Spring 5-11-2019

"There Isn't Anything that Guy Can't Teach About Cars": How Nontraditional Female Career and Technical Education Students Perceive Instructor Effectiveness

Christopher J. Healy
University of Maine, chealy71@maine.edu

Recommended Citation

Healy, Christopher J., ""There Isn't Anything that Guy Can't Teach About Cars": How Nontraditional Female Career and Technical Education Students Perceive Instructor Effectiveness" (2019). *Electronic Theses and Dissertations*. 2988.
https://digitalcommons.library.umaine.edu/etd/2988

"THERE ISN'T ANYTHING THAT GUY CAN'T TEACH ABOUT CARS": HOW NONTRADITIONAL FEMALE CAREER AND TECHNICAL EDUCATION STUDENTS PERCEIVE INSTRUCTOR EFFECTIVENESS

By

Christopher John Robert Healy

B.S. University of Maine at Farmington, 2000

M. Ed. University of Maine, 2010

A DISSERTATION

Submitted in Partial Fulfillment of the

Requirements of the Degree of

Doctor of Philosophy

(in Education)

The Graduate School

The University of Maine

May 2019

Advisory Committee:

Susan Bennett-Armistead, Associate Professor of Literacy Education, Co-Chair

Richard B. Kent, Professor of Literacy Education, Co-Chair

Julie Cheville, Ph.D., Graduate Faculty, University of Maine

David Boardman, Ed.D., Mass Media Instructor, Mid-Maine Technical Center

Kenneth Martin, Assistant Professor of Literacy Education (Retired), University of Maine

"THERE ISN'T ANYTHING THAT GUY CAN'T TEACH ABOUT CARS": HOW

NONTRADITIONAL FEMALE CAREER AND TECHNICAL EDUCATION

STUDENTS PERCEIVE INSTRUCTOR EFFECTIVENESS

By

Christopher John Robert Healy

Dissertation Advisors:
Dr. Susan Bennett-Armistead
Dr. Richard B. Kent

An Abstract of the Dissertation Presented
in Partial Fulfillment of the Requirements for the
Degree of Doctor of Philosophy
(in Education)
May 2019

This study explored how female Career and Technical Education (CTE) students who enter predominantly male-attended programs perceive instructor effectiveness. Although previous research has shed light on structural and social barriers faced by females wanting to enter these programs (Whitehead, 2013), new information suggests that CTE instructors engaged in prolonged professional development focused on improving instructional skills can support beneficial learning outcomes for their students (NRCCTE, 2013). It has also been suggested that improved knowledge of instructional approaches can increase nontraditional female students' successful completion of their CTE programs (NRCCTE, 2013). Consequently, I sought to better understand three factors associated with effective CTE instructors, namely their content knowledge, pedagogical skills, and dispositions. Using qualitative methodologies in this case study, I documented how three female CTE students enrolled in an automotive technology program perceived their CTE instructor's knowledge, skills, and dispositions. A main objective of the study was to allow an opportunity for these female students to have a reflective voice and

provide insights about their experiences learning with their effective CTE instructor. Findings revealed that informants were influenced by their instructor's understanding of content knowledge, his vast knowledge of pedagogical skills, and the dispositions he held toward the nontraditional female students who enter his program. This study offers administrators, researchers, and practitioners insights into the construct of effective practice in CTE contexts where female students enter male-dominated technical programs.

DEDICATION

For every skinned knuckle and calloused hand.

ACKNOWLEDGMENTS

It is impossible to personally thank all of the people who helped complete the dissertation because it is the result of a confluence of factors, including my ten-years as an aircraft mechanic, my now twenty-years as a teacher, and my last few years as a researcher. One adventure without the other could not fully explain the gratitude I feel for what each experience taught me.

My family, especially my wife, has been supremely patient with me. As a child, my parents encouraged me to argue my case, question my reasoning, and defend my decision… then question myself once more! In this sense, they allowed me to grow and explore the world around me without fear. In return, I learned that humility and respect for others is always the best path forward. For that, I am forever grateful. My wife taught me that writing, rather than endlessly worrying aloud, is the most productive use of my time; although, she listened to a lot of worrying! I hope I've made her proud.

My military compatriots, especially the women with whom I served, deserve recognition. I am especially grateful to my first supervisor, Technical Sergeant Karen Siracusa, who chose me as an assistant crew chief on her airplane. She gave me confidence as a mechanic. I also want to thank my former line-chief, Senior Master Sergeant Sue Ouellette, who was a consummate problem solver on the flight line. Our on-time takeoff rates were always stellar with Sue in charge!

My committee chairs, Dr. Susan Bennett-Armistead and Dr. Richard Kent have been steadfast in their belief in my work. Though I may have wondered a bit in the process, they provided me with valuable guidance to keep from getting too far adrift. Dr. Kenneth Martin and Dr. Julie Cheville have always provided me with a great sense of wonderment through their teachings. Deep and insightful, both professors have transformed the way I look at myself and

the world. Finally, Dr. David Boardman kept me grounded in the idea that this work will have meaning for those CTE instructors who want what is best for their students. It was this idea that propelled me forward.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

I am currently an English teacher for high school students with learning differences. Accordingly, the bulk of my day is spent interacting with young people in an attempt to improve their literacy skills. Even so, some of my students perceive me as engaged in another career outside of school, a result of sharing with them my experiences as a knuckle-busting, wrench-turning mechanic in the United States Air Force. Often applied to an automobile mechanic, the term, knuckle-buster, is also attributable to aircraft technicians. It is derived from the skinned, sliced, or slashed knuckles of a mechanic as the result of exerting great force on a bolt with a wrench only to have the wrench slip from the bolt's head, leaving the hand careening toward whatever metal component is in its path. The term conjures in me countless endearing images of painfully wiping blood off of my greasy hands with a red shop towel. I was all of nineteen-years old, stationed with the 1703rd Provisional Air Refueling Wing, King Khalid International Airport, Riyadh, Saudi Arabia, fighting a war by turning a wrench, and on occasion busting my knuckles. A mechanic I am.

Over the course of my teaching career, I have found that discussing my past experiences as a mechanic can affirm the forms of labor associated with the industrial and technical trades. This is even truer for my vocationally-oriented students who inevitably test the veracity of my mechanical claims by peppering me with questions about tools and machinery. Recognizing my credibility, the juniors and seniors in my classes who are actively enrolled in a Career and Technical Education program often begin sharing with me the accounts of learning their own trades. They appreciate that I am sensitive to the challenges of learning such complex work. They know I understand the precision required to complete tasks in a technical trade. After

reflecting on their experiences, however, I have noted that many female students talk differently from their male peers about their experiences in vocational education, especially if they are enrolled in predominantly male-attended programs. One such student who stood out prior to this study was Jenny Rayless (pseudonym).

When I met Jenny, she was a shy freshman student struggling to meet the new demands of high school. She was assigned to one of my supported study halls. I met with her individually on a bi-weekly basis to discuss her academic performance and her transition goals following high school. Like many of her peers, she was not thinking too deeply about how to tie together her vocational and academic interests into a career. By the middle of her junior year, however, she was focusing on her transition from high school into either a job or postsecondary training. She had enrolled in a vocational program at a regional Career and Technical Education (CTE) school in our area, specifically auto body and refinishing technology. She spent half of her school day learning this trade. Jenny enjoyed the hands-on challenges of technical learning, and personally felt that her vocational skills were improving with each unit she tackled. For a time, Jenny considered earning a certificate from a community college in this career field following high school graduation. The more I talked with her, though, the more she opened up about experiencing feelings of alienation as the only female in her program. According to Jenny, many of her male classmates quietly, yet persistently, displayed a gender stereotyped attitude toward her and her learning potential in the program. For example, she said that early errors in executing such tasks as measuring and cutting sheet metal had resulted in some students casting doubts about her academic abilities. These doubts, apparently, persisted long after she became competent in performing these tasks. Many of her classmates questioned her physical strength for accomplishing such vocational jobs as hoisting an engine from a car or removing its body

panels. Regardless of the competency exhibited in her work, Jenny's finished projects were often singled out for negative critiquing by these students. Many times, Jenny privately doubted her vocational capabilities due to these dismissive comments, interfering with her mastery of technical skills. I learned that, among her peers at the CTE school, Jenny was made to feel like she could not learn auto body refurbishing because she was being cast stereotypically as a weak female.

I wondered aloud as we spoke about how Jenny continued to gain academic and vocational skills amidst criticism from her peers. Jenny responded that it was her CTE instructor, Mr. James (pseudonym), who made learning possible and even enjoyable. When Jenny felt that her skills were inferior to the males in her classroom because of their negative comments, Mr. James would step in and provide more accurate assessments of her capabilities. He made valid critiques of her work and offered helpful suggestions to improve her skills. Jenny would disregard her peers' pessimistic comments and critiques upon receiving these words of encouragement from him. As she became competent with the foundational skills of the trade, Mr. James consistently motivated her to tackle more complicated techniques. According to Jenny, he so nurtured her commitment to learning auto body repair, rather than be constantly dissuaded by the displays of gender stereotyping made by her male classmates, she would move forward with more complex projects. Mr. James had assisted in accurately shaping the individual beliefs she held about her vocational capabilities, thus mitigating the effects of gender stereotyping on her learning.

What makes sharing Jenny's story difficult for me is recognizing that the negative effects of gender stereotyping on her academic and vocational self-beliefs continued during her second year in the same CTE program. I began to ponder what it must be like to teach in a classroom

where gender imbalances were so striking. Surely in a program like Jenny's, an instructor would be aware of the potential for such stereotyping and biased attitudes? I wondered about this specific aspect and about other teaching characteristics Mr. James might be demonstrating. I began to question how these teaching characteristics and attitudes helped support Jenny's willingness to learn in this classroom despite the negative stereotyping.

Background of the Study

At the time of my conversations with Jenny, I was a new graduate student in Literacy Education, journaling about aspects of my own instructional performance while teaching reading comprehension strategies to students with an Autism Spectrum Disorder. I was hoping to determine a potential research topic. Jenny's CTE experiences continued to resonate with me. Reflecting on her story through the lens of a special education teacher helped me to understand certain dimensions of the educational struggles she faced, especially in terms of being viewed as an outsider by her peers. This lens also assisted me in making sense of how her CTE instructor may have approached working with nontraditional students. The acuteness of gender identity in relation to vocational education and career development in male-dominated CTE fields was a new concept to me. While similarities could be drawn between different groups of students facing stereotyping in school, my special education background could not fully explain Jenny's experiences as a female student performing in her CTE program. Similarly, it could not fully explain the teaching characteristics displayed and dispositions expressed by Mr. James as he entered a classroom where a gender imbalance in numbers was so visible. Jenny had perceived Mr. James as a highly effective instructor, helping her master technical vocational skills despite her negative peer interactions. I wondered about Mr. James's teaching characteristics and the dispositions that had assisted him in his teaching.

My interests in the topic of effective teaching characteristics of CTE instructors eventually lead to a shift in the focus of my graduate work. I began to search the research literature on this topic. My initial attempts resulted in scant returns. It appeared the current research literature on CTE instructors was focused on topics such as broadening instructional techniques and incorporating rigorous academic skills into vocational learning. Widening the parameters on following searches, I included effective teaching characteristic of not only CTE instructors, but also Core Subject Area (CSA) teachers. These searches resulted in a wider array of published studies. While I discovered there are many approaches to identifying and measuring personality traits (Boyle, Matthews, and Saklofske, 2008), my review of the literature showed that many studies investigating teaching characteristics utilize a perspectival approach to document narratives from students and pre-service teachers. From this body of knowledge, I found Walker's (2008) design and methodology particularly compelling when applied to teaching effectiveness.

For a period of 15 years, Walker (2008), a college professor in teacher education, collected over one thousand essays written by pre-service teachers. The students were asked to write about a teacher who had the greatest influence on their lives and who was most able to engage them in learning the subject material. These students were also asked to think about the teachers they most wanted to emulate and who impacted their decision to enter the teaching profession. Walker asked students to explain their selection by providing observed examples of how this person inspired them and by describing their unique personal qualities. Methodologically, Walker inductively generated analytic codes to document twelve characteristics of teaching effectiveness:

1. Positive

2. Hold High Expectations

3. Cultivate a Sense of Belonging

4. Respect Students

5. Fair

6. Have a Sense of Humor

7. Compassionate

8. Admit Mistakes

9. Prepared

10. Display a Personal Touch

11. Creative

12. Forgiving

From my reading, I also learned there is debate among researchers and state certification committees regarding the proper weight that should be granted to the factor of teacher dispositions in effective CTE instruction (Adams, 2010; Lynch, 2000; Rojewski, 2002; Jacques & Potemski, 2014; Gordon, 2014). Typically, successful teaching candidates have to demonstrate the integration of three factors thought to comprise effective teaching: content knowledge, pedagogical skills, and dispositions, as defined by the Maine Department of Education (see Definition of Key Terms, p. 16). According to Gordon (2014), in the majority of states, criteria for gaining initial certification as a CTE instructor places a premium on a candidate's content knowledge. Training in teaching methodology and developing instructor dispositions and attitudes are often seen as secondary concerns when applying for certification as a CTE instructor (Adams, 2010; Gordon, 2014).

From this imbalance has come concern that CTE instructors, when compared to their CSA teaching counterparts, possess less knowledge of teaching methods and hold more rigid attitudes toward the teaching profession in general (Gordon, 2014). Researchers have explored this concern, finding mixed results. For example, researchers have found that CTE instructors do use fewer instructional strategies when compared to CSA teachers (Fletcher, Djajalaksana, & Eison, 2012). Still, when Morgan (2015) utilized the twelve characteristics documented by Walker (2008) to probe the beliefs held by both CSA teachers and CTE instructors regarding effective teaching characteristics, little statistical difference was detected between the groups. Essentially, both CTE instructors and CSA teachers agreed with each other that particular characteristics were vitally important to effective teaching.

I found Morgan's work particularly compelling because it focused exclusively on the factor of teacher dispositions, which interested me at the time, and had adopted Walker's (2008) characteristics when designing the survey instrument. Morgan's study was also the only one of its kind to directly compare whether CTE instructors and CSA teachers agreed with one another regarding Walker's (2008) twelve characteristics for effective teaching. After reflecting on Morgan's research design and considering the limitations of the samples it included, I became interested in exploring if female CTE students in the State of Maine would similarly agree with the CTE instructors in Morgan's study regarding effective teaching characteristics. I wanted to know if female CTE students similarly recognized these twelve characteristics as vitally important to effective CTE instruction. Beyond these variance type questions, however, I was also interested in how female CTE students described these effective teaching characteristics. Jenny had provided some comment on her instructor's beliefs and attitudes; I wanted to know how other female students described these characteristics. With this in mind, I initiated a mixed-

methods pilot study to understand better how female CTE students perceived the personality traits of their effective CTE instructors.

Characteristics of Effective CTE Instructors: A Pilot Study

The purpose of my pilot study was to document the perceptions expressed by female students who entered predominantly male-attended classrooms to better understand the ways in which they viewed and described the characteristics of their CTE instructors. To frame this mixed-method pilot study, I developed two research questions. The initial question asked: What relationship exists, if any, between female CTE students' perceptions and award-winning CTE instructors' (both male and female) perceptions of Walker's (2008) "Twelve Characteristics of an Effective Teacher"? The null hypothesis for each individual characteristic was that there is no statistical significant difference between perceptions of importance held by female CTE students and award-winning CTE instructors. However, if statistical significance was achieved on any characteristic, a second research question would follow: "How do female CTE students describe the characteristics of Walker's (2008) "Twelve Characteristics of an Effective Teacher" that were found to be statistically significant?

To collect student survey data in the first phase of data collection that could be compared statistically to the CTE instructor sample in Morgan's (2015) study, I developed a Likert-scale survey that mirrored the *Teacher Perception Survey* utilized in that study. Morgan's instrument was constructed to include the twelve characteristics described by Walker (2008) and had five items within each construct. Morgan's *Teacher Perception Survey* measured teachers' self-perceptions of effective teaching characteristics. By rewording questions into student language, my survey mapped onto items asked of CTE instructors. In the second phase of data collection, a

structured interview protocol was constructed using the statistically significant results from the survey in order to focus informants in describing key effective teaching characteristics.

Informants for this pilot study were drawn from the North East Regional School of Applied Technology (NERSAT) (pseudonym), the same school Jenny had attended. The school is considered one of the largest CTE regional centers in the State of Maine. At the time of the pilot study, total student enrollment at NERSAT was 562, with 185 being females, constituting 33% of the overall student body. Approximately 70 female students who attended NERSAT received information packets about participating in my study. Consent and Assent forms were received from a total of 32 female students.

Data collection began April 11, 2016, and ended on June 3, 2016. Surveys began data collection. All 32 informants were encouraged to complete surveys on or before May 17, 2016. After receiving 15 completed surveys, descriptive statistics were calculated so that a rank-ordered list of the twelve traits by mean scores could be constructed. This procedure aided in restructuring the structured interview protocol by positioning the teaching characteristics that received higher mean scores first in the interview protocol. These preliminary findings also supported the inclusion of a third follow-up question for each of the four highest reported characteristics. Each of the 32 informants completed a survey. From this group of 32 informants, four were randomly selected to participate in individual interviews. Random numbers were generated via a computer program to select interview participants on April 30, 2016. Individual interviews were scheduled during the week of May 23, 2016. Observational field notes were written immediately following each interview. Additional sources of evidence included analytic memos written during analysis of interview transcripts.

Data were analyzed using descriptive statistics, chi-square tests of independent statistical procedures, structured individual interviews, and content analysis. The analysis of quantitative data made use of descriptive statistics to rank-order significance in the twelve teaching characteristics, and chi-square tests of independence on each of the twelve teaching characteristics to explore differences in agreement and disagreement among CTE instructors and female CTE students. To compare these informants' survey results to CTE instructors, I accessed the results Morgan (2015) had documented from his CTE instructor sample. Morgan's data included survey responses from a national sample of 48 CTE instructors who had been recognized as effective by winning "CTE instructor-of-the-year" awards in their respective states. Analysis of qualitative data used predetermined deductive codes from the twelve teaching characteristics and direct content analysis to highlight how these students describe these characteristics.

In the first phase of analysis, chi-square tests of independence (Coladarci, Cobb, Minium, & Clarke, 2011) of survey data revealed statistically significant differences between students and instructors in 5 of the 12 characteristics. Students reported significantly less support than that of the CTE instructors for the characteristics of "Creative," X^2 (1, N=80) = 10.75, $p > .01$, and "Display a Personal Touch," X^2 (1, N=80) = 12.51, $p > .001$. Students' support was found to be significantly greater than that of the CTE instructors for the characteristics of "Admit Mistakes," X^2 (1, N=80) = 12.15, $p > .001$, "Have a Sense of Humor," X^2 (1, N=80) = 4.78, $p > .01$, and "Compassionate," X^2 (1, N=80) = 18.63, $p < .001$.

In the second phase of data analysis, informants discussed how a CTE instructor's capacity to "Admit Mistakes" was linked to their gaining an appreciation for, and reflecting on, the precision required of learning content in the technical trades. For three of the four informants,

these events were described as a confluence between accuracy in assembling materials to exacting standards and the aesthetic presentation of an object being built. CTE instructors, it appeared, do make mistakes in the technical aspects of executing vocational tasks. Informants felt like an instructor's willingness to admit to these mistakes provided them with information regarding task difficulty. Informants also referenced how their CTE instructor's ability to admit mistakes helped them assess their own skill level.

The informants also discussed how "Sense of Humor" was used to prompt and guide students to use vocational equipment and machinery safely. The descriptions were described in paradoxical terms in which the safety issues around dangerous machinery were often met with a lighthearted guiding approach. This is not to say that female CTE students reported a lack of seriousness demanded by operating such equipment. In fact, all informants spoke about the training and education that goes into learning the operating procedures of their respective program's equipment. For example, a participant recalled learning the proper chainsaw cutting techniques to prevent injury and another spoke about proper protective clothing and footwear when working in a professional kitchen. These findings notwithstanding, CTE instructors were described as providing tongue-in-cheek corrective input to students who were operating machinery in an unsafe manner. These moments appeared to be a compromise on behalf of the CTE instructor in an attempt to have student focus more on safety without instilling fear in their students.

Lastly, students discussed how "Compassion" was used by their CTE instructor to reduce frustrations over gender stereotyping faced by female students. Descriptive analysis found that three of the four female informants described their CTE instructor's compassionate characteristic following explicit examples of gender bias outside of their CTE program. NERSAT is a large

building housing many different vocational programs and often these programs provided services to other programs. For example, I observed the building construction program renovating a room for the culinary arts program. The fact that these programs support one another is a benefit to the entire school, and to the students who perform these vocational tasks autonomously; however, interview data suggested the fact that females students working independently are confronted with negative gender messaging and gender stereotyping from their male counterparts on a regular basis. CTE instructors were reported to be approachable and responded with compassion to these female CTE students' concerns. Beyond describing displays of compassion, two informants reported that their CTE instructor addressed incidences of gender stereotyping with a teaching colleague in order to eliminate future incidences. The informants referenced how this compassionate approach made them feel valued as tradespersons in NERSAT.

Following the pilot study, I returned to the literature on effective teaching and discovered serious limitations that negatively impacted the design of my pilot study. I had focused on a single factor of effective instruction, namely dispositions. This single focus, while beneficial to structuring the survey, constrained my interview participants' perceptions, leaving little room for them to address the linkages between these characteristics and the other important factors often referenced in the literature regarding effective teaching. Beyond the beliefs and dispositions of teachers, these factors include a teacher's content knowledge and pedagogical skills. I focused my reading on these three factors—knowledge, skills, and dispositions—and discovered that CTE instruction is currently undergoing major credentialing and professional development reforms to improve an instructor's abilities to deliver integrated curriculum to a more diverse population of students, including females in predominantly male-attended course. These three factors are often considered primary to such improvements in CTE (Adams, 2010). However, as

with the narrow scope of my pilot study, which included concepts of dispositions, it appeared that research on CTE teachers' instruction was limited to instructional practices and content knowledge. In fact, during my review of the literature, I was not able to locate a single study on CTE instruction that was designed to gather data on all three factors thought to comprise effective teaching. With this gap in the literature in mind, I began to design a research project that could help me understand the multifaceted concept of instructing in a Career and Technical Education context.

Statement of the Problem

Career and Technical Education (CTE) schools continue to be challenged with an underrepresentation of female students who want to pursue traditionally male, industry and technical training programs and careers. This occurrence is despite the reauthorization of the Carl D. Perkins Career and Technical Education Improvement Act of 2006 (Perkins IV) which had aimed to reduce the structural barriers thought to inhibit female participation in predominantly male-attended CTE programs. At the time, the primary driver for increasing female participation in these programs was the significant gender stratification found in the American workforce (Gordon, 2014). Women's involvement in the labor force was almost equal to that of men, yet women were largely employed in low-wage, low-mobility, and low-skilled occupations (Mastracci, 2004). In fact, by the early 1970's, America's workforce was so heavily skewed that it was easy to identify male-dominated or female-dominated occupations (Gordon, 2014). CTE was viewed, then, as a pragmatic way to increase the occupational skills of women to potentially reduce the imbalance found in the workforce.

The U.S. Department of Labor (2012) defines nontraditional trades as "those in which individuals from one gender comprise less than 25% of individuals employed in the occupation

or field of work" (p. 36). Likewise, Perkins IV identifies nontraditional CTE programs as those programs with fewer than 25% participation of one gender (20 USC 2302, Section II). It is important to note that these definitions include both sexes, although as stated above, females are more likely to experience the negative effects of gender inequities. Current examinations of female participation rates in industrial and technical occupations unfortunately demonstrate continued gender segregation patterns (U.S. Census Bureau, 2012). Not surprisingly, enrollment trends in CTE courses nationwide continue to demonstrate gender imbalances, as well (Toglia, 2013).

The State of Maine, on the other hand, has made modest gains in increasing female students' enrollment in nontraditional CTE programs. To date, nearly 21% of females attending secondary CTE schools are enrolled in programs traditionally attended by males (State of Maine CTE reports, 2014). Enrollment numbers have increased 2% over the last seven years. This encouraging news is beneficial for a state projected to need a large number of replacement workers in occupations dedicated to installation, maintenance and repair, production and manufacturing, and technical services. Even so, the current participation rate falls short of the state's stated goal of balancing all gender bias in CTE programs by bringing enrollment rates up to 40% or greater (Maine DOE, Five Year Perkins State Plan, 2013).

Maine's focus on providing support services to students and improving the overall quality of their CTE programs is responsible for these modest gains. Acting on the gender balancing provisions in Perkins IV, Maine revised their State Standards of Service for students who are members of special populations (Maine DOE, 2007). The document outlines a comprehensive set of measures to enhance the learning outcomes for students entering nontraditional settings. Specific to nontraditional CTE participation, the state recommends students have access to

support systems that provide services such as basic skills development, skill assessments, self-esteem enhancement, emotional support, and job-seeking strategies. An integral component of these support systems is the CTE instructor.

CTE instructors not only act as the nucleus for many of these support systems, but are also a primary factor in successful learning outcomes for every CTE student (Adams, 2010; Clark, Threeton, & Ewing, 2010) and especially for female students who enter nontraditional programs (Gordon, 2014). It is critically important that Maine's CTE instructors have the knowledge, skills, and dispositions to meet the learning needs of female student who enter a nontraditional program.

Purpose of this Study

The purpose of the proposed study is to explore how female CTE students who enter predominantly male-attended programs perceive instructor effectiveness. For the purpose of this study, effective instruction was defined as the quality of the information in both form and substance that was presented at the appropriate levels by the instructor to his students in order to promote their understanding and achievement (Astleitner, 2005). Although previous research has shed light on the structural barriers faced by females in nontraditional settings (Whitehead, 2013), new information suggests CTE instructors engaged in prolonged professional development focused on improving pedagogical skills provide these students instructional benefits leading to successful completion of their CTE program (NRCCTE, 2013). Consequently, I seek to better understand the factors associated with effective CTE instruction, namely content knowledge, pedagogical skills, and dispositions.

Research Questions

For the purpose of this study, the primary question reflects my interest in a perspectival study that places its emphasis not on the instruction itself but upon how female informants describe teaching effectiveness. While the CTE instructor involved in this study was reported to be effective by the director of NERSAT, this study was open—by virtue of the question—to the possibility that he will be less or not at all effective. Therefore, the following primary question grounded this study:

1.) How do female Career and Technical Education (CTE) students enrolled in a predominantly male-attended program describe instructor effectiveness?

I devised secondary questions because my aim was to isolate three domains of instructor effectiveness emerging from existing research. Methodologically, these discrete questions also grounded the design of instruments, as well as the deductive codes that arose from the instruments themselves. The secondary questions, then, provided an essential focus that insured I contributed to the research base. The following secondary questions grounded this study:

1.) Considering the effectiveness of their automotive technology instructor, how if at all, do informants describe the instructor's knowledge of content? (What they know)

2.) Considering the effectiveness of their automotive technology instructor, how if at all do informants describe the instructor's pedagogical skills? (What they can do)

3.) Considering the effectiveness of their automotive technology instructor, how if at all do informants describe the instructor's dispositions? (Their attitudes and beliefs)

Definition of Key Terms

A basic understanding of terminology is fundamental to this proposed research study. The following definitions will be used throughout the context of this study:

Career and Technical Education (CTE)

Career and technical education is defined as an educational program consisting of a combination of academic and technical courses that prepare students for postsecondary employment in a specific career field (U.S. Department of Education, 2009).

Content Knowledge

Content knowledge refers to a CTE instructor's understandings of the central concepts, methods of inquiry, and structures of a subject area (Maine DOE, Chapter 15 Section II, 2016).

Dispositions

Dispositions refers to a CTE instructor's values, commitments and professional ethics that influence behaviors toward students, families, colleagues, and communities and affect student learning, motivation, and development as well as the educator's own professional growth. Dispositions are guided by beliefs and attitudes related to values such as caring, fairness, honesty, responsibility, and social justice (Maine DOE, Chapter 15, Section II, 2016).

Effective Instruction

Effective instruction occurs when the quality of the information in both form and substance is presented at the appropriate level of the students to promote understanding and achievement (Astleitner, 2005).

Gender

Gender is defined as a learned behavioral aspect of an individual that is developed based upon biological, psychological, and sociological factors (Bussy & Bandura, 1999).

Gender Stereotypes

Gender stereotypes are defined as societal behavioral expectations placed upon a person as a result of their gender group membership (Kiekman & Eagly, 2000).

Female-dominated Occupations

Female-dominated occupations are defined as occupations in which 75% or more of the employees in that field are female (U.S. Department of Labor, 2010).

Industry Credentials/Certifications

Industry credentials and or certifications can be earned by CTE students who pass an assessment designed to measure technical competency of a skill set used in a specific career field (NRCCTE, 2013).

Male-dominated Occupations

Male-dominated occupations are defined as occupations in which 75% or more of the employees in that field are male (U.S. Department of Labor, 2010).

Nontraditional Careers

Nontraditional careers are defined as careers or occupational fields in which 25% or less of the workers in that field are composed predominantly of one gender (U.S. Department of Labor, 2010).

Nontraditional CTE programs

Nontraditional CTE programs are defined as Career and Technical Education programs in which 25% or less of the enrolled students are predominantly of one gender (Carl D. Perkins Career and Technical Education Improvement Act of 2006).

Occupational Gender Segregation

When employees in a particular occupational field are composed predominantly of one gender. The generally accepted cut off is 25% or less of one gender (U.S. Department of Labor, 2010).

Pedagogical Skills

Pedagogical skills refers to a CTE instructor's understandings of learning, human development, professional ethics, motivational techniques, cultural and individual differences, instructional strategies, classroom management, and assessment strategies that have an impact on the learner (Maine DOE, Chapter 15 Section II, 2016).

Perkins IV

Perkins IV refers to the Carl D. Perkins Career and Technical Education Improvement Act of 2006. This is the primary law governing CTE programs in the United States. The intent of the law is to encourage students to pursue high wage, high demand occupational training. It also establishes accountability for nontraditional participation (Carl D. Perkins Career and Technical Education Improvement Act of 2006; Meeder, 2008).

<div align="center">

Significance of the Study

</div>

The goal of this dissertation study was to document how female high school students enrolled in a predominantly male-attended CTE program perceive their CTE instructor's effectiveness, which includes expressed content knowledge and observed pedagogical skills and dispositions. The findings from this study may have numerous implications in policy, socioeconomic and educational domains. First, the findings from this study should be of interest to policymakers who focus on the certification issues related to CTE instructors. Since gender equity in educational access has been the aim of several pieces of federal legislation, research that explores issues of CTE instruction and female participation is relevant. This study will also add to the literature by examining the reality of females who defy these barriers participating in CTE. Findings from this study could have socioeconomic implications. Despite increases in educational training (NCES, 2012) and workforce participation among women (U.S. Census

Bureau, 2012), occupational segregation persists. The results from this study might provide greater understanding of how CTE instructors encourage persistence of their female students, resulting in successful completion of CTE programming. Additionally, educational decision makers, particularly at the state level, may be able to use these findings to develop avenues to encourage increased nontraditional participation within segregated programs.

CHAPTER 2

REVIEW OF THE LITERATURE

The purpose of this study was to understand the ways in which female CTE students experienced the phenomenon of nontraditional enrollment in a male-dominated automotive technology program and how they perceived instructor effectiveness. The proceeding review of the literature sets out to frame this phenomenon as a teaching-learning process, where student input and the instructor's general pedagogical-psychological knowledge are included.

In this chapter, I first examine concepts and conceptual frameworks that guided the design of this study. The theoretic framework for this study is Bandura's (1986) social cognitive theory. Within this theoretic frame, the concept of self-efficacy is of great importance. My review of the literature will address forms of self-efficacy that informed my study. Beyond Bandura's theoretic frame and concepts, my literature review includes scholarship addressing teaching effectiveness and the role of gender in teaching and learning. In the second section, I will highlight salient literature on gender differences in academic and career development self-efficacy. I will conclude this chapter by providing a historical account of legislative attempts to end gender segregation in CTE schools.

Theoretical Foundation

Although current research casts few doubts that the educational choices made by female adolescents regarding CTE programming is influenced by gender stereotypes, little is known about the females who defy these stereotypes and enter CTE programs where males make up the majority of the classroom population. Therefore, this study is situated within an emerging line of inquiry that includes findings documenting gender differences in the importance given to each of the four sources of self-efficacy information as they relate to academic and occupational beliefs

(Butz & Usher, 2015; Zeldin, Britner, & Pajares, 2008; Zeldin & Pajares, 2001). This line of inquiry is being developed to understand better the underrepresentation of women in certain academic and career pathways. Butz and Usher (2015) found that, somewhat contrary to the theoretical assertions of Bandura's (1977) social cognitive theory, adolescent female students emphasized to a greater degree than male students the influence of teachers to the development of their academic self-efficacy beliefs in math and reading. The prior theoretical position posited that vicarious observations and verbal persuasions provided by the likes of a teacher would have only a limited influence on the development, and subsequent durability, of an adolescent student's beliefs regarding their academic capabilities (Schunk & Meece, 2006).

Likewise, Social Cognitive Career Theory (SCCT) developed by Lent, Brown, and Hackett (1994), which incorporated the postulates advanced by Bandura, asserts that when individuals make occupational choices, a large factor weighed during these decisions would be their academic self-efficacy beliefs. Individuals, in turn, use these achievement beliefs to provide them with confidence that their choice to enter a particular career will be successful. However, as Zeldin, Britner, and Pajares (2008), and Zeldin and Pajares (2000) have found, females who had successfully transitioned from academia into male-dominated Science, Technology, Engineering, and Mathematics (STEM) careers reported social persuaders as one of the salient sources of their beliefs about the academic capabilities they held in their field. Further, the investigators found men and women based their confidence to succeed in a STEM career on different sources of self-efficacy information. Women, it appears, continue to utilize the social persuasive messaging of others as an important source of career self-efficacy beliefs. Men, on the other hand, reported utilizing mastery experiences as their most influential source of

career self-efficacy information. Academic self-efficacy is rooted in Bandura's (1977) social cognitive theory. Therefore, I will begin this section with an overview of that theory.

Social Cognitive Theory

The theoretical framework for my study is Bandura's (1986) Social Cognitive Theory (SCT). According to Bandura, explicit actions are an interaction of three factors: the person, their behavior, and their environment. This explanation of human behavior is known as reciprocal determinism (see Figure 2.1). In this model, the personal factors address internal issues such as cognitive and personal factors. The behavior factor addresses the explicit actions of the individual. Lastly, environmental factors address the individual's setting, situation, and context.
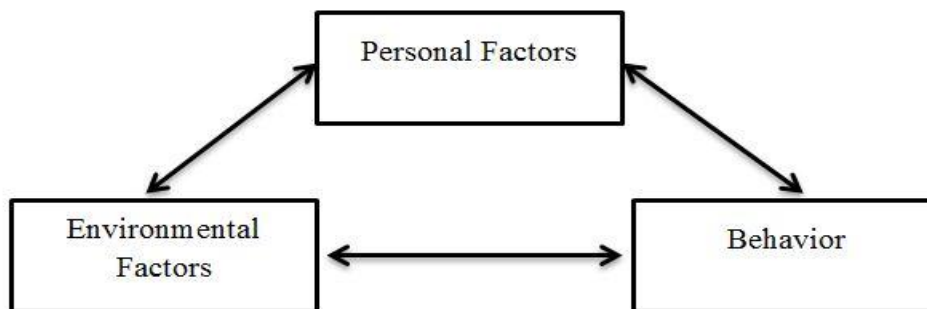
Figure 2. 1 Triadic Model of Reciprocal Determinism (Bandura, 1986, p. 24).

Using a CTE context, for example, would mean that in the male-dominated CTE classroom (environment) a female student (person) brings certain internal factors like preferences, experiences, and abilities. As a student, she can vary her course engagement (behavior) by opting to attend the class, listen to the lecture, and take notes. According to reciprocal determinism, the amount of student engagement is influenced by the environment of the classroom and the student's previous experiences of being in classrooms. In the case of this

female student, environment and personal factors influence behavior. She is, however, also able to manipulate her environment by selecting which CTE class she wants to attend based on her preferences and is able to select how much she want to engage in the class. Additionally, personal engagement in her course is manipulated by her environment in terms of how the CTE instructor designs the course and manages the classroom. The three factors, therefore, influence each other in a reciprocal manner.

Bandura (1986) also theorized that people have five basic cognitive processes: symbolism, forethought, vicariousness, self-regulation, and self-reflection. The symbolizing cognitive process recognizes a person's ability to use symbols to "process and transform transient experiences into internal models that serve as guides for future action" (p. 18). This process allows people to evaluate potential solutions mentally rather than acting them out in a trial and error fashion. The forethought process builds on symbolizing to allow individuals to plan courses of action for themselves, which results in self-directed behavior. The cognitive process of vicariousness allows people to learn by observing another person's behavior and their consequences. In the CTE setting, students who watch other students be rewarded by the instructor in the form of verbal praise for attempting to complete a complicated vocational task will be more inclined to try the task themselves.

The latter two cognitive processes are vital to understanding self-efficacy. The self-regulatory capacity means that people are able to motivate, set, and regulate their own internal standards. In the CTE classroom, this translates to how motivated students are to succeed following their own criterion of success. The self-reflective capacity means that people have a metacognitive ability to analyze their own thought processes and gain knowledge about

themselves and the world around them. Thus, CTE students are able to examine their own abilities, learning, and their environment.

Self-Efficacy

The term used to describe a person's belief in his or her own ability to perform necessary tasks to achieve goals is self-efficacy (Bandura, 1986). Self-efficacy tends to be assessed for narrow (e.g., this course) as opposed to general tasks (e.g., general learning; Bandura, 1986). In social cognitive theory, Bandura hypothesized that individuals form these self-efficacy beliefs based on their interpretation of information from the environment. Bandura identified four sources of information.

First, it is hypothesized that academic performance is the most powerful source of information in interpreting one's own learning outcomes. Following the completion of an academic task, students interpret and assess the outcomes they created. This source of information is referred to as *mastery experiences* (Bandura, 1986). Judgments are made by the student on their competence to produce the desired academic outcomes. When a student believes their output was successful, they become more confident that they can accomplish a similar task. The converse is also hypothesized. If a student believes that they failed to achieve success in the outcome of their efforts, the belief that they can successfully perform related tasks decreases. Bandura believed that these mastery experiences were the most potent source of academic self-efficacy information and that success in a particular academic domain often has effects that are long lasting. And, while periodic academic struggles are fairly typical during initial periods of new learning, when a gradual improvement occurs over time a student is more likely to see a rise in self-efficacy beliefs. As hypothesized by Bandura, overcoming difficult and challenging tasks will provide particularly powerful self-efficacy information. However, the opposite is also

thought to occur. When a student experiences failure following prolonged and intense effort, their self-efficacy beliefs in that academic domain may be weakened. Similarly, positive outcomes that are achieved through joint efforts provided by others are thought to supply a weaker interpretation of academic ability.

Emotional and physiological states are a second hypothesized source of information used to inform academic self-efficacy beliefs. This source of information is referred to as *affective states* (Bandura, 1986). For this source of information, one can posit that students interpret physiological arousals, such as stress, fatigue, and mood, during the performance of a task. Weak emotional reactions to specific school-related academics can provide cues to anticipated failure, whereas strong emotional reactions can provide cues for expected success. A high level of anxiety during learning is thought to impair academic self-efficacy. An increase in anxiety has been reported as students matriculate through school (Schunk & Meece, 2011). Therefore, Bandura (1977) believed that bolstering a student's sense of well-being and reducing the potential for negative emotional states would strengthen academic self-efficacy. Affective states are also hypothesized as distorting other sources of academic information. For instance, weak emotional reactions can lead to a lack of confidence in task performance. Low confidence leaves some students to misinterpret task failure as incompetence rather than confusion. These emotional states also influence the interpretations of experiences. Pessimism, like low confidence, signals to students that their mistakes are due to inability. Optimism, on the other hand, increases academic self-efficacy beliefs and increases motivation to learn.

Social models are the third hypothesized source of information used to inform academic self-efficacy beliefs. Referred to as *vicarious experiences* (Bandura, 1986), the act of observing others perform academic tasks is a component of social cognitive theory. Two different types of

social models have been explored in social cognitive theory (Schunk & Hanson, 1985). A coping model is the first type of model a person can utilize for vicarious information. In school contexts, these coping models are viewed as students who persist through challenging problems until they successfully master a task. These coping models are thought to provide the most informative information to other learners. By comparison, the second type of model, referred to as a mastery model, provides little relevant information because they achieve success with relative ease. Similarity to the person being observed, then, may be a critical factor in the strength of the vicarious information gained from others. Social models provide comparative information that students use to make judgments about their own academic capabilities. This information is especially powerful when students hold low self-efficacy beliefs in a given subject or have limited experiences with an academic task. While comparing themselves to others in the classroom, judgments about the student's own academic capabilities are made. Social models can also impart information that undermines the academic self-efficacy beliefs of those watching them. This is true if the social model is viewed as a competent learner and fails at a task which is perceived as easy.

The final source of academic self-efficacy information comes in the form of efficacy-supportive feedback. Referred to as *social persuasion* (Bandura, 1986) these messages often work to boost a learner's confidence in their academic capabilities. During times of new learning that is difficult, social persuasion can encourage a student's efforts and self-confidence. In school contexts, these messages also provide information to support the fine tuning of a learner's self-appraisals following an academic task. Social persuasion, however, is viewed as a source of information that is limited in the ability to create durable academic self-efficacy beliefs (Bandura, 1977). Further, Bandura (1986) suggests that it may be easier to undermine the

creation of positive self-efficacy beliefs due to poorly framed feedback provided during the formative years of a young child's upbringing.

The four hypothesized sources of self-efficacy information play a key role in the academic accomplishments of students in the formal school setting. Students use these sources of information as a means to assess their own skills and levels of confidence before, during, and following learning activities. While Bandura (1977) theorized that certain sources were more powerful, there is a purported interconnectedness among these sources.

Academic Self-Efficacy

Due to the fact that the triadic model of reciprocal determinism includes the environment as a factor, researchers have found that information used to form self-efficacy beliefs are better understood by focusing on specific domains. A high sense of academic self-efficacy, therefore, has been identified by Bandura (1986) as fostering elevated levels of motivation, academic accomplishments, and developing intrinsic interest in particular academic domains. The self-regulatory capability of SCT helps account for skills that students employ. According to Bandura, these skills include "planning, organizing, and managing instructional activities; enlisting resources; regulating one's own motivation; and applying metacognitive skills to evaluate the adequacy of one's knowledge and strategies" (p. 175).

Choi's (2005) research on academic self-efficacy demonstrated that course specific abilities (Wood & Locke, 1987) are a better measure of academic-self efficacy than a general self-efficacy measure. Owen and Froman's (1988) measure of academic self-efficacy that was also used in Choi's study was found to be a better measure of academic self-efficacy because it adhered to Bandura's (2006) recommendations for creating a self-efficacy measure. These academic self-efficacy measures have the added benefit of assessing a larger array of specific

skills, as well. Examples of the abilities in the CTE context might include understanding a majority of the specific technical systems that define a trade, diagnosing a complex mechanical problem, and earning good marks on written exams. Researchers are beginning to investigate if differences exist between males and females in how they utilize and integrate the four sources of information in a specific academic setting. I will review these differential considerations in a later section of this chapter; but first, I will turn my attention to the teacher's role in organizing the environment and delivering the academic content.

The Teaching-Learning Process

 Research has shown that teacher effectiveness has an impact on student achievement (Darling-Hammond, 2000). Various quantitative research studies have shown teacher quality is an important factor in determining achievement gains in students (Darling-Hammond, Berry & Thoreson, 2001; Wright, Horn & Sanders, 1997). In quantitative studies, predictors of teacher quality have accounted for factors such as degrees earned or years of experience, types of qualification, and certifications held. Yet, inconsistencies within these findings exist (Darling-Hammond, 2000; Darling-Hammond, Berry & Thoreson, 2001).

Inconsistencies within the results of quantitative studies may be due to the conceptual frameworks utilized by these researchers. Factors such as degrees earned or years of experience, types of qualifications, and certifications awarded are intermediaries assumed to measure teacher quality. These studies posit such factors will differentiate teacher quality (Hill, Rowan, & Ball, 2005). However, teachers' competencies in the classroom, such as the effectiveness of instructional skills, are not directly examined.

Other studies, however, use a more direct indicator of teacher effectiveness. These studies investigate the makeup of teachers' knowledge base. Utilizing this approach, studies of

effective teaching go beyond investigations of factors such as college degrees and teaching experience, types of qualifications, and certifications to more conceptual investigations of effectiveness by studying the knowledge base of teachers thought to inform capable instructing (Goe, Bell, & Little, 2008). Studies utilizing teacher knowledge as a conceptual framework posit that differences in the conceptual quality of teachers' knowledge can better discern effective teaching because performance is based on a pedagogical knowledge base. This approach to understanding teacher effectiveness is more complex than statistical approaches.

