly that women did not belong in an automotive repair facility (Sub-theme 8.1.3).

Harsh et al. (2012), in their longitudinal study of practicing scientists and graduate students participating in Undergraduate Research Experiences (UREs), found that UREs provide positive experiences that "mediate intrinsic gender-based filters" (p. 1368) and act as a gateway for women entering STEM graduate school programs. Additionally, women reported that these experiences positively affected their self-efficacy, interest in science, and enthusiasm for practicing authentic research. Because of this opportunity to perform hands-on research, women were able to effectively dispel lack of confidence, reduce their undergraduate attrition rates and become more likely to pursue post-graduate education in a STEM field. This confirms an earlier study by the NSF (1989) that found UREs are effective at attracting undergraduate women to STEM graduate programs. Even though the participants in my study did not perform research, they did perform many STEM-related hands-on activities as part of their secondary and post-secondary automotive education (Sub-theme 1.3). The participants perform STEM-related hands-on activities that included laboratory endeavors related to their automotive or STEM classes and industry internships as found in theme (Sub-theme 1.6). They are similar to Harsh et al.'s (2012) study in that they all are persisting or did persist in their STEM (automotive)

education with three continuing students and nine graduates of the automotive programs at this university.

Strenta et al.'s (1994) study of 5,320 undergraduate students investigated the causes of undergraduate student interest in and attrition rates for science and engineering. They found that even with the same grades as men, women in science at highly selective universities lacked confidence in their ability and were more depressed with regard to their academic progress, in spite of the fact that the women were more conscientious about their homework. In my study, Sabrina studied harder than her male counterparts and surpassed them in knowledge. Others, such as Karen and Melanie, joined sororities that emphasized grades and enforced study hours. Participants also had to prove their knowledge of, and commitment to, automotive (Theme 4). This could easily discourage a person who was not fully committed to a STEM automotive career. However, these women were very dedicated to their choice of an automotive career based on what a majority had to overcome just to enter and then to continue in the career.

Interestingly, Strenta et al.'s (1994) study found women's interest in science to be more influenced by people, both in their lives and by how science can help them. In my study, Elisabeth specifically stated that she wanted to improve improve people's lives through her work in automotive. Silvia said that she went from "fixing one car at a time to millions at a time," speaking to the effect she now has on improving the world through her automotive position. This realization could be capitalized on through early mentoring experiences at the university and the workplace (Sub-themes 8.2 and 8.3) as Heilbronner (2013) discussed.

Self-efficacy also plays a role in the reasons why women leave STEM careers, and another study looks to explain why. In a quantitative study of two waves of engineering students, Cech et al. (2011) looked at three common explanations of why women leave male-dominated professions: math self-assessment, future family plans, and professional role confidence. In my study, I did not have findings related to math self-assessment or future family plans. They did find, however, that professional role confidence was a significant factor for women's persistence in engineering, which led to more women leaving engineering than men, creating "gender segregation" (p. 656) in the profession. This was found in my study whereby a majority of the participants had to prove to others their knowledge of, and commitment to, automotive (Theme 4). The participants reported occurrences both during their education and while working. This attacks their "expertise and career-fit confidence," the two sub-categories into which Cech et al. broke down professional role confidence.

In my study, just one participant, Sabrina, indicated that she did not believe she fit in to the the automotive industry after years of attacks of her expertise and career-fit confidence. All of the other participants experienced these attacks and continued in the pursuit of their automotive career. This shows they have a great amount of self-efficacy because the continue with very low response to those who wish to discourage them from their career path. This "early professional role confidence predicted measurable persistence three years later" confirmation of this comes from Cech et al.'s (2011) study and my study because many participants who experienced attacks on their professional role confidence well over three years prior to my research interviews (Theme 4). Cech et al. in addition, suggested programs to develop student's professional role confidence with

real-world career experiences similar to what was found by Harsh et al. (2012), in their study of UREs. Once again, my study participants revealed accounts of real-world career experiences, such as internships, in automotive (Sub-theme 1.6). Because a majority of my participants had these experiences and persisted in an automotive career, it is reasonable to conclude that their professional role confidence and level of behavioral persistence is strong. Lastly, Cech et al. also found that when women changed majors from engineering, they were twice as likely as men to choose another STEM major. My findings agree with Cech et al., in that, I found a vast majority changed their major within automotive (Sub-theme 3.1), and in doing so, did not leave STEM.

Smith et al. (2013) in their study on belonging uncertainty, which they described as, "when one feels unsure of his or her ability to 'fit in' within a given academic arena" (p. 131) found that women used perceptions of effort to determine their personal "fit" in a STEM field. In a similar vein, Seymour and Hewitt's (1997) study found lack of belonging often emerged as "less assertiveness" to ask for help, less "inner strength" to deal with academic obstacles and "set-backs," and reliance on "others" for reassurance (p. 242). Perceptions of effort were discussed by some of the participants in my study. Elisabeth felt that the degree she earned at this university was more difficult than the male students described. Couple this with the majority of participants having to prove to others their knowledge of, and commitment to, automotive, which made the participants feel a lack of belonging (Theme 4). Furthermore, a majority of the participants reported being the only female in class or in the workplace, made some of the participants feel isolated (Theme 5), which would contribute to belonging uncertainty. One of the participants, Karen, did report being less assertive during the times when she was bullied

by the class clown and on the service area. However, most of the participants typically dealt with the setbacks and obstacles.

Heilbronner (2013), in her investigation of factors that influenced college graduates to choose or not choose a STEM major, found that women reported lower self-efficacy in relation to STEM in college than did the men in the study. As noted by other researchers, fewer women choose an undergraduate STEM major. For both genders, interest was the most influential reason indicated for choosing a STEM career. As for leaving STEM, more women in their 30's cited leaving STEM career because of inflexible hours and family responsibilities. My study did not compare genders or find that women left automotive because of inflexible hours or family responsibilities. However, I did find that interest was a very strong factor in why the participants in my study chose automotive. A vast majority of the participants indicated an external factor influenced them to choose automotive (Theme 2). Once again, some of these factors were: family influence, influence from friends, or some life event that sparked an enthusiastic interest in an automotive career. Seymour and Hewitt (1997) found that regardless of influencer, women were found to have chosen a STEM career because of the "active influence" (p. 77) of someone significant to them twice as often as men (Theme 2).