More elaborate social-cognitive models of the teaching-learning process have been proposed. Seidel and Shavelson (2007), for example, view learning as the integration of several components. The researchers view learning as the intentional process of constructing knowledge in a specific academic domain. They suggest that necessary components of teaching and learning also included the social learning environment, a regulative and evaluation feature, and a goal directed focus (Seidel & Shavelson, 2007). Effective teachers, in turn, employ teaching practices that best make use of the learning process. For example, effective CTE instructors are those who differentiate teaching in different vocational trades (building construction engineering vs automotive technologies), allow enough learning time for students to actively construct their knowledge, structure learning by setting and orienting students towards goals, establish a climate of social learning in the classroom and in the live work (or hands-on) shop setting, and provide support and feedback through monitoring and evaluation of student learning. Although teaching effectiveness is parsed through results of outcomes in student learning, motivational-affective and cognitive components, the model is rooted in the perspective of teaching. The student's contribution to the teaching-learning process, however, is not made explicit in this model.

Student's contributions to the teaching-learning process are made explicit in other sociocognitive models. These models also incorporate a student's contributions to the teaching-learning process as inputs to the process of effective teaching. Carroll (1963) proposes a model that is comprised of five elements that contribute to the effectiveness of instruction: students' general ability, prior knowledge, motivation to learn, opportunity to learn, and the quality of instruction. Three of these five elements (general ability, prior knowledge, and motivation to learn) are student inputs to the teaching-learning process, while the other two (opportunity to learn and quality of instruction) are under control of the instructor. Carroll's model introduces the concepts of learning differences and adaptive instruction in the teaching-learning process. Given that students within the classroom will vary in ability, knowledge, and motivation, teachers need to consider both the time needed for instruction and the time available for instruction. For example, students with processing deficits often require more time for instruction. At the same time, however, higher instructional effectiveness will result in less time needed for a lesson. Therefore, an interconnectedness and interdependence among teachers and students are a part of Carroll's model of the teaching-learning process.

Slavin (1984) extends Carroll's (1963) model by focusing on the factors of effective instruction that are modifiable by teachers. These elements include the quality of instruction, appropriate levels of instruction, motivating students, and time allocated for learning. In Slavin's model, these elements are modified by teachers when combined with student factors such as motivation and cognitive capabilities. The end result is student learning. Slavin also proposes two mediating factors in the teaching-learning process: instructional efficiency (a product of quality of instruction, appropriate levels of instruction, and motivation) and engaged time on task (a product of motivation and time allocated to learning). Consistent with Carroll's model, Slavin

conceptualizes the teaching-learning process as an interconnection and interdependence among teachers and students. For example, student aptitude and motivation contribute to instructional efficiency and engaged time, which in turn, ultimately affect student achievement.

This brief review is meant to illustrate the complexity of the teaching-learning process and the complex relationship between students and teachers. This review contrasts with statistical models that attempt to predict effective teaching by controlling for student factors. While it is reasonable to want to control for differences in student characteristics that are beyond the control of teachers, literature on the teaching-learning process that includes student factors indicate an interconnectedness and interdependence among teachers and students. A model of effective teaching would need to account for these.

More importantly, these models advance the idea that a teacher's knowledge goes beyond just a solid foundation of knowledge of content (e.g., automotive technology, automotive diagnostics) and classroom management. Models of interconnectedness among teachers and students should also include knowledge of students and learning. In the following sections I will review the various conceptualizations of teacher knowledge as viewed as interdependent with student factors and how it functions in the teaching-learning process.

Teacher Knowledge

The pedagogical knowledge base of teachers has been defined by Verloop, Van Driel, and Meijer (2001) as all the knowledge required for teachers to conduct the activities in the teaching-learning process. In their definition, Verloop, Van Driel, and Meijer posit that teachers require both theoretical and scientific knowledge. Such combined knowledge includes theories of learning and of the teaching-learning process. Teachers also require practical or practice-based knowledge, which is viewed as situated knowledge. However, according to Verloop, Van Driel,

and Meijer, this knowledge base does not equate to guidelines for teaching. Rather, it is essentially the incorporation of the cognitive knowledge required for creating effective teaching and learning environments. As proposed by Verloop, Van Driel, and Meijer, this pedagogical knowledge base can be made explicit and studied. Before proceeding with a review of the content of such knowledge, however, considerations will be made for the ontological and epistemological foundations of how knowledge is conceptualized in social-cognitive orientations.

In the sociocognitive perspective, knowledge is a multidimensional concept that is both declarative and procedural. Understanding this distinction is important because it identifies not only how knowledge is acquired, but also how it is developed into mastery experiences. The simplest definitions of the concepts of declarative and procedural knowledge are "knowing THAT something is the case" (e.g., factual knowledge) and "knowing HOW to do something" (e.g., knowledge of how to drive a car). However, distinctions between the two are actually more complex. These considerations have to do with how knowledge of skills is stored in memory and how it is developed into mastery experiences (Jiamu, 2010).

According to Jiamu (2010), declarative knowledge is viewed as static and can be either factual or experiential knowledge. Procedural knowledge, on the other hand, is viewed as dynamic and relates to motor-skills, cognitive skills, and cognitive strategies. Knowledge, then, starts out in declarative form and is then converted into procedural form. It is represented by the performances of skills. In teaching, for example, knowledge about instructing is initially encoded in a pre-service teacher's memory in declarative form through reading texts and listening to lectures on the practice of teaching. These activities form knowledge of facts such as instructional practices or classroom management techniques. Through practice, declarative

knowledge is interpreted into procedural knowledge to initiate certain behaviors. For example, knowing when and how to use a particular instructional strategy is based in procedural knowledge. Teacher effectiveness, then, is subsequently affected through continued practice as both declarative and procedural knowledge is strengthened.

These differences are important to the current study as they explain how novice CTE instructors may develop into effective CTE instructors. Specifically, a novice instructor starts with the acquisition of declarative knowledge and then begins to apply that knowledge to teaching students. Still, research on how effectiveness in CTE instruction is acquired shows that novice and expert instructors differ in their ability to apply their knowledge (i.e., procedural knowledge), which suggests differences in the quality of pedagogical knowledge based on experience (Ruthland & Bremer, 2002). In the next section, I will review the hypothesized components of a teacher's knowledge base.

General Pedagogical Knowledge

In the seminal work on the structure and content of teacher knowledge, Shulman (1986, 1987) proposes that teacher knowledge should be viewed as an integration of different knowledge bases. These bases fell into seven particular categories referenced in Table 2.1 below.

Table 2. 1

Components of Shulman's (1986) Teacher Knowledge Base

Components	Definition
General pedagogical knowledge	Principles and strategies of classroom management and organization that are cross-curricular
Content knowledge	Knowledge of subject matter and its organizing structures
Pedagogical content knowledge	Knowledge of content and pedagogy
Curriculum knowledge	Subject and grade specific knowledge of materials and programs

Table 2.1 Continued

Knowledge of educational contexts	Knowledge of classrooms, governance and financing of school districts, the culture of the school community
Knowledge of educational ends, purpose, values, and their philosophical and historical grounds.	Knowledge of educational history and contexts
Knowledge of learners and their characteristics	Knowledge of individual student characteristics

Source: Adapted from Shulman (1986)

Shulman (1986) formally proposes the concept of pedagogical content knowledge, in which he referred to knowledge that integrates the content knowledge of a specific subject and the pedagogical knowledge for teaching that particular subject. According to Shulman (1987), pedagogical content knowledge "represents the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction" (p. 8). This category also includes knowledge of strategies for reorganizing the understanding of learners because students of different ages and backgrounds bring with them prior knowledge, some of which may include misconceptions (Shulman, 1986). According to Shulman, this is the category of knowledge that is fundamental to teachers' knowledge of teaching. This conceptualization, in fact, fits well with this study as it takes into account students' individual differences in the teaching-learning process which was described above.

Pedagogical content knowledge generates the idea that teachers held a unique from of technical knowledge available only to the profession of teachers (Ball, Thames, & Phelps, 2008). For example, Ball, Thames, and Phelps propose that pedagogical content knowledge, as defined by Shulman, is actually comprised of two categories which include: knowledge of content and

students (knowledge of students' conceptions and misconceptions) and knowledge of content and teaching (knowledge of instructional strategies). They further propose that Shulman's concept of content knowledge is comprised of common content knowledge (knowledge common to teacher and non-teachers) and specialized content knowledge (knowledge unique to the work of teachers). These categories, then, are hypothesized to contribute to teachers' knowledge of teaching specific content knowledge.

Research is beginning to show that general pedagogical knowledge is just as essential as content knowledge and pedagogical content knowledge for developing effective teachers. However, it is clear that content knowledge alone is not enough to produce effective teaching. For example, Baumert, et. al. (2010) demonstrates that when content knowledge is controlled, higher levels of knowledge do not predict better student outcomes. Researchers, then, are beginning to conceptualize teacher effectiveness as including the concept of general pedagogical knowledge as part of professional competence.

General Pedagogical-Psychological Knowledge

Shulman's (1987) original definition of general pedagogical knowledge was limited to classroom management and curricular considerations. More recent conceptualizations have become more refined to integrate components of the teaching-learning process. Voss, Kunter, and Baumert (2011) advance a model of general pedagogical knowledge that combines aspects of pedagogy and psychology to account for the social environment of the classroom and heterogeneity of the individual student learning. This model is referred to as general pedagogical-psychological knowledge. It is comprised of the following five sub-dimensions listed in Table 2.2 below.

Table 2. 2

Components of Voss, Kunter, and Baumert's (2011) General Pedagogical-Psychological Knowledge

Components	Definition
Knowledge of classroom management	Maximizing the quantity of instructional time by having awareness of what is going on in all parts of the classroom, handling two or more events at the same time, teaching at a steady pace throughout the lesson to maintain momentum, maintaining clear directions in lessons and keeping students alert.
Knowledge of teaching methods	Making productive use of instructional time by having command of various teaching methods and knowing when and how to apply each method in promoting students' conceptual involvement with learning tasks
Knowledge of classroom assessment	Knowledge of different forms and purposes of formative and summative classroom assessments and knowledge of how different frames of reference impact students' motivation
Knowledge of learning processes	Supporting and fostering individual learning process by having knowledge of various cognitive and motivational learning processes, including learning strategies, impact of prior knowledge, memory and information processing, causal attributions and how they foster student engagement, effects and quality of characteristics of praise, and opportunities for increasing student engagement
Knowledge of individual student characteristics	Meeting individual student needs by heterogeneity, such as test anxiety, dyslexia, mental abilities and giftedness, and influence of ethnic background

Note: Adapted from Voss, Kunter, and Baumert (2011)

In contrast to knowledge of classroom management, teaching methods, and classroom assessment, which are pedagogical components, knowledge of learning processes and individual student characteristics are psychological components. Psychological components are included in this model because learning occurs in a social context and learning success depends on cognitive capabilities, affective states, and motivational characteristics of individual students. In other words, psychological aspects such as general cognitive abilities, motivational and affective characteristics, and prior knowledge will differ among students and impact their learning. As such, teachers need to know how to deal with what Voss, Kunter, and Baumert (2011) refer to as heterogeneity in student learning. In this way, this model is similar to those of Slavin (1984) and Carroll (1963) where learners and instructors are considered interconnected and interdependent in the teaching-learning process. In the next section, I will incorporate the idea of student heterogeneity as affecting the teaching-learning process and turn my attention to the role gender is hypothesized to play in the process.

Differences in Academic Self-Efficacy

Utilizing the constructs of social cognitive theory to examine formal learning environments has proven effective in demonstrating the existence of differences in academic self-efficacy in various subject domains (Huang, 2013) and in the importance given to each of the four sources of information comprising a learner's academic self-efficacy beliefs (Butz & Usher, 2015). This emergent line of inquiry is being developed to better understand previous research findings describing female students as holding lower levels of academic self-efficacy in a range of academic subjects (Pajares, Johnson, & Usher, 2007; Usher & Pajares, 2006; Lopez, Lent, Brown, & Gore, 1997; Whitley, 1997). Lower levels of academic self-efficacy have been shown to affect course selection and career choice in secondary and college aged students. (Lent,

Brown, & Larkin, 1986). Recent findings provide evidence for the notion that age and subjects areas are also contributing factors to the gender differences found in self-efficacy beliefs.

Huang (2013) published a meta-analysis of research studies from 1981 to 2008. The analysis consisted of 187 studies containing 247 independent studies. The combined number of participants from all the studies comprising the meta-analysis was 68,429. The goal of the analysis was to clarify past research findings on gender differences in academic self-efficacy. Prior researchers suggested that gender differences in general academic self-efficacy were largely a function of bias or exclusionary oriented social barriers. Yet, when specific subject domains were isolated and investigated, results became mixed. For example, Pajares and Valiante (1996) examined the writing self-efficacy of 218 grade 5 students and found girls held significantly higher scores than did boys. In the mathematics self-efficacy of grade 7 students, however, boys were found to hold higher scores than girls (Friedel, Corina, Turner, & Midgely, 2007). Similarly, Miura (1987), who investigated 400 grade 8 students enrolled in introductory computer concept classes, found that males held higher self-efficacy in computer technologies than did girls.

Age also appeared to be a factor in these mixed findings. In the subject area of science, for example, Britner and Pajraes (2001) found grade 7 girls had higher science self-efficacy beliefs than did boys. Anderman and Young (1994), on the other hand, did not find gender differences in science self-efficacy among grade 6 students. While these two studies focused on middle school aged students, Lerose, Ratelle, Guay, Senecal, and Harvey (2006), who examined science self-efficacy for 411 late adolescents transitioning into college, found that females had lower science self-efficacy beliefs than did males. Given these mixed results, Huang's first task was to consider if the existence of a gender difference in academic self-efficacy could be

detected. If significant findings were detected, Huang would employ moderator analysis to help explain the variability with such factors such as age and subject area. Three hypotheses tested by Huang were most relevant to the study of female CTE students:

1. There exists a gender difference in academic self-efficacy.

2. Subject area significantly predicts variation of gender differences in academic self-efficacy.

3. Participant age significantly predicts variation in gender differences in academic self-efficacy.

To test these hypotheses, Huang (2013) conducted variance analysis due to concerns over erroneous findings resulting from mean differences analysis. Errors have been found to occur when comparing means if the variances of the two groups are unequal. Huang cited prior analysis (Feingold, 1992) that found unequal variances with studies examining academic self-efficacy using mean differences analysis. Effect size was standardized by using a pooled standard deviation method for males and females. Corrections were made for the various population sizes of the studies, given that smaller samples tend to overestimate effect size. Test statistics such as t values, F values, and p values were converted to g values. Huang assumed a fixed-effects assumption to assert that all studies would hold a true effect sizes. Variance ratios were calculated to consider the homogeneity of the all of the findings. If variations fell outside of this fit statistic, effects sizes were attributed to either sampling error or random components. If statistical significance was reached, moderators were used to help explain some of the variability. Huang found significant results for the three hypotheses tested.

Existence of Gender Difference in Academic Self-Efficacy

In examining if gender differences in academic self-efficacy exist, Huang (2013) found a range of effect sizes from -1.60 to 1.40, with a mean $g=0.08$. The g value of 0.08 indicated that the average academic self-efficacy level for males was 0.08 standard deviations above the average academic self-efficacy level for females. A homogeneity test concluded that this finding fell outside the population parameter. Thus, the hypothesis was rejected, demonstrating that a gender difference in academic self-efficacy exists. Moderator analysis was employed to assist in explaining the variance observed.

Subject as a Moderator

Huang (2013) applied five subject specific domain codes when employing subject area as a moderator of variance: Language arts, mathematics, science, social sciences, and computers. The effect sizes of studies where multiple subjects were examined were coded individually. Three subject areas were found to have statistically significant mean effect sizes favoring males. For mathematics self-efficacy, a g value of 0.18 was obtained, indicating higher male mathematics self-efficacy. The same was true for the subject areas of social sciences ($g=0.26$) and computers ($g=0.18$), where higher male self-efficacy than female self-efficacy beliefs were found. However, there were few studies that investigated the social sciences ($k=5$), leading Huang to caution interpretation of this finding. Higher female self-efficacy than male self-efficacy was found in the content area of language arts. The mean effect size was $g=-0.16$, indicating higher female language arts self-efficacy. Science was the only subject area not found to have a statistically significant gender difference in self-efficacy beliefs ($g=0.04$). Specific subject domains appear to be a factor in explaining the gender differences found in academic self-efficacy.

Age as a Moderator

Huang (2013) divided the mean ages of participants based on school levels into five groups, resulting in the following categories: 6-10 (elementary school), 11-14 (middle school), 15-18 (high school), 19-22 (college), and over 23 years old. Two groups were found to be significant contributors to the unexplained variance found in the gender differences in general academic self-efficacy. First, the 15-18 (high school) group was statistically different (g=0.08). The second, the over-23 years old group, obtained a g value of 0.23. Test of homogeneity between-groups did not produce significant findings. However, Huang also observed that mean effect sizes appeared to increase with age, and therefore, conducted regression analysis to determine if a pattern could be detected. The analysis resulted in a regression coefficient of b=0.01 (p<0.01), leading to the conclusion that for each unit change in age, an average gain of 0.01 unit is in effect size. Age also explained 3.17% of the variance among effect sizes. These initial findings did not consider subject domain as a variable. Therefore, Huang investigated the age effect with a subject specific domain, as well.

Testing the age effect within a subject specific domain was conducted using mathematics self-efficacy. Studies that measured mathematic self-efficacy where mean ages were reported comprised the largest group, with 74 samples in the analysis. The five age groups significantly explained variation in effect sizes. However, at the 95% confidence intervals, the 6-10 (elementary school) group and the 11-14 (middle school) group included a 0, indicating that no gender differences were detected within these two groups. The 15-18 (high school) age group, on the other hand, obtained a mean effect size of g=0.20. The college aged group and adult group were also significant, with mean effects sizes of 0.36 and 0.33, respectively. Age, it appeared, was a factor in the gender differences found in mathematic self-efficacy.

The meta-analysis conducted by Huang (2013) found that males do have slightly higher academic self-efficacy than females. Subject domain was a significant moderator in explaining this variation. Female students held stronger language arts self-efficacy beliefs, while males held stronger self-efficacy beliefs in mathematics and computers. Science was a subject area where no gender differences were detected. Also, an age effect was supported in this meta-analysis, with statistically significant findings for the 15-18 (high school) aged group and over 23 aged group showing the greatest differences. In the subject domain of mathematics, age effects were not detected in students from about the elementary to middle school years. However, age effects in mathematic self-efficacy began to appear in middle school aged students and continued through into adulthood.

Sources of Academic Self-Efficacy Information

Given the findings supporting gender differences in academic self-efficacy, with females holding higher self-efficacy beliefs in language arts and males holding higher self-efficacy beliefs in mathematics, and an age effect perhaps beginning by the middle school (grade 6-8) years, Butz and Usher (2015) explored the possibility that these dissimilarities could be the result of discrepancies in the importance given to, or the reliance on, particular sources of information comprising a person's academic self-efficacy beliefs. As noted, Bandura's (1986) social cognitive theory advances the idea that individuals interpret information from four sources to develop and modify their self-efficacy beliefs: mastery experiences, vicarious observations, social persuasion, and physiologic states. Bandura hypothesized that mastery experiences, or an individual's interpretations of past experiences, are typically the strongest source of self-efficacy information. Studies have supported this position with regard to both academic domain and across age groups (Usher & Pajares, 2008). However, it has also been reported that some

individuals prioritize information from other sources, such as vicarious experiences, social persuasion, or their own effective states, when assessing their academic beliefs in various subject domains (Usher & Pajares, 2008). In fact, Usher and Pajares (2006) discovered preliminary evidence demonstrating that entering middle school female students often prioritized mastery experiences and social persuasions over the other sources of information. Butz and Usher (2015) questioned if this discontinuity in the theoretical underpinnings of social cognitive theory could be explained by the factors of age effect and specific subject domain differences.

Butz and Usher (2015) investigated the perceptions of 2,511 early adolescents (grades 4 to 8) in the academic domains of reading and mathematics. The researchers employed a two-level mixed-methods approach in attempting to answer the following research questions:

1. What are the most frequently reported sources of self-efficacy in math and reading among upper-elementary and middle school students?

2. How do the sources of self-efficacy described by individuals compare across domains?

3. How do the responses of older and younger students, boys and girls, and students with high and low levels of self-efficacy compare in math and reading?

Qualitative and quantitative data were collected to answer these research questions. Data were collected using one computerized survey. On the first section, students responded to open ended-questions focused on math and reading. Students completed the math related question while in math class. The reading question was completed during language arts class. The questions read "In the space below, write something that happened that made you feel MORE confident about yourself in [reading, math]" (Butz & Usher, 2015, p. 51). Students were provided as much time as needed to answer these questions; no word limit was imposed on responses. On the second section of the survey, students were asked to rate, on a six point Likert-

scale, their confidence in their ability to do well in math and reading. This measure was developed utilizing the tents of social cognitive theory and included seven questions.

The two-level, mixed-methods approach employed by Butz and Usher (2015) consisted of both individual and group level data analysis. Qualitative data was analyzed at the micro-level, while quantitative data was analyzed at the macro-level. At the first level of analysis, quantitative data was investigated using exploratory factor analysis. Scree plot and eigenvalues were evaluated for factor loadings. During this level, initial coding of the qualitative data began deductively with theory driven codes applied to the open-ended written responses. On the second level of analysis, factorial loads were examined and estimations of unidimensionality for the scales were reviewed. With these quantitative considerations observed, an inductive coding process began to capture emerging data that were not part of the first-level theoretical framework. Deductive and inductive codes were then quantified to establish frequency patterns across the different data sets.

Factor analysis found high levels of internal consistency in the quantitative data for both math (α=.93) and reading (α=.92). Factor loadings from the exploratory factor analysis for each item reached above .74, suggesting a single factor solution and that each scale was unidimensional. The initial codes derived from Bandura's (1986) hypothesized sources of self-efficacy information were expanded to include 5 additional codes. The final list consisted of 23 codes. Agreement between raters for all codes was 98%. Over the course of coding and analysis, a total of 5,203 codes were applied to participants' written responses.

Results indicated that within both the math and reading domains, the most frequently reported sources of self-efficacy information were mastery experiences and social persuasion. For mastery experiences, 42.91% of the responses referenced this source of information vital to

mathematics self-efficacy, whereas 45.57% of participants reported using this source to inform their reading self-efficacy. Social persuasion was lower in math self-efficacy, with 18.66% of the respondents using this source of information. In reading, 23.07% of respondents utilized social persuasive messaging to inform their self-efficacy beliefs. These two sources proved to be the primary information utilized for each of the grade levels examined for both boys and girls. These findings were consistent with Bandura's (1977) assertion that master experiences are the most powerful source of self-efficacy information.

An examination of the qualitative data for the overall most frequently reported sources revealed that students often used grades and certain testing benchmarks to inform their self-efficacy beliefs. Other participants wrote about the successful completion of a challenging goal as a source of mastery experience. Yet, Butz and Usher (2015) noted a more refined understanding regarding these mastery experiences in the qualitative data, as well. For example, the researchers highlighted a female in 7th grade math who noted that her grade 6 teacher had told her she was good at math while she was working with fractions. This female student also mentioned that she received math awards during her 5th grade year for earning outstanding scores on state standardized tests. Butz and Usher noted that such mastery experiences as high scores on a test can also reflect a social component, as it did for this girl when presented with an award at school. They also pointed out how a single comment by a teacher can have enduring effects in providing a boost to the self-efficacy beliefs of this student.

The importance these middle school students ascribed to a teacher, and the teacher's instructional style, became clearer for researchers while they examined the sources of information for all participants in each subject domain. Butz and Usher (2015) had originally created two coding categories that were related to teaching. The first code referenced the

availability of a teacher to support a student's learning (*help availability from teacher*). An example of this code described a student's response where a teacher worked with them over a lunch period. The second code described reports of a teacher's actions or mannerisms that informed a student's self-efficacy (*teacher and teaching style*). A teacher who chanted and created jingles to help students remember mathematics was used as an example of this code. More importantly, when these codes were collapsed, they formed the third most frequent source of information for both math and reading self-efficacy. In the domain of reading, the teacher code captured slightly different perceptions. A large number of students reported the influence of a reading teacher who not only scaffold instruction, but also let the student "be who they are" in making choices about reading material (Butz & Usher, 2015, p. 55). Teachers appeared to provide the bulk of the social persuasive messages these students recalled the most.

Sources of Academic Self-Efficacy Information Across Subject Domains

In determining whether students utilized the same primary sources of information across academic domains, Butz and Usher (2015) examined the intra-individual differences by academic subject. That is, the researchers compared each student's response in one domain to their response in the other domain. Half of the participants (50.2%) identified a different source of information in math than in reading. Only 37.4% of the participants named the same source of information in both domains. In some cases (12.4%) participants named the same source in the two domains but also added a source to one or both domains. Butz and Usher found statistically significant differences in students who named the same source, a different source, or an additional source by grade level and gender. Students in the upper grades tended to name the same source of information than were younger students. Boys were more likely to name the same

source of information whereas girls more frequently named a different, or an additional, source of information.

When gender was employed as a factor, two analytic codes were found to be statistically significant. Social persuasion was more frequently reported for girls than boys in both math and reading. The social persuasion code comprised 20.91% of all the codes assigned to girls and 15.91% of all the codes assigned to boys in math. In the domain of reading, the social persuasion code made up 29.38% of all the codes assigned to girls and 20.91% of all the codes assigned to boys. The second code found to be statistically different in assignment to girls and boys was social comparison. The social comparison code accounted for 5.19% of all the codes assigned to girls and 3.3% of all the codes assigned to boys. These findings lead Butz and Usher (2015) to speculate that female students attend to social messages more than boys when constructing their academic self-efficacy. Moreover, when interpreting the entire set of results, Butz and Usher posited that girls not only report higher levels of social persuasion, but that they might also prioritize social information over other forms of information when assessing their own capabilities.

The literature reviewed in this section raises several important theoretical considerations regarding female adolescents who attend CTE. First, female students appear to hold stronger language arts self-efficacy beliefs when compared to male students, but they were also found to have lower self-efficacy beliefs in mathematics and computers. Mathematics and computer technologies are especially important subject areas to consider as the technical aspects of the skilled occupations taught in a CTE school often demand high levels of mathematics and technology integration for their execution. These gender differences also appear to become most prominent around the age range of 15-18 years of age. This age range marks the period of time in

which students typically begin to enroll in CTE programs. When students were asked to describe the sources of information that proved the most edifying, female students reported utilizing social persuasive messaging for constructing their mathematical and reading self-efficacy more than male students. More importantly, students so often referenced their teachers as social persuaders that a teacher's availability and mannerisms became the third largest reported source of academic self-efficacy information (Butz and Usher, 2015). The unique interconnectedness and weight given to each of these sources of information also appears to crystallize during the adolescent period. Male students were thought to retain the same source of information across academic domains, whereas female students shifted importance from different sources depending on the subject area being learned.

These and previous findings on academic self-efficacy have been used to investigate the underrepresentation of women in certain career pathways. It has been suggested that women do not enter highly technical career fields at the same levels as men due in large part to their perceived lower levels of the academic abilities required of these occupations (Zeldin, Britner, & Pajares, 2008; Zeldin & Pajares, 2000). And while gender stereotypes and societal barriers should not be discounted in accounting for these differences, some have pointed to a null environment, or an environment that does not recognize differences between the learning styles of men and women, as precipitating the decline of academic self-efficacy beliefs among women (Betz, 1989; Butz & Usher, 2015). In the next section, I will review literature on the application of social cognitive theory to career development.

Impact of Lower Academic Self-Efficacy on Career Choice

Career self-efficacy has been defined as judgments of personal efficacy in relation to behaviors involved in career choice and adjustments (Lent, Brown, & Hackett, 1994). Applying

the theoretical tenets of self-efficacy theory to career development was first performed to help understand the underrepresentation of women in male-dominated career fields. Hackett and Betz (1981) initially adopted self-efficacy theory in a model that suggested women limited their career options as a result of weak self-efficacy beliefs. While they did acknowledge the acute societal and institutional barriers that served to limit women's career development, they were nonetheless interested in exploring the processes by which women internalized societal expectations and how these beliefs then affected career exploration. Since their conceptual article, researchers have supported the significant linkages between academic self-efficacy beliefs and career development. These researchers have found a mediational role played by academic self-efficacy between prior achievement and occupational choice as well as a direct contribution to high school and college course selections, and college majors (Hackett & Betz, 1989; Lent et. al., 1991, 1993). Other researchers have examined the role academic self-efficacy plays in the transitional period between academia and career decision-making (Zeldin, Britner, & Pajares, 2008; Zeldin & Pajares, 2000).

The first empirical investigation that applied self-efficacy theory to career development was conducted by Betz and Hackett (1981) following their conceptual article drawing linkages between self-efficacy and career development. These researchers investigated the relationship of career self-efficacy expectations to perceived career options of 235 college men and women. They selected 20 occupations. Occupations spanned a range of interests and were selected based on gender representativeness, from male-dominated to female-dominated careers. Careers were categorized as either traditional if a high percentage of women were employed in them, or as nontraditional if a low percentage of women were employed in them. Researchers assessed career self-efficacy by asking participants if they felt as though they could fulfill both the

educational requirements and job requirements for each of the 20 occupations. Students were asked to rate their degree of interest and how seriously they considered pursuing each occupation. Participants responded with *yes* or *no* assessments to educational and job duty requirements. For Betz and Hackett, interest included concerns for participants' career self-efficacy, reflected in the request that participants rate their desire to perform these tasks. The strengths of these self-efficacy beliefs were assessed by asking participants to rate their confidence to complete both requirements on their *yes* responses on a 10-point scale. Students were asked to rate their degree of interest and how seriously they considered pursuing each occupation. Academic self-efficacy was assessed by the scores each participant obtained on the English and mathematics subtests of the American College Test (ACT).

Betz and Hackett (1981) found no significant gender differences in the total level of self-efficacy for men and women for the educational requirements and the job duties of the 20 occupations. However, when mean scores were regressed by traditional and nontraditional occupations, there were significant gender differences. Regression analysis demonstrated that, while females reported higher self-efficacy on traditional female occupations and men held significantly greater self-efficacy beliefs for traditional male occupations, gender differences with regard to traditional and nontraditional occupations were due to reported levels of self-efficacy. Males perceived themselves as capable of completing the educational requirements of an average of 6.9 of the 10 traditional jobs and 6.9 of the 10 nontraditional jobs. Females, on the other hand, felt confident in completing the educational requirements of 8 of the 10 traditional jobs and only 5.7 of the 10 nontraditional jobs. The analysis also revealed that the range of considerations of performing traditional and nontraditional occupations was also significant. Females would consider a significantly greater number of traditional options than would males.

Betz and Hackett reported that females would consider on average 2.6 nontraditional careers. Conversely, males reported considering significantly more nontraditional occupations, averaging better than 4.4 nontraditional careers. Therefore, gender differences were found to be due to the women's responses to the traditionality of the occupation.

The researchers also found no significant gender differences in academic self-efficacy as measured by the ACT. Both male and female participants had scored similarly on the mathematics and English sections. The differences exhibited in the traditionality of career self-efficacy, then, did not correspond with the actual levels of achievement. It appeared that self-efficacy beliefs were the contributing factor to the differences displayed by participants. Also, the range of career options and occupational interest were found to be related to self-efficacy. The researchers found that perceived academic self-efficacy and career interests were strong predictors of the range of occupational options.

Betz and Hackett (1981) produced findings that uncovered considerable implications for career self-efficacy. These findings from Betz and Hackett were the initial suggestion that social cognitive theory could be employed to investigate career development. Moreover, this work demonstrated that academic self-efficacy beliefs played an important role in the career selection process. This line of inquiry has received a considerable amount of attention over the last few decades. While the specificity of measurement techniques have improved over these years, most findings investigating the link between academic self-efficacy and career decision-making have confirmed the initial work of Betz and Hackett (Betz & Hackett, 2006; Riegle-Crumb, King, Grodsky, & Muller, 2012). However, as with investigations focusing on the emerging inquiry into the gender variations in the importance given to each of the four sources of academic self-

efficacy, researchers utilizing social cognitive theory to explore career development have turned their attention to this feature, as well.

Zeldin and Pajares (2000) created a structured interview protocol based on the sources of information comprising career self-efficacy beliefs. The researchers interviewed fifteen women who had entered science, technology, engineering, and mathematics (STEM) careers. The women were asked to talk about their academic and career development, as well as their career decision-making process. Participants recalled family members, teachers, peers, and supervisors who were vital in helping them establish self-efficacy beliefs that were strong enough to aid them in transitioning into male-dominated career fields. Social persuasion and vicarious sources of information appeared important to the women who had entered STEM careers. The firm beliefs that these women developed were paramount in the subsequent resiliency and persistence that they felt was necessary to achieve their career goals in career fields with female underrepresentation.

More importantly, all women in this study recalled experiences which involved an influential person who, often during a critical time, helped them affirm or develop their beliefs about their capabilities in these career fields. These critical moments were construed as obstacles which frequently included the feature of negative social messaging about gender and their pursuit of a career in a male-dominated field. The participants recalled the influence of positive messaging they received from social persuaders and models during these challenges. These interactive moments were often central to the participants' selection and retention of career choices.

In a follow-up study by Zeldin, Britner, and Pajares (2008), the investigators made use of the same structured interview protocol to interview ten men in STEM careers. As with the

women in the Zeldin and Pajares (2000) study, these men were asked to talk about the development of their academic and career self-efficacy beliefs. Unlike the female participants, males in this study recalled mastery experiences as the primary source of information informing their career self-efficacy. When asked about their academic development, the men spoke as if they possessed natural abilities and talents for the underlying academic features of their profession. The men used these past academic accomplishments to transition into their current occupations. Socially constructed obstacles were also described differently by these men. Men did not appear to question if they were capable of certain career behaviors. In fact, men did not recall their difficulties with the same level of severity that the earlier female STEM professionals had. However, these men did express sensitivity to the struggles women faced as they transitioned into STEM careers.

Contrary to the hypothesized relationship among the four sources of self-efficacy information, where past performances are the most significant sources of information, findings from Zeldin and Pajares (2000) suggest that adult women in STEM careers perceive the importance of social persuaders and vicarious models over mastery experiences. Recall that there have been examples on both quantitative scales and qualitative narratives of instances where adolescent females have reported higher levels of social persuasion and vicarious experiences than male students, as well (Butz & Usher, 2015). The potential implication of this evidence is that there are gender differences in the weight of importance, and thus integration of, the sources of academic self-efficacy that affect not only academic self-efficacy, but also career development and transition. Teachers, then, can provide female students and transitioned professionals important academic self-efficacy information.

In the next section, I will review the importance of the teaching-learning process as applied to Career and Technical Education (CTE) as the nexus of academic and career self-efficacy. I provide a historical account of the legislative attempts to end gender bias in CTE schools and will conclude with a review of the current efforts to improve CTE instructors' performances in meeting the needs of diverse learners.

Career and Technical Education

At their core, Career and Technical Education (CTE) schools are organized institutions that prepare students for a particular career. These occupations typically require some form of technical competency beyond a traditional high school diploma. The goal of CTE is to equip students with occupational-specific skills necessary for them to achieve economic independence and contribute positively to society (U.S. Department of Education, 2009). CTE is often grouped into eight broad categories: agriculture technology, business and marketing, communication technology, construction technology, health and human services, public safety and security, manufacturing technology, and transportation technology. Within these categories, states authorize various programs of study. The Maine Career Clusters framework is comprised of 10 clusters of programs of study (Maine DOE, Career and Technical Education, Maine Career Clusters, 2017). These clusters include agriculture and natural resources; architecture, construction, and manufacturing; arts, audio/visual technology, and communications; business, management and administration, finance, marketing, sales, and service; health and human services; education and public service; public safety and security; science, technology, engineering, and math (STEM); transportation; and hospitality and tourism.

CTE History and Legislation

The roots of CTE, formerly known as vocational education, began hundreds of years ago as colonial apprenticeship programs and evolved over time into trade schools during the American industrialization period. As the need for skilled labor increased, the federal government introduced legislation to organize and promote the emerging vocational education field. The Smith-Hughes National Vocational Education Act of 1917 provided federal funds for the promotion of vocational education in agriculture, home economics, and trades and industrial arts fields. While the effects of the Smith-Hughes Act were successful in organizing and promoting vocational education, an unintended consequence was the separation it created between vocational schools and the more traditional academic schools (Gordon, 2014). Yet, for more than 40 years, the Smith-Hughes Act was the most consequential piece of federal legislation governing vocational education.

When the height of the industrial revolution began to recede, and new technological demands were being placed on America's workforce, the federal government passed the Vocational Education Act of 1963 (Gordon, 2014). The purpose of the act was not only to improve the quality of existing programs, but also to expand access to vocational education. While not specifically centered on the issue of gender segregation, this act marked the first attempt at focusing federal policy on the social services aspect of CTE education, as it recognized the need for students with disabilities and economically disadvantaged students to gain a vocational education in order contribute to the American society (Rojewski, 2002). In so doing, the law stipulated that a portion of the funds provided to vocational schools go to supporting these particular students. However, this legislation did not direct funds to any particular vocational services (Calhoun & Finch, 1982).

The educational reform movement of the 1960's resulted in The Educational Amendments Act of 1972. This legislation reshaped the concept of providing access for all students, of which Title IX prohibits sex discrimination in education. According to this piece of legislation:

> No person in the United States shall, on the basis of sex, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving federal financial assistance (Title IX of the Educational Amendments Act of 1972, 20 USC Section 1681).

Title IX had a significant impact on vocational education. The U. S. Department of Education has interpreted Title IX as also prohibiting disproportionate course enrollment between males and females on the basis of gender discrimination (Eardley & Manvell, 2006). Prior to the passage of this law, CTE programs were still largely segregated based upon the gender appropriateness of the career field. Title IX effectively made such segregation illegal (Lufkin et. al., 2007). In order to provide guidance in achieving gender equity as outlined in Title IX, the 1976 reauthorization of the Vocational Education Act mandated that each state appoint a full-time Sex Equity Coordinator (SEC) (Gordon, 2014).

Carl D. Perkins Vocational Education Act of 1984

The most recent policy mandate affecting CTE is the Carl D. Perkins Vocational Education Act, which was passed by congress in 1984 and has been reauthorized in 1990 and 2006 (U.S. Department of Education, 2009). Attempting to bridge earlier divides between vocational and traditional education, the main thrust behind the initial Perkins Act was to place emphasis on fusing traditional academics to vocational education programs (Lynch, 2000). Two goals framed the original Carl D. Perkins Vocational Education Act of 1984: meeting the needs

of the nation's workforce by modernizing vocational education programs and ensuring that every student had access to a quality education program (Hayward & Benson, 1993). The law included requirements for programs of study that linked academic and technical content. Along with this emphasis, the Perkins Act replaced the term "vocational education" with "career and technical education" and ushered in the current notions of CTE in American schools as providing high-quality technical education. The law carried over the requirements for a Sex Equity Coordinator in each state, as well as mandating that 3.5% of a state's grant be set aside for sex equity programs and services (Lufkin et. al., 2007).

1990 Perkins II

The 1990 reauthorization of the Carl D. Perkins Act, known as Perkins II, introduced new accountability measures to assess the integration of academic and technical curricula. As in the past, Perkins II continued an effort to bridge the gap between academic and Career and Technical Education programs. Due to the emphasis placed on academics, as well as occupational skills development and learning, Perkins II was considered the most impactful version of the law in terms of focusing on improving student learning outcomes (Threeton, 2007). The Sex Equity Coordinator position and 3.5% funding mandate continued in Perkins II, thus indicating a continued commitment to ending sex discrimination in education. This time period also marked the shift in language from "sex equity" to "gender equity" in describing attempts to end gender segregation in CTE schools (Gordon, 2014). However, little data was collected by the U. S. Department of Education on the progress made to eliminate gender bias in CTE programs.

1998 Perkins III

The third reauthorization of the law, Perkins III (1998), aimed to position CTE in the broader educational reform context, placing an even greater focus on curriculum integration,

secondary and post-secondary partnerships, technology use, and professional development for CTE instructors (Gordon, 2014). Accordingly, accountability measures increased with states required to evaluate performance on four indicators: student achievement; acquiring credentials; transitioning to employment, post-secondary institutions, or the military; and nontraditional training and employment (Stone & Aliaga, 2003). Underlying this heightened focus on educational and academic reform meant major changes for Perkins III with regards to issues of gender equity. No longer was the focus exclusively on gender bias. Females entering predominantly male-attended programs, and vice-versa, were folded into a special populations designation, which included individuals with disabilities and disadvantaged students.

The law was stripped of the requirement that states employ a Sex Equity Coordinator, as well as the mandate to spend at least 3.5% of federal funds on gender equity programs. It had been estimated that between 1984 and 1998, an average of $100 million per year was spent on programs attempting to eliminate sex bias from CTE schools (Lufkin et. al., 2007). Thus, states had discretion to spend these funds on other CTE purposes. However, states were required to reserve $60,000 to $150,000 of "state leadership" funds to create services for students who chose to pursue nontraditional training. One of those services included support programs for special populations leading to high-wage, high-skills careers.

1998 Perkins III accountability measures. Instead of focusing specifically on eliminating gender bias in CTE, Perkins III centered on supporting nontraditional career training for both male and female students. The U.S. Department of Education (2014) defines nontraditional occupations as "those in which individuals from one gender comprise less than 25 percent of individuals employed in the occupation or field of work" (p. 36). Specific to nontraditional programming, Perkins III required that states and local districts collect and report

data on student participation and completion of nontraditional CTE programs. These accountability measures were to be disaggregated by gender, race/ethnicity, and other special populations (NAPE, 2006). Using this information, states had to identify CTE programs that prepared students for these occupations and were required to set benchmarks for their own performance.

2006 Perkins IV

In the final iteration of the law, the Carl D. Perkins Career and Technical Education Improvement Act of 2006 (Perkins IV), several changes were made: required programs of study, expanded state and local accountability, focused on economic competitiveness for student success, and strengthened professional development requirements for CTE instructors. These alterations were made as a way of ensuring students were encouraged to pursue high-wage or in high-demand career options (Meeder, 2008). In fact, while the bill changed little from the 1998 reauthorization, a key element is an emphasis on student self-sufficiency following completion of a CTE program (Gordon, 2014). In order for students to achieve these goals, programs of study are organized around appropriate course that met industry standards. Perkins IV specifically defines successful student outcomes as "student placement in postsecondary education or advanced training, in military service, or in employment" (Section 250-15). Retained in the law are the core indicators measuring participation between genders. CTE schools are held accountable to increase nontraditional participation rates and to report on program completion by underrepresented special populations (Lufkin et. al., 2007).

2006 Perkins IV professional development for CTE instructors. In order for students to meet outcome standards, Perkins IV requires CTE instructors to actively participate in professional development. The primary goal of such professional development is to prepare CTE

instructors to integrate rigorous academic skills into their technical curricula. Perkins IV recommends high-quality and classroom-focused professional development that is continuous rather than one-day or short-term workshops or conferences.

The professional development requirements in Perkins IV are also in response to two central problems faced by CTE schools in meeting rigorous standards. First, researchers suggest that CTE instructors who come to the profession through alternative teacher certification face the difficulty of inadequate instructional competency (Fletcher, Djajalaksana, Eison, 2012). These instructors often possess experiences in industry, but lack the pedagogical knowledge. Second, the number of CTE instructors was in decline and issues around recruitment and retention were becoming paramount (Wilkin & Nwoke, 2011). The focus on professional development for CTE instructors marks the initial attempt to reform the instructional practitioners of CTE (Adams, 2010). Included in the design of professional development has been the recognition of supporting CTE instructors who teach nontraditional students. In the next section I will focus on strategies recommended for professional development design.

Female Nontraditional CTE Participation

Despite the gains women have made in seeking employment, Gordon (2014) cites the National Commission on Working Women who found that females continue to be segregated in a few occupations that require skills equal to those required in many male-dominated occupations. Statistics from the National Coalition for Women and Girls in Education (2014) provides visually detectable segregation within programs of study offered through CTE schools: Female students make up 90 percent of students enrolled in cosmetology, 87 percent of childcare students, and 86 percent of those in health-related courses. Conversely, females are largely

absent from traditionally male courses, making up only 5 percent of welding students, 6 percent of electricians, and 9 percent of automotive students (NCWGE, 2014).

Barriers to equality in CTE range from a lack of role models and information on nontraditional fields to overt discrimination. Students may also face career counseling biased by gender stereotyping, unequal treatment by teachers, and various types and degrees of sexual harassment. Although these issues disproportionately affect girls and women, they can impede boys and men as well. Those of either gender who brave the barriers to take nontraditional courses often face an unwelcoming atmosphere, and many report being harassed (Lufkin, 2007).

To facilitate the career development for females in nontraditional CTE programs, instructors should be informed of the expectations of industry and the realities of the 21st century workforce including the education and training required by industry, and the application of effective teaching strategies that stimulate and motivate students to learn (Kazis, 2005; Zhao, 2009). As CTE instructors support the goals of females participating in nontraditional programming, educators themselves must be supported in their work. Opportunities for professional collaborations, in-service trainings, and the opportunity to develop an innovative curriculum should be made valuable to educators' global understanding, teaching proficiency, and the ability to empower students to achieve (Adams, 2010).

Literature has identified the importance of using gender-friendly instructional strategies and course designs in engaging both males and females in the learning process (Powell & Kusuma-Powell, 2012). Kommer (2006) identified strategies for creating gender-friendly classrooms. Primary to the study were the strategies of raising awareness of how gender issues affect classroom dynamics. Kommer's recommendation that teachers respond immediately to stereotyping and harassment is also valuable advice to this study.

The conceptual scholarship offered by Gordon (2014) suggests eight additional strategies may assist in broadening the scope of nontraditional opportunities for female CTE students. These strategies include the following:

- Develop mentorship programs

- Treat students equally

- Provide career exploration activities

- Recognize the achievements of nontraditional students

- Include assertiveness training as part of overall curriculum

- Select texts and materials free from sex bias

- Work with employers to help them obtains highly skilled workers, regardless of gender

- Bring nontraditional students and workers to the attention of all students through presentations and conferences

Of the strategies advanced by Gordon (2014), several are under the control of CTE instructors. For example, recognizing the achievements of nontraditional students, treat students equally, and providing career explorations activities are directly related to the teaching-learning process addressed earlier in this literature review. Other strategies, however, appear to be focused at a school administrative level. The strategies of developing presentations and conferences, for example, would fall under the purview of a building administrator. CTE instructors can advocate for such strategies to be implemented but would need to learn of them through professional development.

Lastly, CTE instructors should engage in reflective practice and critical thinking to assess their interactions with nontraditional students and consider the application of non-sexist, gender sensitive instructional approaches (Zaman, 2008). Gilbert, Hallett, and Eldridge (1994), as

reported in Walsh and Osipow (2004), argue that if educators are to affirm and empower females to pursue courses leading to nontraditional careers, they must assess their own "patriarchal values, sex-role stereotypes, and heterosexist biases that may inadvertently constraint and limit growth" (Walsh & Osipow, 2004, p. 163). Educators must be aware of what they are teaching students about gender through overt or hidden curriculum, behaviors, or within the classroom environment (Sandlin, 2004).

Summary of the Literature

This literature review presented studies on the topics of gender and academic self-efficacy and career self-efficacy development, gender and occupations, and Career and Technical Education. The literature on academic self-efficacy described emerging inquiries on gender differences in academic self-efficacy and the sources of information utilized in the development of these beliefs. Huang (2013) found female students held stronger language arts self-efficacy beliefs when compared to males; however, females were found to have lower self-efficacy beliefs in mathematics and computers. These gender differences also appear to become most prominent around the age range of 15-18 years of age. This age range marks the period of time in which students typically begin to enroll in CTE programs.

Butz and Usher (2015) explored the possibility that these dissimilarities could be the result of discrepancies in the importance given to, or the reliance on, particular sources of information comprising a person's academic self-efficacy beliefs. When students were asked to describe the sources of information that proved the most edifying, female students reported utilizing social persuasive messaging for constructing their mathematical and reading self-efficacy more than male students. More importantly, both male and female students so often referenced their teachers as social persuaders that a teacher's availability and mannerisms

became the third largest reported source of academic self-efficacy information (Butz & Usher, 2015). The unique interconnectedness and weight given to each of these sources of information also appears to crystallize during the adolescent period. For male students, they were thought to retain the same source of information across academic domains, whereas female students shifted importance from different sources depending on the subject area being learned.

Academic self-efficacy beliefs are important factors in career choice. The literature on gender and career self-efficacy development described the evolution of thought on occupational choice, beginning with the seminal work of Betz and Hackett (1981) on traditional and nontraditional work expectations and perceived career options. Since then, studies have captured the development of career self-efficacy of females who enter male-dominated occupations. Contrary to the hypothesized relationship between the four sources of self-efficacy information, which holds that past performances are the most significant sources of information, findings from Zeldin and Pajares (2000) suggest that adult women in STEM careers perceive the importance of social persuaders and vicarious models over mastery experiences. The potential implication of this evidence is that there are gender differences in the weight of importance, and thus integration of, the sources of academic self-efficacy which affect not only academic self-efficacy, but also career development and transition. For female students and transitioned professionals, teachers can prove to be an important, and lasting, source of self-efficacy information.

A review of the literature found that the impact of pursuing a nontraditional career is mixed for both men and women. Women who pursue nontraditional careers experience benefits such as higher pay (Hayes, 1989) and status (Wilbourn & Kee, 2010) but face barriers such as bias, discrimination, and harassment based upon their gender (Collins, Meyer, & Burris, 2013).

Currently, women are more likely than men to pursue nontraditional careers (Wilbourn & Kee, 2010).

Education can play a key role when it comes to preparing women for nontraditional employment. The United States has a fairly comprehensive secondary program of education dedicated to career preparation known as CTE. Research suggests that CTE programs are generally segregated along gender lines. This reality is despite legislative efforts to boost nontraditional participation (Lufkin et. al., 2007). Maine, however, has made modest gains in meeting nontraditional participations goals (State of Maine CTE reports, 2014).

Perkins IV required CTE instructors to actively participate in professional development. Professional development requirements in Perkins IV resulted from two central problems faced by CTE schools in meeting rigorous standards for all students. First, researcher suggested that CTE instructors who come to the profession through alternative teacher certification faced the difficulty of inadequate instructional competency (Fletcher, Djajalaksana, Eison, 2012). These instructors often possessed experiences in industry, but lacked the pedagogical knowledge. Second, the number of CTE instructors was in decline and issues around recruitment and retention were becoming paramount (Wilkin & Nwoke, 2011).

The literature reviewed in this chapter suggests that gender plays a substantial role in influencing occupational decision-making and career preparation in CTE. Efforts have been made to modify gender imbalances within CTE programs. CTE instructors not only act as the nucleus for many of the support systems thought best to provide assistance to females entering nontraditional programs, but are also a primary factor in successful learning outcomes for every CTE student (Adams, 2010; Clark, Threeton, & Ewing, 2010) and especially for female students who enter nontraditional programs (Gordon, 2014). It is critically important that CTE instructors

have the knowledge, skills, and dispositions to meet the learning needs of female student who enter a nontraditional program.

In reviewing aspects of the social persuasion offered by teachers, I suggested that female students in various subject areas prioritize this information as a matter of importance. To my knowledge, no studies of female students who attend CTE have examined the social persuasive messaging of instructors. It is with this gap in the literature in mind that I developed the current study on nontraditional female CTE participation. In the next chapter, I will describe the method used in this study.

CHAPTER 3

METHODOLOGY

The purpose of this qualitative study was to explore how female students enrolled in a single CTE program perceived their instructor's effectiveness as a teacher. In this chapter, I provide a brief rationale as to why I adopt a combination of case study and phenomenology methodologies. According to Merriam (2002), "qualitative research assumes that there are multiple realities, that the world is not an objective thing out there but a function of personal interaction and perception. It is a highly subjective phenomenon in need of interpreting rather than measuring" (p. 17). Accordingly, the unit of analysis for this study is interview statements made by informants. I will examine their perceptions of instructor effectiveness. The limitations of utilizing case study to explore these informants' realities will then be discussed. I will continue by addressing the procedures for data collection and data analysis. The conclusion of this chapter will focus on strategies I used to ensure reliability and validity.

Statement of Purpose

The conceptual framework and research design of this study were informed by the phenomenon under investigation. Career and Technical Education has long been imbued with behavioral epistemological and pedagogical orientations (Doolittle & Camp, 1999; Gordon, 2014). These concepts were new to me, as I had been trained within the social constructivist perspective. The literature review, then, helped me navigate the behavioral aspects of the teaching-learning process as viewed from the social cognitive perspective. Because my hope was to understand the case of female nontraditional CTE course participation and how these students perceived instructor effectiveness, I naturally needed to gather data that would reveal informants' perspectives and reflections while in a male-dominated program. This led me to employ a

combined case study, phenomenology approach. Yin (2009) suggests case study is especially

appropriate when prior theoretical propositions guide data collection and analysis. Proponents of

career self-efficacy theory suggest a clear set of propositions, as well as the social circumstances

within which propositions are believed to be true (Schunk & Meece, 2006). Case study

methodology, then, allowed me to select a small representative group, develop a description of

each case, and conduct single-case analysis (Creswell, 2016). Phenomenology allowed me the

collection of data from informants experiencing the phenomenon and the development of rich

textual and structural descriptions (Creswell, 2016).

Bounding the Case

According to Creswell (2013), a key defining feature of case study is that it is "bounded

or described within certain parameters" (p. 98). Setting parameters for the study allows a

researcher to present an in-depth understanding of the case. However, the term case study has

been described differently (Creswell, 2013; Maxwell, 2013; Merriam, 2002; Yin, 2016), leading

to conflicting definitions. Still, there are two unifying features that are typical when utilizing this

method. The first feature is that there is a clear unit of analysis, or "what" exactly is under

investigation (Maxwell, 2013). The second feature is that there are specific boundaries on time,

space, and participants (Creswell, 2013). In this study, the specific unit of analysis being studied

is instructor effectiveness as perceived by female students enrolled in nontraditional CTE

programming. In defining this unit of analysis, it is important to be precise about what

constitutes nontraditional CTE programming. In this case, space and participants are bound in

two distinct ways. First, I adopted the definition of nontraditional programming provided by the

Federal Law governing CTE schools (Carl D. Perkins Career and Technical Education

Improvement Act of 2006) to identify a single program that fit this definition. By focusing on a

single program, I was able to describe more deeply the contextual features, social interactions, and material artifacts of this case. In addition to a single program, I further delimited this case by collecting data from only female informants who were enrolled in this particular program.

Research Setting

Informants for this study were drawn from the North East Regional School of Applied Technology (pseudonym). Selection of NERSAT was based on two characteristics central to the study. First, the school is one of the largest CTE schools in the State of Maine. It enrolls more than 570 total students. At the time of informant recruitment, 186 female students attended NERSAT. This means female students comprised 32% of the overall student body. The school's enrollment numbers were a factor in determining a site of study because this metric afforded me the greatest opportunity to find a single CTE program that was historically male-dominated but also had three to five female students enrolled in the program at the time of this study

The second characteristic of this study was that NERSAT, as compared to the other CTE schools in Maine, is one of only two CTE schools offering programs of study in all 10 Maine Career Clusters authorized by the state. Five of these career clusters—public safety and security; architecture, construction and manufacturing; business, management, and administration; transportation; and science, technology, engineering, and mathematics (STEM)—have historically seen an underrepresentation of female students (Whitehead, 2001). The school's course offerings were a factor in determining a site of study because this metric afforded me the widest possible range of programming that was not only typically male-dominated but also the potential to identify a unique program of study that may not have been studied in past research.

At the time of informant recruitment, the current enrollment patterns for courses with gender imbalances with female nontraditional participation at NERSAT included welding

technology, 17%; outdoor power equipment, 3%; automotive technology, 13%; auto body refinishing/composites, 8%; and robotics engineering technology, 3%.

Informant Recruitment

I recruited three informants enrolled in the same automotive technology program at NERSAT. According to Merriam (2002), for qualitative studies "the crucial factor is not the number of respondents but the potential of each person to contribute to the development of insight and understanding of the phenomenon" (p. 83). Since the purpose of this study was to explore the phenomenon of nontraditional course participation experienced by females and how they perceived instructor's effectiveness, it was critical that I identify female students who were academically and vocationally successful in their programs. As noted, a component of effective instruction is student achievement. I wanted, then, to identify achieving students who could comment on the effectiveness of their instructor. Therefore, I used a purposeful selection process that included recommendations from the director of NERSAT and the school's career counselor. I asked them to recommend students based on the initial criteria of nontraditional participation in a male-dominated program as well as the following criteria: 1) students who were achieving in their program as evidenced by grades and experiences at NERSAT, and 2) students who have been recognized as high achievers through awards and/or commendations.

Informant Selection

Following recommendations by the director of NERSAT and the school's career counselor, I met individually with eight potential informants. Informational recruitment meetings were held privately in the career counselor's office. The career counselor, Ms. Patten (pseudonym) was present during these meetings to ensure students felt comfortable meeting with me in a private setting. I wanted to be sensitive to the idea that these female students did not

know me and would view me as an outsider. I introduced myself and read from a prepared script (Appendix K). All eight students agreed to review the Informed Parental Consent Letter (Appendix M) with their legal guardian and consider participation in this study. Of the eight students who received recruitment material, seven returned signed Informed Parental Consent Letters. Of the seven potential informants, three were enrolled in a single program – automotive technology. Other potential informants included two welding students and two auto body refinishing/composites students. Because the study criteria included meeting the threshold of three to five students enrolled in a single program, the automotive technology program was selected. Informants for this study, then, were three students enrolled in the automotive program who were academically successful as evidenced by passing grades in the program. Informants signed a Student Assent Letter (Appendix N) at the beginning of the study. Table 3.1 below presents participant demographic.

Table 3. 1

Study Informants

Pseudonym	Grade	Years at NERSAT	Program	Transition Counseling
Colby	12	2	Automotive	College - Automotive
Maya	12	2	Automotive	College - Automotive/Auto body
Raven	12	2	Automotive	Military Enlistment – Firefighter

Role of the Researcher

As previously stated, I was an aircraft mechanic for ten years before transitioning into a teaching career. My time in the transportation maintenance industry has afforded me some advantages. First, I understand many of the universal mechanical principles governing the operation of vehicle systems. This knowledge allowed me to enter the site of study with a clear

understanding of the various units being taught. I was also able to engage in informed, yet limited, dialogue with the instructor and students to better understand the work being conducted during live work shop sessions. With this in mind, however, I knew I needed to guard against biasing my data collection as a result of attempting to develop a teacher-student relationship with my informants. I briefed informants about my primary role as a researcher with a background as a mechanic and a teacher, and I structured my research activities so there was guidance in collecting the data need for this study.

Due to the fact that my mechanical background was in aircraft maintenance not automobile repair, I assumed the role of non-participant-observer during this study. Also, my current position as a high school teacher could have complicated my role as a researcher during data collection and analysis. It should be noted, I was never a teacher for any of the informants in my study. Still, I had to guard against the professional impulses I experienced during interviews and observations. During analysis, I wrote journal entries to ensure my biases were monitored and examined, if needed. I read aloud a script at the beginning of each interview reminding informants that they need not to refrain from any particular subject due to my status as a teacher. The script reminded them, as well as me, that the nature of this work was to seek their experiences, not to satisfy my research agenda.

Research Design and Data Collection

The design of this study was structured so as to better understand how female students enrolled in a predominantly male-attended program perceived instructor effectiveness. To this end, I crafted a design utilizing key features of case study and phenomenology to collect data. Data collection began in January 2018 and ended in May 2018, approximately the duration of the informant's second and third quarters at NERSAT.

Forms of Data Collection

This study is comprised of data from several sources of evidence. The primary evidence was three semi-structured interviews conducted with each informant. Secondary sources of evidence included an appraisal inventory, direct observations during 14 site visits, a collection of teaching documents, and photographic evidence of the research setting. In addition, I compiled field notes and wrote analytic memos.

Appraisal inventory. Prior to entering the research setting to conduct interviews and observations, an inventory titled, "Appraisal Inventory" (Appendix B), was administered to document informants' perceived capabilities of vocational learning and eliciting certain performances from their CTE instructor to strengthen their confidences. The intent of generating such data was to provide information that would corroborate data collected during interviews and observations. According to Maxwell (2013), different methods of collecting data can act "as a check on one another" (p. 102). I extracted descriptive statistics, frequency counts, and individual responses from the data to complete this work. Results from the appraisal inventory were used to develop questions on the second semi-structured interview protocol and contextualize the teaching-learning process addressed by each informant. This data set was not, however, subjected to comparative or corroborative statistical testing procedures at any time during the study.

The inventory was administered by Ms. Patten (pseudonym), NERSAT's career counselor, in her office. She was familiar to informants, as she had been present during my recruitment efforts, but acted in an assistive capacity when administering the tool. Prior to her administering the tool, we met to review the instrument and its applications. I provided her with a script to read before issuing the inventory to informants (Appendix A). She was also instructed

to not share information from the inventory with NERSAT's administration or staff. An informant key was provided to Ms. Patten and stored in her office at all times in a locked file cabinet. The key, along with the completed inventories, were returned approximately three weeks later.

Construction of the inventory was accomplished by adhering to guidelines set out by Bandura (2006). The inventory focused on informants' perceived capabilities of their CTE learning and their perceived capabilities of eliciting certain performances from their CTE instructors within the three factors associated with effective instruction. These performances were identified through the literature review and the pilot study. Self-efficacy is best inventoried within specific content; therefore, questions regarding this concept focused exclusively on Career and Technical Education learning. Conceptually, the inventory was designed to elicit judgments of capability rather than statements of intent or attitudes towards particular factors. Below, I address content validity and minimizing response bias.

Content validity. Response items on the inventory were tailored to the domain of Career and Technical Education learning and vocational self-efficacy. Due to the fact that vocational self-efficacy is concerned with perceived capability, inventory items were phrased in terms of *can do* rather than *will do*. The concept of "can" is a judgment of capability; however, the concept of "will" is a statement of intention (Bandura, 2006, p. 308). Preliminary instructions were provided to help informants think about the confidence of their current beliefs when rating their personal capabilities. Primary informants were asked to judge their operative capabilities as of now, not their potential capabilities or their expected (future) capabilities. This design element was meant to bolster the content validity of the inventory and support the concept of CTE instructor effectiveness.

Response scales included a 100-point scale, ranging in 10-unit intervals from 0 ("Cannot do"); through intermediate degrees of assurance, 50 ("Moderately certain can do"); to complete assurance, 100 ("Highly certain can do"). The theoretical concept of vocational self-efficacy appraisals represents "gradation of challenge" (Bandura, 2006, p. 311). Informants were appraising the amount of difficulty they believe they can overcome within the context of CTE learning. Pajares, Hartley, and Valiante (2001), found greater response sensitivity to this type of scale when inventorying the academic domain of writing when compared to a traditional 5-point interval scale.

To establish face validity, the inventory was read by two teachers and five students who did not attend MRSAT. Teachers were asked to provide feedback on conceptual clarity and readability of the instrument. The five students were asked to put question marks next to confusing items and to circle unfamiliar words or words that they could not read. Items were modified based on this feedback. Finally, I piloted the inventory to a group of four CTE students who attended Seven Hills High School and MRSAT but were not part of the study. The results were used to modify the instrument in the hopes of increasing the overall reliability of the instrument.

Minimizing response bias. Several strategies for minimizing response bias were proposed in both the instructions and administration of the inventory. First, the inventories were taken privately without asking for personal identification. I included a document tracking number on each inventory to identify the informant who completed it. However, this information was not shared with informants. Prior to administering the inventory, Ms. Patten read from a script (Appendix A) that informed informants that their responses would remain confidential and that they could choose to not answer any or all of the items.

To encourage honest responses, informants were informed of the importance of their contribution to this study. In the script read by Ms. Patten, she informed informants that the knowledge gleaned from this study would help increase the understanding of the CTE profession and assist in identifying effective CTE teacher instructional practices. Lastly, the title of the inventory, "Appraisal Inventory" was nondescript and thus did not bias responses regarding the beliefs and attitudes of informants' vocational self-efficacy.

Semi-structured interviews. I conducted three separate interviews with each informant. Interviews were semi-structured, with protocols guiding each discussion (Appendixes C – G). I read a script (Appendix L) when scheduling individual interviews to ensure informants understood the three interview structure of my study. Each interview was audio recorded and lasted no longer than 90 minutes in length. These spoken word data were transcribed, de-identified, and cleansed. Previous research in the area of female students' vocational learning has predominantly utilized results from structured surveys. In order for the unique narratives that emerge when individuals reflect on their own interactions with their CTE instructor, I structured these three interviews using phenomenological methodology (Seidman, 2013; Weiss, 1994). This study, however, was not of a phenomenologically purist nature. It did consist of a limited use of phenomenological interviewing procedures chosen by me. I utilized predetermined topics, or frames, to construct the first two semi-structured interview protocols used for this study. These topics were informed by the conceptual framework and research questions. This approach was employed in an effort ensure that all three sub-questions were investigated. Provisional analysis using frequency counts of applied deductive master and sub-codes to the first two interview transcripts was conducted following the completion each informants' second interview. This step

allowed me to construct three individualized semi-structured interview protocols for each informant's final interview.

According to Seidman (2013), the purpose of interviewing is rooted in an "interest in understanding the lived experiences of other people and the meaning they make of that experience" (p. 9). Interviewing also allows for direct focus on the case study topic and provides insights as to perceived social interactions especially important to this study (Yin, 2009). Primary informants were asked to reconstruct and reflect on the events and their experiences of participating alongside their CTE instructor as they learned a vocational trade. Primary to the phenomenological approach, then, is the use of primary informants' language and the words they use to reconstruct the events and experiences learning from a CTE instructor.

Seidman (2013) recommends that three interviews, specific in purpose, timing, and length, be conducted with each primary informant to make the best use of the phenomenological approach. This design allows for the standardization needed to acquire similar information from each participant, but also provides the flexibility required during individual administration. According to Seidman, interviews should be spaced between three days to a week apart. This timing allows for participants to reflect on the prior interview while not losing the connection to the last if too much time passes between interviews. I adhered to this recommendation while conducting informant interviews. The design and construction of each protocol is reviewed below.

First interview. The first interview was focused on placing each informant's experience in context. The focus of the initial interview, therefore, was to gain an understanding of the life histories of each informant (Seidman, 2013). The semi-structured open-ended interview protocol (Appendix C) for the first interview includes questions designed to elicit a variety of

information. I asked informants to reconstruct their early experiences with the trades, as well as the social influences affecting their interests in the automotive technology program. Due to the fact that the purpose of this study is to understand how these students perceive effective CTE instructors, I focused on the informant's past experiences in school and in any situations such as internships or prior work experiences they might have done before entering their CTE program.

Second interview. The purpose of the second interview was to concentrate on the concrete details of the primary informants' present lived experiences as students in a CTE learning environment. The semi-structured, open-ended interview protocol (Appendix D) for the second interview included only questions designed to elicit information regarding concrete experiences or behaviors (e.g., If I followed you through a typical day at NERSAT, what would I see you doing?), and sensory questions (e. g., Describe for me what I would see if I walked through the doors of NERSAT as a new student.). The intent of asking about the details of their experiences, rather than opinion or feeling questions, was to provide concrete details from which opinions were built once reflected upon.

Experience/behavior and sensory questions formed in the second protocol eliciting details of CTE instruction were designed in keeping with the current understandings of certification of effective CTE instruction in the State of Maine (Chapter 115), as well as the conceptual framework and scholarship of Jacques and Potemski (2014) in *21st Century Educators: Developing and Supporting Great Career and Technical Education Teachers*, and Adams (2010) in *A Framework for the Preparation of Accomplished Career and Technical Education Teachers*.

Third interview. The third interview focused on primary informants' making sense, or making meaning of, the concrete details they shared in the first two interviews. Weiss (1994)

suggests that, because informants have information that no one else does, drafting individual

interview guides with particular responses in mind will focus the third interview specifically on

informants making meaning from their prior concrete responses (p. 51). Provisional analysis,

then, was conducted in order to structure the third interview protocol. I applied tentative

deductive master and sub-codes to the first two interview transcripts. I derived this start list of

codes from the conceptual framework and research questions. Once codes were applied, I

tabulated the frequency of the three targeted factors of effective instruction. Within the most

frequently occurring codes, I selected significant statements from each informant. A review of

the observational field notes and informants' responses from the appraisal survey was conducted

to corroborate the selection of statements that were deemed significant. I used two question

stems recommended by Seidman (2013) that included, "Given what you have said about your

interests in the trades…" and "Given what you have said about your CTE education…" to

develop the phrasings for each question. Informants' individual statements were then

incorporated into each question. These questions structured the third semi-structured interview

protocol (Appendix E - G).

Observational and analytic note-taking. My observations of instruction were part of

this study. In documenting these observations, I generated three types of data. Upon entering the

research site, I produced jottings taken in-the-midst of instruction. Following observational

periods, jottings were converted to contextualized field notes. From these field notes, I wrote

periodic analytic memos. Over the course of the data collection period, I conducted 14

observations. Each of these observations lasted one hour. Creswell (2013) recommends an

observation protocol be used to clearly delineate descriptions recorded during observations from

interpretations and judgments made following observations. An observation protocol was

employed during these data gathering events (Appendix H). The first two observations I conducted were focused on gaining a sense of the context in which instruction took place. I documented the physical setting, activities that occurred, and the social interactions between the instructor and students. As I became familiar with the routines of the automotive program, I engaged in observations that began to focus solely on the verbal and non-verbal behaviors of individual informants in response to being instructed, while others began to focus on the verbal and non-verbal behaviors demonstrated by the CTE instructor while teaching his students. My goal was to document the CTE instructor's instructional practices and social interactions in order identify the key features of his knowledge, skills, and dispositions. Two questions grounded my observational jottings. The first question read—what verbal and non-verbal behaviors are demonstrated by the instructor while teaching? I further delineated this question into the three factors of effective instruction and created shorthand initials to annotate my jottings during observations. The second question read—what are the experiences of NERSAT students as they learn from their CTE instructor?

Immediately following each observation, I reviewed my in-the-midst jottings and began creating contextualized field notes, noting topics, social interactions, contexts of instruction, and instructional practices. Yin (2016) recommends that researchers convert jottings as soon after an observation has been completed in order to "reflect on what happened" during the observation (p. 174). I was able to convert jotting to field notes during the one hour period between NERSAT sections and directly following school dismissal. These initial revisions consisted of expanding and correcting sentences that were not clear in the jottings. Within 24 hours of my initial conversion, I synthesized the details of the observation to further contextualize and thicken the

field note. The result was a narrative of the observation that became part of my on-going and retrospective analysis.

My note-taking procedure included analytic memos. Throughout the duration of this study, I wrote analytic memos periodically. According to Maxwell (2013), memos should be viewed as "a way to help you *understand* your topic, setting, or study, not just as a way of recording or presenting an understanding you've already reached" (p. 20, original italics). I composed three memos. The first came after all informants had completed their second interview. At that time, six field notes were part of the data set. This memo focused on identifying recurring instructional practices, patterns of social interactions, and verbal and non-verbal behaviors of the CTE instructor by comparing field notes to other data. The opportunity to compare what informants' reported on the appraisal inventory and discussed during their interviews aided in constructing the final interview protocol. As my data set expanded, I wrote two additional analytic memo focused on emerging themes and potential inductive codes. I pursued a more reflective approach on matters such as methodological issues, personal reactions, and general wonderings about this study. As I began to analyze data, I honed my memo writing to focus on the analytic features of my thinking and the potential concepts emerging from the data.

Documents and photographs. I solicited, and was offered, documents found within the research setting. According to Bowen (2009), documents represent a stable "non-reactive" source of data (p. 31). In other words, documents can be read and reviewed multiple times without being altered by the researcher's influence or research process. I initially collected a Course of Study booklet from NERSAT prior to entering the research setting. I presumed students used the information in the booklet to help them make program choices. Informants' use

of this booklet was verified by them during the first interview. Other relevant documents were collected after I observed their use by informants during instruction (e.g., time cards, repair order slips, and ProDemand printouts) or these documents were offered to me by Mr. Giles's following his teaching (e.g., Automotive Motor Vehicle State Inspection Quiz #1). Documents were used as corroborating evidence of practices addressed in the conceptual framework on effective instruction. As themes emerged within the secondary question focused on pedagogical skills, documents became an important source of data in developing thick, rich descriptions of significant instructional practices. Table 3.2 present relevant documents gathered during the data collection period that were either observed being used by informants or referenced by them in interviews.

Table 3. 2

List of Documents Gathered in Research Setting

	Document Title	Document Use
1	Automotive Time Card	Management/Assessment
2	Automotive Time Card Instructions	Setting Expectations
3	Workplace Employability Skills: Student Weekly Evaluation Rubric	Assessment
4	Automotive Technology Repair Order Report (CCC)	Management/Instruction
5	Example of ProDemand printout: Fig. 1: Strategies Based Diagnosis Flow Chart	Instruction
6	Automotive Motor Vehicle State Inspection Quiz #1	Assessment
7	Course of Study: Your Regional High School for Career and Technical Education (booklet)	Recruitment

I also collected a total of 32 photographs of the research setting. Table 3.3 presents relevant photographs taken at the site of study that were referenced by informants during

interviews. Photographs did not contain images of individuals. Photographs were accompanied

with full textual support from either interview data or observational notes. Photographs were also

used to document evidence of practices addressed in the conceptual framework on effective

instruction. For example, photograph #18 is of a poster on the wall of Mr. Giles's classroom in

which a female automotive student is depicted working on a vehicle's engine. The use of this

poster is in-line with the recommendation by the National Coalition for Women and Girls in

Education (2014), which suggests classroom materials use images of females engaged in work

rather than as passive observers of work.

Table 3. 3

List of Photographs Taken in Research Setting

	Image Description	Image Location
1	Locked Tool Room	Automotive Technology Program/ Backroom
2	Unlocked Tool Room	Automotive Technology Program/ Next to Shop Floor
3	Customized S-10 Frame for Teaching Vehicular Brake Systems	Automotive Technology Program/ Shop Floor

Research journal. To document my own thoughts and reflections on the progress of my

research, I kept a research journal. The journal was used daily as a way to record insights,

questions, and dilemmas, and to keep a chronological timeline of activities that would become

my audit trail. I followed recommendations provided by Maxwell (2013), that included

repeatedly asking myself, "what beliefs or assumptions about the topic or setting have resulted"

from my experiences during the study (p. 35). If these entries seemed significant, they were used

for the basis of an analytic memo. I also monitored for bias on my part by journaling about assumptions I might have made while conducting interviews.

Managing Data

Digital recordings of individual interviews were transferred to Sonority, a computer software program used to enhance the audio recordings. Transcriptions of these recordings were completed by July 2018. When transcriptions were transcribed, de-identified, and cleansed, the audio files were destroyed. Hand written jottings were locked in a file cabinet and converted into typed field notes. A digital camera held the photographs until they were printed out. These photographs were locked in a file cabinet. Interview transcripts, typed observational field notes, and digitized versions of research setting documents were uploaded into ATLAS.ti, a qualitative analysis software program designed for the social sciences. This program was accessible on my personal computer, which is password protected. ATLAS.ti was instrumental in keeping track and organizing data, as well as allowing memo writing, developing codes and coding, and developing pattern themes.

Data Analysis

Due to the fact that this study identified three female students who attended a single CTE program predominantly attended by male students, this case study sought to use a within-case analysis method. Therefore, one stage of analysis was conducted. The study of female students' perceptions of effective instruction when entering a predominantly male-attended CTE program was treated as a comprehensive case. According to Miles, Huberman, and Saldaña (2014) within-case analysis should aim to "describe, understand, and explain what has happened in a single, bounded context—the 'case' or site" (p. 100). The intent of selecting a within-case method was to focus analysis on providing a well-grounded sense of these informants' perceptions and

realities of their instructor's effectiveness within the CTE program. Data was analyzed using a combination of case study and phenomenological approaches recommended by Creswell (2016). Case study approaches included bounding the case within a single program, the use of deductive and inductive coding methods, within-case analysis, and organizing findings into themes. Phenomenological approaches included reducing the data into significant statements and developing rich textual and structural descriptions of informants' experiences. Integrating these data analysis approaches allowed me to document the complexity of the informants' experiences, perceptions, and meanings, and situate their experiences within the conceptual framework and research questions.

Coding

Interview transcripts, observational fieldnotes, and relevant documents and photographs were coded utilizing guidelines set forth by Saldaña (2013), and expanded upon by Miles, Huberman, and Saldaña (2014). Two cycles of coding events occurred during analysis. According to Miles, Huberman, and Saldaña, First Cycle coding is an approach for summarizing segments of data. Second Cycle coding runs include pattern coding and was a way for me to group these summaries into smaller number of sets.

First cycle analytic coding. During the First Cycle of coding, I developed a list of deductive codes according to the conceptual framework of the sociocognitive perspective of the teaching-learning process and from my findings from the pilot study. Their development was primarily guided by the sub-questions in this study, which identified knowledge, skills, and dispositions as factors of effective instruction. Deductive codes were initially descriptive in nature for the purpose of "chunking" information into smaller units for analysis. I revised these deductive codes during initial coding applications of interview data in order to provide either a

more nuanced code or describe subjects that were not included in the beginning list. Alterations to these deductive codes continued during subsequent coding attempts, and emergent master and sub-codes were developed using an inductive approach where necessary (Strauss & Corbin, 1990). During these coding applications, I simultaneously analyzed the data across all primary informants by using comparative matrixes. A comparative matrix allowed me to analyze data across several sources in one graphic and was used to clarify master and sub-codes (Miles, Huberman, & Saldaña, 2014). Once a stable set of master and sub-codes were in place, I developed a coding dictionary (Appendix I) and coding map (Appendix J) to insure reliability across subsequent coding sessions.

To test the external reliability of my master and sub-code definitions, I conducted inter-reader reliability sessions with two educational professionals who were unfamiliar with my current data. These individuals, however, were readers during the pilot study and were familiar with the inner-reader reliability procedures. Miles, Huberman, and Saldana (2014) recommend a reliability index of 85% agreement over a dozen pages of data. The first session resulted in 77% agreement. The master and sub-codes were revised for clarity. A second coding session was conducted by the same two raters using new data. The session resulted in 85% agreement. I proceeded with the application of master and sub-codes across the data set.

Second cycle pattern coding. Pattern-based codes or themes were inductively generated during the Second Cycle of coding (Miles, Huberman, & Saldaña, 2014; Saldaña, 2013). Descriptive codes from the First Cycle were sorted and grouped according to their interconnectedness and relatedness to the theoretical constructs proposed in this study. Analysis of these groupings was used for the basis of generating inferences from the data. According to Miles, Huberman, and Saldaña (2014), creating a graphic "map" of the component codes and

segments of fieldnotes that structure the emerging pattern-based code is helpful in ensuring that its construct fits the pattern and name of the code (p.88). To remain mindful during inductive coding attempts, I engaged in creating annotations from these displays. Ideas and reactions to the perceived meanings in the pattern-codes were annotated in a different section in Atlas.ti and were attached to the relevant passages that sparked the annotation. These interpretations, along with the coded sections, were a source for writing focused analytic memos discussing the potential importance of these pattern-codes.

Using the phenomenological approach described by Moustakas (2014), I developed a list of significant statements found within each pattern code group about how informants experienced nontraditional status and instructional interactions with their CTE instructor. These significant statements were arranged into meaning units. I then wrote a textual description of what the informants experienced. Meanings were integrated into core themes, reflecting a higher level of abstraction and were compared between different texts. Themes were examined to find connections and interrelations. From these examinations, I wrote a structural description of how these experiences happened. I then compared the themes emerging from my codes and the textual and structural descriptions to the propositions underlying the key theories presented in the literature review. This comparison was made in an effort to ensure analysis answered my research question.

Trustworthiness

A primary assumption underlying the social constructivist paradigm of qualitative research is that reality is holistic, multidimensional, and ever-changing. Researchers engaged in qualitative investigations recognize reality is not a static, objective phenomenon to be observed and measured. Thus, attempts to establish validity though symmetric correspondence between

data sources and their collection and the lived experiences of these female CTE students is inappropriate. Rather, I utilized four strategies to guard against threats to internal validity of this study. Likewise, to guard against threats to external validity and provide a sense of the transferability of this work, I employed two strategies. Lastly, I have addressed my considerations of the reliability issues of this case study.

Internal Validity

First, I attempted to render an honest representation of how my informants perceived the effectiveness of their CTE instructor and how his instruction had affected the development of their career interests. I attempted to provide thick, rich descriptions that emerge from examining the theoretical concerns addressed in the social interactions that influence female adolescents' vocational beliefs. Beyond describing these personal insights, I focused on a single program within NERSAT to ensure that sufficient contextual details and descriptions of material artifacts were included in these renderings. The intent was to provide a sense of interconnectedness within written descriptions that were substantive.

Second, I strove to triangulate information within the data set. The sources of data for this study include appraisal inventory results, personal interviews, observational notes, analytic memos, public documents, and photographs. By comparing data, I hoped to ensure that different sources have the potential to answer my research questions. These sources of data acted as corroboration evidence and were used to illuminate potential themes as they were being developed and reported.

Third, this study utilized member checks. Shenton (2004) suggests the primary purpose of member check sessions is to ensure informants' words match what they intended to say. By allowing informants to review conclusions and recommendations drawn from their own words

and actions, the member check process bolsters the credibility of analysis and findings generated by the researcher. I conducted member checks sessions after drawing tentative conclusions rather than involve informants during the course of ongoing data collection. The timing of these member checks was to ensure interviews and observations of informants were not altered due to awareness of preliminary analysis or findings. I conducted individual member check sessions with each participant. Together, we reviewed transcript excerpts, and the potential conclusions drawn from them, for accuracy of the analysis.

Lastly, Creswell (2013) recommends researchers clarify their potential biases at the outset of a study. As discussed in the first chapter, I have been a certified aircraft technician and possess an aptitude for understanding electrical and mechanical systems. My time as a skilled tradesperson influences the way I perceive the importance and utility of a Career and Technical Education. It was also during this time as a mechanic that I first encountered strong women supervisors and female peers who engaged in the technical trades dominated by men. These women have left upon me a lasting and positive impression of females in skilled trades. By being upfront about my biases and influences, I hope to allow readers to examine my personal intentions in designing and conducting this work as well as assess my attempts to balance the level of empathy I feel for both my informants and their CTE instructor.

External Validity

Considerations for the transferability of the findings produced from this study are an important consideration. I addressed these validity issues in keeping with guidelines set out by Creswell (2013). First, I attempted to analyze and report in a detailed manner the ways in which informants' perceived the effectiveness of their CTE instructor in providing a vocational education. In this way, readers can assess for themselves the appropriateness of the

transferability of this case study to similar educational contexts. I also aimed to establish the typicality of this case so others will be able to make comparisons with similar situations. By setting parameters and providing a report that emphasizes the uniqueness of these female CTE students, users should have a solid foundation from which to make comparisons.

Reliability

My main strategy to address threats to reliability of the overall study was to document my case and develop an audit trail. I kept detailed records of how data was collected and how decisions were made regarding the study. I recorded the rudimentary logistical issues of conducting this work to include such events as my attempts to contact informants and the circumstances under which I work.

CHAPTER 4

PORTRAITS

As noted in the previous chapters, there is compelling evidence that nontraditional female CTE students who enter male-dominated programs rely on an effective instructor to help them achieve in their program. As a result, there is a need for better understanding the aspects of effective instruction as addressed by these students. Since Career and Technical Education supports the development of career interests, informants' outcome expectations with regards to this trade career are relevant to this study. While not a direct influence on instructor effectiveness, outcome expectations are believed to assert an indirect influence during the performance processes (Lent, Brown & Hackett, 1994) and are a significant factor in women's career choices (Eccles, 2011). I will being each informant's portrait with a review of the relevant theory of career development. This chapter then presents each informant's outcome expectations, the unique formation of her career-relevant interests, influences affecting her career choice options, and her beliefs regarding female participation in the automotive technology trade.

My own experiences as an aircraft mechanic still have a profound impact on my identity as an English teacher. I recognize the interest my vocationally-oriented students express when I share my past experiences with them. They often appreciate that I am sensitive to the challenges of learning such complex work when they, themselves, enter Career and Technical Education programs. In talking with these students, however, I realized that many talk differently about their experiences in vocational education, especially if they are enrolled in predominantly male-attended programs. I wondered, as a teacher, what it must be like to teach in a classroom where gender imbalances are so striking. Surely in programs of this type, an instructor in these programs would need to be aware of the potential for stereotyping and biased attitudes? Yet,

Jenny, a former student of mine, was clear that not only did her CTE instructor understand these conditions, but he also helped her overcome them by being proactive and positive. In effect, Jenny perceived her CTE instructor as an effective teacher. I now aim to understand how three interrelated dimensions of instruction were addressed by other female students in a similar situation. The narratives in Chapter 4 and the findings in Chapter 5 represent the perspectives of three nontraditionally enrolled female CTE students in a single automotive technology program. At the time of this study, the informants were completing their second year of Career and Technical Education.

This chapter presents portraits of each informant based primarily on interview data but also incorporating appraisal survey results and observational field notes. Each portrait documents the knowledge, skills, and dispositions that informants attributed to her instructor. Also included in these portraits are contextualizing details that explain the informants' decision to enroll in the automotive technology program.

The first portrait presents Maya, a seventeen-year-old senior enrolled in a small public high school. Maya was a high-achieving student who took honors level courses at her traditional high school. Her desire to move to California following graduation, along with a mother who viewed the skilled trades as an immediate access point for a job, led Maya to explore the automotive trade. As a result, she applied to a dual-enrollment program in automotive technology and auto body collision repair. The second portrait represents Colby, an eighteen-year-old senior enrolled in a private Christian high school. Her childhood dream was to become an automobile technician. Participation in Mr. Giles's program enhanced her desire to continue in the trade. The third portrait presents Raven, an eighteen-year-old senior enrolled in a large public high school. Raven's father was an automobile mechanic, and she had prior knowledge of

many of the systems taught by Mr. Giles. She was less committed to the automotive trade and sought enlistment in the United States Air Force. Her dream was to become a firefighter.

This chapter focuses on each participant's reported experience with the influences that helped to develop her desire to enter the automotive technology program. Chapter 5 presents analysis of their perceptions of effective instruction while in the program. Utilizing a within-case analysis strategy, I used interview transcripts, observational notes, documents, photographs of the site of study, and responses to the appraisal inventory to document the complexity of the informants' experiences, perceptions, and meanings, and situate their stories within the conceptual framework and research questions on effective CTE instruction.

Maya: Formation of Career-Relevant Interests - A Cultural Awakening

While a person's self-beliefs regarding performance attainments are a relevant source of information to help provide feedback on career pursuits, other career theorists argue that a co-construction occurs between an individual and society in the early stages of career-relevant interests. The constructivist notion of career development sees an individual's early interests developed from the outside in, not from the inside out. As Vygotsky (1978) noted, "There's nothing in the mind that is not first in all of society" (p. 42). Therefore, exposure to various career options is an important feature of career development. One source of information for adolescents on career options is the mass media. In surveying adolescents, Levine and Hoffern (2006) found that mass media was cited most often as providing positive information to adolescents about work. These researchers suggested that media portrayals of occupations affect these adolescents' occupational aspirations. However, Levine and Hoffern noted that occupational requirements were not considered in the portrayals of these jobs.

Maya's portrait offers a compelling account of an adolescent whose career interest was strongly influenced by the mass media. It is also the portrait of how the high cost of college affects one's career choices. When Maya first enrolled in NERSAT's automotive technology program, her goal was to explore this career. In my interviews with Maya, she believed the utility of such a trade job might be beneficial to her when she moved to California. The idea came from the realization that the earlier academic success she experienced at her traditional high school held little value to her. "The cost of college is crazy," she told me. Maya's high-achieving status in taking honors level courses, in her view, would only lead to financial instability if she were to pursue a bachelor degree. A viable option was to explore how a skilled trade could assist her in achieving her transition goal.

My interviews with Maya, along with the appraisal survey and observational field notes, indicated that mass media social messaging can influence a person's career ideas and pursuits. Maya ultimately was open to pursuing automotive technology as a way to gain personal agency. She reported capitalized on her academic prowess and acquired automotive competencies through continued and varied practice. Maya acknowledged a CTE instructor who demonstrated a wide-range of teaching approaches that supported her growth in both the declarative and procedural knowledge of this trade.

I open Maya's portrait with her outcome expectations. I then present the genesis of her career interest in automotive technology, drawing on the conversation we had during our first interview. I will explain the influence of her high-achieving status, as well as her Mother's encouragements. Lastly, I will present Maya's beliefs about why so few female students enroll in the automotive technology program at NERSAT and what she believed could be done to change this in the future.

A Portrait of Maya

"Megan Fox in the *Transformers* movie. Looking at the car and telling the guy what's wrong

with it. That was a pretty big, huge, part." (Maya)

Maya's outcome expectations for the automotive technology program were initially

modest, as she was using the program to explore a career path. Originally, she wanted to learn to

work on her own vehicle as labor prices made car repair expensive. Maya explained, "I just

wanted to know it so I could do my own car. Because, labor is a lot of money. So, if I could just

buy a part and put it in my car myself, it's a lot cheaper than going to a shop and having someone

else do it and pay them, too. So, that was my thought process at first." However, Maya quickly

learned that the automotive technology program offered more than skills based learning. Maya

spent two days in a classroom focused on the academics of vehicle operating systems. This

academic focus suited her, as she was a high-achieving honors student back at her traditional

high school. The combination of skill practice and academic learning of the automotive repair

trade helped Maya further her career interests. This led her to consider expanding her outcome

expectations to include using her training at NERSAT to find work when she moved to

California. Her mother factored into this expansion, as well. Maya explained:

> She told me, 'You should have something for when you go out there. So you can,
>
> so I know you're not going out there with nothing.' And, I was like I don't really
>
> care to be a mechanic all my life, like work in a shop or anything like that, but
>
> then I could go out there and have that knowledge and get a job out there,
>
> probably. It wouldn't be forever, you know. (Maya, personal interview, March 23,
>
> 2018)

Maya's outcome expectations were expanded due to her desire to move to California. She has family there but does not want to be an imposition. Maya also expanded her expectations due to the perceived utility of a trade education. Her mother impressed upon her that a trade education is valuable.