Another aspect that could keep a woman in a non-traditional career is mindset. Dweck (2006), in her book about mindset, describes two mindsets: a fixed mindset and a growth mindset. In her description of a fixed mindset, individuals are born with a level of intelligence that is fixed and cannot be increased. On the other hand, a growth mindset individual believes her traits such as intelligence in a subject or ability can increase and

improve with effort. Individuals with a growth mindset, such as the participants in my study chose a male–dominated career; one which required them to work hard to prove themselves and to continue learning. Melanie enjoyed the lifelong learning and even said, "I love automotive because there's always something new to learn, and you're never going to know everything." Roxanne pointed to the future and said, "What is cool about the automotive industry is that it is so exciting [with] all the changes, like driverless cars and all the technology surrounding that, and the hydrogen fuel cell vehicles." With these statements, the women in my study are attracted to the ever evolving automotive industry. They are very much growth mindset type of people.

In a similar vein, Duckworth and Eskrels-Winkler (2013) describes grit as the hard work and persistence necessary to accomplish a worthwhile goal. A "gritty" individual would be operating in Dweck (2006) growth mindset believing they can improve their abilities with effort (grit). From her research on grit, Duckworth and Eskrels-Winkler found that talent does not predict high levels of grit. In fact, she found it rare for a person to be both talented and gritty and that highly successful individuals often achieved their status by grit and not natural talent. I found some very "gritty" participants in my study, in that a majority had to prove to others their knowledge of and commitment to automotive (Theme 4). Having to go through the men doubting your knowledge and motives for your career choice would drive most people away, but not these women. A majority of the participants reported being the only female in the class or in the workplace (Theme 5), and this made some participants nervous, but they became used to it and paid it no mind. Very gritty indeed. A majority reported that they experienced gender bias and/or discrimination (Theme 9). This occurred during college and in the

workplace. Only one person ultimately left the automotive industry for this reason. The true revelation of grit for these women was found in that a vast majority would choose automotive as a career again (Theme 10). This means that in spite of all the negative experiences, they would do it all over again.

Gender Socialization and Career Choice

Traditional gender roles make it more difficult for women to choose a STEM career and persist in it. Sax (2008) found in her study of college students that women still gravitate toward gender stereotypical careers that have low pay. This runs counter to their reported concerns of financial freedom from getting a "good job" and indicates gender socialization is alive and well among certain career choices (p. 39). Yet in my study, Melanie said, "I was between automotive and dance, and you don't make money dancing." This indicates Melanie was conscious of career pay. Let us examine some of these factors.

Family influence. The Seymour and Hewitt (1997) study found that family pressure is strong for young women. Many women often felt duty-bound to an engineering major, particularly when their father was an engineer. This was true of Jane. Her father was an engineer and she wanted to go into automotive engineering like her father. The coursework became difficult, so she changed to automotive management. For Elisabeth, she had to overcome the strong gender role that her father tried to instill on her (Sub-theme 8.1.3). Oddly enough, her father introduced and taught Elisabeth automotive mechanics.

Seymour and Hewitt's (1997) study also identified "some critical qualitative differences" concerning the way family influenced a young person to choose a career. On

the one hand, family pressures can force a career that does not fit the individual. Alice experienced this when her parents blocked her from going into automotive. She of course earned an associate's in criminal justice, but eventually landed at this university's automotive engineering technology program after convincing her parents it was what she wanted for herself.

On the other hand, Seymour and Hewitt's (1997) study found that families that nurtured career choice based on personality, aptitude and inclination had seven consistent themes which were also present in my study. First, such families play at science, math or technical problem-solving with their children. In my study, Michelle's father and the car diagnosis games they played, are a great example of this as it relates to automotive. Second, such families include their children in a hands-on way with technical domestic tasks, and in aspects of their own work. Many of my participants' fathers shared their passion for automotive with their daughters and that got them hooked, which indicated family and specifically fathers influenced them to choose automotive as a career (Sub-theme 2.1 and Sub-theme 2.2). Third, such families discuss what they do at work, what part their work plays in the world and what they like about it. In my study, Jane's father being an engineer influenced Jane to choose automotive engineering technology. Fourth, such families recognize and foster their children's interests and abilities in school without bias or pressure toward particular subjects or careers, such as Alice's parents, who in my study, pressured her to pursue criminal justice (Sub-theme 8.1.3). Indeed, there were many parents who encouraged their daughter who was pursuing a career that was different than theirs (Sub-theme 8.1). Interestingly, I found that all participants in my study indicated that both parents were involved in their lives during the career decision

making process (Sub-theme 8.1.1). Fifth, Seymour and Hewitt's work found families which nurtured career choice offer practical help with conceptual hurdles and emotional support through academic difficulties. I found that a vast majority of my participants indicated they received support from their families in relation to their career choice (Sub-theme 8.1). Sixth, such families encourage their children to develop realistic aspirations, and (for girls especially) not to under-estimate their potential or options. In my study, Roxanne's parents thinking automotive was the wrong way to go. Finally, such families offer themselves as a source of information and advice, and give plenty of opportunities to talk out the options, clarifying the pros and cons of particular majors or career paths even-handedly. In my study, many family members were supportive in similar ways (Sub-theme 8.1).

Li and Kerpelman (2007) found in their study of the career aspirations of 304 female undergraduates that, even though young women believed they make their own career choices, both mothers and fathers influenced their daughter's career aspirations, and this could include pursuing a non-traditional career. I found this to be true with (Sub-theme 8.1.1, 2.1 and 2.2). On the other end of the spectrum, Bieri et al. (2013) found that parents in their study had stimulated their child's learning, which appeared to create the desire in their children to want to gain knowledge and explore STEM subjects. The study went on to describe the parents as emotionally supportive, and students reported that this parental support was one of the reasons they chose STEM as a major. This suggests that parental support increased the student self-efficacy related to math and science, and created a strong and clear sense of identity as a scientist, which helped them choose and persist in STEM fields. I found this to be true in my study, where family members and in

particular, fathers were supportive to the level that influenced the participants' decision to choose automotive as a career (Sub-theme 2.1, 2.2, and 8.1).

Teachers and other role models. Role models are individuals whose lived experiences somehow influence another individual, they also have characteristics that stand out to a person seeking a role model. This identifiable characteristic could be anything, such as gender, age or race (Bandura, 1986) or in the case of my study, family members, including fathers and step-fathers (Sub-theme 2.1 and 2.2). When women and non-traditional careers are considered together, the role model is increasingly important because the lack of female role models is a barrier to women entering STEM (Nauta et al., 1998). I found this to be true as there were only a handful of participants that reported no STEM role models. Such was the case with Karen, who could not tie her intrinsic interest in cars to any person or life event. One may argue that her father was in STEM, but Karen said he had "no interests in cars." The other, was Sabrina who did not have any role model and choose automotive based on her experience repairing lawn mowers at a summer job.

Owing to the lack of female role models in STEM, the participants in my study had male role models that encouraged them to pursue automotive. They had friends influence them, as the case was with Silvia, or an uncle such as Vanessa, or fathers and step-fathers as was reported by Jane, Roxanne, Dee, Michelle, Brandi and Elisabeth. Support outside of their core families is what Bieri et al. (2013) found, and Melanie, Silvia, and Vanessa confirm this finding because they all had friends as supportive role models. These important role models served in some capacity to provide information or support to the women during the decision process to choose and persist in STEM. What I

found in relation to role models supports the findings of Buck et al. (2008), that girls identify a role model as someone with whom they can have a personal connection such as parents, friends or relatives.

Heilbronner (2013) found that mentors, high school teachers and counselors, college professors and advisors and other, typically older students help in the recruitment and retention of women in STEM. At this university, many participants received mentoring support during their education from a professor, academic advisor, or student organizations such as sororities as was the case with Karen and Melanie (Sub-theme 8.2). Indeed, Lee (2002), found that for women, emotionally satisfying relationships in the context of SME increased the likelihood to see themselves in an SME career. They felt the SME environment was friendlier based on positive relationships with peers and instructors. There were participants who reported studying with their peers such as Melanie and Silvia.

Importantly, enthusiastic STEM teachers help attract and retain female STEM students. In a 2013 interview, Cheryan, found that female STEM role models can be male. They help break the stereotype by talking about, being, or doing things that are outside the stereotypical mold. For Melanie, her high school auto shop teacher encouraged her to pursue automotive as a career by creating an environment that allowed Melanie to perform in automotive repair competitions. This is a great supporting example of what Seymour and Hewitt (1997) found, that high school STEM teachers were also identified as critical to the influence of student choice of a STEM major.

My findings, as they relate to role models, agree with Quimby and DeSantis (2006), as they summed up the importance of role models with their findings that the

presence of a role model increased the likelihood of career choice. My findings, also parallel social cognitive theory's conclusions of the interplay among role models, self-efficacy and career choice (Bandura, 1999, 2000), as well as the suggestion of a direct relationship between career choice and the presence of role models.

Zhu (2013) observed the smiles of the participants and the equating of fun with engineering. By being paid to solve puzzles, the participants learn what engineers do for a living. Solving puzzles is fun and it attracts girls into engineering. This was true for Melanie because she found success in automotive repair competitions in high school and for Michelle who's father turned the diagnosing of vehicles into a game. The other important element Zhu found is the support needed to choose a STEM career, which girls do not often receive from family or other adults. I found lack of parental support in my study however, the women persisted in their STEM career choice. Alice, Silvia, Sabrina, and Elisabeth lacked the support of their parents for their career choice, but persisted in automotive. Roxanne and Melanie also lacked parental support initially for their career choice, but experienced a growing support once their parents saw them happy and successful in automotive (Sub-theme 8.1.3). With the rest of the participants, their parents were supportive as Zhu observed in the competition, that many parents, including fathers of the girls, participated in support of their young engineers (Sub-theme 2.1 and 2.2).

Cheryan (2013) found that when a learning environment seems cold and unfriendly, women gravitate toward more people friendly career paths. Positive personal relationships were found to be important to women when choosing a career in studies by Lee (2002) and Matusovich et al. (2010). The women revealed feeling they do not fit in STEM because of lack of positive personal relationships with peers and teachers in

STEM courses. This gravitation toward people friendly career paths could partially explain why some of the women in my study chose or switched to automotive management. Automotive management is more people oriented over the other two degrees offered at this university. Karen, Michelle, Jane, and Sabrina all switched to automotive management. This should be looked into more deeply in future studies.

Altruistic desires. Women gravitate toward careers that help others and/or the greater society (Strenta et al., 1994; Sax, 2008; Cheryan 2013). Sax (2008) and Cheryan (2013) also found that women have the desire to improve the lives of others through their career choice. In Seymour and Hewitt's (1997) study, altruism was indicated by 90.9% of women and minorities as a reason for choosing STEM majors. Both Elisabeth and Silvia support these findings. In my study, Elisabeth said she wanted to improve peoples' lives through her work. In particular, she mentioned helping repair technicians with accurate information and helping keep the cost of repairs low so that working families could afford the repairs. Silvia, who went from a technician to working for Toyota, said that she went from "fixing one car at a time to millions at a time."

Removal of negative stereotyping. Negative stereotyping is another issue in which women view the typical person in a STEM career as something they do not identify with, or do not want to be identified with, such as a "computer geek," "grease monkey" or "pocket-protector-wearing-science nerd." Research shows that when these stereotypes are broken, women begin to choose these careers (Prives, 2013). The only negative stereotype I found in my study was Alice's parents degrading her automotive career choice as being a "grease monkey."

Why Women Leave STEM Majors

When it comes to choosing a college major, Malgwi et al. (2005) found that for both men and women, as incoming freshman, the most important factor was subject interest. However, for women, subject aptitude was the second most influential factor, that is, they chose a major that they were interested in, and for which they believed they had a talent. I found both of these findings true in my study. All of the participants reported an interest in automotive. Some of the participants developed an aptitude for auto repair in high school or community college (Sub-theme 1.3). Many did this by working on cars with their fathers, step-fathers, or friends (Theme 2 and Sub-theme 2.2). As for changing their major, Malgwi et al. found that the reasons were similar for each gender, but women were more influenced by difficulty of major, advice from college advisor, and discussions with peers than men. In my study, I found this to be true. Jane found automotive engineering technology to be academically difficult and had discussions with her peers about the difficulties of finding an internship. She switched to automotive management. Michelle also switched to, and from, the same degree programs because of having to take chemistry in her situation. Lastly, Elisabeth switched from pre-veterinary to eventually automotive owing to academic difficulties.

Brainard and Carlin (1998) found that the women in their study who entered college with very high confidence in their math and science aptitude reported their self-confidence plummeted during the first year. Interestingly, if they persisted, their self-confidence increased over the length of their studies, but never returned to their pre-college level. They also found that women who changed majors from science and engineering often did so in the first two years, citing low self-confidence and perception

of low academic performance as some reasons, even though they had the same level of performance as women who continued in science and engineering. My findings did not support anything related to a switch out of a STEM entirely, however, Michelle indicated her lack of confidence in success at chemistry and Jane did site her academic performance as reasons for switching within automotive (STEM). Elisabeth cited academic performance in science as the reason she switched from pre-veterinary to automotive, which are both STEM majors. I did find that these three participants persisted and graduated once they switched to a different STEM major.