The initial concept of working on vehicles came to Maya when she watched a movie on television. "Megan Fox in the *Transformers* movie, looking at the car and telling him what's wrong with it. That was a pretty big part," Maya explained after I asked her when she first discovered she had an interest in vehicle repair. *Transformers* is a science fiction action film geared to adolescents. In her quote, Maya references Megan Fox an American film actress who played the character Mikaela Banes. The movie's plot centers on two different races of robots that fight for control of Earth. The robots have the ability to change into different mechanical objects. These objects are most often futuristic vehicles. I followed by asking what she was thinking about at the time she discovered this interest. "I just thought she was cool, I guess," Maya responded. I followed up on this statement by asking her what made the character cool. Maya answered, "I don't know. It was just interesting." I then summarized her statements back to her, saying she was interested in the female character because she talked about cars. This prompted Maya to explain the connection she had with the female character:

> Well, because, it smoked and the kid was like, 'No. No. Not my car.' And she's like, 'Oh, I'll see.' And she's like, 'Pop the hood.' And he's like, 'Okay.' And she, it's, it's kind of like a sexy scene because she's got her shirt rolled up and she's pretty and he's watching her the whole time. And he's like, 'Holy crap. This girl knows about cars and she's hot.' But, I looked at her and was like, 'Wow. She knows what she's talking about.' She was like, 'My dad. He and me, we've taken

apart an engine before, so I know a little bit about cars.' And, I was like, 'That's cool.' (Maya, personal interview, March 23, 2018)

Maya associated with the power this female character demonstrated when she took charge of the situation due to her automotive knowledge. Maya was able to look past the movie itself to recognize her desire to emulate the character. In fact, she appeared drawn to the automotive knowledge itself. It makes sense that Maya's participation in the automotive technology program was primarily exploratory, or an opportunity to elaborate on this interest.

Two experiences with her mother also influenced Maya's decision to enroll in Career and Technical Education. Maya shared a critical experience when I asked her to recall a memorable story that would help me understand how she became interested in attending NERSAT. Maya relayed the story of when she brought home the informational material she had received earlier in the day while touring NERSAT. "I brought home papers about it. I always, whenever I bring home papers, I throw them on the table and she looks at them," Maya explained. Maya then remembered her mother's supportive message. Maya recalled, "She was like, 'I really wish I had the opportunity to go to a technical school like that and learn the way that they're offering you.'" Maya's mother had earned a criminal justice degree; however, she was currently unemployed and felt that the degree offered her little opportunity. Maya explained, "She hasn't done anything with that degree. And so, she was like, 'I shouldn't have even done it.'" Maya gained an understanding of the utility of an education through this experience and her subsequent conversation with her mother.

Maya also described the night she attended an open house at NERSAT with her mother. It was her junior year and Maya was already enrolled in the automotive collision repair program. This program was her third choice, her first being automotive technology program, and she

wanted to show her mother around the program and speak with her instructor, Mr. James. As the

pair walked by the automotive technology program, they saw Mr. Giles standing there. Maya

looked into the shop area. She quietly told her mom, "This is what I want to do." Maya, not

wanting to let the opportunity to talk with Mr. Giles pass, approached him. She explained, "We

went by the automotive and Mr. Giles was standing there and he wasn't talking to anybody, so I

kind of started a conversation with him." She told him that her first choice was automotive. "I

was saying I originally wanted to take his class, but I was planning on doing it next year," Maya

said. Mr. Giles invited Maya and her mother into the automotive technology program. He told

Maya it would be great if she enrolled in his program. Maya's mother told her it would be

"pretty cool" if she took the class the following year.

Another factor in Maya's decision to attend NERSAT was her interactions with friends.

However, her initial experience was one of having to be cajoled by them into attending during

her junior year of high school. "I saw my friend Ryan was in [auto body], too. I was like, 'What

is this class? Is it, like, a basic intro thing?' And, he's like, 'Yeah. Kind of, it is.' I was like,

'Should I do it?' And, he's like, 'Yeah. It's just an intro thing.' So then I did it and was like,

'This isn't that bad.'" Maya's initial hesitation in signing up for a CTE program appears to be

mitigated by her friend's description and recommendation of the program. Once she started

attending, Maya gained a sense of enjoyment by pursuing vocational education. "Ryan was in

there, so at least I knew someone in the class. So, I could go and it's not going to be weird not

knowing anyone," Maya explained to me. However, by her senior year, Maya appears to have

gained a sense of agency over her decision making. As she elaborated, "This year I'm actually

taking this class and I'm not taking it to be with a friend." When I asked her why she was able to

make her decision independently this year, Maya said, "I usually do things that my other friends

are doing, too. Like last year, junior year, when I came here, I had Ryan and that was nice. But, this year, taking automotive, I didn't know anybody I was going to be taking it with. So, my friends really had no influence on me." Maya's ability to make independent decisions for her vocational education appears to be based on her future interests rather than on her ability to spend time socializing with friends. Maya's choices represent an alternative explanation as to why some female students do not enroll in a CTE program. It might be that other students do not want to miss the social aspects of attending their high school during the senior year.

When I asked Maya why so few females enroll in her automotive technology program, she explained that the actual work might keep them from participating. This work was characterized as typical male work by Maya. "Probably because of the actual work. It's probably just the idea, it's typical male work. Not all girls are into that," Maya explained. Earlier in our interview, Maya discussed the physicality of performing some automotive repair. She appreciated how these tasks required physical effort. When I asked her what could, or should, be done to alter having so few females in her program, Maya responded by suggesting that females try different tasks while touring the program. "Let them operate the lift and the air gun and stuff. Let them do that stuff. That's what I did and it was easy so I was like, 'Yeah. I'm going for it,'" Maya said. In essence, Maya's early concept of automotive work was based on the need for great strength and physical prowess to perform these tasks. However, through operating some of the tools while touring the program, Maya learned how they assisted mechanics. She realized that the only obstacle was the stereotypical idea that men were mechanics. Unfortunately, Maya held the view that little could be done to change this concept. Maya explained, "I don't think there is anything anyone can do except for girls being like, 'Yeah. I'm interested in that. I'm going to do it.'"

Colby: Persistence in Occupational Pursuits - A Dream Closer to Reality

Elaborating on prior career choice models, which presumed some linkage between a person's interest and their career choice, Lent, Brown, and Hackett (1994), developed Social Cognitive Career Theory (SCCT) in which they argued that an intermediate step was needed to better understand the career decision-making process. In their performance model of career development, these researchers proposed that this step was a feedback loop between interests and choice actions. For these researchers, performance on career tasks was a contributor to a person's career exploration. Outcomes from earlier career-relevant behavior would serve to confirm or redirect future career choices. This feedback loop was hypothesized as iterative and described as dynamic in the decisional process. However, Lent, Brown, and Hackett proposed a different model of career choice in which they view the effects of performance experiences on future choices being mediated by self-efficacy and outcome expectations. These researchers believed that self-efficacy and outcome expectations would help to either solidify or redefine interests and career goals.

In keeping with Bandura's (1986) general framework for self-efficacy theory, Lent, Brown, and Hackett (1994) believed that self-efficacy asserts a direct effect on performance, as well as an indirect effect via a person's career goals and actions. The relationship of outcome expectations to performance was seen as mediated by goals and actions. Following social cognitive theory's triadic view of person-environment-behavior transactions, the researchers denoted the feedback loop between performance attainments and a person's subsequent choices and behaviors. For example, successful performance on an automotive task would enhance occupational self-efficacy and outcome precepts, thereby strengthening one's interests and goals.

Colby's portrait offers an engaging account of an adolescent determined to meet her career goals through educational persistence. When Colby first enrolled in NERSAT's automotive technology program, she had a dream of becoming an automotive mechanic. Colby shared that, while she loved fast cars and one day wanted to race them, she first wanted to learn to fix them. As she put it, "I want to get my hands dirty." She was a student driven by her passion for automotive repair. In fact, two years into her high school automotive technology program, Colby was already accepted into her local community college's automotive technology program where she planned to earn a two-year associate's degree.

My interviews with Colby, along with the appraisal survey, indicated that positive verbal persuasions and vicarious experiences during her CTE program nourished her self-efficacy beliefs. This was important as she acted upon her dream and met the challenges required to succeed in this male-dominated CTE program. Colby developed her high career self-efficacy in automotive repair because of an instructor who stressed the importance and value of automotive technology knowledge and repair. Colby acknowledged in our second interview that he had encouraged her to persist and persevere when social issues could have taken her off track. I begin Colby's portrait with her outcome expectations of the automotive technology program. Next, I will present the development of her career interests, drawing on the conversation we had during our first interview. I will then explain the reported influence that her private high school experiences had on her as a student, as well as her father's strong and lasting encouragements. Lastly, I will describe and explain Colby's beliefs about low female enrollment in the automotive technology program at NERSAT and what she believed could be done to change this in the future.

A Portrait of Colby

"I was just really pumped about actually, finally, getting closer to finally achieving my dream.

Like one step closer." (Colby)

Colby's initial outcome expectations going into the automotive technology program were modest but increased over time. When I asked what she hoped to get out of participating in her program, she responded, "Basically everything. As much knowledge as I could possible get." During her participation, these outcome expectations were strengthened by her academic choice selection. Colby wanted to go to college for automotive technology. During the year of this study, her senior year in high school, Colby had been accepted at a local community college. While she was enthusiastic about her academic and career choice, at one point Colby appeared to diminish the significance of attending such an institution, saying, "I'm going to go to college, well community college, for automotive." Her statement gave the impression that she considered community college in a different light than a four-year college because she paused before qualifying "well community college" with a modest tone in her voice. The difference appears to, in Colby's mind, lower the status of attending such a school. This feeling may have moderated her outcome expectations early in her program participation. The source of her attitude might be attributed to her traditional high school experiences. Very few students from her school pursue vocationally oriented careers and attend NERSAT. In fact, Colby talked about only four students going on the NERSAT tour during her sophomore year. Even with this small social group of vocationally minded students, Colby was able to remain steadfastly devoted to learning as much as she could from her automotive technology program with the expectation of taking this knowledge with her as she attends community college. In fact, it appeared that the attitude Colby

developed as a result of attending these two schools fortified her beliefs that pursuing a career in automotive technology was the right path for her.

In discussing her views of Career and Technical Education, a factor believed to affect outcome expectations, Colby referenced a student's individual career interests. When I asked how she viewed Career and Technical Education before entering NERSAT, Colby responded, "I felt like, if it was something that a student wanted to do, whether you wanted to go be a full-time chef, or a full-time mechanic, or whatever, mainly focus on that, really. Like, that was what the vocational schools are for." Here, Colby understands that some students hold different expectations for their educations. She agrees they should pursue their interests, as the purpose of Career and Technical Education is to develop these interests. Yet, when Colby and I discussed how she came to know about NERSAT, she mentioned an older classmate who attended the school. "I talked to him a little bit about it, and he was, like, talking highly about it," she recalled. Colby felt genuinely surprised by how much this student enjoyed his time at the school. For Colby, the expectation of enjoyment was not forefront on her mind. She was worried instead whether NERSAT could support the academic expectations she believed were necessary to get her into college. After her participation in the program, however, Colby's views were enhanced in regard to the purpose of Career and Technical Education. "Like I said. I was completely for it. But, now that I'm here pursuing my dream, it made my view stronger for it. Definitely made me love this place even more and I can't believe, like, you earn college credits here." One factor that effectively raised her outcome expectations was that her program was aligned with, and provided, college courses. She realized that her expectations could be met and exceeded through her participation. She would have a solid academic foundation after successful completion of the program.

Colby's interest in automobile mechanics began within her family. She initially gained an interest by watching television with her family. "Ever since I was very little I used to watch the old police shows, like the old car shows and stuff like that. So, I've always loved cars," Colby told me. These early experiences led Colby to develop an interest when extended family members worked on cars. Unfortunately, some of her family members did not always respond positively to Colby's growing interest. As Colby explained, "I have family that works on cars, but they never actually allowed me to get under there and look, like, work on them and everything, mainly because I was female, basically. And, they were like, 'Oh. You're not going to be able to do it.' I had friends tell me that, too." Colby's gender appears to be a factor as to why family members would not encourage her participation when they worked on vehicles. These attitudes might have discouraged her from pursuing this interest, but her father continued to take her to car shows. "When my Dad took me to the old car shows that had all these Chevelles and old Mustangs, and everything. Like sixties, seventies. Oh my word! That was awesome! That was, definitely made me want to work on them but even more so," she explained to me. Colby's immediate family provided her with enough reinforcement to continue to develop her interest in vehicle repair.

When I asked Colby to identify what specifically interested her in working on cars, she told me, "I've just always wanted to learn how to actually get my hands dirty and work on them." While this response did speak to a general understanding of working on vehicles, I asked if she could be more specific. "Well. Cars were like jigsaw puzzles to me and I liked that," she responded. She went on to explain that, while exploring what a mechanic does, she found parts diagrams and assembly sheets. These texts showed all of the constituent components that made up a particular vehicle system. Colby was enamored by the complexity of a vehicle's assembly.

While she understood the physical aspects of working on vehicles, such as getting her hands dirty, she was also captivated by the engineering and design. As she elaborated on her burgeoning interest in vehicles, Colby explained that her traditional school was becoming less interesting. "Trigonometry, or whatever, is important, I know. But, my dream was to work on cars." Fortunately for Colby, the option to attend a Career and Technical Education program was available to her.

The purpose of Colby's participation in her automotive technology program was not only to pursue her dream, but to also develop the knowledge and skills necessary for entry into a college program for automotive technology. For Colby, this was going to be her life's work. She wanted to attend college to earn the required certifications in automobile repair. She was aware that the position of certified automotive technician at a dealership paid well. "It's darn good money to be a mechanic at a dealership," she told me. The expectation of a higher-paying career was the most critical factor in Colby's decision to enter the automotive technology program. Her father continued to influence her by showing interest in her learning. "My Dad's always asking me what I'm doing at NERSAT," Colby explained. While she held a strong conviction to complete her program and had reinforcement at home, Colby did admit to moments of doubt. "There were some days when I was just like, 'You know what? I might as well just shut up. Just forget it. Forget the whole thing.'" In these moments, the purpose of Colby's participation was not enough to ameliorate her self-doubts. Colby credits her father for offering continued encouragement to reduce these negative moments. "He knew I wanted to do this, and he was all for it. So he constantly kept me going and he constantly kept me encouraged," she told me. It is, therefore, a positive development that Colby was admitted into her college automotive program.

Another reason for Colby's participation in the automotive technology program was to assert control over her education through education decision making. For Colby, the prescribed curriculum at her school was limiting. She also wanted to be as independent as possible in her schooling. "The programs at my school didn't have anything to do with my choice in coming here. It was mainly my own way," she told me. Colby's choice to attend NERSAT appears to rest not just on her interests, but also on the agency she acquired in making the choice to attend. "I was actually still in shock that I was accepted. When I found out I was accepted into this program, I was literally, I know this is going to sound weird, but I was jumping up and down, screaming, 'Yes! Yes! Yes!' because I was pumped," she said. Given the opportunity to make her own educational choice provided Colby a sense of exhilaration. She was able to forge her own unique pathway and in doing so gained control over her education.

When I asked Colby why she believed so few females participated in her automotive technology program, she believed it was due to feeling intimidated by male students. "They're too intimidated by guys. So definitely, most of the time they feel like they can't do it," she explained. Colby's belief appears to be formed due to her own experiences with family and friends who told her becoming a car mechanic was a male profession. Colby reported that her extended family and some friends expressed this idea. In her response, Colby also referenced her own disposition toward individuals who believe women should not be in the automobile repair business. "I'm not trying to be rude, but it's like if a guy tells me I can't do it, I'm like, 'Fuck you. I'm doing it,'" Colby asserted. While this strong feeling gives the impression that Colby's dispositional attitude acts as a mechanism to overcome social obstacles, which in fact it does, Colby also received numerous supportive messages. These messages bolstered her confidence when she had feelings of doubt about her own participation. When I asked her what could, or

should, be done to alter having so few females in her program, Colby responded that female students should receive more encouragement to enter the automotive program. She reasoned that perhaps many females did not hold strong career interests in automotive repair but might still be interested in participating in the program. "If it's something they want to do, even just as a hobby, they can do it. So, definitely encouraging them just like, 'Come to the program and show them, no matter who's telling you, you can't. Or even if you're the only female, or whatever. Just go all in,'" Colby recommended.

Raven: Elaboration on Performance - A Deepening of Prior Knowledge

Acting upon one's occupational interests allows a person to understand if they have the aptitude and abilities for that particular career. Positive performances can have lasting effects on one's self-beliefs about that career (Bandura, 1986). On the other hand, preferences for particular work reinforcers can influence an individual's career interests as well. An occupation's status is one of those reinforcers. According to Lent, Brown, and Hackett (1994), reinforcers, which these researchers referred to as *values*, are acquired through interactions with, or observations of, family members, peers, teachers, and other significant persons. Lent, Brown, and Hackett claim people develop proclivities for particular reinforcers and that they perceive different occupations as varying in terms of their ability to satisfy these extrinsic outcomes. Yet, as reviewed in chapter two, men's and women's career choices fall along somewhat predictable lines. In studying women's occupational choice-making, Eccles (1986, 1987) proposed a theoretical model to help explain women's occupational choices. Central to this model was the concept of subjective task value, which included motivational beliefs aroused by anticipated interests likely to be experienced in, the attainment and utility of, and the anticipated psychological, economic, and social cost of the career choice. For Eccles, value socialization, rather than expectancy

socialization, was a key factor in choice differences between men and women. However, Eccles (2011) has found that women's perceived career options can be increased by targeting their beliefs about several factors, including assessing the values they attach to occupations.

Raven's portrait offers a telling account of an adolescent who ascribes value to the status of occupations. For Raven, becoming a United States Air Force firefighter provides her the sense of status she seeks in a career. In my interviews with her, Raven described experiences at NERSAT that were less informative to her intended career choice. Rather, she reported that her participation in the automotive technology program was a way to gain additional knowledge of vehicle repair. Moreover, NERSAT also functioned as a means for Raven to stay engaged with education. In fact, it appears that Raven was offered enrollment at NERSAT as a way to help her avoid getting into trouble at her traditional high school and keep her motivated toward high school graduation.

Below is Raven's portrait. In my interviews with Raven, along with the appraisal survey and observational field notes, it is a portrait that shows how ascribing high social status influences career choice and supports efforts toward meeting those goals. For Raven, automotive technology was not this career. However, she reported being able to capitalize on her substantial prior knowledge of automotive repair that she had learned from her father. This was a benefit to her, as she often struggled behaviorally in her traditional high school setting. I open Raven's portrait, first, with her outcome expectations for the automotive technology program. I will then present the genesis of her career interest in automotive technology, drawing on the conversation we had during our first interview. I will then present the influence her traditional high school had on her, as well as her parents' encouragements. Lastly, I will present Raven's beliefs about why

so few female students enroll in the automotive technology program at NERSAT and what can be done to change this in the future.

A Portrait of Raven

"It was never really an interest to be a mechanic. It was just an interest to get extra knowledge so I could learn how to do more if I needed to." (Raven)

Raven's outcome expectations from participating in the automotive technology program were low due to competing career interests. Her long-term goal was to enlist in the United States military and become a firefighter. The NERSAT program offered her the opportunity to deepen the prior knowledge she had already developed by working with her father. "It's just something I'd like to know on the side because a lot of people break down on the side of the road, or whatever, and I'm just a nice person and I'd stop and help," Raven explained to me when I asked what she expected to get out of her automotive program. It is clear that Raven's altruism factors into her career expectations. Given her low outcome expectations for automotive repair, however, Raven spoke broadly about how she approached learning in her program. Essentially, Raven focused on learning opportunities and tasks on which she knew she would do well. If a task was perceived as too challenging or unnecessary, her motivation to complete it would diminish. "I don't give two craps about Electude. Sorry, I don't even try to do it," she told me when talking about a computer program that is used widely in automotive CTE programs across the country. However, Raven would regularly perform favorable tasks. "The tire machine. He could put me on the tire machine always because I know it like the back of my hand," she explained.

Raven's father helped her develop an interest in automotive repair. He is a certified car mechanic who works for a small automobile repair business. At an early age, he would take

Raven into his home garage and show her how to perform basic maintenance tasks. Over time she built a repertoire of skills. Raven explained:

> I've worked on vehicles with my dad. We'd go in the garage. I'd do the oil
>
> changes, change the tires. You name it, I did it. So, working with my dad gave
>
> me, basically sparked my idea of going into automotive for this year, just so I can
>
> get a little bit more information about, and learn a little bit more about what I can
>
> do at home with my vehicles. Like diagnostics and wiring and electronic stuff.
>
> (Raven, personal interview, March 28, 2018)

Raven credited her father with sparking the interest that led her to attending NERSAT's automotive technology program. He had taught her a range of different tasks that she could perform independently. With this prior knowledge, Raven considered going into the program with the expectation of increasing her knowledge of vehicle repair. She focused her expectations on personal considerations—wanting to work on her own vehicle with this new knowledge.

Unfortunately, other than the positive influence provided by her father, Raven received negative reinforcers which influenced her choice to attend NERSAT. The source of these negative reinforcements came from her traditional school. Raven struggled academically. While she was sociable with me, she recounted how she never really felt like she fit into the social environment at her high school. "My school had no influence on me coming here. They just kind of said, 'It would be a good idea if you came here. You'd get out of school a half day. And that would be really helpful,'" Raven stated.

School administrators also felt that Raven would be more motivated in a vocationally focused environment. She explained that she was able to take a credit recovery course through NERSAT in English because she missed earning the credit at her traditional high school. This

course was offered weekly through NERSAT's Learning Center. Raven felt fortunate to continue her Career and Technical Education while earning her requirements for high school graduation. Her guidance counselor organized this arrangement. Raven expounded, "She was like, 'If you are willing to try to give it a try and do good at NERSAT, without failing any classes, and getting your work done, and get done what you need to get done, then you should do it.' And I said, 'No problem.' So, that's what I did." These influences helped create moments where Raven could manage her expectations, which included meeting her high school graduation requirements.

Another factor in Raven's choice to attend NERSAT was the interactions she had with her friends. "I really didn't know about NERSAT until my freshman year. My best friend, she did auto body her junior and senior year, and I was a freshman and sophomore. She would tell me about it. Snapchat. I mean, we kept up with each other, so I was like, 'I can't wait to go. Like, I want to go now," she explained. When I asked what her initial thoughts were about NERSAT when getting the friend's Snapchats, Raven told me that it seemed like students could do what they wanted to do, and they were more independent. "And then, I did the tour. That was it. I was set," Raven said. While Raven still acknowledged the feeling of independence of attending NERSAT, it appears that she developed a deeper sense of independence in attending the automotive technology program. Raven explained, "I don't want to bring this into my friends, my life, but I don't get to see a lot of my friends as I did. I'm kind of to myself. I'm, like, depending on myself. I'm just kind of sticking to myself and doing my own little thing." Raven's choice to attend NERSAT without the influence or interactions with her friends appears to further develop her self-perceptions of independence and maturity.

When I asked Raven why so few females enroll in her automotive technology program, she explained that many female students do not recognize they can perform the work. She

explained that girls receive social messages that limit what they perceive they can accomplish compared to a boy. These powerful negative messages serve to constrict how these female students see themselves performing on perceived male tasks. Raven elaborated:

> I don't think a lot of girls realize they can do a lot of stuff that men can, or I can do, in the program. And, I think the reason is, they are girls and a lot of people out in the world say girls can't do as much as a guy, which isn't true. I honestly think that's why a lot of girls aren't in the program because they probably think that they can't learn all the terminology and all the equipment and all the stuff that we do. I don't think they think they can do it. (Raven, personal interview, March 28, 2018)

Raven inferred that a lack of recognition in the ability to perform automotive repair kept female students from enrolling in the automotive technology program. The social messages females receive also serves to narrow and reduce this recognition when they compare themselves to their male counterparts. Raven identified the specialized knowledge learned in the program as a potential source of intimidation. For certain, automotive terminology, equipment, and repair processes are challenging. It appeared that Raven recognized these factors as contributing to the low number of female students participating in the program.

When I asked Raven what could, or should be done to alter the low number of female participants, Raven focused her response on the current students of NERSAT. She suggested that they visit the other programs. "You could take the girls up there in the CNA class and throw them down here and say, 'This is your program for the day. Do something. Ask questions. Get your hands dirty,'" Raven explained. These program swaps are exploratory in nature. Raven did not, however, take into account the interests and outcome expectations of the individuals

included in the swaps. Yet, Raven believed strongly in the idea of explorations. She explained, "I think if that could happen more in today's world, the trying things out, I think that we would be a lot better off. And, I actually think we'd have more girl mechanics."

Summary of the Chapter

In this chapter, I presented single portraits of each of the informants reflecting on the influences that helped them develop the desire to enter and persevere in NERSAT's automotive technology program. While each participant's portrait is unique, collectively, these portraits revealed similar aspects about the informants' experiences with family and friends, cultural influences, attitudes toward traditional and Career and Technical Education, and expectations for the program and their occupational aspirations. These aspects are a compelling story in themselves; however, because my interest was in how these informants addressed their CTE instructor's effectiveness, I will now conduct within-case analysis in an effort to document how and under what conditions these informants felt their instructor, Mr. Giles, demonstrated effective instruction. In Chapter 5, I present findings on the three factors of effective instruction: an instructor's knowledge of content, their pedagogical skills, and their dispositions.

CHAPTER 5

THEMES

This qualitative study explored the phenomenon of nontraditional Career and Technical Education (CTE) course participation experience by female students and the role of instructor effectiveness. In Chapter 4, I presented single portraits of each of the informants reflecting on the development of their career interests as well as the phenomenon of nontraditional CTE participation in their automotive program. This allowed informants to share their stories in their own words. Looking across the experiences of these three students, as reported in Chapter 4, it became evident that their understandings and their perceptions of their instructor were key to understanding their success. This chapter is an examination of the characteristics and strategies employed by Mr. Giles that the young women responded to.

The following primary question and secondary questions provided a framework on which the following findings are grounded:

Primary Question

1.) How do female Career and Technical Education (CTE) students enrolled in a predominantly male-attended program describe instructor effectiveness?

Secondary Questions

1.) Considering the effectiveness of their automotive technology instructor, how if at all, do informants describe the instructor's knowledge of content? (What they know)

2.) Considering the effectiveness of their automotive technology instructor, how if at all do informants describe the instructor's pedagogical skills? (What they can do)

3.) Considering the effectiveness of their automotive technology instructor, how if at all do informants describe the instructor's dispositions? (Their attitudes and beliefs)

During my analysis, I drew from social cognitive theory, the concept of self-efficacy, and research on the sociocognitive perspective of the teaching-learning process. In organizing the themes presented here in Chapter 5, I constructed key propositions from the research and aligned these propositions to informants' descriptions of the effectiveness of their CTE instructor.

My first research question focused on the nature of the instructor's knowledge of content. The findings for this question are structured within Proposition A. My second question examined the skills possessed by the CTE instructor. The findings for this question are structured within both Propositions A and B. My third question considered the beliefs and attitudes of the CTE instructor. The findings for this question are framed within Proposition C. All propositions are outlined in Table 5.1

Table 5. 1

Collective Propositions

Propositions	Theories	Concepts
A	Content Knowledge (Ball, Thames & Phelps, 2008; Weiss & Miller, 2006)	Effective instructors possess common content knowledge that can be understood by novice students (Ball, Thames & Phelps, 2008) Effective instructors possess specialized content knowledge that structures the subject they teach (Ball, Thames & Phelps, 2008) Effective instructors possess knowledge of the methods of inquiry appropriate for the subject (Weiss & Miller, 2006)
B	General Pedagogical Knowledge (Köning, et. al., 2011; Shulman, 1987)	Effective instructors possess knowledge of content and their students' concepts and misconceptions of this content as assessment (Shulman, 1987) Effective instructors possess knowledge of instruction and students' aptitude and abilities for motivation (Shulman, 1987)

Table 5.1 Continued

		Effective instructors possess knowledge of strategies of differentiation and use different teaching methods (Köning, et. al., 2011)
		Effective instructors possess knowledge of strategies to prevent and counteract student interferences (Köning, et. al., 2011)
C	Pedagogical-Psychological Knowledge (Thomas, 2013; Voss, Kunter & Baumert, 2011).	Effective instructors foster individual learning processes by having knowledge of various cognitive processes (Voss, Kunter & Baumert, 2011)
		Effective instructors understand the sources of their students' cognitive, motivational, and emotional heterogeneity (Voss, Kunter & Baumert, 2011)
		Effective instructors exhibit beliefs and attitudes that influence students' learning (Thomas, 2013)

Research Question #1: Knowledge of Content

My first research question asked, considering the effectiveness of their automotive technology instructor, how, if at all, do informants address their instructor's knowledge of content? (What he knows). My analysis relied on Proposition A. This proposition drew on research from teacher's content knowledge and focuses on degrees of knowledge complexity, central concepts of the subject, and the method of inquiry about the subject. This section examines key themes associated with the effects informants experienced as a result of their instructor's content knowledge.

The discussion documents informants' perceptions about Mr. Giles's content knowledge. Factors for content knowledge included common and specialized knowledge, central concepts and methods of inquiry. Informants also prioritized processes of inquiry that were critical to their skills development. In the following discussion, I address two themes that emerged from my

investigation of informants' experiences. These themes focused on formal education,

professional experiences, and solutions to problems.

Table 5. 2

Propositions: Research Question #1

Proposition	Theories	Concepts
A	Content Knowledge (Ball, Thames & Phelps, 2008; Weiss & Miller, 2006)	Effective instructors possess common content knowledge that can be understood by novice students (Ball, Thames & Phelps, 2008)
		Effective instructors possess specialized content knowledge that structures the subject they teach (Ball, Thames & Phelps, 2008)
		Effective instructors possess knowledge of the methods of inquiry appropriate for the subject (Weiss & Miller, 2006)

Two important findings emerged from the analysis of Mr. Giles's content knowledge.

The first was the role his formal education and professional experiences played in how

informants came to understand important ideas. The second was the role of the instructor's

professional networks in expanding informants' concept of his content knowledge. The ways in

which Mr. Giles demonstrated his content knowledge will be further described in this section.

Finding #1: Formal Education and Professional Experience Influenced How Informants

Perceived Their Instructor's Content Knowledge

A key finding in this study was that informants referenced how they came to understand

Mr. Giles's content knowledge. In this cluster, all informants addressed his course work in an

automotive technology program as an invaluable experience. According to the informants, Mr.

Giles's formal education helped him build a solid base of content knowledge that he drew from

when teaching. The informants also addressed the role that professional work experiences played

in expanding the breadth of Mr. Giles's knowledge. They recognized the historical aspects of vehicular evolution as a key feature of Mr. Giles's content knowledge. Informants felt Mr. Giles's expansive knowledge of content was a benefit to their educational experience.

In discussing his knowledge of content, informants most often referenced the professional automotive knowledge Mr. Giles gained while he was enrolled in a formal automotive technology program rather than his professional work experiences. When I asked Maya what made Mr. Giles valuable to her as she learned the trade, she responded, "Probably his knowledge. That he, himself, has been through college with a dealership. And, he's worked on cars for a long time." Maya indicated that Mr. Giles's knowledge of content was the most valuable factor in her education. She recognized the role his formal education played in developing this knowledge.

Raven referenced the teacher preparation courses Mr. Giles took to earn his teaching certificate. For Raven, whose father was a car mechanic, the possession of a teacher's certificate made Mr. Giles a more trustworthy source of content knowledge. She noted, "He's worked on cars most of his life when he was growing up, so when he got to the education part he just kind of branched off that and went into the dealerships." Maya and Raven recognized that, while Mr. Giles had a strong interest in automobiles early in his life, it was not until his formal education that he was able to gain the type of knowledge required to perform mechanical work at a dealership. When I asked Colby what I would hear Mr. Giles say when he talks about his knowledge of the subject, she replied:

> He's talked about where he went to college. He got this dealership gig at Dee's
>
> Auto Sales where he took classes. Then he worked at a dealership. I think it was
>
> Hanna's, but I'm not sure. So, knowing what he's talking about, like, not just

somebody off the street who's like, 'Yeah. I know this.' But they don't. So, he's

somebody who's actually gone to school for it.

Colby reported that she understood the role formal education had on developing Mr. Giles's

content knowledge. It appeared that Mr. Giles stressed the importance of his college experiences.

Colby prioritized this information in her response. By understanding the role formal education

had on developing Mr. Giles's content knowledge, Colby was able to juxtapose his example

against automobile enthusiasts. She characterized these home mechanics as lacking the necessary

knowledge to be Career and Technology Education instructors.

Raven was the only participant to identify the formal education that led to Mr. Giles's

teaching certificate. This reference came after explaining that she had spent some of her youth

learning automobile repair and restoration from her father. Raven had confidence in the skills her

father taught to her; however, she recognized the advantages of interacting with an instructor

who had a strong foundation of content knowledge. She elaborated when I asked her to compare

the two experiences.

Well, I do both [repair and detailing]. I mean, I can do the work outside, I do the

working on cars outside of school. And then, coming in here to Mr. Giles's class,

I kind of do the same thing except he gets more advanced in the projects and stuff

we do.

In her response, Raven referenced performing similar automotive work outside of NERSAT but

in a more advanced way. I asked why she thought Mr. Giles provided more advanced learning

opportunities than she received at home. Raven explained:

He has more, like, tools. Like, we don't have everything he has. But, he has an

actual education with a paper saying that he can teach this stuff, so he does know

a little bit more than my Dad does. So, I mean, getting the education from him is

more reliable, to say, than, I mean, getting my Dad, he can teach a lot, but he's

not anywhere near as smart as Mr. Giles.

Raven reported that Mr. Giles's content knowledge was better accessed, and thus more reliable,

because he had a certificate in teaching his subject. Raven was very involved in learning this

trade, but she was able to recognize the quality and depth of Mr. Giles's content knowledge

when compared to other experiences. Raven indicated that Mr. Giles could better provide

insights into his content knowledge because of his teacher training. It appeared that Mr. Giles's

content knowledge could be accessed by students who wished to develop or expand their own

interest related understandings.

In addition to identifying Mr. Giles's formal education as a means to understand his

knowledge of content, informants were unanimous in their responses that his prior professional

work experiences added to the breath of this knowledge. For Raven and Maya, the pair listened

as Mr. Giles spoke about his experiences in professional work life. They were able to understand

Mr. Giles's long professional career in the automotive industry. Maya explained, "Mr. Giles will

be like, 'Yeah, I remember when somebody came in the shop and this was the experience that I

had.' He does that a lot. He's been in the trade for so long. Yeah. I just know that he knows his

stuff."

After I asked her what made Mr. Giles valuable to her as a student, Raven explained:

Don't take offense to this Mr. Giles, but he is older and he has experienced more.

From race cars, to like [cars from the] early nineties and two-thousands, to

modern cars, to cars when he was growing up through his years. So, it makes him

valuable that he has seen a lot of stuff that I haven't seen. So, it's nice to know

that if I ever had an old car come in or something, he's valuable enough to me that

I could go ask him a question about it because he knows a lot of the older cars.

And, I'm taking that and holding on to that.

In her statement, Raven recognized that through his many varied experiences, Mr. Giles had developed a broad base of content knowledge. She appeared to admire the lengthy service Mr. Giles experienced and his ability to recount the historical aspects of an ever-evolving automobile industry. In fact, Raven expressed a sense of satisfaction that she could call upon Mr. Giles if she ever needed answers to questions about older vehicles.

Maya shared another account, and while substantively different than Raven's statement, included a historical feature. She frequently reported listening to Mr. Giles's conversations with other students as a source of information supporting her understanding of his content knowledge.

There's one kid in my class that knows a lot about cars, especially old cars. He always talks to Mr. Giles about old cars, like what would happen with old cars. And, I just remember [Mr. Giles] talking with us about the seatbelts in [older] cars, and how you really don't see those types anymore. So, he is old enough that he's seen some old cars. He's been around when some of them were made. So, he's like, 'Oh, yeah. I remember when that was a big thing.'

Maya recalled that a classmate often initiated conversations with Mr. Giles. Many of these conversations were about older vehicles. These initial chats led to whole group discussions about the automobile industry. The fact that Maya remembered these conversations made them a formative source of information during her time in the automotive technology program.

I observed these student initiated conversations during classroom instruction. While many conversations between a single student and Mr. Giles did not result in whole group

discussions, several turned into events where students listened to Mr. Giles expound on his knowledge of the content. During one observation, I watched Mr. Giles bring his entire class into a conversation about the history of Maine state law regarding license plate inspections. The class was reviewing the Maine State Inspection Manual in preparation for the state inspection test. Mr. Giles had just read aloud this section from the current manual. Unprompted, a student suggested that other states do not require front license plates. Mr. Giles, appearing to not want to be drawn into a conversation, replied, "Well, this is about the mounts on the molded bumpers. So." The student responded that older cars do not have the same bumpers as today. Mr. Giles nodded. "Well, that's true," he said. He then turned his attention to the group. "Okay guys, listen up. On that style of bumper, on the older models if you ever have one come in, often these plates would become bent in the middle, so that police could not see the bottom half of the license plate." He continued to talk about this problem. He reinforced that the technician must inspect both plates. If a plate is bent, he recommended it should be returned to its regular shape. That's "a technician's job, too," Mr. Giles concluded. Then he transitioned students to the next section of the inspection manual.

Colby reported a different source of information when discussing Mr. Giles's work experiences. When I asked Colby about Mr. Giles's knowledge of mechanics, she described him as a humble person, saying "obviously he's not bragging" when he talks about his own skills. Colby was a keen observer as Mr. Giles plied his trade during shop instruction. "You can see it in his actions when you're there," she told me. Later in her third interview, Colby elaborated:

> Definitely, again, out in the shop, he's not struggling at all. He's right there doing
> what he loves and he knows what he's doing…I mean, he'll take a spark plug out
> just like that. He'll take a brake line out without a hesitation. Like, he knows what

he's doing because he got that knowledge from working at a dealership. So, he's a

pro.

Colby made a connection between Mr. Giles's skills and his varied professional work

experiences. She linked these skills with the knowledge he acquired. By understanding that his

knowledge supported his skill development, the vicarious information she received was twofold.

According to Colby, knowledge and skills makes a professional in this given trade.

Items on the appraisal inventory comprising the content knowledge construct and focused

on the central concepts of the subject revealed similar insights. The item asking how confident

informants were in having Mr. Giles teach them the central concepts of his course garnered

unanimous support, with each participant 100% confident in having Mr. Giles teach them the

core concepts of his program. In order for these informants to feel so confident, they first needed

to gain a sense of the level of his content knowledge. From these findings, it appears informants

ascertained that Mr. Giles possessed a high level of content knowledge specific to the central

concepts of the subject matter. They were also 100% confident that they could learn these

concepts from him.

It is important to note the second interview protocol did not include specific questions

about formal education or professional work experiences. It did include questions which were

designed to elicit informants' concrete experiences, such as what they heard Mr. Giles speak

about when discussing automotive technology or examples of how they knew he possessed

knowledge of the content. Without prompting, informants offered insights about Mr. Giles's

formal education and professional experiences. They offered these reports through classroom

discussions. During three of the six classroom observations, I recorded Mr. Giles as he talked

about the importance of a formal education in automotive technology. One of these observations

included a presentation by a representative from the National Technical Institute, a technical

college in Ohio. These moments allowed Mr. Giles to share his experiences with formal

education with the students, and appeared to help them develop an understanding of their

instructor's content knowledge.

Finding #2: Being "In the Background" of the Profession Expanded How Informants

Described the Scope and Nature of Their Instructor's Specialized Content Knowledge

A second key finding to this study was that informants described how Mr. Giles modeled

the use of professional networks and specialized content knowledge that expanded their

understandings of the scope and nature of his teacher knowledge base. Often these networks, and

his deployment of specialized content knowledge, were called upon to assist him in solving

technical problems beyond what was expected of the program. In this cluster, all informants

addressed two primary ways in which Mr. Giles offered solutions to these challenges. First,

informants described how Mr. Giles's active professional networks with local automotive

businesses assisted in solving technical challenges. These moments were especially relevant

when resources were unavailable from within the program. Informants also referenced Mr.

Giles's specialized content knowledge as a way to offer solutions to problems that expanded

outside the scope of an assigned project. Often, Mr. Giles utilized the program's resources in

these corrective actions. Informants felt the solutions derived from Mr. Giles's specialized

content knowledge, or his reaching out to his extensive professional contacts, were a benefit to

their education.

Being "in the background" of the profession. Informants in this study recognized that

Mr. Giles sometimes had to call upon his extensive professional network to solve problems.

These interactions appear to be a means in which informants were able to describe the scope of

Mr. Giles's content knowledge. As Raven stated, "He learns every day from other people about different stuff. Like, he is, in my eyes, a genius. He may not call himself one, but he is." Raven indicated that Mr. Giles continued to incorporate new knowledge, thus broadening the scope of his understanding of automotive content knowledge. During observations, it was revealed that the "other people" Raven referenced were automotive professionals. I observed Mr. Giles frequently reaching out to local dealerships, auto-part stores, and other professional mechanics as part of his instruction. Maya referred to this professional networking as "in the background" of the automotive industry. Maya recognized that, while Mr. Giles's current professional role is a CTE instructor, he still maintained contacts with outside professional automotive entities that enrich his knowledge base.

A salient example of the type of networking Mr. Giles had developed came when I observed Maya and a classmate attempt to remove a harmonic balancer. The harmonic balancer puller tool kit did not have the correct shoulder bolt. Though repeated attempts were made to extract the balancer using the shoulder bolt, Mr. Giles showed the pair how the bolt's thread angle was off. He reasoned that the toolkit, while for the correct make of the vehicle, was most likely the wrong kit for the model of vehicle. He told the pair that he needed to make a call. He retreated to his office, toolkit in hand. I stayed with Maya and her classmate as he spoke on the phone. I ask them about this tool issue. They both said that the local car dealerships seem to care about NERSAT because they were always loaning their tools to Mr. Giles. Maya's counterpart added that most of the time, if Mr. Giles needs to borrow a tool from a local dealership, it arrived that day. When Mr. Giles returned to the workspace, he let them know that the toolkit was, indeed, the wrong one for the type of vehicle. He informed them that the dealership would loan them the correct one. As Mr. Giles made his way to another project, Maya quipped, "See. If he

doesn't have one, he knows where to get it." Maya, again, acknowledged that being in the background of the automotive industry allowed Mr. Giles to ask for assistance from his extensive network.Maya's description added to how she viewed Mr. Giles's responsibilities as a CTE instructor.

In addition to having been described as understanding specialiezed tools, Mr. Giles supported and corrected the ordering of parts to fix vehicles. As Colby stated, "He gets called to the office all the time because he has to sign for [the parts] when they come in." During my eight shop observations, I observed several students looking up parts in part catalogues. Often, these parts were typical to the items mechanics replace on a regular basis such as spark plugs or air filters. Students would write part numbers on an order slip, which was left for Mr. Giles to order. I made one observation when Mr. Giles checked-in with students who were ordering parts. As he looked over the order slip, he asked them several questions regarding engine type and vehicle make. The students had the part catalogue open to a page to show Mr. Giles. These questions appeared to be a way for him to ensure the correct part number was recorded on the order slip as he nodded his head and said, "Okay. Good." However, data indicated that some parts were ordered incorrectly.

During one observation, Mr. Giles supported Raven and her partner after they had ordered an incorrect exhaust pipe. At the beginning of shop time, he asked Raven about the "exhaust pipe" job that she was working on. She responded that the wrong pipe had come in and the job was not finished. Mr. Giles replied, "Oh, that's right. I'll call over to NAPA and get the right one." When all students were assigned tasks for that period, Mr. Giles had Raven retrieve the incorrect exhaust pipe. She brought it into his office. He made a call over to the parts store. Raven listened as Mr. Giles corrected the order. "Should be all set," he told her after he got off

the phone and assigned her another task for the day. In contacting his professional networks to correct ordering errors, informants described Mr. Giles's seeking to provide accurate information. As Raven stated, "Mr. Giles goes on and on sometimes. Like, 'let me call this guy, that guy' just to figure one tiny little thing out. Just to, like, get it right." Raven's description added to what she understood as the nature of Mr. Giles's knowledge.

Offering solutions. All informants discussed how Giles could either offer solutions to complex technical problems, or identify specialized parts or tools to help them diagnose the error to complete the job. As Raven stated, "Mr. Giles always has a solution. That's all I've got to say. He always has a solution to any problem." Informants felt they increased their understanding of why a broad scope of specialized knowledge of content was required of the profession through understanding how mechanical problems develop and add complications to vehicle repair.

All of the informants described a process of how they relied on Mr. Giles's specialized content knowledge to offer solutions to problems. Regardless of the variances in each process, all informants were unanimous in their report that the first step was to develop a sense of task complexity. They described assignments of different tasks throughout the year. Each task demanded various levels of complexity. Informants attempted to fix less complex errors independently. Example of less complex tasks included the following: lubricating mechanical parts, removing spark plugs, replacing air filters, and changing tires. For all informants, performing these tasks provided a basis for forming understandings about Mr. Giles's depth of knowledge when work became more challenging.