Sax (2008) found that women underestimate their academic ability and view their academic success as coming from hard work, not intelligence. She found that the gaps between women and men in STEM majors widen throughout college. Conversely, survey data shows women study more hours than men, and earn higher grades than men, which agrees with the findings of Matusovich et al. (2010). In my study, I found women such as Sabrina, who realized she knew less that the men in her class initially, but then studied hard and surpassed them academically. She also struggled with acceptance of these underperforming men later in the workplace. For Melanie and Karen, joining a sorority, with required study hours and high minimum GPA, sharpened their academic focus. However, Sax also found that something happens to women in college that lowers their self-confidence, leading them to have a higher perception than men that they do not "fit." This happened to Michelle and Jane as well because these women placed a lower value on engineering and switched to a non-engineering major, concluding this perception from their lack of fit academically which is what Sax additionally, found in the study.

Similarly, Matusovich et al. (2010), found that women lose interest in engineering careers more than men. They concluded that female engineering students do not identify with engineering on a personal level, that is, they cannot see a link between engineering and their everyday lives. In contrast, they did find a few students who persisted despite their low level of engineering self-identification because of other reasons, such as earning enough money to take care of their parents. These students, however, had to continually remind themselves of why they needed to persist with the engineering program, unlike their peers who had a higher self-identification with engineering and easily retained the motivation for the journey. In my study, I found the opposite to be true as noted previously with Silvia and Elisabeth who see their positions impacting the others positively. The closest woman in my study to this finding was Melanie, who said, "I was between automotive and dance, and you don't make money dancing." However, Melanie differs from their findings in that she enjoys her studies in automotive engineering technology.

In their study, Seymour and Hewitt (1997) investigated the reasons why undergraduates at four-year institutions with above average ability left STEM majors for other non-science majors. However, this early indoctrination of STEM students led them to believe they are "traitors" or "defectors" when they left STEM majors, especially for social sciences. I did not find this to be true because the switchers in my study stayed in an automotive major.

A majority of the students interviewed in the Seymour and Hewitt (1997) study gave more than one reason as to why they choose a STEM major. Interestingly, switchers gave twice as many answers as the non-switchers, because they had to reflect more on

why they initially choose STEM while they were choosing a new major. I found this to be true in my study. Elisabeth, Jane, and Michelle gave many well thought-out reasons for their switching. Women who switched often cited the active influence of others as a key factor in their original choice of a STEM major, which was the highest degree of importance of a motivating factor in the entire study. For Jane, this was true. She talked with others and had concerns over finding an internship. Seymour and Hewitt found that this influence came mostly from family members and, in particular, ones who were financing the student's education. In the opposite direction, Alice's parents kept her from her automotive degree until the persistence of Alice convinced them to allow her to switch to automotive.

Seymour and Hewitt (1997) also found that there were other influencers, such as peers, teachers, counselors and advisors, but most of the pressure came from family and friends and focused on the attainment of success by choosing a prestigious, financially lucrative career. If that were not enough, there were warnings of low pay and status, or even unemployment, associated with non-STEM majors. I found this true for Silvia, who's family warned her not to go into the automotive industry. Her parents pointed to the recent, at the time, economic downturn, bankruptcy of General Motors and Chrysler, and the massive automotive industry layoffs. For Alice, her parents classified automotive as being a grease monkey and narrowed her career choices down to criminal justice.

Seymour and Hewitt's (1997) study additionally revealed the best predictor of survival and success in STEM was to have intrinsic interest in the discipline or career. The freedom to choose their major based on personal interest came out during the interviews. In my study, there were eight participants who reported participating in

automotive education from high schools, trade schools, and/or community colleges prior to attending an automotive program at this university (Sub-theme 1.3). This means they were committed to their automotive education before they came here ensuring their success. But, it did not always start this way, because eight participants chose in varying degrees of commitment, other career paths prior to choosing automotive (Theme 3). There were many explanations for this; however, once they chose automotive, they stuck with their choice.

Finally, Seymour and Hewitt's (1997) study revealed that women, despite being equally prepared as men, perceived that they were unprepared to confidently take higher-level math and science in college. In describing their feelings, the students pointed to their lack of high school preparation as the reasons for these feelings. In my study, only Michelle described not believing she was prepared for chemistry because she did not take it in high school.

Women Specifically Choosing and/or Leaving Automotive Careers

Few women choose automotive careers and of the ones that do, their stories describe their interesting journey in this mostly male-dominated career. Maher and Atack (2011), in their study of women in a women-only automotive service pre-apprenticeship program, found that participants had a positive perception of self-efficacy. The participants said they benefited from the coaching and mentoring the program provided, which helped them to prepare for the physical and mental challenges of the work. Interestingly the students liked the women-only program, but also said they would like more experiences working with men earlier in the program to prepare them for the "real world." These findings dovetail with my finding where fathers influenced the participants

to go into automotive with experiences that improved self-efficacy (Sub-theme 2.2), that they received support for their automotive career in the form of coaching and mentoring (Theme 8.2), that the women had to prove their commitment to and knowledge of automotive (Theme 4), and that the women were the only females in class and at work (Theme 5). Obviously men are involved in the participants' automotive careers all along the way both positive and negative. The women in my study adapted to being the only women in class or at work and being challenged. The challenges forced them to constantly have at the ready, their knowledge and explanation of why they chose automotive and to be diligent in the defense of their automotive knowledge.

Hart (2004), in her study of three female automotive college graduates working as technicians in the field, found that the women in her study had to overcome the barriers of "sex-role stereotyping (girls should be nurturing)," as well as "occupational sex stereotyping (only boys should be pilots)" (p. 105). Family was both a barrier and a support mechanism. Fathers were found to be a barrier to the women in the study, as parents generally desired to have their daughters in what they considered a safe and secure career. Conversely, sisters, brothers, and friends were mostly supportive. All of the women felt that they would have benefited from more hands-on lab experiences, which was also found beneficial in the study about UREs by Harsh et al. (2012). They all had positive, supportive experiences at the community college they attended, saying the instructors and their mostly male classmates treated them fairly and expected them to perform the same as the men in the program. They also enjoyed helping customers solve their automotive problems, especially female customers, which corroborates what Strenta et al. (1994) found, i.e., women want a career that helps people and society. In the field,

these women experienced heavy discrimination and marginalization from male customers who told them they did not want a “girl” working on their car, to male dealership employees who would place obstacles in their path, such as giving the women difficult repair jobs while saving the easier money-making jobs for the male technicians.