A second feature of this process consisted of observing Mr. Giles as he assisted other students on the many different projects being performed in the shop. Colby discussed her vicarious observations of how Mr. Giles guided and monitored all students while he directly

assisted specific students. When I asked her how she knew Mr. Giles had the knowledge of the content necessary to teach, she replied:

> Definitely, one thing would be, he would do everything. He'd just bounce around from kid, to kid, to kid doing everything. Doing different projects on different cars because every car has a different project, or a different issue with it. So, if something went wrong, he'd be there.

Colby indicated that Mr. Giles was responsible for monitoring many different projects during a class period. By understanding there is little uniformity in these tasks, Colby initially appeared to understand that Mr. Giles assisted with all tasks. Colby recognized that certain tasks required additional knowledgeable assistance from Mr. Giles when problems occurred.

The data indicated another source of information in which informants broadened their understanding of the scope of Mr. Giles's specialized content knowledge when he offered solutions to correct mechanical troubles. Informants frequently reported that specialized tools and tool kits were an integral part of the solutions offered by Mr. Giles. Knowledge of specialized equipment helped informants understand Mr. Giles's knowledge. Maya explained that these tools and instructions were often provided when a new task evolved into something different than the initial task.

> He knows what tools you need for the job. So, if he assigns us something, and it's something new we're learning, he's like, 'You're going to need these tools.' So, you'd have to know what to use in order to do it. And, if that doesn't work because sometimes it'll be something else that's not working, he's like, 'Go get this other tool.' Or he'll go to the tool room and get a tool to fix it, like, what's not working. So, he shows you how to use them, too.

In her statement, Maya recognized that Mr. Giles knew what tools were required for the new jobs he assigned to students. It appeared that students were familiar with the tools since they had to gather them. However, as problems occurred while performing maintenance, informants reported that it was Mr. Giles who suggested specialized tools to correct the problem.

During observations, however, these specific tools appeared to be a separate domain of learning. They were not part of specific instruction prior to being used by Mr. Giles as a way to solve a problem. This specialized equipment, then, was only available to Mr. Giles. Over the course of my observations, I watched Mr. Giles as he made twenty-nine trips into the locked area of the tool room to retrieve a variety of tools and tool kits.

As seen below, Figure 5.1 is a photograph of this tool room. This room stands in stark contrast to the tool room accessible by all students (see Figure 5.2). Figure 5.2 is the unlocked tool room where students collected the tools they needed for their projects. Mr. Giles was the only person with a key to the locked tool room, so he was often required to bring these tools to a group of students working on a particular task. Other times, students accompanied him into the tool room. Colby and Raven did so on three occasions. I never observed Maya make a trip to the tool room with Mr. Giles. Their male counterparts, on the other hand, accompanied Mr. Giles into the tools room a total of ten times. This shows that Mr. Giles independently retrieved these specialized tools and tool kits sixteen times.

Figure 5. 1 Locked Tool Room, NERSAT's Automotive Technology Program, Sign reads: "Access with Instructor Permission Only," April 10, 2018
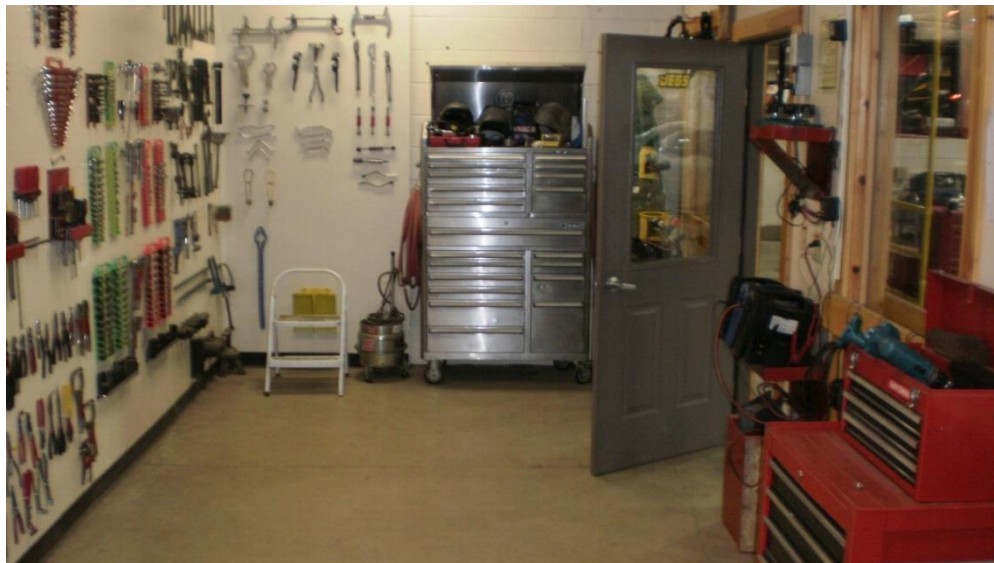
Figure 5. 2 Unlocked Tool Room, NERSAT's Automotive Technology Program, April 10, 2018

Observations also revealed this equipment was most often diagnostic in purpose. For example, while working to rewire spark plug caps, Colby experienced a rough engine idle when performing the operational check. After inspecting her work, which was correct, Mr. Giles explained that an air leak could cause such an issue. The issue was unrelated to the spark plug wires. Together they went into the locked tool room where Mr. Giles located a pressure leak tester kit. Then he performed the leak check while Colby operated the car. Mr. Giles, monitoring a pressure gauge, tweaked some engine components until the engine ran more smoothly. After these corrections, he showed Colby how he had used the leak tester and demonstrated the corrective actions he took to fix the problem.

Items on the appraisal inventory comprising the content knowledge construct and focusing on the instructor's knowledge of the methods of inquiry of the subject revealed slightly less similar results. Informants were unanimous in reporting that they were 100% confident in getting Mr. Giles to display his knowledge of the trade. When informants asked Mr. Giles to demonstrate a task, he would model how to complete the work. However, the two items related to the "use of knowledge", rather than the demonstration of knowledge, revealed differences in the results. Both Maya and Colby were 100% confident in getting Mr. Giles to use his knowledge to help them learn automotive technology. Raven, on the other hand, responded that she was only 70% confident in getting Mr. Giles to use his knowledge to help her learn automotive technology. Similarly, when informants were asked how confident they were, themselves, in being able to use Mr. Giles's knowledge to help them learn, both Maya and Colby were 100% confident that they could use Mr. Giles's knowledge to learn. Raven, however, was only 80% confident that she could use his knowledge to help her learn this trade. Interestingly, Raven addressed the reliability of Mr. Giles's knowledge. These mixed results might be due to

the method of using his knowledge. For example, Raven commented that she did not do well when Mr. Giles lectured during class. This condition could be the reason Raven felt less confident in getting Mr. Giles to use his knowledge to help her learn and using his knowledge to learn this subject herself. Note, too, that all informants favored Mr. Giles's attempts to display his knowledge. This may relate to the live work skills practiced during their shop instruction.

In the next section, I will examine Mr. Giles's pedagogical skills as addressed by the informants. According to Köning, et. al. (2011), effective instructors possess knowledge of strategies of differentiation and use different teaching methods. Teachers use this knowledge to activate their students' motivation processes.

Research Question #2: Pedagogical Skills

My second research question asked, considering the effectiveness of their automotive technology instructor, how, if at all, do informants address their instructor's skills? (What he can do.) My analysis for the findings for this question relies on Propositions A and B (Table 5.3). Proposition A draws on research from teacher's content knowledge and focuses on degrees of knowledge complexity, central concepts of the subject, and the method of inquiry about the subject. Proposition B draws on research of the general pedagogical knowledge teachers develop while instructing students and integrates subject knowledge with student abilities and aptitudes.

This section examines key themes associated with the affects informants experienced as a result of their instructor's classroom practices. The following discussion addresses informants' considerations of Mr. Giles's ability to instruct them in the automotive technology program. Factors for skills included instructional strategies, assessment techniques, student management techniques, and motivational strategies, and informants prioritized processes of instruction, student management, and assessment as critical to their learning. In the following discussion, I

address three themes that emerged from my investigation of informants' experiences. These themes included the following: presenting multimodal content and differentiating instruction, grouping students to promote professional relationships, and establishing a "mutual agreement" assessment approach.

Table 5. 3

Propositions: Research Question #2

Propositions	Theory	Concepts
A	Content Knowledge (Ball, Thames & Phelps, 2008; Weiss & Miller, 2006)	Effective instructors possess common content knowledge that can be understood by novice students (Ball, Thames & Phelps, 2008) Effective instructors possess specialized content knowledge that structures the subject they teach (Ball, Thames & Phelps, 2008) Effective instructors possess knowledge of the methods of inquiry appropriate for the subject (Weiss & Miller, 2006)
B	General Pedagogical Knowledge (Köning, et. al., 2011; Shulman, 1987)	Effective instructors possess knowledge of content and their students' concepts and misconceptions of this content as assessment (Shulman, 1987) Effective instructors possess knowledge of instruction and students' aptitude and abilities for motivation (Shulman, 1987) Effective instructors possess knowledge of strategies of differentiation and use different teaching methods (Köning, et. al., 2011) Effective instructors possess knowledge of strategies to prevent and counteract student interferences (Köning, et. al., 2011)

A key finding from this study was how Mr. Giles used his understanding of his students to create instructional conditions that resulted in positive consequences. Informants addressed three instructional conditions. First, informants addressed Mr. Giles's ability to present content

in a multimodal format and differentiate his instructional approaches to meet student needs.

Second, Mr. Giles was described as using various grouping strategies as a way to promote

professionalism, increase motivation, and assist all students in developing a collaborative

approach. Finally, informants addressed the "mutual agreement" assessment approach that

allows students to reflect on their own learning, as well as their interactions with Mr. Giles and

the other students. The ways in which Mr. Giles demonstrated instructional effectiveness will be

further described in this section.

Finding #3: Responsive Teaching and Differentiated Instructional Techniques Promoted

Informants' Mastery of Knowledge and Skills

A third key finding in this study was that informants described Mr. Giles as offering

multimodal instruction that allowed him to respond to, and differentiate, instructional

approaches. In this cluster, all informants addressed his ability to offer a wide-range of

instructional approaches and opportunities in the classroom and in the shop during live work

activities. These varied instructional approaches produced different positive consequences for

informants. They reported that these instructional approaches allowed Mr. Giles to better

understand how to support their learning when they needed additional instruction. For Colby,

this was invaluable, as she was often observed asking follow-up questions during instruction, or

requesting assistance when struggling with a task. The role of teaching approaches also acted as

a link between classroom and shop settings. Observations revealed that Mr. Giles utilized

components of traditional instruction with more student-centered and computer-based learning

approaches. With this combination, informants demonstrated deeper knowledge and executed the

skills they developed with precision.

Responsive teaching with differentiated instruction. Data from the appraisal inventory focused on pedagogical knowledge showed a fair amount of variability on a number of items; however, three of the seven items shared similar patterns of variability. These three items focused on instructional practices. Data revealed different levels of confidence in benefiting from the instructional practices of Mr. Giles. In fact, Raven's results on the three items were lower in confidence than Colby's and Maya's results. Overall, Raven felt less confident in getting Mr. Giles to use effective teaching strategies even though she reported that a number of various teaching methods maximized instruction time.

On the two items addressing "effective teaching strategies" and "effective teaching skills", Colby and Maya were within 1 point of each other, with Maya feeling 100% confident in having Mr. Giles use both effective teaching strategies and skills, and Colby feeling 90% confident in the same. Both informants displayed the same level of confidence in utilizing these effective practices to benefit their learning in the automotive program (Colby 90% confident, Maya 100% confident).

Raven, on the other hand, did not share the belief in her capability in being assisted by Mr. Giles's attempt at providing her with effective teaching methods. Raven was only 80% confident that her learning benefited from Mr. Giles's effective teaching skills. She did, however, report more confidence, a confidence of 90%, of being able to utilize his effective teaching strategies.

The main difference between skills and strategies is their qualities. Teaching skills encompass a larger range of teaching approaches, whereas teaching strategies are narrowly focused on the instructor-learner exchange within an academic task. This factor might help to explain why Raven felt less confident in getting Mr. Giles to demonstrate effective teaching

skills while at the same time reporting a higher level of confidence in her ability to benefit from his teaching strategies.

The third item from the appraisal inventory showing a similar pattern among informants was focused on Mr. Giles's ability to respond to learning differences. Colby was 100% confident in both eliciting a responsive posture from Mr. Giles, as well as being 100% confident in benefiting from his instructional responses. Maya was slightly less confident than Colby in eliciting from Mr. Giles a responsive posture, with a 90% confidence belief. Raven was the least confident in believing she could activate an responsive teaching approach from Mr. Giles, reporting an 80% confidence belief. She also felt 80% confident this responsiveness would assist her learning. While Maya was 90% confident in having Mr. Giles offer responsive teaching, she was 100% confident that this responsiveness would be beneficial to her learning.

For Colby, then, a significant feature of the varied teaching approaches used by Mr. Giles was the feeling that he was able to respond to her learning challenges. In two observations, Colby asked for additional assistance from Mr. Giles. Each time, he was described by Colby as being able to respond to her requests for additional support. In the first event, Colby was installing a tie rod end. She was unable to orient the part and asked for assistance. Rather than assist her in performing the task, Mr. Giles had Colby review a paper copy of the part's schematic on the workstation next to the vehicle. He explained the orientation of the part using the schematic. Then she completed the work independently.

In the other instance, Colby was observed struggling to understand the mechanical operation of the pressure plate assembly for a clutch. She was working on the iCar computer program on a laptop. Mr. Giles responded by asking her to go onto the internet. He had her locate additional information on the pressure plate assembly. Colby nodded her head, saying, "I

see. I see." For Colby, responding her learning by using different teaching approaches was invaluable to her learning. Colby elaborated:

> One thing would be, whenever I had a question, or when I didn't understand certain material, he'd actually sit down with me and go over it with me, again. He'd come at it from a different angle to have me understand it better, which I liked. So, he'd go over the show-and-tell item, again, Or, he'd print off pictures of different parts, or show me new videos so I could understand the material better.

Colby credited Mr. Giles with recognizing her challenges within the content he teaches and being able to respond to her by describing this content in different ways. He was also able to use different instructional approaches to answer Colby's questions. By knowing different approaches to instruction, and thus utilizing these with her, Colby reported that she was better able to understand the material.

Raven reported that Mr. Giles's responsive teaching was beneficial to her technical education when practicing automobile diagnostics. The class had to diagnose vehicle issues on a Saturn Sky vehicle. During the initial task, however, Raven described being completely overwhelmed. After she advocated for a different approach, Mr. Giles differentiated the activity to help her gain success.

> We had to go out on a Saturn, Sky and we had to figure out what was wrong with it. He put a bug in it and it was wired. At first, it wasn't for me. I didn't do it. My friends were doing it and I was like, 'I don't know.' Like, I need him to show me. Later on, he set it up for just me. He put a bug in and had me do it and he worked me though it and I got it. Like, thank God he could do that, like set it up, again, or I would have been, 'Nope. Not happening. No way.'

Raven reported struggling with this initial task. Later she was required to perform a similar task. She explained that Mr. Giles created an entirely new issue for her to resolve. Differentiating this task allowed Raven to experience how to diagnose the vehicle's problems. If Mr. Giles did not differentiate this task, Raven would not have completed it.

   Customization. When I asked informants to address what it was they found most beneficial as they learned automotive technology, they unanimously reported the use of computer-based learning systems. In the automotive technology program, informants utilized iCar and Electude, two computer-based learning programs. I learned that iCar was an industry presented program used in many Career and Technical Education programs nationwide. The curriculum is pre-defined and programmed in the system for student use. The other computer system is Electude. Electude is used by the local community college in their automotive technology program. Due to the fact that instructors are required to build their own curriculum from the program's material, the program is viewed as customizable. Observational and photographic data revealed that, while whole class content was delivered (e.g., the transmission system), students were assigned different modules during instruction. For example, in a classroom observation of Maya and Colby, both were working on different aspects of the transmission system. Maya was assessed on manual transmission power flow while Colby reviewed transmission gear types and bearings.

   Another practice informants described Mr. Giles engaging in was customizing the teaching tools he used in his classroom and in the shop area. Mr. Giles had created teaching tools that focused directly on automotive learning. Raven noted a customized teaching tool that Mr. Giles used when teaching the automobile braking system. The instructional tool was a stripped-down automotive frame revealing only the components of the brake system (see Figure 5.3). Mr.

Giles had personally painted each part a different color. With this teaching tool, Raven explained

that Mr. Giles could expand on his classroom teaching out in the shop area.

> He has these parts boards for brakes, and suspension, and steering and stuff, like,
>
> all the different parts from each are on them. But then he has the S-10 frame that's
>
> got break parts on it that he's been painting so he can use that as a tool for
>
> teaching. We did go out and look at it. And, he was like, 'What's that part?' And,
>
> he went to whatever color part and we had to say what is was. So, kind of a show-
>
> and-tell but out in the shop. So, he kind of takes the classroom out in the shop and
>
> just expands on it.

With a focus on the customized paint scheme of the brake components, Raven recognized the

personalized nature of the S-10 frame Mr. Giles had created rather than the isolated parts boards

as part of her learning environment. She intimated that Mr. Giles used this instructional tool like

a show-and-tell part in the classroom. Again, creating a link between classroom and shop

instruction helped Raven recognize the myriad of parts making up the breaking system of a

vehicle. Raven's statement also indicated she felt that by having created this link between

instructional settings, Mr. Giles was able to differentiate his instruction. Here, Raven's focus on

the academics of vehicle repair appeared to benefit from such instructional practices.

Figure 5. 3 S-10 Frame with Painted Brake Component, NERSAT Automotive Technology Program, April 10, 2018

For Maya, Mr. Giles's attempts at integrating computer-based learning with customized teaching tools were especially beneficial to the academic knowledge base she expected from the program. As she explained:

> I find the classroom time really beneficial because he goes through what all the parts are. We do this show-and-tell thing. He'll go and pull parts out of the shop and be like, 'This is what we're talking about.' We do iCar, which is a program that is already made for people to learn car stuff. And he uses that, and he goes through it, and gives us a packet and we do write-ins, fill-ins about the stuff. It's not really notetaking, like you don't have to pull out a notebook and free write whatever. I mean, that might help, but he doesn't require it. So, writing it, listening to it, and seeing it. I'm like a learner like that. I can do all three things and know it.

Maya credited the many instructional practices with giving her with an understanding of the constituent parts of an automotive system. She explained that Mr. Giles's preparation for class

includes having him remove parts from cars out in the shop area to bring into the classroom. These parts were then used for demonstration. In conjunction with this hands-on approach, Maya preferred the pre-defined curriculum of iCar. However, rather than having students work through each lesson independently, Maya described Mr. Giles as guiding students collectively through the material. Instead of having students construct their own notes, Mr. Giles provided structured note taking guides. Maya reported utilizing different modes of learning was effective for her academic education.

Finding #4: Grouping Strategies Promoted the Development of Workplace Employability Skills

A fourth key finding in this study was that informants described Mr. Giles as using groupings to foster professional working relationships and develop a sense of belonging in his program. In this cluster, all informants addressed his ability to group students in order to promote professional work characteristics. Through these working groups, informants developed a sense of working relationships among classmates and a sense of accountability for their own learning.

The role teamwork played in building a classroom climate that promoted professional work ethics was also addressed. A key feature of Mr. Giles's method for groupings was his willingness to pair friends while also establishing the need for all students to work with each other at various points during the school year. Informants were unanimous in their feeling that working with all the other students in their class was a benefit to their education and their professional growth.

Sense of belonging. All informants discussed how Mr. Giles reinforced the importance of developing professional working relationships with their male counterparts while working in groups. Primary to this endeavor was staying focused on completing the task and demonstrating

the skills necessary for successful completion. Mr. Giles was described as selecting the groups at the beginning of each class. He assigned jobs and set expectations that promoted group efforts toward task completion. Informants addressed, and my in-school observations revealed, that Mr. Giles would monitor these groups at regular intervals. However, informants did discuss how Mr. Giles was not able to be with each group for long periods of time. This left groups of students to work independently. It was during these times that informants gained a sense of professional group work situations.

During the second interview, I asked informants to describe how Mr. Giles recognized them during instructional time. The question was developed in response to current research on self-efficacy theory, which proposed that female adolescents utilize more effectively an instructor's verbal persuasions. However, instead of addressing the interactions they had with Mr. Giles during class, Colby and Maya both discussed being placed with other students as a form of instructor recognition. Maya was unsure if Mr. Giles had a particular strategy when assigning groups of students to projects. Regardless, she felt that being assigned to particular tasks as part of a group gave her a sense of belonging in the classroom. Maya elaborated:

> At the beginning of class, he always assigns us a project. I don't think that he has
> a certain way of putting people together because I've worked with pretty much
> everyone before. So, he recognizes me by putting me with someone to work on
> something. And, I don't know if he has a plan about, 'I want this person with this
> person.' He might, but I don't know. I just know it helped me feel like I could do
> the work and that I belonged in the class.

Maya described Mr. Giles as routinely assigning students to groups. She was unable to detect the method he used in deciding which students worked together. It appeared to

Maya that the requirement was to ensure all students worked with each other at various points during the school year. By assigning Maya to group projects, Mr. Giles was described as recognizing Maya as a student in his classroom. This recognition made her feel like she belonged in the automotive technology program.

Colby experienced the greatest social benefit from being grouped with other students. When she attended her small private Christian school, interactions with other students were even more limited due to the fact that she took several classes online. However, in the automotive technology program, she described Mr. Giles as requiring that she work with other students. Often, these students were male; however, it appeared that working with others, rather than gender, was Colby's initial concern.

> Honestly, at first, I didn't get along with people that well. So, at first I hated that idea so much. I was like, 'You got to be friggin' kidding me? I don't even know this guy and I got to work on a car with him? Just be next to him?' Like, 'No. Stay away.' But, honestly, after a little bit of working with the guys out in the shop, I realized it wasn't going to be as bad as I thought it was going to be. Definitely made me realized could work with other people fixing cars and not completely hate it.

I followed up Colby's response by asking if being a female student made her feel like she did not fit into the groups. Colby's response echoed Maya's response because she felt a sense of belonging even if she was the only female in her program. "It definitely made me feel like I belonged there. Even when I was the only girl in the class. I didn't really care about that, but [Mr. Giles] put me to work with everyone," Colby said. In her response, Colby attempted to minimize the fact that she was the only female student in her class. However, by addressing the

teaching approach Mr. Giles used in grouping students, it was clear that she had concerns about this reality. Mr. Giles, however, ensured that he included her in grouping students when assigning tasks, which reduced her concern regarding her status in the classroom. This teaching approach also supported her development of a sense of belonging in the class.

      Trust and agency. When I asked Colby about the recognition she receives during instruction, her response addressed Mr. Giles's use of grouping strategies and assigning challenging tasks. For Colby, being assigned to a group brought a feeling of trust when performing a critical automotive task that might result in damaging a vehicle.

> Well, he puts us in groups and I can definitely tell he has trust in us because he actually left my group with the torch and the oxyfuel tank and the flame. He just quickly described how to do it, like, we were heating up this part that wouldn't come loose, and he's like, 'I'll check in on you in a few minutes. I know what you're doing.' So, I got to use the torch and the guys helped me get set up with the tank and my mask. So, he just seems to actually trust that we're not going to do something to break a car.

Colby reported that Mr. Giles places her into groups. These groups are then assigned challenging tasks. She described feeling a level of trust from Mr. Giles, as the assignment could have resulted in damage to a vehicle. Colby reported that he provided initial instruction and left the group to perform the assignment. In leaving student to work in their group, it appeared that Colby's male counterparts also benefited from their experiences working alongside their female counterparts. They were described as preparing her safety equipment before she used the torch. Colby was able to demonstrate competency while working in her group.

Utilizing motivational techniques is a factor to consider when addressing an instructor's skills. Results from the appraisal inventory that focused on the motivational aspects of Mr. Giles's instruction, however, had the greatest degree of variability. An explanation for this disparity may be the role group work played in each participant's view of their growing agency while in the automotive technology program. Both Maya and Colby felt 100% confident in prompting Mr. Giles to use motivational techniques during instruction. However, Maya discussed how Mr. Giles's grouping strategy resulted in a growing sense of agency for her learning. Maya explained:

> Sometimes, when I'm working with somebody, they'll walk off and I'll keep
>
> trying to do something. Like, a couple of times I've been able to break something
>
> loose, or whatever. I did that to Bill a couple of times, like he'd walk away and
>
> come back and he'd be like, 'Oh. You got it.' And, I'm like, 'Yeah. I did.'

Maya described situations where work partners leave the work setting. Observations revealed that this is part of Mr. Giles's approach to grouping students and setting expectations. Students were allowed to leave for a drink or a bathroom break without permission. Students were also observed checking-in with other projects over the course of the live work session. While these events were somewhat frequent, students returned to their own work setting after a short time. In the absence of her partner, Maya persisted on the task the groups had been assigned. In fact, Maya describes her male counterpart as surprised when he returned to find that she successfully completed the task they were working on.

Raven was only 50% confident in prompting the same motivational response from Mr. Giles. Raven experienced anxiety when she was assigned group work with unfamiliar tasks. This anxiety reduced her sense of personal agency. "It is stressful at times because there are a lot of

things I don't know and a lot of guys do know. So, sometimes I don't want to do things" Raven reported. It may be that Raven felt that Mr. Giles was not able to motivate her during these events. However, Mr. Giles also appeared to recognize this concern. According to Raven, he was boost her sense of agency by assigning her to project she felt comfortable performing. Raven explained:

> He puts me on projects that I'm comfortable with. That's what makes me feel like
> I belong in that shop because I know what I'm doing. He doesn't put me on
> something that, like, I know how to do a wiring harness on a plow, but I don't
> know how to do a wiring harness for anything else. Like a car or anything. So, he
> wouldn't do that to me. He wouldn't put me in that group. So, that's kind of how
> he does that.

Raven credited Mr. Giles for understanding her current skill levels for particular tasks. She inferred that he understood the anxiety she felt when assigned to unfamiliar group projects. As a result, Raven believed that Mr. Giles purposely assigned her to group projects she was able to perform. As Raven noted, Mr. Giles was influenced by her skill level when he assigned groups.

Additional data from the appraisal inventory found that Colby appeared to benefit the greatest from Mr. Giles's use of motivational techniques, as she felt 100% confident in using the motivation Mr. Giles provided to support her learning. Maya felt 80% confident in doing the same. As noted earlier, giving Raven's low confidence level in getting Mr. Giles to use a motivational technique, she was only 10% confident in utilizing the motivation he provided. This result marks the lowest rating on the inventory. It appeared that Raven did not believe she was capable of eliciting motivation from Mr. Giles and that she did not benefit from his attempts at

motivating her. Again, this may be explained by the approach Mr. Giles took in placing Raven into group projects.

Developing "working friendships." In contrast to demonstrating competency to groupmates, Colby addressed the competitiveness she experienced from group work. As previously noted, Colby described gaining a sense of belonging by working alongside her peers on group projects. Initially, Colby experienced great anxiety from these situations. However, it appeared that once Colby felt comfortable in these situations she accepted encouragement from these partners. When I asked how Mr. Giles created a positive environment among his students to foster learning, Colby described him as requiring her to working alongside her peers.

> He usually tries to team up, like you can work on stuff yourself, but he tries to
>
> team up people who you don't know. Other guys in the class that you don't know,
>
> don't really know a whole lot. Because you want to work with your buddies, but
>
> he wants us to build that working friendship with, maybe, someone that we don't
>
> really know, or [we] feel a little uncomfortable around because they help you do
>
> better, like, push you to do better. But, he'll also partner up people who are
>
> friends. So, it goes both ways, which is good.

Colby offered the term "working friendships" to describe the relationships that developed by working with her peers in groups. According to Colby, Mr. Giles's intention for group work was to build working relationships and ease the discomfort some students experience while working with others. However, an unintended consequence of these working friendships was the competitiveness students developed in wanting to complete a task. It appeared that the competitive spirit among group members was focused less on personal factors and more on professional and skill development factors.

Maya also addressed how Mr. Giles's insistence on grouping students supported her in establishing working friendships. Unlike Colby's experiences with being encouraged by groupmates to do better, Maya experienced making mechanical errors without being teased or ridiculed. For his part, Maya described Mr. Giles as accepting that errors occur. She explained:

We had to put a lot of connecting parts to make the brake lines flow. I think it was actually the third brake line we were doing that we accidentally flared the end before putting on the fitting. Flaring the end makes it so you can't get the fitting on. So, we were like, 'Dang it.' So, we had to cut the end off and put the fitting on and flare it, again. And I remember laughing about that because, actually it was me and Greg doing it, and we were like, 'This is ridiculous.' Like, 'Of course we'd forget even though we've been doing this three times.' And, we told Mr. Giles we had to cut off more, and he was like, 'Oh, yeah. I guess that happens.'

Maya reported that she and her partner made a mechanical error while installing a brake hose fitting. This error occurred even after the pair had completed the same task several times prior. After realizing their error, Maya described how she and her partner laughed with each other before taking corrective action. Maya stated that Mr. Giles was informed of the group's error. His response was that mistakes do happen during repair project.

Finding #5: Creating a "Mutual Agreement" Assessment Strategy Promoted Critical Reflection

A fifth key finding in this study was that informants described how Mr. Giles had them reflect on their own performance in his program. In this cluster, all informants addressed how Mr. Giles had them assume different frames of reference when assessing their learning.

Informants produced and received assessment feedback in different forms and for different purposes.

Three forms of assessments were noted in the data as critical. The first assessment technique informants addressed was recording their own scores on timecards. Observations revealed that timecards were a central task for all students in Mr. Giles's program. By having informants punch into their day and reflect and assess their week's performance on timecards, informants were unanimous in feeling that reflections on their work habits benefitted their education. The second technique informants described were the verbal persuasions Mr. Giles provided as part of his assessments. These judgements helped informants form realistic self-conceptions of their interests and skills in the automotive trade. Finally, Mr. Giles was described by informants as incorporating professional parlance into his instruction to bolster informants' standardized test taking abilities.

Self-evaluations. All informants addressed the use of timecards in the automotive technology program. These timecards were a critical tool in Mr. Giles's approach to assessment. Students were required to time stamp their cards upon entering the program using a timecard machine. Students would then use the machine during breaks and at the end of the period before leaving for the day. Analysis of the documents collected in the research setting found that, unlike a typical timecard, on the back of this student timecard was a weekly assessment referred to as the *Student Employability Weekly Evaluation*. Students ranked themselves on a 5-point scale (with '5' being *Outstanding* and '1' being *Unacceptable*) in seven categories, or performance indicators. The seven indicators focused on personal behaviors, social interactions, and academic considerations. They were: Attendance/Punctuality, Professional Attitude, Teamwork/Cooperation, Responsibility/Dependable, Professional Work Habits, Communication

Skills, and Literacy/Terminology. Students were given a *Workplace Employability Skill Student Weekly Evaluation Rubric* that aligned to the weekly assessment. This rubric was kept in their classroom binder. A large poster of the rubric hung above the timecard machine, as well. It defined, in writing, expectations in these seven areas.

Informants described timecards as a way for Mr. Giles to enact a form of assessment in the shop area. This assessment consisted of informants reflecting on their performance over the week. They then would rank themselves. After the student self-evaluations were completed, Mr. Giles would then rank students, himself. The back of the timecard also had a spot for "instructor notes" in each of the seven performance indicators.

Informants were unanimous in addressing how Mr. Giles did not issue formal written grades on the outcomes of their shop projects. Raven explained, "We don't get a grade for our projects. We get them checked. We get them inspected, or whatever you want to call it. But, we don't get a grade for what we do." The "what we do" statement is a reference to the actual task students are assigned to perform. Mr. Giles did, in fact, inspect student work to ensure a task was completed properly. Observations revealed that he often required student to perform an operational check of their work after this inspection. Informants reported that they did not receive written summative feedback regarding these completed tasks.

The data indicated that informants perceived and were affected by this self-evaluation assessment approach differently. In this sense, Mr. Giles was described by informants as allowing them the independence to assess their own skill level based on the rubric. Still, Raven reported feeling that reflecting on her performance in the shop area was a form of being graded beyond reflection of her own performance. She explained this phenomenon when I followed up

on her statement and asked her how she felt about not receiving a written grade from Mr. Giles

for the projects she completed in the shop:

> We do get graded on our work performance out in the shop. And, we get graded
>
> for our work in the classroom. But, he doesn't grade us on, like, the whole, overall
>
> project on the car. He's not going to grade you on the bolts and the torque specs
>
> and everything else on the vehicle. If you got the job done, you got the job done.
>
> He's going to give you a grade for it out in the shop, like participation, or
>
> whatever you want to call it. And, then you'll get a classroom grade. So, I mean,
>
> overall it doesn't really affect me because I do both. I'm either out in the shop,
>
> working. Or, I will choose, somedays, to stay inside the classroom because I've
>
> got work, or organize my binder, or work on late work, or help someone else. But,
>
> I mean. I think, like. There's no like, really, downgrading to being in the shop. If
>
> you're sweeping the floor you're going to get a grade for it. So, it's just simple
>
> stuff like that and, I mean, it doesn't really affect me because I do everything.

Raven implied that there was a subtle difference to working in the classroom and in the shop.

The difference appeared to be focused on how classroom activities, which were assessed in a

traditional method, are presented in comparison to shop tasks. Essentially, shop tasks could range

from the more mundane tasks of sweeping and cleaning to practicing new skills. For Raven,

these moments appeared to assert an indirect effect on how she reflected on her performance.

She believed that these moments were also considered by Mr. Giles. Classroom activities, on the

other hand, appeared to focus exclusively on course content. Raven reasoned that both were

equally important to her overall development of work related skills. However, according to

Raven's statement, she is relatively unaffected by completing the timecard weekly evaluation because she actively participates in a host of activities in the automotive technology program.

Colby and Maya did not hold the same view as Raven when explaining the assessment Mr. Giles makes in the shop area. For these informants, assessment in the shop area was primarily self-initiated and focused on the seven performance indicators. Neither addressed the feelings Raven expressed in that all shop tasks were subject to evaluations, however indirect. Maya elaborated when I asked about the type of assessments Mr. Giles used in the shop area:

> He doesn't really grade us out there. We do a self-evaluation on our time cards. There's a self-evaluation on the back. So, it's a self-kind of test, where there are columns, where like, did you use professionalism? Did you dress all right, so you could work out in the shop? Did you work well with others? So, it's more like we, ourselves, have to go out there and do it so we can report back that we did work.

According to Maya's statement, she did not feel that she was specifically graded on her work performance in the shop. Instead, she explained that she does a self-evaluation focused on her conduct and efforts. By suggesting that she is not graded on projects in the shop, Maya inferred that she needed to report the particular tasks she completed over the course of the week. By identifying the project she worked on during the week, Maya inferred that students needed to demonstrate a high level of self-initiation, as Mr. Giles did not track each project.

During our third interview, I asked Maya why Mr. Giles's assessment method of self-reflection on timecards was effective for her. She explained that while Mr. Giles annotated the cards, they were primarily the responsibility of the students. She felt that Mr. Giles's review of their reflection was a benefit to her ability to assess her own standing in the program. Maya explained,

He has us do it. Like, we own our timecards, write what we do in the shop. So, we

grade ourselves and he backs up whether he thinks that grade's right, or not. So, I

guess just the independence is what helps. And then, if he doesn't change your,

whatever you write, then you know he agrees. So, I guess the mutual agreement

that's what the grade is, or whatever, and that helps because then you know where

you are with the program.

Maya credited the expectation that required her to manage her own timecard as a boost to the

feelings of independence. She appreciated that Mr. Giles also provided his assessment of her

performance. When Mr. Giles's assessments were in-line with her personal assessments, Maya

used the term "mutual agreement" to describe this correspondence. By reviewing his

assessments, Maya better understood her status within the program.

Colby addressed a similar concern regarding gauging where she was in the program.

Unlike Maya, however, Colby was less secure in her own independence. Often she was very

critical of her own performance. These moments afforded Mr. Giles an opportunity to help Colby

understand workplace conduct.

A couple of times I would like give myself, like I felt like I was just having a bad

week, so I'd be, 'You know what? I'm just going to give myself a three.' And, he

ended up giving me a four four-point-five. And, I'd be like, 'Mr. Giles. Did you

actually round it up that much? Like, why did you think I had a four?' And he's

like, 'Obviously, I could see that you wanted to be here. You were taking good

notes and you were being professional in the shop and helping others.' So, I

guess, even when I didn't see it he could still pick it up.

In her statement, Colby addressed the fact that her ability to accurately reflect on her performance was affected by feelings of self-doubt. A few times over the course of her program, Colby marked herself low on her evaluation. It appeared that during these times she simply marked the middle most score. Colby reports that in these rare moments, Mr. Giles assigned a higher rubric ranking to her performance. Mr. Giles was then able to draw Colby into a conversation about the level of conduct and effort he believed she demonstrated. These moments allowed Colby to gain a better sense of her efforts and attitude toward her classmates.

Verbal persuasion. In addition to a mutual agreement assessment strategy, informants reported Mr. Giles as providing direct verbal persuasions that were vital to their overall assessment of their own skill level. When I asked informants how they knew, for themselves, that they had done a good job on automotive tasks, all addressed the verbal persuasion they received from Mr. Giles. Variances in the intensity and significance of this verbal persuasion among the informants, however, appear to be related to their prior automotive knowledge. For example, Maya used this source of information to develop an understanding of her own skill level, as she had very little prior knowledge. She explained:

Well, Mr. Giles taught me, so I listen to him. I don't really consider it myself.

Even with math at school, I didn't know I was good at math until my teacher was

like, 'You know what you're doing.' And, I was like, 'Oh. Okay.

For Maya, having an instructor who is able to identify the quality and competency of her skills influences how she conceives her own abilities. In doing so, Maya described Mr. Giles as providing feedback that was informative due to his status as her CTE instructor.

Colby credited Mr. Giles in a similar way. In her response, she spoke about the confidence she had as a result of having familiarity with automotive technology.

Well, I was definitely confident in the fact that I was going to prove to them that I could do this. I was confident that if I put my mind to it, I'll succeed. But, I was also like very anxious because I kind of knew what to expect, but I didn't know exactly what to expect. Like for working on cars, and stuff. If that makes sense. But, he definitely always, like, whenever I'd get done with something, he'd be like, 'Good job. You did such a good job.' And, he's like, 'Wow! That was fast.' Like, how quickly I could get a brake line on, or something like that. So, I was already headstrong in going into this field, but he made me actually want to succeed even more because he kept telling me I did a good job.

Lastly, for Raven, who had extensive prior knowledge of automotive repair, Mr. Giles social persuasive massages helped her verify her own work outcomes. Raven acknowledges that she would not be able to assess her own outcomes on new tasks without Mr. Giles's verbal persuasion. Raven explained,

If it's something I know how to do, I just kind of praise myself, when I know I did a good job. But, if it's something I don't know, but I'm thinking I did it right, I'm like fifty-fifty on it, I always second guess myself. So, sometimes I'll be confident about that I did something good. But, for me, when I try something and I think I did it right, I almost second guess myself. But then, when he comes over and tells me I did a good job, that just makes me feel overall better because I know I did it and I can do it, again.

Mr. Giles was described as providing verbal persuasive messages that acted as judgments on informants' skills. These verbal messages appeared to act as mirrors through which informants viewed and defined their own self-beliefs about their skills. For Maya, the verbal

persuasions allowed her to recognize and develop her interest in automotive technology. Colby felt a boost in her confidence in performing automotive tasks. Lastly, Raven, who enjoyed a substantial level of prior knowledge, utilized the verbal persuasive messaging to ensure that her work outcomes were correct.

Test preparation. All informants addressed how Mr. Giles prepared his students for the standardized evaluations that were part of the automotive technology program. For Colby and Maya, two certification examinations were critical to their future endeavors in the automotive trades. The first examination was the Maine State Inspection Examination. Earning passing marks on the exam, which was administered by the Maine State Police, resulted in a Motor Vehicle Inspection License. Recipients of this license could conduct state inspections on vehicles in authorized automobile shops. The second standardized evaluation critical to Colby and Maya was the Automotive Service Excellence (ASE) Certification Examination. The test, made up of nine different sections, was designed to indicate a satisfactory level of practical knowledge-based readiness for entry into the automotive industry. Raven found little importance in the ASE testing, choosing to focus on the Maine State Inspection Examination and the unit reviews Mr. Giles conducted as part of his classroom instruction.

Salient data from informants reveled that an effective test preparation technique used by Mr. Giles was to incorporate the style of the test questions during regular instruction. This approach was evident in regard to the ASE certification examination. Here, test questions centered on the automotive technician's professional parlance. Students were expected to analyze these test questions in a problem-solving manner. Colby explained this when I asked her to name the classroom assessments used in the automotive program.

We mainly do, um, I don't know how much you know about ASE certified

testing, but it's like automotive testing. It's sort of, technician talk. So, it's kind of

like that style. The answers are like, technician A says such-n-such. Technician B

says such-n-such. And the answers are like whether it's A only or B only, or A

and B, or neither A and B. So, you have to pick apart the questions. Like, that's

kind of like the test we take. And, Mr. Giles asks questions like that sometimes

when we're working in the shop. He'll say, like, 'Could it be this? Or, do you

think it could be that?' And he'll be like, "Well. It could be that if it were more

like that." Like, he explains what it could have been, but he's like, "No. This is

like this. So, we need to find something that fixes this problem. But, that could be

part of it, the problem, on a bigger scale." Sometimes he does that.

Colby described how Mr. Giles generalized the style of questions asked on the ASE examination

to the shop setting. She used the term "technician talk" to describe how language was a central

feature of these examinations and during instructional time. These problem-solving moments

allowed Colby to experience real-world application of the type of questions she would encounter

on her examinations. Mr. Giles followed up with the correct answer. He then detailed further

why the response best resolves the issue. Colby inferred that this approach was done to better

prepare her for these examinations.

Observations revealed that Mr. Giles would, indeed, form objective response questions

which were asked orally to students as they performed tasks in the shop area. He was observed

asking more declarative questions of students, as a majority of the tasks completed in the shop

were step-wise and procedural. When multiple response questions were asked, tasks often

required responses in a problem-solving context. For example, during one observation, Maya

was tasked with replacing a turn signal switch and lever. While she was successful installing the component, upon the operational check the blinkers failed to illuminate. Mr. Giles, who was assisting her with the operational check, asked, "Could be the bulbs? The wiring? Or, the breaker? What'd you think?" Maya, sitting in the driver's seat, responded, "I could check the breaker real quick." Mr. Giles agreed. As Maya reached down to unfasten the breaker cover inside the car, he further explained that checking the breaker would be the most logical step to solving the problem.

In contrast to their confidence in performing well on tests, as reported on the appraisal inventory, informants felt differently on the actual assessment material. Informants felt less confident in their confidence to have Mr. Giles design quality assessments. Maya was the only one who was 90% confident in persuading Mr. Giles to use good designs on his assessments, while Colby and Raven were both 80% confident in having Mr. Giles design good assessments.

One explanation for these lower confidence ratings may have to do with a revelation made during a single classroom observation. Mr. Giles had assigned a test review in an effort to prepare for State Inspection Examination. The review consisted of one hundred multiple choice questions. However, the material was written for an older version of the State Examination. During the observation Mr. Giles asked student to skip a question on the review that was no longer applicable. He then cautioned students to keep an eye out for other questions that were irrelevant. While students worked on the review, Mr. Giles reviewed the material, stopping the students to adjust outdated questions. After students had finished, Mr. Giles explained that the review material was written by a committee of automotive instructors at both the high school and college level. This group, however, had not revised the material since the state issued a new

inspection manual. This event might explain why informants reported feeling less confident in describing Mr. Giles as developing quality assessments.

In the next section, I will look more closely at the Mr. Giles's dispositions as addressed by the informants. Teacher dispositions have been defined as the values, commitments and professional ethics that influence behaviors toward students and affect student learning, motivation, and development. According the Maine Department of Education, dispositions are guided by beliefs and attitudes related to values such as caring, fairness, honesty, responsibility, and social justice (Maine DOE, Chapter 15, Section II, 2016).

Research Question #3: Instructor Dispositions

My third research question asked, considering the effectiveness of their automotive technology instructor, how, if at all, do informants address their instructor's dispositions? (Attitudes and Beliefs.) My analysis for the findings for this question relies on Propositions C (Table 5.4). Proposition C draws on research from the general pedagogical-psychological knowledge dimension of teaching which focuses on the dispositional aspects of teachers. This section examines key themes associated with the effects informants experienced as a result of their instructor's attitudes and beliefs.

The following discussion addresses informants' considerations of Mr. Giles's attitudes and beliefs which they perceived as effective. In the following discussion, I address two themes that emerged from my investigation of informants' experiences. Informants addressed how Mr. Giles recognized the seriousness with which they approached learning in his classroom and capitalized on this motivation. Informants also addressed the attitude of Mr. Giles held in regard to how students succeed in the automotive trades.

Table 5. 4

Propositions: Research Question #3

Proposition	Theory	Concepts
C	Pedagogical-Psychological Knowledge (Thomas, 2013; Voss, Kunter & Baumert, 2011).	Effective instructors foster individual learning processes by having knowledge of motivational processes (Voss, Kunter & Baumert, 2011)
		Effective instructors understand the sources of their students' cognitive and emotional heterogeneity (Voss, Kunter & Baumert, 2011)
		Effective instructors exhibit beliefs and attitudes that influence students' learning (Thomas, 2013)

Two important findings emerged from the analysis of Mr. Giles's dispositions. The first was the patience he demonstrated and the supportive attitude he took toward helping his students achieve in his program. The second was his belief that success in his program was a matter of effort and commitment.