In my study, there was one report of gender role stereotyping with Elisabeth and her father, who did not want her to go into an automotive career because he felt it was not a place for a woman. Like Hart (2004), I did find that family could be a support mechanism (Sub-theme 8.1), and a barrier (Sub-theme 8.1.3). I found the opposite of what Hart found, in that fathers were not always barriers, in fact, they were the reason half of the participants were introduced to automotive in the first place (Sub-theme 2.2). In addition, all but one participant performed an automotive internship type experience during their education which gave them hands on experience that was found beneficial to the participants (Sub-theme 1.6). Another parallel of my study to Hart’s study is that a majority of my participants indicated they received support from high schools, colleges and this university (Sub-theme 8.2), and in particular, they made mention that there were many males along the way who helped them at the educational institutions. I additionally found that Michelle, Elisabeth, and Silvia enjoyed solving customer and technician problems all the way up to the automotive company-wide level. Furthermore, I found some of the women in my study experienced gender bias and discrimination from male customers (Theme 9), but I did not find any instances where certain repair jobs were being funneled to a male technician. However, Brandi, when she worked as a technician, reported her boss would funnel jobs to her that required attention to detail because she was more quality conscious than some of the male technicians. This is opposite of what

Hart found, which indicates a positive change for female technicians at that particular workplace (Sub-theme 8.3).

Research has also found that the work-life balance is a struggle for women in STEM because the traditional STEM environment is not family-oriented nor supportive of career mothers. Bieri et al. (2013) found in their study that women who indicated they fit the description of "family-oriented" as opposed to "job-oriented" viewed STEM career negatively (p. 2). I did not find this in my study.

Szelényi et al. (2013) found in their study of data from the 2004–2007 National Study of Living Learning (L/L) Programs that women's participation in a coeducational STEM L/L program positively related with their outcome measures. This indicates that including men in the L/L programs for women is effective. My study found that men are important in the careers of women in automotive. From the influence to choose the career to the mental and emotional toughness required to continue in the career, to the support throughout the career from students, teachers, mentors and coworkers (Sub-theme 2.2, and Themes 4-9).

Glass et al. (2013) studied working women with four-year degrees. This Bureau of Labor Statistics (BLS) study collected data from both men and women aged 14-22 in 1979, and reinterviewed them annually through 1994 and biennially from 1996 to present. The study compared STEM career women with non-STEM career women. They found women in STEM careers are more likely to leave their career field than non-STEM career women. This likelihood increased the earlier a women was in her STEM career. They found that family factors cannot account for the higher loss of STEM workers. They did find, however, that investments in training and high job satisfaction do not

entice women to stay in a STEM career. Conversely, Sax (2008) found that women on campuses that employed more women faculty reported less desire to raise a family, and she suggests that this is caused by the role modeling of the female faculty, who many chose a career above having children. None of the women in my study indicated that they had children or discussed "family factors" in the interview. Sabrina, the only woman who left the transportation industry in my study, left after ten years into her automotive career, but not for "family factors."

Table 3 offers a snapshot of my major findings and their alignment w/previous research as discussed in this section.

Table 3

Major Findings as Linked to Previous Research

Leonard (2016) Major Findings	Previous Research
Females in automotive fields have varying demographic backgrounds	Aligns with Lent, Brown, and Hackett (1994) as related to background affordances in SCCT.
Such females had formal internship or related automotive experience (a technical activity) either prior to, or during, their education at this university	Aligns with Lent, Brown, and Hackett (1994) as related to background affordances and contextual influences in SCCT. Supports Cech, Rubineau, Silbey, and Seron (2011) in that professional role confidence increased with real-world experiences and predicts persistence in a STEM career. Supports the findings by Harsh, Maltese, and Tai (2012), Schaub and Tokar (2005), and Hart (2004) in that hands on experience and relevant occupational learning experiences positively shape self-efficacy and outcome expectations in STEM. Aligns with Inda, Rodríguez, and Peña (2013) who found the SCCT model accurately predicted the interest level of engineering and technology activities and the participant's level of academic persistence (action). Aligns with Malgwi, Howe, and Burnaby (2005) in that subject interest and aptitude were influential factors to career choice.

Table 3 – continued

Leonard (2016) Major Findings	Previous Research
Such females had a family member influenced their automotive career choice, with males often cited as being the primary influencer	Aligns with NSF (2007) because a vast majority of the women in my study had positive STEM experiences with their families during this common leaky pipeline timeframe. Aligns somewhat with Bandura (1986) because the major contributor to these 12 women choosing automotive was an enactive mastery experience of working on automobiles with family members and vicarious experiences of watching family members work on cars. However, it did not completely align or support the findings of Bandura given the vicarious experiences they identified with their male friends and male family members even though they were not the same gender. Aligns with Van Dinther et al. (2011) because enactive mastery experiences are the most powerful in creating positive self-efficacy. Supports Schaub and Tokar's (2005) study in that they confirmed the SCCT theory assertion that relevant occupational learning experiences positively shape self-efficacy and outcome expectations. This means that the enactive mastery experiences, such as mentoring and working on cars with family, have positive impact on career choice. Supports Seymour and Hewitt's (1997) study concerning the way family influences a young person to choose a career by including their children in a hands-on way with technical domestic tasks, and in aspects of their own work. Supports the findings of Li and Kerpelman (2007) and Zhu (2013) in that both mothers and fathers influenced their daughter's career aspirations, and this could include pursuing a non-traditional career Supports Bieri et al. (2013) in that parents in their study had stimulated their child's learning, which appeared to create the desire in their children to want to gain knowledge and explore STEM subjects. Contradicts Hart (2004) in that fathers were not always barriers, in fact, they were the reason half of the participants were introduced to automotive in the first place.

Table 3 – continued

Leonard (2016) Major Findings	Previous Research
Such females considered another career path prior to automotive; some also changed their major within automotive, but stayed within STEM	Aligns with Cech et al. (2011) in that when women changed majors from engineering, they were twice as likely as men to choose another STEM major. I found a vast majority changed their major within automotive, and in doing so, did not leave STEM.
Such females felt nervous or the center of attention because they were the only female in class or the workplace	Aligns with Bandura (1986) in that negative physiological and psychological states influence self-efficacy negatively. However, the women in my study had high self-efficacy because of their ability to work past the nervousness of being the only female in a school or workplace. Supports Smith et al. (2013) in that it contributes to belonging uncertainty. Supports Maher and Atack (2011), in that the participants were the only females at school and in the workplace.
Difficulty with automotive job interview	No previous research found
Such women received support from post-secondary schools and their workplaces	Aligns with Lent, et al. (1994) in that career support from a post-secondary school is a positive contextual influence in SCCT. Aligns with Inda, et al. (2013) in that teacher support increased women's self-efficacy and outcome expectations. Aligns with Heilbronner (2013) in that mentors, high school teachers and counselors, college professors and advisors and other, typically older students help in the recruitment and retention of women in STEM. Supports Maher and Atack (2011), in that the participants received support for their automotive career in the form of coaching and mentoring from their school. Aligns with Hart (2004) in that women in automotive received support from their post-secondary school. Opposes Hart (2004) in that women in automotive did not receive support from their workplace.

Table 3 – continued

Leonard (2016) Major Findings	Previous Research
Such females have grit and a growth mindset because they were persistent in their interests, goals, and actions in spite of experiencing gender bias/discrimination and having to prove their knowledge of, and commitment to, automotive.	Aligns with Lent et al. (1994) in that an experience of gender bias/discrimination is a negative contextual influence in SCCT. Aligns with Duckworth and Eskrels-Winkler (2013) in that a gritty individual works through barriers. Aligns with Dweck (2006) in that a growth mindset is believing they can improve their situation with effort. Aligns with Hart (2004) in that these women experienced heavy discrimination and marginalization in the field from male customers who told them they did not want a "girl" working on their car. Supports Cech et al. (2011) in that professional role confidence was a significant factor for women's career persistence in engineering.
Such females would choose an automotive career again	Aligns with Lent et al. (1994) in that a woman who does not regret choosing a male-dominated automotive career after overcoming all they may have negatively experienced, is a positive example of self-efficacy and outcome expectations powering interest, goals, and action in SCCT. Supports Duckworth and Eskrels-Winkler (2013) in that the true revelation of grit for these women was found in that a vast majority would choose automotive as a career again. This means that in spite of all the negative experiences, they would do it all over again.

Implications for Future Research

My study could be built upon by following such females longitudinally, perhaps at five-year intervals, to capture how the participants evolve in their careers. The study could ask the same questions to see if the climate in the workplace changed in relation to their gender. Additional questions could probe further into the family plans that these

women have and could ask, “if they had a daughter, how would they feel about her following mommy’s career choice?”

Because this study only focused on women who persisted in this career, a future study could explore females who did not persist in an automotive career. It could specifically ask what ultimately caused them to leak out of the “pipeline,” what career they eventually switched into, and if they maintained any interest in automotive outside of their former career, such as a hobby.

Another future study could focus on the stereotype that a female must be a lesbian if she chooses a male-dominated career such as automotive, and what it means to women of differing sexual orientation in automotive. The language that a few participants came out with indicated that they were aware of, and did not wish to be categorized with the stereotype of being a lesbian just because they are in an automotive. This could be a stand-alone study. Two examples that tipped off my female assistant, who read between the lines and pointed this out to me. First, Karen embraces her femininity and makes it clear that she is a woman who loves cars. She describes herself as “a thin, blonde, blue-eyed girl” not “a butchy, mechanic girl.” Second, Melanie proclaimed:

> I think coming in being a girl and being feminine is the biggest barrier. I’ve noticed after being here for a year and proving myself to professors and other students in my class, I gained respect. I’m not here for other reasons. I’m here for an education. This is what I want to do.

It would be a good idea to research in a future study the perception of automotive as being one of the “trades” instead of “professional” career. I was surprised to find that parents with a STEM career sometimes did not initially support the participants’ choice

for an automotive career. Some were in the medical field and some were engineers or other STEM "professionals." For example, Alice's parents did not want her to go to school to be a "grease monkey." Karen indicated that her parents wanted her to pursue a bachelor's degree as opposed to an associate's degree or trade school certificate. Karen said, "So the decision making process was pretty quick for me because I knew I wanted a four-year-degree." Karen had to go through mechanics training as part of the four-year degree, but "never wanted to be a mechanic. [I went through it] because I wanted to learn how cars worked mechanically." While her father did not influence her career choice, he did influence her to pursue a four-year degree rather than a two-year automotive service degree. "My dad has a very strong work ethic, so I think wanting to get a bachelor's degree came from my dad." According to Karen, she wanted to "do more than just a trade job."

Another future study could look into gender bias/discrimination during interviews for automotive industry positions. In my study, there were three experiences of gender bias/discrimination during an interview. Two of the gender discrimination experiences were for mechanic's positions, which typically require a certificate or associate's degree. This was what Vanessa and Karen either had or were pursuing. Roxanne was interviewing for a position after interning at the same company while she finished her bachelor's degree. Her experience was subtler and fell into gender bias. It is important to note that at the higher levels of education and larger companies, that gender bias exists and was harder to detect. Though I can not explain each participant's perceived difficulty with interviews was related to gender issues, after reading these last three experiences, I

began to wonder if there may have been more gender bias/discrimination related to the interviews of the six participants who reported difficulty in the hiring experience.

Furthermore, a future study could also expand on the impact friends and "study buddies" have on automotive career persistence. For example, some participants found support with the automotive students in her cohort at this university. They studied together and supported each other throughout their classes. Melanie explains, "There's a group of us who always would study last year together, because we were all in the same classes. So it's kind of like we've been each other's support system." Silvia described how she made new "study buddies" in each of her university classes, while Karen found the support she needed to persist all throughout college and her career by increasing her social life. Like Melanie, Karen joined a sorority. Karen explains, "[It] has nothing to do with automotive, but that is [one of] the reasons I made it through because I found girlfriends, which I didn't have my first year."

Chapter VI Closure

My study found that when a woman has passion for the industry in which she chooses a career, there is very little "pipeline leakage." Indeed, there was little written about the experiences of women currently in the automotive technology pipeline. Only two studies could be found where Hart (2004) looked at just three women automotive technicians who received a mechanics certificate, and Maher and Atack (2011) studied 17 women in a women-only automotive pre-apprentice program. My study differed from both Hart's and Maher and Atack's work in that the women in my study are all pursuing or pursued a bachelor's degree in automotive technology, which is the next step after an automotive mechanic's associate degree or certificate.

The literature on this topic has now been expanded via my study's rich description of a qualitative inquiry into the experiences of women in automotive careers. My inquiry looked deeper into the social support or barriers of family, peers, teachers and societal expectations and how they experienced gender, as an influential factor to career choice, relating to self-efficacy beliefs, outcome expectations, interests, goals, and actions.

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Appendix A

Interview Questions

Interview Questions

Questions for those still within the university:

Demographic Information:

1. What is your age?
2. Are you a: Freshman? Sophomore? Junior? Senior? 5th Year Senior?
3. Did you transfer from another institution? If so, where within your program did this occur?
4. Are you an in-state or out-of-state student?
5. Are you the first person to attend college in your family?