Finding #6: Displaying a Supportive and Patient Attitude Established Conditions Where Informants' Confidences Developed

The sixth key finding in this study was that informants addressed the attitudes Mr. Giles displayed when instructing them in automotive technology. In this cluster, all informants referenced how Mr. Giles exhibited a patient and supportive attitude. In their descriptions of his patience, Colby and Raven referenced the amount of time Mr. Giles took to ensure they learned a concept. Informants also frequently referenced Mr. Giles's supportive attitude during instruction. All informants felt that Mr. Giles's support was individualized for them.

For Raven, the support she received from Mr. Giles felt personal. By demonstrating these traits, Mr. Giles was able to create the conditions where informants gave extra effort and reached

out for, and received, support. However, this cluster was also marked by variability within the data. Spoken word and observational data, and the findings of the appraisal inventory are markedly different. Informants far more frequently reported Mr. Giles's patience and supportive disposition rather than items on the appraisal inventory, which were created from the pilot study findings. In contradicting the dispositions referenced in the appraisal inventory findings, informants appeared to more strongly support the attitudes of patience and support. Yet, there appeared to be conceptual overlap between demonstrating a supportive attitude with the appraisal inventory item focused on getting Mr. Giles to display a caring attitude. This alignment could be explained because of the way informants felt in regard to the outcomes they experienced from his support. Two of the three informants discussed how Mr. Giles was proactive when dealing with gender stereotypes in his classroom. Colby also discussed how Mr. Giles dealt with the sexual harassment she experienced during her first year in the program. These events could have resulted in informants feeling that Mr. Giles was caring; however, because these events were traumatic, they may not have fully shared them when I asked informants to tell me about Mr. Giles's attitude toward teaching them. Rather, these events were shared when I asked about a memorable moment that made learning hard for them in the automotive program. I will begin with an analysis of the results of the appraisal inventory, as these findings also showed the greatest variability among the data.

Four items on the appraisal inventory that focused exclusively on exploring the dispositional aspects of Mr. Giles were somewhat varied. According to her responses, Maya held confidence percentages of 100% for all the items. These items included the dispositions of: fairness, honesty, humor, and caring. Maya felt capable in having Mr. Giles demonstrate these personality traits. She was able to capitalize on their inclusion in the learning environment, as

she indicated 100% confidence in being able to utilize these four traits while learning in the automotive program. Colby's confidence was similar to that of Maya's confidence because she marked all four items at 90%. Colby, while less sure of activating these dispositions in Mr. Giles than Maya, did see value in having these dispositions displayed while she learned in the automotive program. Similarly, Colby indicated 90% confidence in being able to utilize these personality traits while learning.

Raven was the outlier when evaluating these four dispositions. The item which Raven felt the least confident in utilizing was fairness. Raven was only 50% confident in utilizing the applications of fairness while learning in her program. This does not mean that she was unable to have Mr. Giles display an attitude of fairness. Quite the opposite is true. Raven felt 80% confident in getting Mr. Giles to be fair during his instruction. As addressed earlier in this chapter, this result may speak to Raven's feelings toward her male counterparts' attitudes and the interactions Mr. Giles had with them. Raven also displayed low confidence in her ability to have Mr. Giles use humor with her. She felt only 80% confident in activating his sense of humor. In the end, however, she may not have been seeking his humor, for she only felt 80% confident in utilizing humor as a mechanism to support her learning. For Raven, the final two items–honesty and caring–were easy to get Mr. Giles to display. Both items garnered 100% confidence. However, Raven was only 80% confident in using the effects of both of these dispositions to benefit her learning in the automotive program.

As the results from the appraisal inventory indicate, collectively, informants felt moderately confident in having Mr. Giles display the attitudes of honesty and caring. However, informants were less enthusiastic about these attitudes when discussing Mr. Giles's dispositions during interviews. In fact, honesty was discussed only by Raven in the context of assessments

and feedback on her skills development. For her, Mr. Giles was honest when pointing out errors she had made on projects.

As discussed earlier, Maya addressed how Mr. Giles was able to admit his mistake when working with her and Colby while they were performing tire alignments. It is his honesty she referenced as helping her reflect on her own work. While events where Mr. Giles admits mistakes do align with the concept of honesty, they do not appear to be focused on the process informants developed to help them build confidences in performing automotive tasks. Rather, in boosting confidence in performing tasks, all informants felt that the patience Mr. Giles displayed benefited them the most.

Patience. In describing how Mr. Giles was patient, both Colby and Raven mentioned the amount of time he took when explaining a challenging concept. For Colby, she recognized that Mr. Giles would be calm even though she felt like her struggles would not lead to her being able to complete a task. It appeared that she was used to having teachers express frustration if she struggles to learn a new concept. When I asked her what helped her learn from Mr. Giles, Colby addressed how calm Mr. Giles was when instructing her.

> Well, definitely one thing would be, he would be really patient with me. He
>
> wouldn't get ticked off, or whatever. If I had a question, or if I was doing
>
> something wrong he would be willing to, even if it took twenty minutes, he would
>
> be willing to explain it over until I got it. Or, he would show me, himself, how to
>
> do it. He's very patient and that's one thing that's helped me a lot.

Colby credited Mr. Giles with being patient when she makes errors or needs help to learn a task. She appeared to be able to ask Mr. Giles for additional instruction. By demonstrating a patient

attitude, Mr. Giles was able to spend the necessary amount of time with her to ensure she grasped or corrected her learning issue.

Raven also addressed how Mr. Giles was patient when instructing students who were struggling with a task when I asked her what he says to students who struggle. In her description, Mr. Giles was viewed as being available to help both male and female students when they needed and requested it. As with Colby, once a student asked for assistance, Mr. Giles would take his time instructing them.

> He tells people, if they're having a hard time, ask questions. Because, he's right there, obviously. To like, to take notes. Follow along with the readings we do. Because nine times out of ten we do fill in the blanks, following along on the board. And, he'll make it pretty broad. So, if someone has a question, to make sure they ask, he'll feel free to explain it. And when he explains it, he'll take twenty minutes to explain it. It just goes on and on, but we need that and he's patient enough to do it. So, he's a really good one-on-one person, too. I like working with him.

In her statement, Raven indicated that Mr. Giles recommends that students ask questions if they are unsure of his instruction. She recognized that Mr. Giles also made himself available to support students when they asked for assistance. It may be this availability, or his encouragement, that allowed students to seek assistance from him. In fact, Raven's comment suggested that, while he attempted to instruct in a broad manner, Mr. Giles allocated time to explain any issues that arise. When he did, according to Raven, he took his time to make a though explanation. The inference was that students often required additional explanation. Raven recognized that Mr. Giles possessed the temperament and patience to assist these frequently

occurring events. Other times, however, it appeared Mr. Giles worked more closely with students, sometimes in a one-to-one capacity. For Raven, these moments increase her enjoyment of working alongside Mr. Giles.

Data from observations revealed that Raven and Colby benefited from the patient attitude Mr. Giles displayed. Frequently, moments included learning challenges with either Raven or Colby. An example came from an observation of Raven. She was sanding off the cloudiness on a pair of headlight covers with a small palm sander. Mr. Giles checked in with her on eight occasions. Six times, the pair talked about her performance and progress. However, as she worked down to the finer grits of sandpaper, the clear headlight covers she hoped to achieve were not emerging. She called Mr. Giles over to explain why the covers were still dull. It appeared Raven had become frustrated. Mr. Giles demonstrated how she needed to make smaller circles with the sander. He also showed her how the paste wax she was using had not been fully dried before she began sanding. Together the pair cleaned and reapplied the wax, Mr. Giles taking time to explain exactly what to look for when the wax was sufficiently dry. While waiting for the wax, the two talked about the red car Raven was working on. As they talked, Raven's frustration seemed to decrease. Mr. Giles came over to Raven one final time while she was working on the headlight covers. This occasion was similar to the last, only this time Raven was having trouble keeping the machine from bouncing off the cured cover.

In addition to being patient while working through a difficult learning moment, Mr. Giles's patience was also described by Maya as reducing stress and frustration. She addressed the fact that Mr. Giles took seriously the learning outcomes for students. However, he was not so serious that students felt stressed if they made errors. By not interjecting stress into the classroom, students appeared more willing to seek assistance.

He seems like a pretty happy guy. I mean, he doesn't, he's not very serious all the

time. He can be serious, but. He is patient and he is positive. So, I guess, you get

that. Like, everybody, usually we're having a good time and laughing and so just

being in that class, just everyone is positive like everybody else. So, if you get

stuck or do something, you feel okay. And then he'll come over and explain it

patiently, calmly to you.

Maya described Mr. Giles as upbeat and positive. The source of this happiness appeared to be his

ability to balance the seriousness he needed to be productive as an instructor, with the reality of

working with high school students. While this data point appears to moderate the earlier finding

in which all informants stressed the seriousness with which Mr. Giles approached his

professional role, Maya did recognize the times when it was less critical for him to be serious.

By being less serious and more positive, Maya recognized that students in the automotive

program felt a level of positivity they received from him. In turn, female and male students

constructed a classroom where they felt comfortable with each other and with Mr. Giles. It was

this comfort that appeared to allow informants to reach out for instructor support. In so doing,

female and male students did not feel ashamed.

Supportive. Supporting students through the performance of a challenging task was

frequently reported by informants in their interviews. As Colby stated when I asked what Mr.

Giles would say when learning got challenging:

He definitely tells them not to give up. He's said, if you give up then you're just

basically saying, 'Oh, yeah. I'm never going to succeed, anyway.' Like, he's very

supportive. Again, I can't say it enough. He's so supportive for everyone.

Colby indicated that a majority of students, at one point or another in the program, experienced doubts about completing certain tasks. It was in these moments where Mr. Giles verbally encouraged them to continue learning through this challenge. For Colby, these messages offered her support and encouragement.

Observational data backed Colby's assertion that many students, male and female, sometimes struggled with learning complex mechanical tasks, and that Mr. Giles supported these students when this occurred. Still, it appeared that these moments were made more challenging by the fact that Mr. Giles was the only adult supervisor in the shop area. "There's only one of him which is sometimes a problem when I'm having a problem," Maya commented when I asked what made learning challenging in the automotive technology program. Given this, it was surprising to observe how supportive Mr. Giles was for his students. Efficiency in providing support was a critical characteristic of Mr. Giles's attitude toward his students. In one observation, as a male student attempted to operate a brand new brake lathe machine, Mr. Giles checked-in often to ensure the operational procedures of the new machine were being followed. Each time, Mr. Giles stood observing the student for a few seconds before offering praise of the student's work. At one point in the process, Mr. Giles had to intervene to inspect the brake lathe's arms which were not centering on the disc's rotor. The student commented that he had attempted to do this step but was having difficulties. Following his inspection of the machine, Mr. Giles provided the student with verbal directions on correcting the error. From that point forward the student was able to operate the machine without any other difficulties.

Maya reported a different understanding as to the supportive messages she received from Mr. Giles. She discussed having Mr. Giles offer not only verbal support, but also written

feedback. She participated in activities beyond what was asked of students during the normal school day. These moments came not during a challenge but rather following a positive outcome.

> He's very supportive. If I'm doing something, he'll be like, 'Good job.' And, at the end, on our time cards, he'll write like, *Good job this week*, or *Thanks for doing this*. I did that teacher thing Monday night where I was tour guide for the teachers, and he was like, 'Very good.' He gave us extra credit for that, coming and doing that.

In her statement, Maya indicated that Mr. Giles provided verbal support while students were working toward task completion. She also described him as providing supportive messages in written form. These messages were written on her timecard. It appears these written messages came at the end of the week. Timecards played a central role in classroom management and assessment. In this case, however, it appeared that Mr. Giles offered praise for her work habits, or the additional out-of-school tasks she completed. For Maya, these messages were considered a form of support. By recognizing Maya's efforts during the week, or her extra efforts, Mr. Giles appeared to help develop her willingness to engage in different activities outside of the normal classroom routine.

In addition to the verbal and written support students received during instruction, two informants spoke about the support they received from Mr. Giles when experiencing issues related to their nontraditional status in the automotive program. For Raven, who experienced verbal gender stereotyping messages from her male counterparts, Mr. Giles support was described as listening to her frustrations. In recognizing her frustrations, he talked with her about the additional support systems offered at NERSAT. Raven explained this phenomenon when I asked how Mr. Giles got on a personal level with her.

He just always checks-in on me. I kind of feel like it's one-on-one to me because I
don't normally see him ask anyone else that, and I think it's because I'm the only
girl who's trying to put any effort into there. And, sometimes I'll get frustrated
about something. Everyone will get frustrated when they make mistakes on
something. Can't figure something out. So, he just comes over to make sure I'm
okay. He gets down to a personal level like he asks me if I need to talk to anyone
or whatever. Or, if I need to talk to him about something. Sometimes it's just
working it out with the guys because they'll say things. So, he listens and that
really helps.

Raven credited Mr. Giles with frequently checking in with her during the class period. These
appearances appeared to be focused on supporting her on tasks where she is struggling.
However, in her statement, Raven implied that Mr. Giles understood that she received negative
messages from her male counterparts during work periods. These issues related to task
difficulties were possibly compounded by the social comparisons she made of her peers.
According to Raven, the certain male students did not put forth as much effort as she did while
working. These male students appeared to be the ones who made comments about her gender. By
listening to Raven express these frustrations, Mr. Giles ensured that the issues she faced were not
causing her to feel discomfort. He also suggested that she utilize the support systems at
NERSAT. In this case, NERSAT employed a full-time guidance counselor who was available to
resolve student conflict. For Raven, the moments she spent talking with Mr. Giles made her feel
better.

Listening to the frustrations of his nontraditional female students was not the only
supportive attitude Mr. Giles displayed when dealing with the interactions of his male and

female students. As Maya stated, "He doesn't let the boys get away with too much stuff, so that's a pretty good thing for me." Maya indicated that Mr. Giles took a proactive approach in dealing with gender issues. Yet, it appeared that Maya was only indirectly involved in these events. Maya suggested that Mr. Giles did not allow his students to be disrespectful.

> It's the boys messing around. Like they draw swastikas in the dirt on the windows, and he's like, 'Don't do that. You can't do that. Get rid of that.' Like, only a guy would think of that. Or like penises because guys are obsessed with their own genitalia. They draw it all over everything.

Maya indicated that Mr. Giles addressed disrespectful and hateful images. He required his male students to remove these images. For Maya, this supportive attitude decreased the discomfort she might have otherwise experienced.

Colby reported a different understanding as to the type of support Mr. Giles provided around issues of gender. She was the victim of sexual harassment while in his program. In this case, Mr. Giles reported the incident to the school administration. This action resulted in the student being removed from NERSAT. Colby explained this situation to me when I asked her what Mr. Giles would say if someone broke a classroom rule.

> Mr. Giles, he'd get mad because he does not stand for rude people who are being disrespectful. Like last year, there was one person in my class. Like, I don't know if he was going through mood swings, or whatever, but I had nothing but problems with him. One day he'd be nice to me. Another day he'd make sexual comments at me. And, other days he looked like he'd want to literally rip my head off. And, other days he was nice, again. And, [Mr. Giles] actually got rid, like, I talked with Mr. Giles and I heard, [the student] actually got sent away from

NERSAT and everything. Like, Mr. Giles took care of it because they don't stand

for sexual harassment and stuff, here. Of any kind. I went to him right away and

he took care of it right way.

In her statement, Colby described Mr. Giles as intolerant of students who were disrespectful. Colby identified sexual harassment as an example. For her, experiencing a peer who seemed to cycle through being friendly, harassing her sexually, and then loathing her when she did not engage with him created fear and anxiety. Colby addressed the cause of these feelings with Mr. Giles. The fact that she addressed this trauma with him provides an understanding of the type of supportive attitude he displayed. Instead of just listening to her, however, Mr. Giles reported these incidences to administration. In further supporting Colby, Mr. Giles appeared to have advocated for the removal of this student from his program. By actively advocating for removal, it appeared that Mr. Giles understood the potential severity of the negative consequences to Colby if the behavior would have been allowed to continue.

Finding #7: Believing that Vocational Accomplishments are a Matter of Effort and Commitment Established Expectations for Success.

The seventh key finding in this study was that informants addressed Mr. Giles's beliefs about success in the automotive technology program. In this cluster, all informants referenced how Mr. Giles focused his attention on the merits of students' efforts and commitments to learning. After informants displayed these attitudes and behaviors, Mr. Giles openly recognized their status as nontraditionally enrolled students. Success in the program, as addressed by informants, meant meeting personal goals. Mr. Giles was described as wanting students to achieve to the level of their commitment.

Informants referenced two forms of recognition Mr. Giles utilized to honor not just their efforts and commitments, but also their status as nontraditional students. The first form of recognition was to be volunteered to support other students who were struggling. For Colby and Raven, being volunteered to assist other students increased their own belief in their learning and supported a higher level of effort. The second form of recognition for all informants was to be appointed to the Tour Master position. This Tour Master position, coined by Mr. Giles, consisted of leading tours of the automotive technology program for potential NERSAT students. These events also bolstered their resiliency to adversity. By holding the belief that merit was the product of effort and commitment, informants were unanimous in their feelings that Mr. Giles treated them equally while recognizing their nontraditional status.

In discussing the beliefs Mr. Giles held, informants were unanimous in stressing the seriousness with which he approached his professional role as a Career and Technical Education instructor. This seriousness was focused primarily on the content of his program and his desire to see all of his students put forth the effort to achieve in his classroom. All informants referenced verbal pronouncements and behaviors that lead them to view Mr. Giles as holding the belief that success in his automotive technology program was a matter of effort and commitment. Informants addressed how students who displayed seriousness about their studies and their skills practice were often viewed as being more successful in the program.

Classroom conditions appeared to factor into these perceptions. As Raven acknowledged, often her male counterparts did not display the attitudes and put forth the efforts Mr. Giles sought. She commented, "They all just kind of 'Joe-Blow-it' in a way to like get by." Raven's description of her classmates may reflect a classroom and shop atmosphere where males either overestimate their own skill levels, or lack the confidences to achieve academically in the

classroom. Data from observations appear to support these assertions. During shop instruction

and skills practice, male classmates did make more procedural errors in their repair efforts.

However, this group also performed more tasks due to the number of students involved in these

activities. Male students were also observed performing less academic tasks such as note taking

and answering questions during classroom instruction. All female informants, on the other hand,

were observed taking notes, highlighting passages, and answering questions Mr. Giles posed

during classroom instruction at a rate higher than their male classmates.

The resistance male students sometimes displayed did not appear to alter the beliefs Mr.

Giles held in regard to the seriousness he wanted his students to demonstrate. Neither did these

moments affect the approach he took regarding interacting with students. Rather, when

challenges arose, Mr. Giles reinforced the belief that all students needed to put forth effort in

order to achieve in his program. Raven explained this when I asked how Mr. Giles's attitude

affected her personally.

I don't know. I mean, I really don't know. The attitude he gives, like, 'Pay

attention, here. Be serious about this.' He kind of gives it to everyone, unless

you're really pushing his buttons. He's, I'm going to say, level with everyone.

For Raven, verbal pronouncements by Mr. Giles are intertwined with his belief that all students

need to demonstrate a sustained level of focus and studiousness with the work in which they are

engaged. Raven described Mr. Giles as displaying this attitude to all of his students.

Identifying the difference between behavioral considerations and learning challenges that

result from putting forth efforts in learning supported informants' understanding of Mr. Giles's

beliefs. When I asked what Mr. Giles said to students who struggled in his classroom, Colby

responded, "He tells them to think about all the good that can come from this program if you

really pay attention and try your hardest and ask for help when you need it. That's definitely something he talks about." As part of his belief system, Mr. Giles incorporated the view that a career in the automotive service industry can provide a level of benefit. He believed these benefits are attainable by being an active participant in the learning process. Both Colby and Raven referenced the financial aspects of being an automotive technician as one of the primary benefits Mr. Giles expressed. The theme of benefitting from a career in the automotive service industry was reported by all informants as the foundational aspect of Mr. Giles's beliefs. While this focus on benefits and active participation may be considered a motivational strategy, the effect appeared to be more transformative for informants. It appeared that informants valued Mr. Giles's emphasis on effort and commitment to a greater degree than male students. This may be true because informants did place a high value on succeeding in the face of adversity. Raven explained why she considered Mr. Giles's beliefs to be one the most valuable aspect of his instruction:

> What he tells us and what he teaches us, I mean, it kind of shapes us into the students that we are. Like, with me, he'll explain something that he did and I'll ask him and he'll tell a story about how he did that thing, or tearing apart an engine or adding a turbo. He's, like, always super focused on cars.

Raven recognized that the beliefs Mr. Giles held, as demonstrated through his behaviors, shaped the type of student she was in his classroom. By listening to Mr. Giles describe his own experiences in the automotive industry, Raven was able to conceptualize the role herself.

Due to the fact that social comparative assessments were made of their male classmates' efforts and commitments, informants addressed how Mr. Giles reacted to the seriousness they

displayed for their learning. All informants referenced their personal dispositions toward

learning, which included a component of intrinsic motivation. Colby explained this phenomenon,

> I can tell he was kind of like shocked with how serious I was taking the program.
>
> I think I threw him off guard a little bit. I don't think he expected me to actually
>
> want this program as much as I did.

Colby's statement captured Mr. Giles's reaction when he instructed a student who met his

standards about effort and commitment. Given the "Job Blow It" atmosphere Raven described

earlier, it seemed as though Mr. Giles was genuinely surprised when Colby displayed behaviors

he believed a student needed to achieve in his classroom. Similar to Colby's statement, Maya

discussed how she was able to personally connect with the beliefs about commitment Mr. Giles

held for his students through her commitment to learning.

> He wants me, he seems like he kind of wants me to learn because I kind of went
>
> into that class knowing nothing. So, he wants to teach me and I want to learn.
>
> And, I can learn because we both want me to learn.

Maya credited Mr. Giles for showing a willingness to instruct her even though she lacked prior

automotive knowledge. Maya demonstrated the type of necessary commitment that Mr. Giles felt

was needed to be successful in his program. By recognizing each other's foundational beliefs of

the role of the instructor and of the student, Maya felt she was able to benefit from the

instruction.

Informants described Mr. Giles as being able to build positive teacher-to-student rapport.

Results from the appraisal inventory focused on the establishment of a good rapport between Mr.

Giles and informants showed little variance. All informants reported being 100% confident in

having Mr. Giles establish a good rapport with them. Both Colby and Maya reported 100%

confidence in utilizing this rapport to help increase their learning potential in Mr. Giles's

program. Raven reported a confidence percentage of 90% in using her rapport with Mr. Giles as

a source of assistance for her learning.

Skill recognition and help availability. In addition to believing that students needed to

demonstrate effort and commitment, Mr. Giles also believed students who were more capable

needed to be recognized for their skills. This recognition often came in the form of verbal

pronouncements. Another form of recognition was being asked to help other students. For the

informants, this recognition felt like respect from Mr. Giles. Colby explained this feeling when I

asked her what Mr. Giles believed about teaching her.

> I can definitely tell he has respect for me. And like, since around December break,
>
> well, even before that, more toward the beginning of the school year, when there's
>
> first year students in the program, he'd have me show them around the shop, or
>
> he'd, when he's in the classroom talking to the first-year students, he said, 'If you
>
> guys have any questions, don't know what tools are, or just need help, you can
>
> ask Colby.'

For Colby, she felt that Mr. Giles respected her because he offered to have her help students who

needed assistance. She appreciated the recognition and actively supported Mr. Giles in his efforts

to make newer students more familiar with the program. However, by making these comments to

his entire class, Mr. Giles also raised the idea that effort and commitment, rather than gender,

were the primary factors in a student's academic success.

I followed up my question and asked Colby if any student had requested help from her as

a result of his comments. She responded:

> Oh, yeah. Like, guys mainly. Like, some guys are like, [whispers] 'Don't tell my
>
> friends. Make sure they don't see me. But, I don't have a clue what I'm doing. I
>
> want you to help me.' It was last year. One of the guys in my class. He's really
>
> shy. But, he tried to come off tough in front of his guy friends. And he's like,
>
> 'Okay. I'm being totally honest with you. I don't know what I'm doing exactly
>
> with it.' I think it was tearing down an engine. He's like, 'I don't know exactly
>
> how to do this. What I'm doing. But, can you please help me? But, just don't tell
>
> them. I don't want them to see that I don't know what I'm doing.' And, I was,
>
> like, 'Sure. No problem.'

The effect of Mr. Giles's suggestions to seek support from Colby resulted in students asking for help. Colby detailed how a majority of these students were her male counterparts. Interestingly, it appeared that one student sought anonymity when asking her for assistance. One reason Colby offered about this request was that he didn't want others to know about his lack of skill.

The data indicated another way in which Mr. Giles held the belief that skills needed to be recognized. All informants spoke about being asked by Mr. Giles to help a classmate, often a male classmate, with an academic assignment in the classroom. These assignments, unlike the group work mentioned earlier, required students to work independently. As students completed this work, informants reported that Mr. Giles would assign these students to work with others who were behind. Often, informants were completing assignments and assisting others. Raven said, "It's like the girls are always finishing up first and helping out, like, on the computer on iCar, or going over a review paper or fill-in-the-blanks. And Mr. Giles will say, 'See what happens when you pay attention.'" By reinforcing his belief in recognizing studiousness among

his students and making help available from them, Mr. Giles was able to subtly honor the fact that the informants were the ones demonstrating these behaviors.

Tour master. Informants identified a single event where Mr. Giles was not so subtle in his belief that female nontraditional students outperformed typical students in his program. This was during recruitment school tours of NERSAT. Each year, the seven sending schools send second-year high school students to the school to visit three programs of their choosing. To facilitate the tour of the automotive technology program, Mr. Giles assigned a student to lead tour groups. The groups rotated through different parts of the program. According to Maya, Mr. Giles referred to the student leading the tour as the Tour Master. Tour Master, that's what he calls it," she said.

For Raven, being Tour Master was a way for her to feel that Mr. Giles recognized her as a competent student beyond her grades and projects. Here, Mr. Giles appeared to believe that he needed students who can perform tour activities successfully. When I asked Raven about how Mr. Giles motivates her in the shop, she responded by addressing the fact that she is often selected to lead tours.

> He'd have me, like, especially when other schools come for a tour, he'd volunteer
>
> me to show them how to properly operate a lift, or the tire machine, or whatever.
>
> Give them a tour around the automotive program. So, it's pretty motivating
>
> because I've done it a bunch more times than anyone else, so he knows I know
>
> what I'm doing and I can lead a tour.

Raven indicated that she is selected to lead tours due to her competencies in operating equipment. These events motivated her because she recognized that Mr. Giles selected her more often than the other students in her class. By selecting a tour leader based on their skills rather

than on other factors, Mr. Giles appeared to help Raven develop her understanding of her own skill level.

Informants also addressed how Mr. Giles would acknowledge that nontraditional female students often outperformed his typical male students. Colby gained an appreciation for the way Mr. Giles talked about the nontraditional female students in his program during tours. It seemed that Mr. Giles did not shy away from the fact that female students were tour leaders at the time. Colby explained this when I asked her if Mr. Giles ever made comments about her gender.

> One of the comments he's made to me is like, when we're doing the tours and
>
> there's a few girls that come on the tours, he's like, 'Honestly. Having these girls
>
> in the class, they outdo the guys in the class because they pay attention more and
>
> take it more seriously than most guys.' So, that made me feel good.

In her statement, Colby acknowledged that Mr. Giles does, in fact, recognize her gender. In this case, it was done in a positive manner. He also did so in a manner that confirmed his belief that students need to exhibit commitment and effort in order to do well in his program. The fact that these students are often female did not escape Mr. Giles, nor did it prevent him from making the claim in front of potential students. To this end, he made Colby feel good about her participation in the program.

Recognizing the seriousness of nontraditional female students to tour groups with female students present was one way Mr. Giles reinforced his beliefs. Maya, on the other hand, addressed the tours she has given when no female students were present. Here, Mr. Giles did not explicitly reference gender in regard to merit. He did, however, attribute competence to Maya when presenting his program to her tour group. She addressed this when I asked about her Tour Master experiences.

Sometimes there are just groups of boys. Sometimes it's just boys. And, me being

the person that takes them on the tour and explains to them what the class is

about, and everything. Like, Mr. Giles talks to them in the classroom, like 'You'll

learn about all this stuff. So, listen to Maya. She knows what she's talking about.'

And, I've never seen anybody, I've never seen any of them look at me, like,

surprised that I know what I'm talking about. But like, maybe one of them is like,

'I didn't know a girl could do that.' Like, 'I didn't know a girl would know so

much.' Because, I'm always like, 'Got any questions?' And, they're like, 'No.

Not really.' And I'm like, 'Okay.'

In her statement, Maya reported that Mr. Giles did mention her knowledge of the automotive

program while she was a tour leader. His reference, unlike Colby's reference, did not explicitly

contain a reference to gender. By addressing her skills and abilities, Maya indicated that a

majority of the male tour informants did not express surprise over the fact that she can perform

automotive tasks. For his part, Mr. Giles, again, reinforced to his students that effort and

commitments, not gender, lead to positive outcomes in his program.

Summary of the Chapter

In this chapter, I reported my findings based on the analysis of informants' interviews,

observations, and appraisal inventory results. Also included in this analysis were documents

collected from the program and photographs taken of the research setting. I presented findings

that addressed my primary research question about how female CTE students enrolled in a

predominately male-attended automotive technology program perceived the effective practice of

their Career and Technical Education instructor. Findings from my secondary research questions

addressed this instructor's content knowledge, pedagogical skills, and dispositions. Table 5.5

presents a summary of the findings. Factors thought to comprise effective instruction included an instructor's content knowledge, pedagogical skills, and dispositions. Therefore, these factors are included in the first row of Table 5.5.

Table 5. 5

Summary of the Findings

Content Knowledge	Pedagogical Skills	Dispositions
Formal Education in Trade	Differentiation Strategies	Effort and Commitment for Success
Professional Work Experiences	Responsive Teaching	Equity of Academic and Live Work
Teacher Certification/Preparation Courses	Verbal Persuasions	Recognized Gender Status
Historical Knowledge of Trade	Customized Learning Tools	Focused on Instructional Challenges
Advanced Diagnostic Evaluations	Generalized Professional Parlance	Supportive
Solutions to Problems Outside Curriculum	Grouping Strategy	Patience
Specialized Tools and Tool Kits	Established Workplace Standards	Positive
Active Professional Networks	Varied Frames of Reference for Assessment	

Two important findings emerged from the analysis of Mr. Giles's content knowledge. The first was the role his formal education and professional experiences played in how informants came to understand his content knowledge. The second was that informants expanded their understanding of the scope and nature of their CTE instructor's knowledge required for his job by observing hi use of the professional networks he had built over time. Informants also described moments where he offered solutions to problems that were unrelated to the projects they were tasked with completing.

Three significant findings emerged from the analysis of Mr. Giles's pedagogical skills. The first was his use of responsive teaching and differentiated instructional approaches. To this end, Mr. Giles was described by informants as possessing a wide range of traditional and progressive teaching methods. The second skill informants address was grouping students together to work on project-based assignments. Informants described how these working conditions created "working friendships" among male and female students and provided them a sense of belonging. Lastly, informants described the skills Mr. Giles employed when assessing them. They described his use of assessment strategies that required students to take a different frame of references. Asking students to assess from different vantage points helped them better reflect on their own learning experiences. This approach also aided Mr. Giles in knowing the different facets of his students' academic learning.

Finally, two important findings emerged from the analysis of Mr. Giles's dispositions. First, all informants described the patience Mr. Giles demonstrated and the supportive attitude he took toward helping his students achieve in his program. These attitudes legitimized informants' interests in the field of automotive technology. Second, informants addressed Mr. Giles's belief that success in his program was a matter of effort and commitment. By holding this belief, Mr.

Giles was described as being able to recognize the success each individual participant had in his program. This recognition assisted informants with finding their own passions for automotive technology.

CHAPTER 6

DISCUSSION AND IMPLICATIONS

The purpose of this study was to understand the ways in which female CTE students experienced the phenomenon of nontraditional enrollment in a male-dominated automotive technology program and how they perceived instructor effectiveness. Primary analysis of 3 narratives from nontraditional female students enrolled in an automotive technology program resulted in several key findings regarding their instructor's content knowledge, pedagogical skills, and dispositions. Because the sources of self-efficacy information for female students are currently being questioned by researchers, I was especially interested in how this instructor affected the self-efficacy beliefs of his students through factors thought to comprise effective instruction. I also wanted to do so from a qualitative perspective so informants would be free to reflect on their experiences as nontraditional female students enrolled in a male-dominated automotive technology program.

My own experiences as an aircraft mechanic with the United States Air Force influenced the development of this study. I spent close to a decade performing maintenance tasks on airplanes before becoming an English teacher for students with learning differences. Being a mechanic was a life-changing event for me, as I gained not only an appreciation for the technical work skilled laborers perform, but I also developed an admiration for the knowledge they possess. Working as a mechanic built confidence in my own capabilities. These capabilities included being able to learn a deep base of mechanical knowledge and being able to repair complex aircraft systems. When I used my knowledge of a mechanical system to perform a successful repair, I gained the understanding of how vital learning was to the skilled labor professions. To this day, I carry the confidence gained by being a mechanic with me.

I also share my stories of being a mechanic with my English students who are enrolled in Career and Technical Education programs. Jenny was one such student. She was enrolled in a predominantly male attended CTE program. Through our conversations, I learned that her instructor was an important figure who helped her believe in her skills as an auto body repair technician. This importance took on a more significant meaning when Jenny elaborated on her experiences with gender bias in her program. I began to wonder what it was like to be a CTE instructor in a program where gender imbalances were so striking. Surely in a program like Jenny's, an instructor would be aware of the potential for such stereotyping and biased attitudes? Thus, I developed this study on the phenomenon of nontraditional female participation in a CTE program as a way to consider the role effective instruction might play in benefiting these students.

Through my analysis in Chapter 5, I noticed that interconnectedness and integration among the three factors of content knowledge, pedagogical skills, and instructor dispositions were present. This chapter is going to be a discussion of these connections and integrations. Chapter 6 consists of a discussion of the findings of the study along with the implications for practice and future research. The discussion of each theme will be integrated with discussion of its relationship to other findings and conclusions.

Because I studied a CTE instructor through the lens and experiences of that instructor's students, I wanted to visually represent how they addressed Mr. Giles's attention to each of the three factors associated with effective instruction. Figure 6.1 presents a visual representation of the case which was constructed from my data analysis. The model presented in Figure 6.1 represents a theoretical conceptualization of how the three factors of effective instruction were integrated and interconnected for this instructor.

The visual representation (Figure 6.1) is of a Borromean knot, which includes three rings. Each ring represents one of the three factors associated with effective instruction. The Borromean knot is comparable to a Venn diagram; however, the image is viewed as three-dimensional. The three intersections of the diagram represent sub-domains of each of the three factors.

The links between the Borromean knot's three rings provides that no two of the three are linked with each other. In other words, if one ring is removed the result is two unlinked rings. Because the three rings are not all linked at the same time, the analogy of untying and retying the knots by shifting considerations among the three factors allows for the dynamic representation of Mr. Giles's instructional practices. In the discussion that follows, I will present the interconnected shifts of (a) when content knowledge was shifted in the direction of each of the two other factors; (b) when pedagogical skills were shifted in the direction of each of the two other factors; and (c) when instructor dispositions were shifted in the direction of each of the two other factors.

In Figure 6.1, the Borromean knot is bound inside a three-dimensional triangular pyramid. The base of the pyramid forms the boundaries of the three factors. Looking outside, and through the peak (center-point) of the pyramid, an intersection among knowledge, skills, and dispositions is found. It is my hypothesis that this intersection represents the integration of these three factors which then leads to effective instruction. Listed outside the pyramid are each of the theoretical foundations thought to inform the corresponding factors. A review of the literature led me to understand that there are other outside forces that may influence CTE instruction; however, in this study I was focused on the experiences informants had with their instructor.

While it would be comfortable to extrapolate from the literature review that there are outside

influences, it would be inappropriate to do so based on the findings from this study.

Figure 6. 1 Conceptual Illustration of Effective CTE Instruction of Nontraditionally Enrolled
Female Students
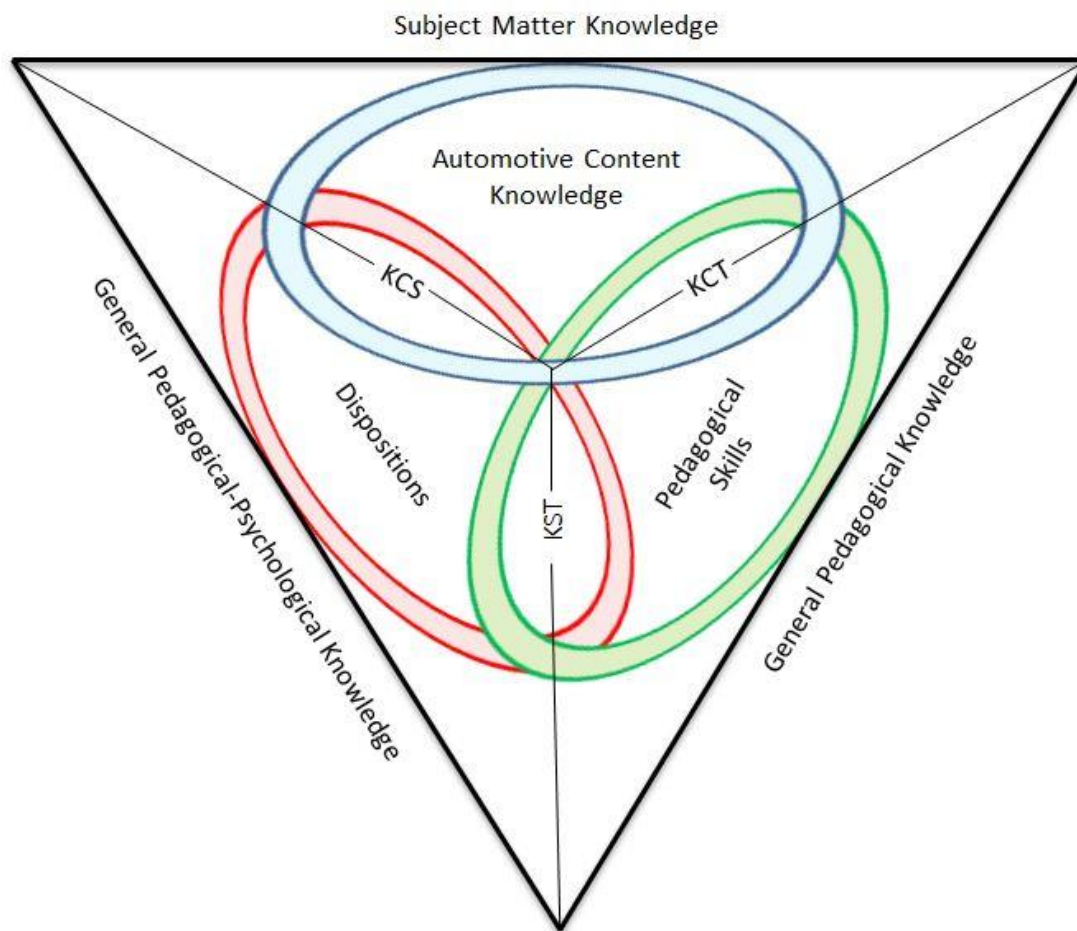
Note: KCS = Knowledge of Content and Students, KCT = Knowledge of Content and Teaching,
KST = Knowledge of Students and Teaching

The conceptual illustration I constructed (Figure 6.1) incorporates Köning, Blömeke,

Paine, Schmidt, and Hsieh's (2011) categories of general pedagogical knowledge (GPK) and

pedagogical skills (PS), Shulman's (1987) category of subject matter knowledge (SMK), Ball,

Thames, and Phelps's (2008) sub-domains of teacher knowledge, namely knowledge of content

and teaching (KCT) and knowledge of content and students (KCS), and Voss, Kunter, and Baurmert's (2011) categories of general pedagogical-psychological knowledge (GPPK) and dispositions (D). This, then, is an original model bringing together all of the conceptual aspects of effective instruction based on the findings in this study.

My analysis of the findings of this study revealed each of the three factors was consistently relevant to effective practice. They were of equal value, with nothing weighted. Additionally, all factors were relevant all of the time. But, they still shift all the time. The shift, then, is the CTE instructor who gazes through the center-point of the pyramid, and can see all of this all of the time as his field of view, but who, at times, casts his gaze slightly differently. In doing so, he is untying and retying knots in an effort to pay deference to the instructional decisions he must make. Therefore, there is no internal shift. The instructor is not changing perspectives or reflecting on a prior action. Instead, the instructor is outside looking through the pyramid which makes up his field of view. There are circumstances of the moment which cause him to shift his focus.

As mentioned earlier, I begin this discussion by presenting each of the factor's shifts (or untying and retying of knots) toward the other two factors. The integration of, and interconnections to, each factor will be examined through the findings and themes presented in Chapter 5 of this study. By presenting my discussion in this manner, I will include salient data which speaks to the outcomes experienced by the informants as a result of Mr. Giles's effective instruction. Following each discussion, I will present the implications of the discussion. Finally, recommendations for further research and the limitations of the current study will be presented.

Discussion of Content Knowledge

To continue the analogy of untying and retying the knots by shifting considerations among the three factors of effective instruction, I provide a visual representation of the two shifts that can be made of content knowledge (Figure 6.2 and Figure 6.3). When Mr. Giles looked closely at his content knowledge, shifting in the direction of his pedagogical skills, his understandings of automotive technology and his teaching were observed with the deference due his experiences in both the professional trade and as a CTE instructor. (see Figure 6.2). In these situations, there was knowledge of content and teaching (KCT). This sub-domain of a teacher's content knowledge has been explained by Ball, Thames, and Phelps (2008). Retying these factors to form a knot between them resulted in considerations of the complexity of automotive tasks when designing instruction and the mechanical difficulties experienced while conducting live work activities. Unconnected were considerations of his students, their thinking, and their approach to solving automotive problems. This shift helps explain informants' descriptions of their instructor utilizing his professional experiences and specialized content knowledge to create instruction. Examples from this study included Mr. Giles's advanced diagnostics skills of automotive issues, offering solutions to problems outside of the curriculum, and knowledge of specialized tools and tool kits.

Figure 6. 2 Conceptual Illustration of the Shift of Content Knowledge in the Direction of Pedagogical Skills

Subject Matter Knowledge

Content Knowledge

KCS

KCT

Dispositions

KST

Pedagogical Skills

Pedagogical-Psychological Knowledge   General Pedagogical Knowledge

_____
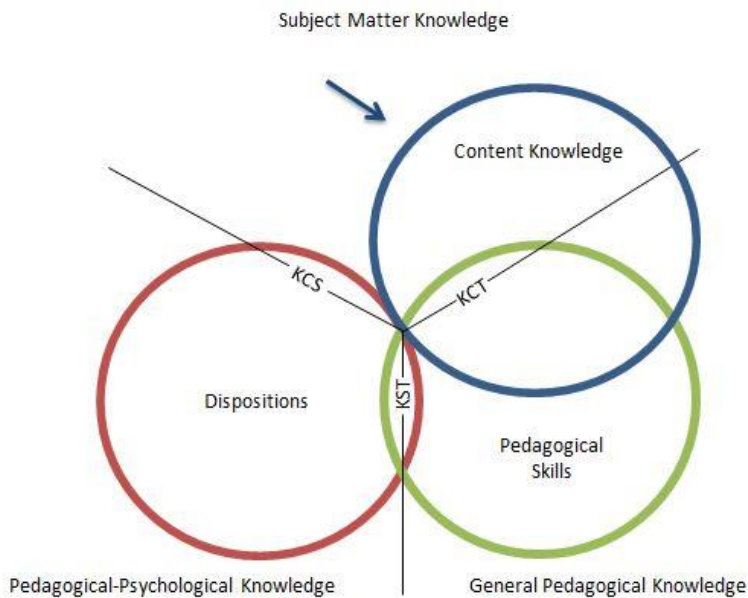
Note: KCS = knowledge of content and students, KCT = knowledge of content and teaching, KST = knowledge of students and teaching

When Mr. Giles looked closely at his content knowledge, shifting it in the direction of his dispositions, his understandings of automotive technology and that of his students was observed with the deference due his students' interests and passions for automotive technology (see Figure 6.3). Retying these factors to form a knot between them resulted in connecting informants' passions and interests to the automotive technology industry and heightening their sense of outcome expectations. Unconnected were pedagogical considerations related to the task of instructing. This shift helps explain informants' descriptions of their instructor as sharing his formal education and professional experiences to help them develop and legitimize their interests. Examples from this study included Mr. Giles's sharing of historical knowledge of the automotive industry and his personal educational and professional pathways when entering the profession.

Figure 6. 3 Conceptual Illustration of the Shift of Content Knowledge in the Direction of Dispositions

_____
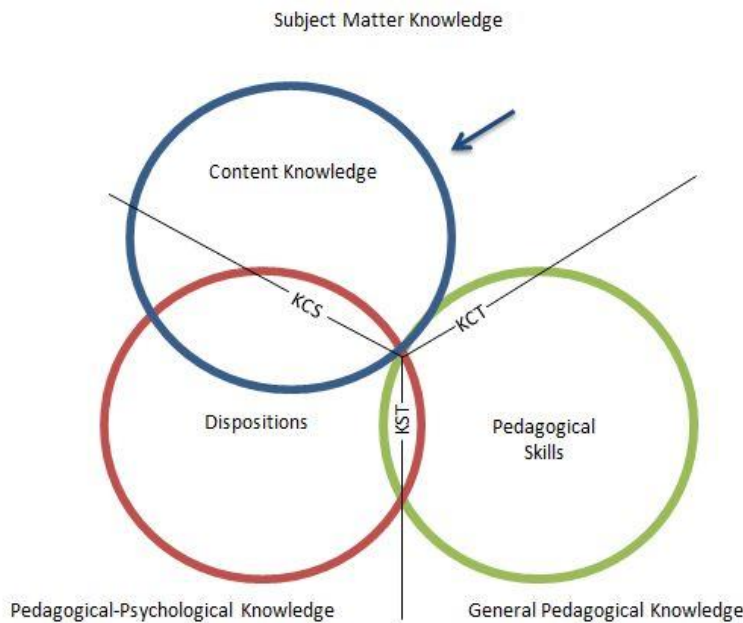
Note: KCS = knowledge of content and students, KCT = knowledge of content and teaching, KST = knowledge of students and teaching

Formal education and professional work experiences were key factors in how informants came to understand Mr. Giles's content knowledge, but they were also key sources of information informants used to assess the credibility and reliability of his instruction. Often, informants gained a conceptual understanding of these two factors by listening to Mr. Giles talk about his experiences. Acknowledging his educational pathway allowed students to understand the development of his content knowledge. However, verbal pronouncements of formal education were not the only means informants used when gaining an understanding of his content knowledge. Informants addressed the vicarious information they incorporated by watching him perform automotive tasks. In these instances, Mr. Giles's students observed firsthand the connection between automotive knowledge and skills.

A secondary feature addressed by informants in regard to Mr. Giles's professional experiences was the historical knowledge he built over time and would share during instruction. By interpreting the automotive industry's past and linking it to the present, Mr. Giles provided informants a window in which the automotive industry was ever evolving. The picture that emerged from this data was a group of three students who wanted to pursue a career in the skilled trades. They envisioned their future roles in the automotive industry as it continued to evolve.

While Raven was the only participant who addressed the teacher preparation programing that Mr. Giles took to become a certified CTE instructor, it is a noteworthy point of data as this study is focused on effective practices within this profession. Raven was the only participant who was not going to pursue higher education in automotive technology. In this case, her father, a certified mechanic, had provided her with ample instruction prior to her enrollment in the automotive program. Raven addressed why she felt Mr. Giles instruction, in comparison to her father's instruction, was more reliable. The source of this belief was two-fold. First, Mr. Giles had access to more tools and equipment, thus allowing for more complex activities to occur. Secondly, Raven acknowledged that Mr. Giles participated in teacher preparation courses. Raven did not explicitly reference courses, but it appeared that his participation resulted in a deeper understanding of effective instructional methods. Raven's assumptions regarding Mr. Giles's teacher preparation are accurate based on Maine State law governing teaching certifications for CTE instructors.

Surprisingly, Mr. Giles's formal education had great influence on informants. This information resonated with them long after they had entered his program. Formal education and professional experiences were not directly questioned during this study, so it was insightful that

both were addressed by informants. Informants were reassured that Mr. Giles not only possessed a deep level of content knowledge, but that he utilized this knowledge to support their learning.

Content knowledge has also been defined as the knowledge a teacher needs to carry out her or his work teaching a particular subject (Ball, Thames, & Phelps, 2008). Obviously, an automotive CTE instructor needs to know the content they teach and that students are expected to master. However, a striking aspect in the findings is that it appeared that they may need to know more than just what they instruct, especially in the domain of diagnosing and troubleshooting mechanical malfunctions. Data consistently indicated that informants found themselves needing considerable assistance on mechanical issues that were not part of their assigned projects. Often, these malfunctions were unrelated to the work they performed; yet, there were occasions where informants created errors that needed to be corrected. During these moments, Mr. Giles relied on his substantial knowledge of vehicle repair to correct issues. In doing so, informants appeared to gain the understanding that the content knowledge Mr. Giles possessed was not always intertwined with his instructional practices or knowledge of teaching (see Figure 6.3). Informants provided examples of the specialized tools and diagnostic equipment Mr. Giles would use to detect and resolve these issues.

When students' projects presented challenges, and they lacked the knowledge to overcome these difficulties, informants described the process they used to decide when to seek assistance from Mr. Giles. The process included assessing a task's complexity and manageability. Often, informants relied on the social comparisons they made of their peers and/or the vicarious information they gathered by observing Mr. Giles as he worked with others. After they sought support from Mr. Giles, informants addressed how he utilized his knowledge of content to offer solutions to their issues. Data indicated that, rather than giving a direct answer

to resolve the issue, Mr. Giles provided hints as to the proper corrective action. Informants characterized Mr. Giles as always being able to resolve project challenges. This sophisticated professional knowledge appeared to be a key feature of Mr. Giles's content knowledge.

Lastly, informants recognized the professional networks Mr. Giles kept active as part of his role as a CTE instructor. Informants addressed how Mr. Giles interacted with other professionals in the field of automotive technology. By remaining current in his knowledge of the field, Mr. Giles provided informants with a sense of the necessary networking for a career in the automotive service industry. Since he interacted with different area businesses and learned from others in these specialized fields, informants appeared to gain an appreciation for the various industries that comprise the field of automotive technology.

Findings from the analysis of content knowledge lead to several educational implications. First, they lend support to the contention that CTE instructors need a firm base of content knowledge. Findings from this study revealed that a CTE instructor who gained knowledge of content through formal educational routes had a positive effect on his students' confidences in instruction. The professional experiences of Mr. Giles did play a role in helping students understand the content knowledge of their instructor. However, Mr. Giles's involvement in the automotive profession seemed to primarily benefit informants' vicarious experiences, as they gained information on how a professional mechanic worked. Therefore, it would be sensible for teachers to care about their content knowledge, and how to model this knowledge, because clearly, when a CTE instructor possesses deep content knowledge they are able to demonstrate their skills, creating linkages between learning automotive skills and applying automotive skills. As indicated by Colby, "He seems to be more humble, kind of. He doesn't, obviously he's not bragging about his own knowledge really, but he talks about how knowing your stuff is

important. Really, you can see it when you're out in the shop." Having a deep understanding of automotive technology was important to Colby. Acknowledging that Mr. Giles had developed both his content knowledge and skills was an important connection made by Colby as she advanced in her formal education in the automotive industry.

Equally important to the recognition professional experiences play in developing both knowledge and skills, CTE instructors would be wise to consider the importance formal teacher preparation courses have on their ability to deliver reliable instruction. As Raven indicated:

> …he has an actual education with a paper saying that he can teach this stuff, so he
> does know a little bit more than my Dad does. So, I mean, getting the education
> from him is more reliable, to say, than, I mean, getting my Dad, he can teach a lot,
> but he's not anywhere near as smart as Mr. Giles.

Many students in Mr. Giles's course had considerable prior knowledge of automotive repair; however, it appeared that Mr. Giles's formal educational courses in instruction, assessment, and literacy provided them a reliability they considered important for their learning.

It seems wise for administrators to encourage their CTE instructors to partake in professional development designed to support the development of knowledge of content and teaching. A majority of the knowledge Mr. Giles demonstrated focused on the curriculum he taught. Yet, Mr. Giles did, at times, utilize additional knowledge when needing to fix errors beyond what he had asked his students to learn. This approach appears to be related to an understanding of how his curricular knowledge interacts with the design of instruction. In other words, Mr. Giles understood that sequencing particular content for instruction would affect his students' learning outcomes differently. He recognized that using various examples of tasks

would afford students opportunities to go deeper into this content. However, if issues arose, Mr. Giles demonstrated a willingness to resolve issues even if instruction became secondary. As indicated by Maya, "If there's a problem he sticks with it. So I'm learning from him to just keep going with it. And to try other things of what it could be." These vicarious experiences were important to Maya because they developed her diagnostic understanding of resolving automotive issues. While this particular domain appears to be related to instruction, and indeed there appears to be an interrelatedness associated with content knowledge and pedagogical skill, it does offer an interesting perspective on content knowledge. It appears this domain requires an interaction between specific automotive understandings and an understanding of the pedagogical circumstances affecting student learning. One without the other appears less likely to produce effective instruction.

<center>**Discussion of Pedagogical Skills**</center>

To continue the analogy of untying and retying the knots by shifting considerations among the three factors of effective instruction, I provide a visual representation of the two shifts that can be made of pedagogical skills (Figure 6.4 and Figure 6.5). When Mr. Giles looked closely at his pedagogical skills, shifting in the direction of his content knowledge, his understanding of teaching automotive technology was observed with the deference due the quality and level of his instructional skills (see Figure 6.4). Retying these factors to form a knot between them resulted in considerations of the reliability of the information he was providing informants. Unconnected were dispositional considerations related to the task of instructing. This shift helps explain informants' descriptions of their instructor as concerned with the reliability of the information he provides students. Examples from this study included Mr. Giles's integration of technology, traditional teacher demonstrations, and his use of classroom manipulatives.

Figure 6. 4 Conceptual Illustration of the Shift of Pedagogical Skills in the Direction of Content Knowledge

_____
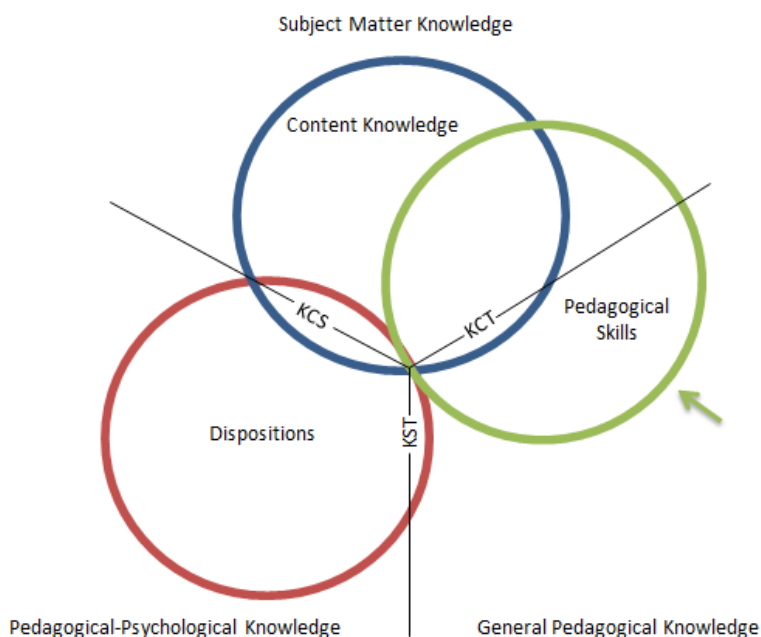
Note: KCS = knowledge of content and students, KCT = knowledge of content and teaching, KST = knowledge of students and teaching

When Mr. Giles looked closely at his pedagogical skills while instructing the informants, shifting in the direction of his dispositions, his understanding of teaching and that of his students was observed with the deference due such interactions (see Figure 6.5). Retying these factors to form a knot between them resulted in considerations workforce preparation and workplace employability skills. Unconnected were dispositional considerations related to content knowledge. This shift helps explain informants' descriptions of their instructor as concerned with developing their workplace employability skills. Examples from this study included Mr. Giles's use of "mutual agreement" assessments techniques, grouping students to promote teamwork, and using timecards.

Figure 6. 5 Conceptual Illustration of the Shift of Pedagogical Skills in the Direction of Dispositions

_____
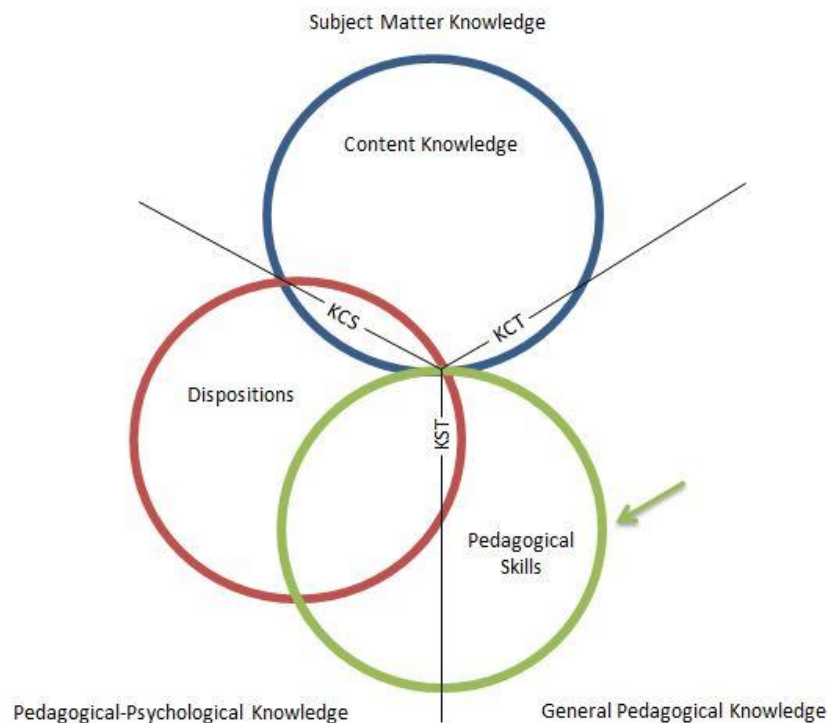
Note: KCS = knowledge of content and students, KCT = knowledge of content and teaching, KST = knowledge of students and teaching

In this study, the concept of pedagogical skill was divided into four domains. Analysis attempted to examine them individually. These domains included instructional strategies, assessment techniques, motivational techniques, and classroom management strategies. However, of these four domains of pedagogy, only two were frequently cited by informants as critical to their learning. These areas included instructional strategies and assessment techniques. This is not to say that the other two areas of pedagogy were unimportant to, or not discussed by, informants. Rather, informants' reports were found to have interrelatedness among these four domains, leading to an analysis that highlighted only certain domains of pedagogy. For example, informants reported that not being formally graded on shop tasks, and instead self-reflecting on timecards (an assessment technique), was motivating to their learning. They also reported that

students in Mr. Giles's program did not require motivation because of their intense interest in the program itself. Therefore, when discussing the pedagogical skills possessed by Mr. Giles, informants most often addressed his instructional approaches and assessment techniques.

Instruction

Mr. Giles was recognized by informants as understanding and incorporating a wide range of instructional methods. These instructional methods included both conventional and progressive forms of instruction. The more conventional approaches included lecture, repeated demonstrations, and memorization. Progressive methods of instruction included project based learning, customized learning tools, and technology integration. Informants acknowledged Mr. Giles's ability to combine this knowledge of these instructional methodologies with his knowledge of automotive technology. In doing so, informants addressed how he made productive use of instructional time by having command of various teaching methods and knowing when and how to apply these methods in promoting their involvement with learning tasks.

When students experienced learning challenges, informants described how Mr. Giles combined his knowledge of instruction with his understanding of individual students. Informants addressed how Mr. Giles interpreted their difficulties by listening to their thinking before offering a new approach. In selecting a particular method for an individual, it appeared that Mr. Giles considered the most likely outcome resulting from its use. These predictions not only focused on the potential learning outcomes, but also the interest students had in the particular concept. In this sense, Mr. Giles also focused his instructional methods by motivating each of the three informants.

This evidence is important because a common criticism of Career and Technical Education instruction is that it is often limited in instructional approaches (Fletcher, Dajajalaksana & Eison, 2012). In fact, when Fletcher, Dajajalaksana, and Eison (2012) surveyed over 1500 CTE instructors, the researchers found that these instructors more frequently reported traditional forms of teaching and learning. When asked what instructional methods they utilized, respondents included questioning, lecture, and whole-group discussions. Conversely, the least frequently reported strategies include video creation, reflective blogs, and synchronous online lecture. These researchers noted that the infrequently used instructional strategies were associated with the integration of technology into the classroom. By utilizing iCar and Electude, two computer-based automotive learning programs, Mr. Giles integrated technology into his CTE classroom. Moreover, informants reported a wide range of instructional methods utilized by Mr. Giles that had a positive effect on their learning.

Groupings

According to Voss, Kunter, and Baumert (2011), effective instructors possess knowledge of instruction and students' aptitudes and abilities. Teachers use this knowledge to activate their students' motivation processes. For Mr. Giles, utilizing a student-centered approach of working in groups and assigning projects requiring a high degree of problem solving appeared to engage informants' motivational processes when learning automotive systems. As discussed earlier in the analysis discussion for Finding #2, Mr. Giles initially assigned less complex tasks and increased task complexity over time. Both Maya and Colby experienced increased motivation given these learning conditions. Informants discussed how grouping students began early in their program. It was Mr. Giles's expectation that every student, at one point during their program,

work with every other student in the class. Other than understanding this condition, informants were not aware of Mr. Giles's grouping process.

By being placed in groups, informants drew on the vicarious experiences they had while working with their male counterparts to alter how they viewed working in a male-dominated program. These vicarious experiences—watching and learning from others—not only influenced informants' ideas regarding the automotive service industry, but also their philosophies about women in this male-dominated profession. In this regard, Maya's statement is critically significant to this study. She essentially experienced interacting positively and professionally with her male counterparts, and her male counterparts learned how to interact with her without resorting to stereotypical gender discrimination, sexual harassment, or female denigration. For his part, Mr. Giles was described as creating contexts in which these issues did not arise within the group work arrangement. Central to the creation of this context was his insistence that all students work with one another. The projects he assigned targeted students within their ability range. Mr. Giles set high expectations for task completion and checked in with groups frequently.

Informants' reports about their experiences working in groups with their male counterparts suggest that they also gained vital career readiness skills. As they acquired the professional skills needed for the technical workplace through group work, informants accepted more responsibility for their own learning. Informants also uniformly questioned their initial identities as nontraditional female students within a male-dominated program. A sense of belonging challenged their preconceived assumptions and translated into what Colby referred to as "working relationships" within the group of students in her classroom.

Lastly, informants spoke about the honor and gratification they felt when Mr. Giles selected them to work with him on a project. Data suggest that he selected informants based on different considerations. Maya was new to automotive repair; therefore, it appears Mr. Giles worked independently with her to begin to engage her in his program. He offered her praise following her completion of this task. Mr. Giles also appeared to select students based on their growing abilities in the program. Colby was asked to "tear down engines" with Mr. Giles. These complex tasks provided her with a sense of accomplishment. She also experienced a level of trust from Mr. Giles that led her to believe she could work more independently.

Assessment

Mr. Giles demonstrated a clear understanding of how utilizing different frames of reference for assessment—social, individual, criterion referenced—impacted informants' understanding of their own skill levels. By possessing knowledge of different forms and purposes of assessments, Mr. Giles affected how informants used the feedback they were provided. For Maya and Colby, who planned to continue into post-secondary education for automotive technology, standardized evaluations were central to this future endeavor. Mr. Giles appears to recognize the significance of these assessments. However, informants also implied that he struggled in the past to prepare his students for these examinations. It appeared former students were a source of this understanding. They shared with him their experiences taking similar, if not the same, assessments with him. According to the informants, Mr. Giles would adjust his test preparation in an effort to have his current students perform at their best.

Informants addressed how Mr. Giles utilized a "mutual agreement" style of assessment for shop projects. By asking students to rate their performance weekly on timecards, informants gained personal agency over their own performance beliefs. Mr. Giles shared his judgements on

these timecards, as well. Informants appeared to benefit from understanding how their self-assessments aligned with Mr. Giles's assessments. Recall that one dimension emerging from the narratives on assessment was that, just as important as it was for informants to believe in themselves, it was also important for Mr. Giles to believe in them. Bandura (1997) suggested that the "self-affirming beliefs of others promote development of skills and a sense of personal efficacy" (p. 101). Employing a feedback loop consisting of mutual agreement appeared to heighten informants' sense of self-efficacy.

Lastly, informants in this study spoke with greater frequency of the verbal persuasions they received from Mr. Giles than any other form of assessment information. In fact, when asked how they assessed their own skill levels, all informants referenced the verbal messages they received from Mr. Giles as the information most illuminating to their automotive self-efficacy. Some researchers have found that, of the four sources of self-efficacy information, females prioritize these verbal persuasive messages in educational and career settings (Butz & Usher, 2015; Zeldin, Britner, & Pajaras, 2008; Zeldin & Pajaras, 2001). Informants seemed to rely on the confidence that came with his verbal persuasive messages. Fortunately, it seems that Mr. Giles understood that it was critical for him to express that confidence to them. In doing so, informants developed stronger career self-efficacy in themselves.

<div align="center">**Implications for Pedagogical Skills**</div>

Findings from the analysis of pedagogical skills lead to several educational implications. First, it seems wise for State of Maine officials to consider strengthening certification standards for Career and Technical Education instructors. Bolstering specific course work in teaching methods could develop a CTE instructor's ability to respond and differentiate their instruction. Starting in 2015, all certified CTE instructors were required to take a four course sequence

focused on gaining pedagogical skills. Courses included: Curriculum and Instruction, Assessment, CTE Shop Safety and Classroom/Lab Management, and Literacy in CTE. While this appears to be a good first step toward improving CTE instruction, findings in this study suggest that an instructor versed in a wide range of teaching approaches is highly effective at delivering vocational content. As informants addressed, Mr. Giles possessed a solid teaching foundation that provided comprehensive and differentiated instruction and reached as many students as possible. "There isn't anything that guy can't teach about cars," Raven said. Colby and Maya agreed. Being knowledgeable about instructional methods was important to them because of their desire to continue in the skilled trades after finishing their high school CTE program.

As part of considering additional course work in teaching methods, State of Maine officials might consider providing CTE schools with professional development around technology integration in the classroom. It was reported that Mr. Giles was successful in utilizing computer-based learning systems into his classroom. Two computer programs were discussed by informants. They included iCar and Electude. The benefit to informants in the use of technology was that they could earn college credits from completing modules on Electude. For two informants, this was invaluable to their goal of entering post-secondary education for automotive technology. Technology use was also found to be more appealing and motivational to student learning because it aligned with their perceived strengths. As indicated by Raven:

 iCar is really helpful. I just follow along with the slideshow. It has words on the

  side of it and a picture and you really have to read the words to be able to figure

  out what the fill-in was. I guess I'm really good at that. So, when he does that, it's

  kind of a good thing for me (Raven, personal interview, March 28, 2018)

Other students might find the integration of technology as appealing and motivating as Raven.

Second, State of Maine officials might consider strengthening certification standards for Career and Technical Education instructors in the area of assessment. While there is little doubt that the assessment course offered to CTE instructors provides a broad application of assessment techniques, there may not be enough time spent on developing this knowledge to have a transformative effect. Essentially, taking one course in assessment may result in an instructor adopting only one type of assessment. The concern is that the selection of the assessment technique might not be based on what works best for students, but rather what is most comfortable for the instructor. A key finding was that Mr. Giles was able to provide students with different frames of references for assessment. Seeing their performance from differing point of view created a constellation of judgments regarding their achievement in the automotive technology program. Perhaps the most impactful assessment technique to informants personally was the "mutual agreement" technique he used on their timecards. In this case, students were asked to self-reflect on their own performance before Mr. Giles rendered his judgements of their performance. Often it was reported that he actually ranked students higher than themselves. Informants appreciated this assessment technique because it allowed them to gain a sense of the expectations for the workplace.

Third, teachers should care about their level of pedagogical knowledge because of the social construction and social impact they have working with nontraditional female students. Grouping students was another instructional strategy informants felt was highly beneficial to their learning. It seemed that this instructional approach provided informants opportunities to develop working relationships with the male counterparts. These interactions decreased informants' concerns about belonging in a male-dominated classroom. Informants reported

acquiring professional skills required in an automotive shop through participating in group work, as well. As indicated by Colby, who initially struggled with working alongside her male counterparts:

> Honestly, at first, I don't get along with people that well. I have horrible trust issues when it comes to people. So, at first I hated that idea so much. I was like, 'You got to frigging be kidding me? I don't even know this guy and I got to work on a car with him? Just be next to him?' Like, 'No. Stay away.' But honestly, after like a little bit of working with the guys out in the shop, I realized it wasn't going to be as bad as I thought it was going to be. Definitely made me realize I could work with other people and not completely hate it (Colby, personal interview, March 3, 2018).

Other students who are isolated from their peers due to the teaching methods employed in their traditional high school, or who are withdrawn due to the circumstances of their situations, may experience the same positive benefits to their social and employability skills through this type of project-based grouping.

Lastly, a source of valuable insight and sapient advice to businesses leaders employing skilled workers and the CTE schools developing their career interests was presented by Maya. For her, visualizing a pathway to transition into the skilled trades was important. She said:

> Mr. Giles always tells us we're the next generation. All the mechanics these days are really old so they need people, young people to go in and do some mechanics stuff because, if not, we're not going to have any. So, if I ran an automotive shop, I'd be here at this school every day looking at these kids (Maya, personal interview, March 10, 2018).

It seems prudent for business leaders, statewide labor organizations, and school administrators to continue to develop partnerships in which students gain valuable information regarding employment in the skilled trades. Beyond reaching out students, Mr. Giles's was a valuable asset in providing information to his students who had a desire to enter the trades. Informants addressed how Mr. Giles continued to network with professionals within the automotive industry to support his instruction. This information made it into his classroom during discussion of the future of the career. Therefore, CTE teachers, provided current and accurate information, would be wise to assist their students to see past the "right now" of their education to apply for opportunities later.

Discussion of Dispositions

To continue the analogy of untying and tying the knots by shifting considerations among the three factors of effective instruction, I provide a visual representation of the two shifts that can be made of an instructor's dispositions (Figure 6.6 and Figure 6.7). When Mr. Giles looked closely at his dispositions, shifting in the direction of his content knowledge, his understanding of the content he teaches and the status of his nontraditional female students was observed with the deference due such experiences of his female students (see Figure 6.6). Retying these factors to form a knot between them resulted in his belief that effort and commitment were paramount to success in his program regardless of gender; yet, Mr. Giles recognized the potential adversity his female students might experience while learning automotive technology in a male-dominated classroom. Unconnected were dispositional considerations related to the task of instructing. This shift helps explain informants' descriptions of their instructor as believing that all students can learn automotive technology. Examples from this study included Mr. Giles's recognition of

informants' studiousness in learning and developing their skills, the verbal persuasions he

provided, and appointing them Tour Master.

Figure 6. 6 Conceptual Illustration of the Shift of Dispositions in the Direction of Content Knowledge

_____
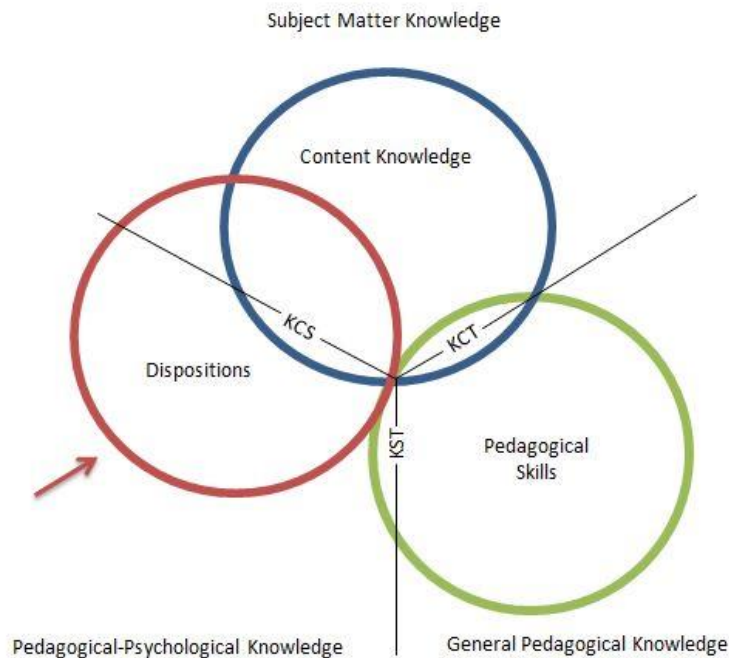
Note: KCS = knowledge of content and students, KCT = knowledge of content and teaching, KST = knowledge of students and teaching

When Mr. Giles looked closely at his dispositions, shifting in the direction of his

pedagogical skills, his understanding of teaching and that of his students was observed with the

deference due such effects (see Figure 6.7). Retying these factors to form a knot between them

resulted in considerations of the social/emotional concerns of his students, a focus on

instructional challenges rather than on behavioral issues, and an attempt at equity between

academic pursuits and live work activities. Unconnected were dispositional considerations

related to content knowledge. This shift helps explain informants' descriptions of their instructor

as recognizing the characteristics and heterogeneity of his students. Examples from this study

included Mr. Giles's persistent, patient, and supportive attitude while instructing.

Figure 6. 7 Conceptual Illustration of the Shift of Dispositions in the Direction of Pedagogical Skills
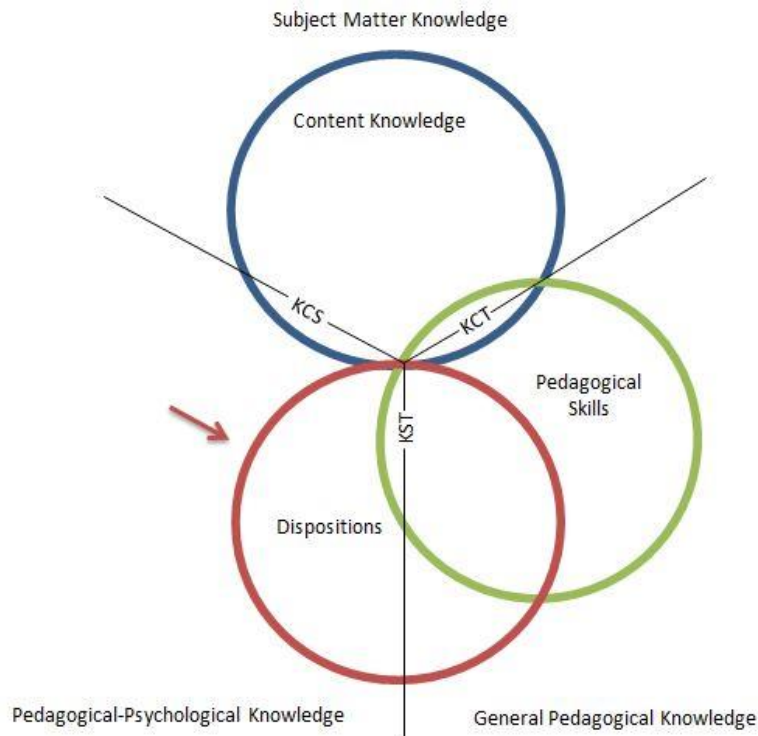
Note: KCS = knowledge of content and students, KCT = knowledge of content and teaching, and KST = knowledge of students and teaching

Bandura (1977) observed that teachers act as enabling influences in helping students

develop resilience to adversity. Teachers often serve to validate one's own self-beliefs. The

modeling provided by teachers can be especially critical in this regard because "self-appraisals

are partly based on the opinions of others who presumably possess diagnostic competence gained

through years of experiences with aspirants in a given field" (p. 104). The influence of

persuaders, such as teachers, is significant when they are knowledgeable about the activity in

which people are engaged. Mr. Giles strove to treat male and female students equally while at the

same time disbelieving in a null environment where all students were viewed singularly. Rather,

according to informants, all students were viewed heterogeneously. Mr. Giles overtly recognized the achievements of his nontraditional female students; however, he also recognized the achievements of his outstanding students. Regardless of gender, this recognition was merit based.

Informants generally viewed this belief in a positive manner. They seemed to develop an appreciation for merit based learning and recognition. Yet, informants addressed the fact that Mr. Giles often expressed an appreciation for his nontraditional female students. The source of his appreciation seemed to be that, unlike many of their male peers, informants entered his program with a studious determination to succeed in his program.

Informants received recognition for their efforts and commitment when they excelled in the program. The first form of recognition was to be appointed a tour leader. In this role, informants became the face of the automotive program. By having female students lead tours, Mr. Giles seemed aware that they often confronted the norms and assumptions made about his male-dominated program. Mr. Giles also had students available to help other students who fall behind on academic work. Often, the student offering support to their fellow classmates were his nontraditional female students. This appeared to be the case precisely because of their efforts in his program, rather than because of their gender.

Teacher dispositions have been defined as the values, commitments and professional ethics that influence behaviors toward students and affect student learning, motivation, and development. According the Maine Department of Education, dispositions are guided by beliefs and attitudes related to values such as caring, fairness, honesty, responsibility, and social justice (Maine DOE, Chapter 15, Section II, 2016). There were two important findings that emerged from the analysis of the dispositional attitudes Mr. Giles displayed. The first finding was the

patience he exhibited when informants struggled to learn a concept. In being patient, Mr. Giles challenged how informants experienced their vocational education. For Colby, it seemed she was used to teachers who were upset with her when she struggled to understand a concept. She felt rushed and anxious under these conditions. Yet, Mr. Giles displayed no ill will when assisting her through a trouble spot in her understanding. In fact, two informants referenced the amount of time spent with them in order for him to remediate their learning.

The second finding illustrated the importance of recognizing that female students may encounter different forms of harassment because of their gender. Given the fact that the automotive technology program has been historically male-dominated, it stands to reason that female students entering this program stand a greater chance of being victims of this behavior. For Mr. Giles, being supportive and proactive in the face of this reality was not only necessary to reduce frustrations with his female students, but also vital to informants' successful completion of his program. Recall how Mr. Giles advocated for the expulsion of Colby's sexual harasser. If Mr. Giles had not been as forceful, Colby may have left his program. However, Mr. Giles seemed to acknowledge the agency some students assert when dealing with these types of issues. In this case, Raven wanted Mr. Giles to support her by listening to her frustrations rather than address the issue himself. Mr. Giles appeared to understand her wishes. Through the conversation, Raven appeared to be able to refocus her energies on learning.

Findings from the analysis of Mr. Giles's dispositions lead to several educational implications. First, it seems wise for administrators to recognize the need for continued training in gender equity in CTE classrooms. This is especially important given the implication from this study that positive social benefits were associated with grouping nontraditional female students with their male counterparts. National organizations such as the National Coalition for Women

and Girls in Education and National Alliance for Partnerships in Equity offer training programs.

Partnering with these organizations could help to alleviate, and even eliminate, this type of

negative behavior. Mr. Giles understood these conditions; he did his best to be proactive and

intervene when issues occurred. As indicated by Colby:

> [Mr. Giles's interventions] definitely made me feel liked I belonged there. Even
>
> when I was the only girl in the class. He honestly made me feel like he was taking
>
> seriously what they were doing. And, that made me realize that, yeah, I belong
>
> here whether the guys like it or not (Colby, personal interview, March 3, 2018).

It appears that instructors are continually faced with these issues. Both Perkins IV and

Title IX address these concerns. In the laws, support services for nontraditional student, both

male and female, are recommended and required. In this case, Mr. Giles did suggest that if his

nontraditional female students were experiencing issues related to their gender, that they seek out

support through these services. However, what appears to go unaddressed is how to confront and

remediate harassment and stereotyping by male students. While Mr. Giles does not appear to

believe in a null environment, where gender is not recognized, at times it appears he needs

additional support in dealing with his male students rather than simply recommending that his

female student go talk to a counselor.

 Second, teachers should care that their students need an instructor who legitimizes their

interests. Gordon (2014) made this recommendation as a way to broaden the opportunities for

female CTE students. Mr. Giles was keen to recognize that these informants were serious in their

desire to develop their interests in automotive diagnostics and repair. He promoted the belief that

success in his program was a matter of effort and commitment and not of gender. If any student

with an interest in learning automotive technology put forth the effort they could achieve in his

program. Yet, Mr. Giles openly promoted informants' nontraditional status as part of their

commitment when recruiting potential students. According to a model of academic choice

developed by Eccles (2011), academic choice and achievement is based both on the expectations

for success and the value of the activity. Mr. Giles, then, was wise to promote to potential female

students the successes of other females in his program. As indicated by Colby:

> When we're doing the tours and there's a few girls that come on the tours, he's
>
> like, 'Honestly. Having these girls in the class, they outdo the guys in the class
>
> because they pay attention more and take it more seriously than most guys.' So,
>
> that made me feel good (Colby, personal interview, March 18, 2018).

This encouragement may just be enough for these potential students to sign up for the

automotive technology program.

Lastly, CTE teachers should recognize the content they teach is often brand new to their

students because when CTE instructors view their students as novice learners of new material

they are more likely to reduce the frustrations associated the teaching-learning process.

Informants addressed the attitude Mr. Giles displayed while working with them as their

instructor. Students recognized the patience he demonstrated when learning became challenging.

He was reported by informants to be unconcerned with how long it took to support a student

through a difficulty in their learning. Mr. Giles remained calm when a student experiences a

learning struggle. In all, it appeared that Mr. Giles anticipated students would have difficulties

with his curriculum. Given the information he was teaching was most likely brand new to many

of his students, it appears he was able to recognize the level of anxiety this might produce.

Therefore, he was patient. Students sensed wiliness on his part to want students to learn because

of this approach. "…he would be really patient with me. He wouldn't get ticked off, or

whatever," Colby reported. Without question, other students can benefit from a CTE instructor who understands the challenges of learning technical information and developing specialized skills for the first time.

Recommendations for Future Research

Several recommendations for future research are warranted. Because this study relied on a behavioral framework to document teaching and learning practices of this CTE instructor, it might be clear that this approached underestimated the value of students working together to build their knowledge of automotive repair. This is unfortunate, as there appears to be another picture that emerges in the data regarding the pedagogical skills possessed by Mr. Giles. First, it seems vocabulary acquisition was paramount in almost all instructional endeavors. Second, grouping student and assigning them project based learning opportunities appears to have required some level of knowledge of the students' skill levels. Both of these concepts have been explored extensively from a constructivist framework in traditional classroom settings; however, there are few, if any, studies utilizing a constructivist framework to explore how these theories operate in a CTE classroom. Therefore, future research on the effective practices of CTE instructors may want to employ a constructivist framework when examining this phenomenon.

Secondly, data supports the critical importance Mr. Giles's verbal persuasions had on informants. Yet, the questions I framed for this study were not finite enough to detect the content of these messages. What was important in them? Were there contextual features that made these verbal persuasions more powerful? Under what conditions did these messages have the most impact? A study focused on this factor could provide valuable insights into the content and function of these verbally persuasive messages.

Third, while this study allowed for the opportunity of nontraditional female students to reflect on their experiences learning from their CTE instructor in the automotive technology program, it would be important to hear directly from CTE instructors who teach in traditional male-attended programs. Understanding how they perceive the knowledge they possess, the instructional skills they employ, and the beliefs and attitudes they hold toward teaching would provide valuable insights regarding the composition of effective CTE instruction for nontraditionally enrolled students. In addition, researchers might gain a better understanding of effective CTE instruction in gender imbalanced programs by including the voices of both male and female students who attend these programs. Cross-case analysis of these informants' perceptions of effective instruction could reveal potential differences.

Lastly, the informants' stories presented in Chapter 4 are compelling examples of the modern American adolescent transitioning from secondary school and into adult life. The stories offered insights into the decision making process of these young women as they navigated their choices to enter the automotive technology program. Further exploring the factors associated with the career decision-making process for women who wish to enter traditionally male-dominated CTE programs could offer deeper insights into their thinking and experiences.

Limitations

Issues of sampling, representativeness, and generalizability are important in qualitative research, especially when there are implications for educational policy and practice (Maxwell, 2013). Given this, the nontraditional female students interviewed for this study cannot speak for all nontraditional female students. While I took safeguards to maximize validity and reliability of the findings, caution must be exercised when making inferences about other students in similar

situations. Also, the number of informants may have limited the range of information provided by them.

Due to the fact that the qualitative design of this study required me to be the primary instrument for gathering data, it is important to consider a cautionary note regarding the potential for bias in the informants' responses, as well as in my own interpretations. Given this concern, efforts were made to ensure reliability and validity, and I tried to safeguard against this issue in the research design. Moreover, it should be noted that responses from these nontraditional female students may have been influenced by the fact that they were being interviewed by a man.

Lastly, there may well have been other strategies employed by Mr. Giles, and there may have been things he should have done that he did not do, but the findings in this study were what the young women reported. Therefore, this was a case of an instructor through the lens and experiences of these students. Given that Mr. Giles did not participate directly in this study, it would be imprudent for the reader to assume that these findings are a comprehension representation of his instruction.

Conclusion

Career and Technical Education (CTE) schools continue to be challenged with an underrepresentation of female students who want to pursue traditionally male, industry and technical training programs and careers. As stated earlier, this reality is despite the reauthorization of the Carl D. Perkins Career and Technical Education Improvement Act of 2006 (Perkins IV). This law aimed to reduce the structural barriers thought to inhibit female participation in predominantly male-attended CTE programs. The primary factor for increasing female participation in these programs was the significant gender stratification found in the American workforce. Women's involvement in the labor market was almost equal to that of men,

yet women were largely employed in low-wage, low-mobility, and low-skilled occupations. CTE was viewed, then, as a pragmatic way to increases the occupational skills of women to potentially reducing the imbalance found in the workforce.

Not surprisingly, enrollment trends in CTE courses nationwide continue to demonstrate gender imbalances seen in the labor market. The State of Maine, on the other hand, has made modest gains in increasing female students' enrollment in nontraditional CTE programs. This could be because of the traditions of skilled labor in our state, where all students see value in pursuing a skilled career. However, it could also be the evolution of the CTE schools in Maine that recognize that effective instruction is a key factor in the success of all students. Given Mr. Giles's deep content knowledge, his vast pedagogical skills, and his positive dispositions toward the nontraditional female students that enter his program, it is not hard to believe that he qualifies as one of these effective instructors. The idea before us, then, is to expand on what we know of effective instruction for nontraditional female students to other instructors who teach in historically male-dominated programs. In doing so, the hope is to shift gender imbalances and create an economy where all students have access to high-skilled, high-paying careers

REFERENCES

Adams, E. (2010). A framework for the preparation of accomplished career and technical education teachers. *Journal of Career and Technical Education*, *25*(1), 21-34.

An Act to Ensure Effective Teaching and School Leadership, ME Pub. L. 1858, Chapter 635, 2012.

Anderman, E. M., & Young, A. J. (1994). Motivation and strategy use in science: Individual differences and classroom effects. *Journal of Research in Science Teaching*, *8*, 811-831. doi: 10.1002/tea.3660310805

Astleitner, H. (2005). Principles of effective instruction—General standards for teachers and instructional designers. *Journal of Instructional Psychology*, *32*(1), 3-8.

Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education*, *59*(5), 389-407.

Bandura, A. (2006).Toward a psychology of human agency. *Perspectives on Psychological Science*, *33*(2), 43-55. doi:10.1111/j.1745-6916.2006.0011.x

Bandura, A. (2005). Guides for constructing self-efficacy scales. In F. Pajares, & T. Urdan (Eds.) *Self-Efficacy Beliefs of Adolescents*. Greenwich, CT: Information Age Publishing.

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Baumert, J., Kunter, M., Blum, M. B., Voss, T., Jordan, A., Klusmann, U., Krauss, S., Neubrand, M., & Tsai, Y. (2010). Teacher's mathematical knowledge, cognitive activation in the classroom, and student progress. *American Education Research Journal*, *47*(1), 133-180.

Betz, N. E. (1989). Implications of the null environment hypothesis for women's career development and for counseling psychology. *The Counseling Psychologist*, *17*(1), 136-144. doi: 10.1177/0011000089171008

Betz, N. E., & Hackett, G. (1981). The relationship of career-related self-efficacy expectations to perceived career options in college women and men. *Journal of Counseling Psychology*, *28*(5), 399-410.

Blackhurs, A. E., & Auger, R. W. (2008). Precursors to the gender gap in college enrollment: Children's aspirations and expectations for their futures. *Professional School Counseling*, *11*(3), 149-158.

Bowen, G. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal*, *9*(2), 27-40. doi: 10.3316/QRJ0902027

Boyle, G. J., Matthews, G., & Saklofske, D. H. (2008). Personality measurement and testing: An overview. In G. Boyle, G. Matthews, & D. Saklofske (Eds.) *The Sage Handbook of Personality Theory and Assessment.* Los Angeles, CA: Sage.

Britner, S. L., & Pajares, F. (2001). Self-efficacy beliefs, motivation, race, and gender in middle school science. *Journal of Research in Science Teaching*, *43*, 485-499. doi: 10.1002/tea.20131

Bussey, K., & Bandura, A. (1999). Social cognitive theory of gender development and differentiation. *Psychological Review*, *106*, 676-713.

Butz, A. R., & Usher, E. L. (2015). Salient sources of early adolescents' self-efficacy in two domains. *Contemporary Educational Psycholog*y, *42*(1), 49-61.

Calhoun, C. C., & Finch, A. V. (1982). *Vocational education: Concepts and operations*. Belmont, CA: Wadsworth.