Interview Questions:

1. Describe your immediate family's working history. RQ 1
    a. Describe the positions your family members held, such as engineer, working professional, or laborer, etc.
    b. What influences, if any, did this have on your career choice?
2. Who or what influenced you to choose automotive technology as a career? RQ 1
3. Describe the process for choosing your major? RQ 1 & 2
    a. Where did an automotive major fit in along the way?
    b. If you changed your major, what from, why, and how many times?
4. Describe your experiences with being in a university automotive technology program. RQ 2

5. Overall describe your major areas of support you have experienced for your career choice from family, friends, peers, the university, instructors or student organizations, etc. RQ 2
6. Overall describe any major barriers you have experienced working against your career choice from family, friends, peers, the university, instructors or student organizations, etc. RQ 2
7. Based on your total experience, would you choose an automotive career again, and why or why not? RQ 3

Questions for those having graduated from such a program and are now employed in a career:

Demographic information:

1. What is your age?
2. How many years ago did you graduate?
3. How many years have you been working in the automotive field?
4. Are you working in a capacity that uses your automotive degree?
5. How many different positions have you held since graduation?
6. How many times have you been promoted?

Interview Questions:

1. Describe your immediate family's working history. RQ 1
    a. Describe the positions your family members held, such as engineer, working professional, or laborer, etc.
    b. What influences, if any, did this have on your career choice?

2. Who or what influenced you to choose automotive technology as a career? RQ1
3. Describe the process for choosing your major. RQ 1 & 2
    a. Where did an automotive major fit in along the way?
    b. If you changed your major, what from, why, and how many times?
4. Describe your experiences with having been in a university automotive technology program. RQ 2
5. Describe your experiences after graduation, being a female professional in this career field, including: RQ 2 & 3
    a. Experiences while seeking employment and RQ 2 & 3
    b. Experiences while employed. RQ 3
6. Overall describe your major areas of support you have experienced for your career choice from family, friends, peers, the university, instructors, employer, or colleagues, etc. RQ 2 & 3
7. Overall describe any major barriers you have experiences working against your career choice from family, friends, peers, the university, instructors, employer, or colleagues, etc. RQ 2 & 3
    a. If you experienced any challenges or barriers, describe how you faced those issues and remained in the automotive career field. RQ 2 & 3
8. Based on your total experience, would you choose an automotive career again, and why or why not? RQ 3

Appendix B

Recruitment Email

«First» «Last»
«Title»
«Company»
«Address», «Address_2»
«City_State_Zip»
Date
Dear «Prefix» «Last»,

Greetings! My name is Russ Leonard and I am a doctoral student at Western Michigan University writing to request your participation in my dissertation research -- a study examining the experiences of women in automotive careers.

The study would require approximately 50-60 minutes of your time in a face-to-face interview to potentially take place in an Automotive Center classroom at the campus-wide break hour of your choosing, either Tuesday or Thursday at 11:00 AM or at another time of your choosing. The topic to be discussed is your experience as a woman in an automotive career. The interview will be voice recorded (not visually recorded) and all information will be kept confidential. Following the interview, you will receive a copy of the transcript to review and make additional remarks. If necessary, I may need to make follow up e-mails for clarification.

I am recruiting participants who fit the criteria and who would be interested in participating in the study. The only key criterion for participation is that you are female and either enrolled in an automotive program at FSU or a graduate of an FSU automotive program working in the field. To my knowledge, this study is the first of its kind in higher education and I hope to publish the research results. Your participation would be greatly appreciated. If interested, please read and sign the attached consent form, and return it to me, or scan and e-mail to me.

Should you have any questions concerning this study and your qualification to participate, or you believe you fit the profile criteria and would be interest in participating in this study, please send an e-mail with your contact information to leonardr@ferris.edu. I will respond to you directly to discuss the study in more detail, including goals and objectives, participant qualification, and participation requirements.

Participation in this study is voluntary. You are free to end your participation at anytime. There are no costs associated, just the interview time commitment provided above. There is no compensation for your time; however, by sharing your experiences, you will provide great insight about the essence of women in automotive careers. Understanding your experience is expected to provide information that may be invaluable to other women in automotive careers, as they may encounter some of the same experiences you have.

This study is being conducted with the approval of the Educational Leadership, Research, and Technology Department at Western Michigan University and in accordance with the University's Human Subjects Institutional Review Board guidelines

regarding research ethical conduct.

With sincere thanks in advance. I look forward to speaking with you.

Russ Leonard

leonardr@ferris.edu

Appendix C

Informed Consent Form

Western Michigan University
Department of Educational Leadership, Research and Technology

Principal Investigator:	Dr. Louann Bierlein Palmer
Student Investigator:	Russell A. Leonard Jr.
Title of Study:	Females in Automotive Careers: Career Decision-making Influences and Experiences During University Preparation and Beyond

You have been invited to participate in a research project titled "*Females in Automotive Careers: Career Decision-making Influences and Experiences During University Preparation and Beyond.*" This project will serve as Russell A. Leonard Jr.'s dissertation for the requirements of the Ph.D. in Higher Education Leadership. This consent document will explain the purpose of this research project and will go over all of the time commitments, the procedures used in the study, and the risks and benefits of participating in this research project. Please read this consent form carefully and completely and please ask any questions if you need more clarification.

What are we trying to find out in this study?

The purpose of this study, therefore, is to make meaning of the experiences of women in automotive technology careers at one Midwestern university. Feminist research has indicated that women do not choose various careers. Automotive technology is one of these careers. Much empirical research has verified a lack of women in technology careers and degree programs. The literature has supported the imbalance in genders in this and other fields.

This study is significant because, in identifying the needs of these women in an automotive program, education professionals are able to influence program design and recruiting efforts that more effectively target future female automotive students, and possibly students of other STEM programs.

Who can participate in this study?

Any female students currently enrolled in, or a graduate of, one of Ferris State University's (FSU's) automotive degree programs meet the criteria to participate in this study. The exclusionary criteria would be anyone not female and not currently enrolled in one of FSU's automotive programs. The selection criterion is based on the study, which is specific to the female gender in FSU's automotive technology degree programs.

Where will this study take place?

The female auto tech students will meet individually with the student investigator and female staff member that will take place in an Automotive Center conference room.

What is the time commitment for participating in this study?

The individual meetings for current students will either take place during the students' class breaks, which is every Tuesday and Thursday at 11:00 AM or at a time of their choosing. Participation in the study will not interfere with any subjects' classroom

instruction. The interview will take approximately 60 minutes of their time. If needed, a follow-up interview is possible. For graduates, the meeting can occur at or near the worksite either during lunch break or after working hours or at a place and time of the participant's choosing. Also, participants will receive the themes, distilled from the interviews, via e-mail for their review.

What will you be asked to do if you choose to participate in this study?

Participants will meet individually for an interview and will be asked questions for which responses are required.

What information is being measured during the study?

The questions are as follows:

1. What were female automotive students' experiences like before college, including who or what influenced these women to choose automotive technology as a career?
2. What are female automotive students' experiences like during their university studies and what helped them to persist?
3. What are female automotive professional's experiences like after graduation, while in the workforce, and based on their total experience, would these women choose an automotive career again?

What are the risks of participating in this study and how will these risks be minimized?

This study is non-invasive in nature; there are minimal risks to the adult subjects of the study. The known risks, or inconveniences to taking part in this study relate to the use of the subject's time. In addition to the amount of time it takes to gain the subject's consent, the subjects will be asked to participate in an individual interview. The time required for the individual interview is 60 minutes to complete. In addition, certain questions that the researcher asks may seem obtrusive or make the participant fill uneasy about providing a response. A subject's responses to individual questions will not be analyzed nor disclosed by the principle investigator or any other research staff. Data analysis will be presented in aggregate form, which may include a composite of each dimension measured by the group interview questions.

What are the benefits of participating in this study?

The benefit of participation is being a part of the expansion of the body of knowledge as it relates to women in non-traditional careers. Your participation may pave the way for future improvements for women in non-traditional careers.

Are there any costs associated with participating in this study?

There are no costs associated with participating in this study.

Is there any compensation for participating in this study?

There is no compensation for participating in this study.

Who will have access to the information collected during this study?

The results of this study will be used as a doctoral dissertation. These results will be in written form in which the primary investigator will have access to the document as well as a presentation for defense. The subjects' names or other identifying information will not be released. Standard methods will be used to prevent disclosure of subjects' identity. Standard methods will include assigning code numbers for participants' name.

What if you want to stop participating in this study?

You can choose to stop participating in the study at anytime for any reason. You will not suffer any prejudice or penalty by your decision to stop your participation. You will experience NO consequences either academically or personally if you choose to withdraw from this study.

The investigator can also decide to stop your participation in the study without your consent.

Should you have any questions prior to or during the study, you can contact the primary investigator, Dr. Louann Bierlein Palmer at 269-387-3596 or l.bierleinpalmer@wmich.edu. You may also contact the Chair, Human Subjects Institutional Review Board at 269-387-8293 or the Vice President for Research at 269-387-8298 if questions arise during the course of the study.

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is older than one year.

I have read this informed consent document. The risks and benefits have been explained to me. I agree to take part in this study.

_____

Please Print Your Name

_____

Participant's signature

Appendix D

Approval Letters from Human Subjects Institutional Review Boards

WESTERN MICHIGAN UNIVERSITY
Human Subjects Institutional Review Board

Date: April 9, 2015

To: Louann Bierlein Palmer, Principal Investigator
Russell Leonard Jr., Student Investigator for dissertation

From: Daryle Gardner-Bonneau, Ph.D., Vice Chair
Daryle Gardner-Bonneau

Re: HSIRB Project Number 15-03-35

This letter will serve as confirmation that your research project titled "Females in Automotive Careers: Career Decision-making Influences and Experiences during University Preparation and Beyond" has been approved under the expedited category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may **only** be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., ***you must request a post approval change to enroll subjects beyond the number stated in your application under "Number of subjects you want to complete the study***)." Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: **April 8, 2016**

1903 W. Michigan Ave., Kalamazoo, MI 49008-5456
PHONE: (269) 387-8293 FAX: (269) 387-8276
CAMPUS SITE: 251 W. Walwood Hall

FERRIS STATE UNIVERSITY

Institutional Review Board for Human Subjects in Research

Office of Academic Research, 220 Ferris Drive, PHR 308 · Big Rapids, MI 49307

Date: April 30, 2015

To: Mr. Russell A. Leonard, Jr. and Dr. Louann Bierlein Palmer
From: Dr. Stephanie Thomson, IRB Chair
Re: IRB Application #150405 *(Females in Automotive Careers: Career Decision-Making Influences and Experiences during University Preparation and Beyond)*

The Ferris State University Institutional Review Board (IRB) has reviewed your application for using human subjects in the study, "*Females in Automotive Careers: Career Decision-Making Influences and Experiences during University Preparation and Beyond*" (#150405) and determined that it meets Federal Regulations *Expedited-category 2G*. This approval follows the expiration date outlined by the Western Michigan University IRB (HSIRB). **As such, you may collect data according to the procedures outlined in your application until April 8, 2016**. Should additional time be needed to conduct your approved study, a request for extension must be submitted to the IRB a month prior to its expiration.

Your protocol has been assigned project number (#150405), which you should refer to in future correspondence involving this same research procedure. Approval mandates that you follow all University policy and procedures, in addition to applicable governmental regulations. Approval applies only to the activities described in the protocol submission; should revisions need to be made, all materials must be approved by the IRB prior to initiation. In addition, the IRB must be made aware of any serious and unexpected and/or unanticipated adverse events as well as complaints and non-compliance issues.

Understand that informed consent is a process beginning with a description of the study and participant rights with assurance of participant understanding, followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document and investigators maintain consent records for a minimum of three years.

As mandated by Title 45 Code of Federal Regulations, Part 46 (45 CFR 46) the IRB requires submission of annual reviews during the life of the research project and a Final Report Form upon study completion. Thank you for your compliance with these guidelines and best wishes for a successful research endeavor. Please let us know if the IRB can be of any future assistance.

Regards,

S. Thomson

Ferris State University Institutional Review Board
Office of Academic Research, Academic Affairs

FERRIS STATE UNIVERSITY

Institutional Review Board for Human Subjects in Research

Office of Research & Sponsored Programs, 220 Ferris Drive, PHR 308 · Big Rapids, MI 49307

Date: April 27, 2016

To: Louanna Bierlein Palmer and Russell A. Leonard Jr.

From: Dr. Gregory Wellman, IRB Chair

Re: IRB Application #150405 *(Females in automotive careers: career decision making influences and experiences during university preparation and beyond*

The Ferris State University Institutional Review Board (IRB) has reviewed and approved your request for an extension to continue using human subjects in the study, *"Females in automotive careers: career decision making influences and experiences during university preparation and beyond"* (#150405). This approval has an expiration date following that awarded by Western Michigan University IRB. **As such, you may collect data according to the procedures outlined until March 16, 2017.**

Your project will continue to be subject to the research protocols as mandated by Title 45 Code of Federal Regulations, Part 46 (45 CFR 46) for using human subjects in research. It is your obligation to inform the IRB of any changes in your research protocol that would substantially alter the methods and procedures reviewed and approved by the IRB in your application. Thank you for your compliance with these guidelines and best wishes for a successful research endeavor. Please let us know if the IRB can be of any future assistance.

Regards,

Ferris State University Institutional Review Board
Office of Research and Sponsored Programs