Carl D. Perkins Career and Technical Education Improvement Act of 2006. (2006). *The Library of Congress*. Retrieved from https://www.congress.gov/109/plaws/publ270/PLAW-109publ270.pdf

Carroll, J. (1963). A model for school learning. *Teachers College Record*, *64*, 723-733.

Choi, N. (2005). Self-efficacy and self-concept as predictors of college students' academic performance. *Psychology in the Schools*, *42*, 197-205. doi: 10.1002/pits.20048

Clark, R. W., Threeton, M. D., & Ewing, J. C. (2010). The potential of experimental learning models and practices in career and technical education and career and technical teacher education. *Journal of Career and Technical Education*, 25(2), 46-62. doi:10.21016/jcte.v25i2.479

Coladarci, T., Cobb, C. D., Minium, E. W., & Clarke, R. B. (2011). *Fundamentals of statistical reasoning in education* (3rd Ed.). Danvers, MA: Wiley.

Collins, B. J., Meyer, R. D., & Burris, C. J. (2014). Gender differences in the impact of leadership styles on subordinate embeddedness and job satisfaction. *Leadership Quarterly*, *25*(4), 660-671.

Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches.* Los Angeles, CA: Sage.

Darling-Hammond, L. (2000). Teacher quality and student achievement: A review of state policy evidence. *Education Policy Analysis Archives*, *8*(1), 1-44.

Darling-Hammond, L., Berry, B., and Thoreson, A. (2001). Does teacher certification matter? Evaluating the evidence. *Educational Evaluation and Policy Analysis*, *34*, 12-25.

Doolittle, P. E., & Camp, W. G. (1999). Constructivism: The career and technical education perspective. *Journal of Career and Technical Education*, *16*(1), 23-46.

Eardley, F., & Manvell, J. L. (2006). Legal remedies for girls' under-representation in nontraditional career and technical education. *International Journal of Manpower*, *27*(4), 396-416.

Eccles, J. S. (1986). Gender-roles and women's achievement. *Educational Researcher*, *15*(6), 15-19.

Eccles, J. S. (1987). Gender roles and women's achievement-related decisions. *Psychology of Women Quarterly*, *11*, 135-172.

Eccles, J. S. (2011). Understanding educational and occupational choices. *Journal of Social Issues*, *67*(3), 644-648.

Feingold, A. (1992). Good-looking people are not what we think. *Psychological Bulletin*, *111*(2), 304-341.

Fletcher, E. C., Djajalaksana, Y., & Eison, J. (2012). Instructional strategy use of faculty in career and technical education. *Journal of Career and Technical Education*, *27*(2), 69-83.

Friedel, J. M., Cortina, K. S., Turner, J. C., & Midgley, C. (2007). Achievement goals, efficacy beliefs and coping strategies in mathematics: The roles of perceived parent and teacher goal emphasis. *Contemporary Educational Psychology*, *32*, 434-458. doi: 10.1016/j.cedpsych.2006.10.009

Gilbert, L. A., Hallett, M., & Eldridge, N. S. (1994). Gender and dual-career families: Implications and applications for the career counseling of women. In W. B. Walsh & S. H. Osipow (Eds.), *Contemporary topics in vocational psychology. Career counseling for women* (pp. 135-164). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Goe, L., Bell, C., & Little, O. (2008). *Approaches to evaluating teacher effectiveness: A research synthesis.* Washington, DC: National Comprehensive Center for Teacher Quality. Retrieved from: https://www.wested.org/wp-content/uploads/goe-research-synthesis.pdf

Goldharber, D. & Anthony, E. (2007). Can teacher quality be effectively assessed? National board certification as a signal of effective teaching. *The Review of Economics and Statistics*, *89*(1), 134-150.

Gordon, H. R. D. (2014). *The history and growth of career and technical education in America* (4th ed.). Long Grove, IL: Waveland.

Grey, K. & Walter, R. (2001). *Reforming career and technical education teacher licensure and preparation: A public policy synthesis.* Columbus, OH: The Ohio State University National Dissemination Center for Career and Technical Education.

Hackett, G., & Betz, N. E. (1989). An exploration of the mathematics self-efficacy/mathematics performance correspondence. *Journal for Research in Mathematics Education*, *20*, 261-273.

Hackett, G., & Betz, N. E. (1981). A self-efficacy approach to the career development of women. *Journal of Vocational Behavior*, *18*, 326-339.

Hayes, R. (1989). Men in female-concentrated occupations. *Journal of Organizational Behavior*, *10*(3), 201-212.

Hayward, G., & Benson, C. (1993). *Vocational-technical education: Major reforms and debates 1917-present*. U. S. Department of Education Office of Vocational and Adult Education. ED/OVAE93-7. http://www.eric.ed.gov/PDFS/ED369959.pdf

Hill, H. C., Rowan, B., & Ball, D. L. (2005). Effects of teachers on mathematical knowledge for teaching on student achievement. *American Educational Research Journal*, *42*(2), 371-406.

Huang, C. (2013). Gender differences in academic self-efficacy: A meta-analysis. *European Journal Psychology in Education*, *28*(1), 1-35.

Jiamu, C. (2010). The great importance of the distinction between declarative knowledge and procedural knowledge. *Psychological Analysis*, *4*(11), 559-566.

Kazis, R. (2005). *Remaking career and technical education for the 21st century: What role for high school programs?* Washington, DC: Aspen Institute.

Kommer, D. (2006). Boys and girls together: A case for creating gender-friendly middle school classrooms. *Journal of Educational Strategies*, *79*(6), 247-251.

Köning, J., Blömeke, S., Paine, L., Schmidt, W. H., & Hsieh, F-J. (2011). General pedagogical knowledge of future middle school teachers: On the complex ecology of teacher education in the United States, Germany, and Taiwan. *Journal of Teacher Education*, *62*(2), 188-201.

Lent, R. W., Brown, S. D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behavior*, *45*, 79-122.

Lent, R. W., Brown, S. D., & Larkin, K. C. (1986). Self-efficacy in the prediction of academic performance and perceived career options. *Journal of Counseling Psychology*, *33*(3), 265-269.

Lent, R. W., Lopez, F. G., & Bieschke, K. J. (1993). Predicting mathematics-related choice and success behavior: Test of an expanded social cognitive model. *Journal of Vocational Behavior*, *42*, 223-236.

Lerose, S., Ratelle, C. F., Guay, F., Senecal, C., & Harvey, M. (2006). Trajectories of science self-efficacy beliefs during the college transition and academic and vocational adjustment in science and technology programs. *Educational Research and Evaluation*, *12*(4), 373-393.

Levine, J., & Hoffern, C. A. (2006) Adolescents' conceptions of work: What is learned from different sources during anticipatory socialization? *Journal of adolescents Research*, *21*, 647-669.

Lopez, F. G., Lent, R. W., Brown, S. D., & Gore, P. A. (1997). Role of social-cognitive expectations in high school students' mathematics-related interests and performance. *Journal of Counseling Psychology*, *44*, 44-52.

Lufkin, M. E., Wiberg, M. M., Jenkins, C. R., Berardi, S. L. L., Boyer, T., Eardley, E., & Huss, J. (2007). Gender equity in career and technical education. In S. Klein, B. Richardson, D. Grayson, L. Fox, C. Kramarae, D. Pollard, & C. Dwyer (Eds.), *Handbook for Achieving Gender Equity through Education*, (pp. 420-442). Mahwah, NJ: Lawrence Erlbaum Associates.

Lynch, R. L. (2000). New directions for high school career and technical education in the 21st century (ED-99-CO-0013). Office of Research and Educational Improvement. Washington, D.C. Retrieved from ERIC database 5/4/2016.

Maine Department of Education Office of Career and Technical Education. (2017). *Maine career clusters*. Retrieved from htts://maine.gov/doe/cte/resources/clusters/html

Maine Department of Education. (2014). *Maine DOE teacher performance evaluation and professional growth model: A handbook and implementation guide for school administrative units*. Retrieved from htts://www1.maine.gov/doe/effectiveness/documents/Maine-TPEPG-Model.pdf.

Maine Department of Education. (2014). *Rule chapters for the department of education: Chapter 115, Part I & II.* Retrieved from http://www1.maine.gov/sos/cec/rules/05/chaps05.htm

Maine Department of Education Office of Career and Technical Education. (2014). *Secondary accountability measures* [Data file]. Retrieved from http://www.maine.gov/doe/cte/reports/documents/Secondary%20Accountability%20Measures.pdf

Maine Department of Education Office of Career and Technical Education. (2013). *Five year Perkins state plan*. Retrieved from www.maine.gov/doe/cte/resources/ documents/5%20year%20plan.pdf

Maine Department of Education Office of Career and Technical Education. (2007). *Maine state standards of services for students who are members of special populations*. Retrieved from http://www.maine.gov/doe/cte/laws/perkins.html.

Mayer, R. E. (2011). *Applying the Science of Learning*. Upper Saddle River, NJ: Pearson.

Mastracci, J. B. (2004). *Breaking out of the pink-collar ghetto: Policy solutions for non-college women*. New York, NY: M. E. Sharpe.

Maxwell, J. A. (2013). *Qualitative research design: An interactive approach*. Los Angeles, CA: Sage Publications.

Meeder, H. (2008). The Perkins act of 2006: Connecting career and technical education with the college and career readiness agenda. Achieve, Inc. http://www.achieve.org/files/Archieve-CTEPolicyBrief-02-07-08.pdf.

Merriam, S. (2002). *Qualitative research in practice: Examples for discussions and analysis*. San Francisco, CA: Jossey-Bass.

Miles, M. B., Huberman, M. A., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd Ed.). Los Angeles, CA: Sage Publications.

Miura, I. T. (1986, April). Understanding gender differences in middle school computer interest and use. In E. B. Mandinach (Chair), *Gender differences in computing: Policy implications*. Symposium conducted at the annual meeting of the American Educational Research Association, San Francisco.

Morgan, J. J. (2015). *Self-perceived personality characteristics of award-winning career and technical education teachers and award-winning core subject teachers throughout the United States of America.* (Unpublished doctoral dissertation). Auburn University, Auburn, Alabama.

Moustakas, C. (2014). *Phenomenological research methods*. Thousand Oaks, CA: Sage Publications.

National Alliance for Partnerships in Equity (NAPE). (2006). *Guide for program improvement for Perkins IV: Nontraditional CTE program participation and completion.* Washington, D. C.: Office of Vocational and Adult Education, U.S. Department of Education. http://www.napequity.org/nape-content/uploads/Guide-for-Program-Imporvement-Perkins-IV.pdf.

National Center for Educational Statistics (NCES). (2012). *Fast facts: Degrees conferred by sex and race*. Washington, D. C.: Department of Education.

National Coalition for Women and Girls in Education (NCWGE). (2014). *Career and technical education: A path to economic growth.* Retrieved from: https://www.ncwge.org/TitleIX45/Career%20and%20Technical%20Education.pdf

National Research Center for Career and Technical Education (NRCCTE). (2013*). Industry-recognized credentials.* http://nccte.louisvielle.edu/core-issues/industry-recognized-credentials.

Owen, S. V., & Froman, R. D. (1988). *Development of a College Academic Self-Efficacy Scale*. Paper presented at the 1998 annual meeting of the National Council in Measurement in Education, New Orleans, LA.

Pajares, F., Hartley, J., & Valiante, G. (2001). Response format in writing self-efficacy assessment: Greater discrimination increases prediction. *Measurement and Evaluation in Counseling and Development, 33*(4), 214-221.

Pajares, F., Johnson, M. J., & Usher, E. L. (2007). Sources of writing self-efficacy beliefs of elementary, middle, and high school students. *Research in the Teaching of English*, *42*(1), 104-120.

Pajares, F., & Valinate, G. (1997). Influence of writing self-efficacy beliefs on the writing performance of upper elementary students. *Journal of Educational Research*, *90*, 353-360.

Patton, M.Q. (1990). *Qualitative Research and Evaluation Methods*. Los Angeles, CA: Sage Publications, Inc.

Powell, W. &, Kusuma-Powell, O. (2012). Planning for personalization. *Educational Leadership*, *9*(5), 52-55.

Riegle-Crumb, C., King, B., Gordsky, E., & Muller, C. (2012). The more things change, the more they stay the same? Prior achievement fails to explain gender inequality in entry into STEM college majors over time. *American Educational Research Journal*, *49*, 1048-1073. doi: 10.3102/0002831211435229

Rojewski, J. W. (2002). Preparing the workforce of tomorrow: A conceptual framework for career and technical education. *Journal of Vocational Education Research*, *27*(1), 7-43.

Ruthland, S. K., & Bremer, C. D. (2004). Professional development needs of novice career and technical education teachers. *Journal of Career and Technical Education*, *19*(1), 23-32.

Saldaña, J. (2013). *The coding manual for qualitative researchers*. Los Angeles, CA: Sage.

Sandlin, J. A. (2004). "It's all up to you": How welfare-to-work education programs construct workforce success. *Adult Education Quarterly*, *54*(2), 89-104. doi: 10.1177/07417136032602274

Seidel, T., & Shavelson, R. J. (2007). Teaching effectiveness research in the past decade: The role of theory and research design in disentangling meta-analysis results. *Review of Educational Research*, *77*(4), 454-499.

Seidman, I. (2013). *Interviewing as qualitative research: a guide for researchers in education and the social sciences.* New York, NY: Teachers College Press.

Schunk, D. H., & Meece, J. L. (2006). Self-efficacy development in adolescence. In F. Pajares and T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (71-96). Greenwich, CT: Information Age Publishing.

Schunk, D. H., & Hanson, (1985). Peer models: Influence on children's self-efficacy and achievement. *Journal of Educational Psychology*, *77*, 313-322.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education Information*, *22*, 63-75.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, *57*(1), 1-22.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, *15*(2), 4-14.

Slavin, R. E. (1984). Quality, appropriateness, incentive, and time: A model for instructional effectiveness. *International Journal of Education Research*, *21*(2), 141-157.

Stone, J. R. & Aliaga, O. A. (2003). *Career and technical education, career pathways, and work-based learning: Changes in participation 1997-1999*. St. Paul, MN: National Research Center for Career and Technical Education, University of Minnesota.

Strauss, A., & Corbin, J. (1990). *Basics of Qualitative Research*. Newbury Park, CA: Sage.

Thomas, C. N. (2013). Considering the impact of preservice teacher beliefs on future practice. *Intervention in Schools and Clinics*, *49*(4), 230-236. doi: 10.1177/1053451213509490

Title IX of Educational Amendments of 1972, 20 U.S.C., Section1681

Toglia, T. V. (2013). Gender equity issues in CTE and STEM education. *Tech Directions*, *72*(7), 14-17.

U. S. Census Bureau. (2012). Labor force, employment, and earnings. Retrieved from http://census.gov/prod/2011pubs/12statab/labor.pdf

U. S. Department of Education. (2009). Career/technical education statistics. Retrieved from http://nces.ed.gov/surveys/ctes/tables/glossary_secondary.asp

U. S. Department of Education (2012). *Investing in America's future: A blueprint for transforming career and technical education.* Office of Vocational and Adult Education. Washington, D. C.

U. S. Department of Labor. (2014). Nontraditional occupations of employed women in 2014. http://www.dol.gov/wb/stats/NontraJobs_2014.htm

U. S. Department of Labor. (2014). Quick facts on nontraditional occupations for women. Retrieved from http://www. dol.gov/wb/stats/NontraJobs_2014.htm

Usher, E. L., & Pajares, F. (2008). Sources of self-efficacy in school: Critical review of the literature and future directions. *Review of Educational Research*, *78*(4), 751-796. doi:10.3102/0034654308321456

Usher, E. L., & Pajares, F. (2006). Sources of academic and self-regulatory efficacy beliefs of entering middle school students. *Contemporary Educational Psychology*, *31*, 125-141. doi: 10.1016/j.cedpsych.2005.03.002

Verloop, N., Van Driel, J., & Meijer, P. (2011). Teacher knowledge and the knowledge base of teaching. *International Journal of Educational Research*, *35*, 441-461.

Voss, T. Kunter, M., & Baumert, J. (2011). Assessing teacher candidates' general pedagogical-psychological knowledge: Test construction and validation. *Journal of Educational Psychology*, *103*(4), 952-969.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Walker, R. J. (2008). Twelve characteristics of an effective teacher: A longitudinal, qualitative, quasi-research study of in-service and pre-service teachers' opinions. *Educational Horizons, 87*(1), 61-68.

Weiss, I. R., & Miller, B. (2006). Deepening Teacher Content Knowledge for Teaching: A Review of the Evidence. Paper presented at the MSP Evaluation Summit II, Minneapolis, MN, October 4-5, 2006. Retrieved from: http://km.mspnet.org/index.cfm/14124.

Whitley, B. E. J. (1997). Gender differences in computer-related attitudes and behavior: A meta-analysis. *Computers in Human Behavior*, *13*, 1-22. doi:10.1016/S0747-5632(96)00026X

Whitehead. C. L. (2001). Women in nontraditional career and technical education. In M. S. Plakhotnik, S. M. Nielsen, & D. M. Pane (Eds). *Proceeding of the Tenth Annual College of Education & GSN Research Conference* (pp. 226-231). Miami, FL: Florida International University.

Wilbourn, M. P. & Kee, D. W. (2010). Henry the nurse is a doctor too: Implicitly examining children's gender stereotypes for male and female occupational roles, *Sex Roles*, *62*, 670-683.

Wilkin, T., & Nwoke, G. I. (2011). Career and technical education teacher shortage: A successful model for recruitment and retention. *Journal of STEM Teacher Education*, *48*(1), 22-35.

Wood, R. E., & Locke, E. A. (1987). The relation of self-efficacy and grade goals to academic performance. *Educational and Psychological Measurement*, *47*, 1013-1024.

Wright, S. P., Horn, S. P., Sanders, W. L. (1997). Teacher and classroom context effects on student achievement: Implications for teacher evaluation. *Journal of Personnel Evaluation in Education*, *11*, 57-67.

Yin, R. K. (1998). *The abridged version of case study research: Design and method*. In L Bickman & D. J. Rog. (Eds). Handbook of Applied Social Science Research Methods. Thousand Oaks, CA: Sage.

Yin, R. K. (2009). *Case study research: Design and methods*. Los Angeles, CA: Sage.

Yin, R. K. (2016). *Qualitative research from start to finish*. New York, NY: The Gilford Press.

Zaman, A. (2007). Gender-sensitive teaching. *American Association of Colleges for Teacher Education*, *129*(1), 110-118. doi: 10.1002/pamm.20701147

Zeldin, A. L., Britner, S. L., & Pajares, F. (2008). A comparative study of the self-efficacy beliefs of successful men and women in mathematics, science, and technology. *Journal of Research in Science Teaching*, *45*, 1036-1058. doi: 10.1002/tea.20195

Zeldin, A. L., & Pajares, F. (2001). Against the odds: Self-efficacy beliefs of women in mathematical, scientific, and technological careers. *American Educational Research Journal*, *37*(1), 215-246. doi: 10.3102/00028312037002115

Zhao, Y. (2009). *Catching up or leading the way: American education in the age of globalization*. Alexandria, VA: Association for Supervision and Curriculum Development.

APPENDIX A

SCRIPT FOR REQUESTING APPRASIAL INVENTORY

Before we being, I want to let you know that I have met with Mr. Healy and he has provided me with instructions to read to you. First, he wants me to remind you that your responses and your inventory will remain confidential. If you look at the inventory, he is not asking for you to put your name on it. When you finish today, I will hold onto the inventory in my office; it will be locked up in my file cabinet. Also, Mr. Healy is the only person who is going to look at your responses. He asked that I not share any of this information with any staff here at NERSAT. My job this morning is to make sure you know how to complete this inventory.

Mr. Healy also wanted me to remind you that you can choose to not answer any or all of the items on the inventory. Choosing not to answer will not affect your standing with him or your teacher. He is only interested in your honest thoughts and feelings. So, when he ask a particular question, it's not because he looking for a particular answer. He only wants to know more about what you think. The only right answer is the answer you think is true. Again, I will not be looking at your answers.

Do you have any questions I can write down for Mr. Healy before we begin?

The inventory is going to ask you to rate your "right now" confidences of performing certain tasks. For example, look at the practice response on the front of the inventory. The question asks about your confidence to lift different objects of a specified weight. You are asked to rate how confident you are in being able to lift these objects, right now, (as we sit here today) on a 0% to 100% scale. So, a 0% confidence rating means you are not at all confident in lifting the object, while a 100% confidence rating means you are certain you can lift the object. Notice, too, that there are in-between levels of confidence. The idea here is to be as accurately possible in your confidence to perform certain tasks.

Do you have any questions about the inventory or how to fill it out?

APPENDIX B

APPRASIAL INVENTORY

Practice Rating

To familiarize yourself with the rating form, please complete this practice item first.

If you were asked to lift objects of different weights **right now**, how certain are you that you can lift each of the weights described below?

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

Physical Strength	**Confidence**
	(0-100)
Lift a **10** pound object	_____
Lift a **20** pound object	_____
Lift a **50** pound object	_____
Lift a **80** pound object	_____
Lift a **100** pound object	_____
Lift a **150** pound object	_____
Lift a **200** pound object	_____
Lift a **300** pound object	_____

This section of the inventory is designed to help me get a better understanding of the kinds of things that are **working well** for career and technical education students and instructors. Please rate how certain you are that you can do each of the things described below by writing the appropriate number. Your answers will be kept strictly confidential and will not be identified by name.

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

Career and Technical Education	**Confidence (0-100)**
Get my instructor to teach me the central concepts of the technical trade I'm studying	____
Get my instructor to teach me how to independently answer questions about the technical trade	____
Get my instructor to demonstrate his knowledge of the technical trade being taught	____
Have my instructor use his knowledge of the trades to help me learn	____
Get my instructor to help me when I get stuck on schoolwork	____
Get my instructor to make accommodations for the particular learning differences I have	____
Get my instructor to motivate me to do my best	____
Get my instructor to use effective teaching strategies	____
Get my instructor to establish good classroom rules	____
Get my instructor to design good assessments	____
Have my instructor use effective teaching skills to help me learn	____
Get my instructor to display a positive attitude about classroom learning	____
Get my instructor to display positive beliefs about teaching	____
Get my instructor to be fair	____
Get my instructor to be honest	____
Get my instructor to show a caring attitude	____
Get my instructor to use humor	____
Have my instructor establish a good rapport with me	____

This section of the inventory is designed to help me get a better understanding of the kinds of things that are **difficult** for career and technical education students. Please rate how certain you are that you can do each of the things described below by writing the appropriate number. Your answers will be kept strictly confidential and will not be identified by name.

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

0	10	20	30	40	50	60	70	80	90	100

Cannot do at all   Moderately can do   Highly certain can do

Career and Technical Education	**Confidence**
	(0-100)
Learn the central concepts of the technical trade	_____
Independently answer questions about the technical trade	_____
Demonstrate my knowledge of the technical trade	_____
Using my instructor's knowledge of the trade to help me learn	_____
Asking for help when I get stuck on schoolwork	_____
Use accommodations for the particular learning differences I have	_____
Use my instructor's motivational technics to do my best	_____
Use my instructor's effective teaching strategies	_____
Follow my instructor's classroom rules	_____
Do well on my instructor's assessments	_____
Understanding my instructor's effective teaching methods to help me learn	_____
Use my instructor's positive attitude about classroom learning to help me learn	_____
Use my instructor's positive beliefs about teaching to help me learn	_____
Use my instructor's fairness to help me learn	_____
Use my instructor's honesty to help me learn	_____
Use my instructor's caring attitude to help me learn	_____
Use my instructor's humor to help me learn	_____
Use the good rapport between my instructor and me to help me learn	_____

APPENDIX C

FIRST INTERVIEW PROTOCOL

Good afternoon. Before we begin, I want to remind you that everything you say in this interview is confidential. I will not tell your teacher, other students, or anyone else the things you tell me. I'm recording this interview, but the recording will be locked up and I'll be the only person who listens to it. I'll be transcribing the interview into a word document. When I do that, I'll change your name to a pseudonym or fake name and I'll also be disguising or taking out any information that might be used to identify you or any other student. When I write my final paper or give any presentations about this study, I will not use an actual names or other identifying information.

I also want to stress to you that you are free to skip any questions I ask or to stop the interview altogether, at any point, if you want, and that will not affect your standing with me or your teacher in any way. The purpose of this interview is to find out about you as a person and how you came to your program. I want to emphasize that I am not judging what you say in any way. I'm only interested in your honest thoughts and feelings. When I ask a particular question, it's not because I'm looking for a particular answer. I only want to know more about what you think. The only right answer is the answer you think is true.

Do you have any questions for me before we start?

Demographic	• What grade are you in? • What program are you currently enrolled in at NERSAT?
Career Interest Development	• When did you notice, or think, you might be interested in your program? • How did you happen to discover this interest? • What was it like when you discovered this interest? • If you recall, what were you thinking then about this interest? • Thinking back before you became interested in NERSAT, could you share with me a memorable story that would help me understand how you became interested in your vocation?
Actions and Expectations	• When you did sign up for the program, but before you started attending, what did you hope to get out of your program when you first decided to enroll in it? • What are your career plans after you graduate? • Considering your career pursuits at NERSAT, if you could have done anything differently, what would that be?
Information Gathering	• Did you tour NERSAT before enrolling in your program? • Did you ask questions during the tour? If you remember, who did you speak to? • What impression did your instructor give you during the tour and before you enrolled in the program? • Can you describe how you viewed your instructor's presentation during the tour? • Did you use any informational source materials before enrolling in your program? Website, booklet, videos, etc. • Can you recall any other sources of information you used before deciding to enroll in your program?
Enrollment	• Going back to the time you initially signed up for your program, could you describe the events and the decision making processes you used to help make your choice?
Influences	• In terms of your participation in your program, what people influenced your choice to attend NERSAT?

	• Tell me about how they influenced you. • How did your family influence your interest in your program? • How did your friends influence your interest in your program? • How, if at all, did your work experiences influence your interest in your program? • How, if at all, did your schooling or the courses you took before going to NERSAT influence your interest in your program? • Did any of your teachers, or perhaps a guidance counselor, make comments about NERSAT that influenced you?
Dispositions of Informants	• How does it make you feel being in your program? • How would you describe your beliefs about your vocational program? • What are your beliefs about the trade for which you are preparing yourself to have a career? • How would you describe your view of NERSAT before enrolling there? • How, if at all, has your view of NERSAT changed since going there? • After having these experiences at NERSAT, what advice would you give someone that is planning on enrolling?

APPENDIX D

SECOND INTERVIEW PROTOCOL

Hello again and good afternoon. Before we begin, I want to reiterate that everything you say in this interview is confidential. I will not tell your teacher, other students, or anyone else the things you tell me. Again, I'm recording this interview, but the recording will be locked up and I'll be the only person who listens to it. I'll be transcribing this interview into a word document, as well. If you remember, when I do that, I'll change your name to a pseudonym or fake name and I'll also be disguising or taking out any information that might be used to identify you or any other student. When I write my final paper or give any presentations about this study, I will not use an actual names or other identifying information.

I also want to stress to you, again, that you are free to skip any questions I ask or to stop the interview altogether, at any point, if you want, and that will not affect your standing with me or your teacher in any way. The purpose of this second interview is to find out about how you perceive the effectiveness possessed by your vocational teacher. I want to emphasize that I am not judging what you say in any way. I'm only interested in your honest thoughts and feelings. When I ask a particular question, it's not because I'm looking for a particular answer. I only want to know more about what you think. The only right answer is the answer you think is true.

Do you have any questions for me before we start?

Ideal	• Describe for me "the ideal job" -- from your perspective.
	• Describe for me your ideal NERSAT classroom/shop from your perspective.
	• Describe for me your ideal NERSAT instructor from your perspective.
CTE Definition	• How would you define, for yourself, what Career and Technical Education is?
Personal	• Describe what helps you learn from your instructor.
	• Describe what makes it hard for you to learn from your instructor.
	• Tell me what makes your instructor valuable to you as you've learned this trade.
	• Describe how your instructor builds your confidence in your skills.
	• Describe how your instructor made you feel like you belonged in that classroom.
	• Describe how your instructor made you feel like you belonged in that shop.
	• Tell me about your instructor's attitude toward teaching you.
	• Tell me about your instructor's beliefs about teaching you.
Effective Practices	• What are the most effective teaching approaches your instructor uses in the classroom to help you learn?
	• Tell me about the classroom assessments that you believe are most effective for you.
	• What are the most effective teaching approaches your instructor uses in the shop to help you learn?
	• Tell me about the shop assessments that you believe are most effective for you.
Instructor Knowledge	• Describe your instructor's specialized knowledge about the subject he teaches.
	• How can you tell your instructor has the knowledge to teach his subject?
	• Give me some examples of how you know your instructor knows his trade.
	• What will I hear your instructor taking about when he's talking about his knowledge of the subject he's teaching?
Student Management	• What are some of the major classroom rules you have to follow when you do classroom work or academics? If a classmate broke a major rule while you're

	doing academics, what would I see happen? • Describe for me how your instructor creates a positive classroom atmosphere so academic learning can happen. • What are some of the major shop rules you have to follow when out in the shop area using equipment? If a classmate broke a major rule while you're using the equipment, what would I see happen? • Describe for me how your instructor creates a positive shop atmosphere so skills can be practiced and learned.
Motivation	• Describe for me how your instructor motivates his class to do their best academically. • Describe for me how your instructor encourages students to do their best when learning gets challenging. • Describe for me how your instructor motivates his class to do their best when using the machines. • Describe for me how your instructor encourages students to do their best when a job in the shop area gets challenging, or isn't working.
Assessments	• What are the different kinds of test you take for the academic components of your program? • What are the different kinds of assessments for the shop portion of your program?
Instruction	• What are the different ways (teaching approaches) your instructor uses to instruct you in the academics of your program, regardless of the effectiveness of each? • What are the different ways (teaching approaches) your instructor uses to instruct you in the shop, regardless of the effectiveness of each?
Dispositions	• Describe your instructor's attitude toward teaching the vocational trades? • What are some of the things your instructor says he believes about teaching? • What does your instructor value (or what is most important to him) about teaching this trade?
Typical Routine	• If I sat through a typical academic class session, what would I see you doing? What experiences would I observe you having? • If I followed you through a typical shop session, what would I see you doing? What experiences would I observe you having?
Memorable Moments	• What are some of the memorable things your instructor has done as your instructor during class or shop time? • Share with me a memorable story about a class session when things went really, really well. • Share with me a memorable story about a not-so typical class session when things were not going all that well. • Share with me a memorable story about when your teacher really was at his best and taught you academics really well. • Share with me a memorable story about a shop session when things went really, really well. • Share with me a memorable story about a not-so typical shop session when things were not going all that well. • Share with me a memorable story about when your teacher really was at his best and taught you a shop task really well.

APPENDIX E

COLBY – THIRD INTERVIEW PROTOCOL

Hello again and thank you for meeting with me this last time. I want to remind you that everything you say in this interview is confidential. I will not tell your teacher, other students, or anyone else the things you tell me. I'm recording this interview, but the recording will be locked up and I'll be the only person who listens to it. I'll be transcribing the interview into a word document. When I do that, I'll change your name to a pseudonym or fake name and I'll also be disguising or taking out any information that might be used to identify you or any other student. When I write my final paper or give any presentations about this study, I will not use an actual names or other identifying information.

I also want to stress to you that you are free to skip any questions I ask or to stop the interview altogether, at any point, if you want, and that will not affect your standing with me or your teacher in any way. The purpose of this interview is to find out about you as a person and how you came to your program. I want to emphasize that I am not judging what you say in any way. I'm only interested in your honest thoughts and feelings. When I ask a particular question, it's not because I'm looking for a particular answer. I only want to know more about what you think. The only right answer is the answer you think is true.

Do you have any questions for me before we start?

Today, I'd like you to reflect on some responses you made in the last two interviews. Don't worry, I've taken the time to write these responses down and have incorporated them in the questions I'd like to ask you. You don't have to recall everything you told me over the last two interviews.

But, first I want you to think about how you've changed as a person because of the things you've learned. So, at its core, the purpose of education is to create change. Being taught something changes, or adds to, **what you know** and that knowledge affects **how you think** about things the world and yourself as a more capable person. For example, when you were younger, learning how to count using numbers changed what you knew and it changed the way you thought about things. So, when you were little and you really, really wanted to do something but were told "hold on a minute" it felt like forever, which effected how you understood numbers on a clock and your level of being patient. As you got older, you began to change—inside your mind—on how you think about numbers on a clock so that you now understand "hold on a minute" isn't forever and you can be more patient if someone else needs a little bit more time. Also, learning to use numbers when you were little continues to make you a more capable person in the world, like with learning to drive. Estimating cars approaching an intersection, or using a speedometer adds to what we know and effects how we think about ourselves. So, that feeling of freedom that comes from driving all by yourself helps you see yourself as a more capable person. So, the purpose of being taught something is to create change in you and help change how you see yourself as a capable person in the world.

- Given what you have said about seeing your family members working on cars when you were little but being told you couldn't do it because you're female, to now having two years of career and technical education in the automotive program, how does the idea of being a mechanic when you were a little girl compare to your learning this trade from Mr. Giles?

- Given that you responded, "He seems humble. He doesn't really brag or talk about his own knowledge. He doesn't bring up his own knowledge that much." when I asked you about his knowledge of mechanics. How do the moments when Mr. Giles DOES display his knowledge shape you as his student?

- When I asked you about effective teaching approaches in the classroom, you talked about how Mr. Giles uses Electude and iCar and has show and tell pieces. You commented that these pieces are different parts that you are studying and that "he'll pass that around to show us and explain to us how that works." Given these experiences in the academic classroom, how does Mr. Giles's academic teaching change how you see yourself as a student?

- Given that you responded "I can definitely tell he has trust in me because he actually left me alone with the torch and the oxy fuel tank." and that "he quickly describes how to do it, like break lines or tie rods, and he walks away and is like, 'I'll check in on you in a few minutes. I know what you're doing.' So, he seems to actually trust me that I'm not going to do something to break a car." How has Mr. Giles's effective approach to teaching shop helped you gain confidence as a newer mechanic?

- You mentioned that Mr. Giles always makes comments to you whenever you're done with a task. You said, "He'll say, 'Good job. You did such a good job.' And, he's like, 'Wow! That was fast.' He's just very happy when he sees I've finished something." How does the feedback Mr. Giles provides you change how you see yourself as a student?

- During your second interview, I asked about how you judge your own skill level, or confidence in doing a task, and you replied, "Last year, getting all those awards and being inducted into the National Technical Honors Society. It definitely felt like a huge achievement within myself." How has the recognition Mr. Giles gives you changed how you see yourself in the future?

- When I asked you how Mr. Giles approached the situation of either having you stay in his program, or be transferred to auto body, you told me that, "he was kind of shocked with how serious I was taking the program. I think I threw him off guard a little bit. I don't think he expected me to actually want this program as much as I did." How has the attitude Mr. Giles displays when working with you helped you gain confidence as a student?

- When I asked you what made Mr. Giles valuable to you as your instructor, you talked about "the whole patients aspect" of him and mentioned "a couple of days when I was like, 'You know what? I should just be done. I'm never going to succeed.'" Mr. Giles,

you said, was very patient with you. You also said that you struggle with self-doubt a lot. How has Mr. Giles's attitude toward your struggles helped you preserver and learn in his program?

- Given that you told me there are no real "grades" out in the shop area when I asked about assessments in the shop, how has Mr. Giles's approach to judging your shop skills affected your confidence in knowing what you can, and cannot do, independently?

- You mentioned that Mr. Giles uses an ASE certified automotive testing program that incorporates "technician talk" and "you have to pick apart the questions" using different terminology (or vocabulary) responses technician might say. How has the use of "technician talk," or car terminology (vocabulary) helped you gain confidence as a student?

- When I asked about how Mr. Giles helps you learn, you mentioned his patients and you said that, "Even if it took twenty minutes, he would be willing to explain it over and over until I got it. Or, he would show me, himself, how to do it." How has solving problems alongside Mr. Giles changed how you see a difficult task in his program?

- In talking about rules, you mentioned "a couple of kids, whether they've cursed in class or acted like complete maniacs, [Mr. Giles] will warn them" and that "if someone broke a tool, they'd have to replaces it because [it's] they're responsibility. Own up to it." How has Mr. Giles's approach to rules shaped you as one of his students?

- Given that you told me Mr. Giles will team you up with "other guys in the class that you don't know a whole lot," and that "he wants us to build that friendship with someone we don't really know or feel a little uncomfortable around." How have Mr. Giles's beliefs about having you work with different people you changed the way you approach learning in his program?

  -To follow up on this point, you also told me that Mr. Giles, "He'd have me volunteer and help other guys in the class. It was cool." And, you also told me the story of a shy kid who was very lost on how to do a job, saying, "Can you help me please?" How does being volunteered help you gain confidence as a student?

- Why do you think that so few women enroll in your program?

- What could be, or should, be done to alter this?

Okay, those are my questions. Is there something I might not have asked about that occurred to you during this interview that you'd like to share? Something important?

Is there something else you think I should know to understand your how you came to choose your program at NERSAT?

Is there anything else you would like to ask me?

APPENDIX F

MAYA – THRID INTERVIEW PROTOCOL

Hello again and thank you for meeting with me this last time. I want to remind you that everything you say in this interview is confidential. I will not tell your teacher, other students, or anyone else the things you tell me. I'm recording this interview, but the recording will be locked up and I'll be the only person who listens to it. I'll be transcribing the interview into a word document. When I do that, I'll change your name to a pseudonym or fake name and I'll also be disguising or taking out any information that might be used to identify you or any other student. When I write my final paper or give any presentations about this study, I will not use an actual names or other identifying information.

I also want to stress to you that you are free to skip any questions I ask or to stop the interview altogether, at any point, if you want, and that will not affect your standing with me or your teacher in any way. The purpose of this interview is to find out about you as a person and how you came to your program. I want to emphasize that I am not judging what you say in any way. I'm only interested in your honest thoughts and feelings. When I ask a particular question, it's not because I'm looking for a particular answer. I only want to know more about what you think. The only right answer is the answer you think is true.

Do you have any questions for me before we start?

Today, I'd like you to reflect on some responses you made in the last two interviews. Don't worry, I've taken the time to write these responses down and have incorporated them in the questions I'd like to ask you. You don't have to recall everything you told me over the last two interviews.

But, first I want you to think about how you've changed as a person because of the things you've learned. So, at its core, the purpose of education is to create change. Being taught something changes, or adds to, **what you know** and that knowledge affects **how you think** about things the world and yourself as a more capable person. For example, when you were younger, learning how to count using numbers changed what you knew and it changed the way you thought about things. So, when you were little and you really, really wanted to do something but were told "hold on a minute" it felt like forever, which effected how you understood numbers on a clock and your level of being patient. As you got older, you began to change—inside your mind—on how you think about numbers on a clock so that you now understand "hold on a minute" isn't forever and you can be more patient if someone else needs a little bit more time. Also, learning to use numbers when you were little continues to make you a more capable person in the world, like with learning to drive. Estimating cars approaching an intersection, or using a speedometer adds to what we know and effects how we think about ourselves. So, that feeling of freedom that comes from driving all by yourself helps you see yourself as a more capable person. So, the purpose of being taught something is to create change in you and help change how you see yourself as a capable person in the world.

- Given what you have said about how cool Megan Fox was in the movie Transformers—how cool is was to fix the boy's car—and how this scene generated an interest in automotive for you, how does the idea in the movie compare to your learning this trade from Mr. Giles?

- Given that you responded, "Probably his knowledge" when I asked what makes your instructor valuable to you as you've learned this trade, how does Mr. Giles's knowledge shape you as his student?

- When I asked you about memorable moments in the classroom, you talked about the fun you had with the "intro to electrical lesson" and learning the brake system using Electude. Given these experiences in the academic classroom, how does Mr. Giles's academic teaching change how you see yourself as a student?

- Given that you responded "The joint helping. Giving us a tool, and then letting us do it," when I asked you what the most effective teaching approach in the shop was for you, how does Mr. Giles's approach to teaching shop help you evolve as a newer mechanic?

- You mentioned several times the written comments that Mr. Giles's leaves on your timecards. When I asked you about a shop session that went really well, you talked about working alongside Mr. Giles on another student's driveshaft and afterward, Mr. Giles wrote on your timecard, "Good job on the drive shaft and working through it and getting the parts in." How does the feedback Mr. Giles provides change how you see yourself as a student?

- During your second interview, I asked about how you judge your own skill level, or confidence in doing a task, and you replied, "Whoever taught me. It was them. I don't really consider it myself. Even with math at school, I didn't know I was good at math until my teacher was like, 'You know what you're doing.'" How do your conversations with Mr. Giles change how you see yourself in the future?

- When I asked you about a memorable story when Mr. Giles's was at his best teaching you, you shared the story of using the frontend alignment machine and how you asked Mr. Giles about checking the rears. Mr. Giles's told you that "I guess. If you want. You can go ahead and check the rears. It doesn't really matter." When you did check the rears, they were off and you "set them right." Mr. Giles then commented "Okay. Yeah. Looks good." How does the attitude Mr. Giles displays when working with you help you evolve as a newer mechanic?

- Given that you told me there are no real "grades" out in the shop area when I asked about assessments in the shop, how does Mr. Giles's approach to judging your shop skills affect your confidence in knowing what you can, and cannot do?

- You mentioned that Mr. Giles "knows all the names of everything" and "he knows what tools you need for a job" when I asked you how smart he was. You then commented that you don't know all of these things. Yet, when I asked about a hands-on assessment that

works best for you, you said, "when we looked at the S-10 frame and he said, 'What's that? What's that?'" How does Mr. Giles's teaching of vocabulary knowledge help you evolve as a newer mechanic?

- When I asked about how Mr. Giles motivates you not to give up on a difficult task, you said since he doesn't give up on a task you don't, either. You commented that he often says, "Oh, well. Go get this. Or, get this. Maybe that will work." How has problem solving alongside Mr. Giles changed how you see a difficult task in his program?

- You mentioned that sometimes the class gets off topic and Mr. Giles goes with it a bit, but then he's like, "Okay. We've gotten off topic. Let's bring it back now." You've also mentioned that he won't tolerate students doing "burnouts" even if they are just joking around. How does Mr. Giles's approach to school rules shape you as one of his students?

- Given that you told me it is a belief of Mr. Giles that you folks are the next generation of mechanics and that "all the mechanics these days are really old so they need young people to go in and do mechanics". How does Mr. Giles's beliefs change the way you approach learning in his program?

- Why do you think that so few women enroll in your program?

- What could be, or should, be done to alter this?

Okay, those are my questions. Is there something I might not have asked about that occurred to you during this interview that you'd like to share? Something important?

Is there something else you think I should know to understand your how you came to choose your program at NERSAT?

Is there anything else you would like to ask me?

APPENDIX G

RAVEN – THIRD INTERVIEW PROTOCOL

Hello again and thank you for meeting with me this last time. I want to remind you that everything you say in this interview is confidential. I will not tell your teacher, other students, or anyone else the things you tell me. I'm recording this interview, but the recording will be locked up and I'll be the only person who listens to it. I'll be transcribing the interview into a word document. When I do that, I'll change your name to a pseudonym or fake name and I'll also be disguising or taking out any information that might be used to identify you or any other student. When I write my final paper or give any presentations about this study, I will not use an actual names or other identifying information.

I also want to stress to you that you are free to skip any questions I ask or to stop the interview altogether, at any point, if you want, and that will not affect your standing with me or your teacher in any way. The purpose of this interview is to find out about you as a person and how you came to your program. I want to emphasize that I am not judging what you say in any way. I'm only interested in your honest thoughts and feelings. When I ask a particular question, it's not because I'm looking for a particular answer. I only want to know more about what you think. The only right answer is the answer you think is true.

Do you have any questions for me before we start?

Today, I'd like you to reflect on some responses you made in the last two interviews. Don't worry, I've taken the time to write these responses down and have incorporated them in the questions I'd like to ask you. You don't have to recall everything you told me over the last two interviews.

But, first I want you to think about how you've changed as a person because of the things you've learned. So, at its core, the purpose of education is to create change. Being taught something changes, or adds to, **what you know** and that knowledge affects **how you think** about things the world and yourself as a more capable person. For example, when you were younger, learning how to count using numbers changed what you knew and it changed the way you thought about things. So, when you were little and you really, really wanted to do something but were told "hold on a minute" it felt like forever, which effected how you understood numbers on a clock and your level of being patient. As you got older, you began to change—inside your mind—on how you think about numbers on a clock so that you now understand "hold on a minute" isn't forever and you can be more patient if someone else needs a little bit more time. Also, learning to use numbers when you were little continues to make you a more capable person in the world, like with learning to drive. Estimating cars approaching an intersection, or using a speedometer adds to what we know and effects how we think about ourselves. So, that feeling of freedom that comes from driving all by yourself helps you see yourself as a more capable person. So, the purpose of being taught something is to create change in you and help change how you see yourself as a capable person in the world.

- Given what you have said about working with your dad and already having jobs detailing cars, how do these experiences compare to your learning this trade from Mr. Giles?

- Given that you responded, "he's valuable enough to me that I could ask him a question about older cars because he knows a lot about older cars. And, I'm taking that and holding on to that" when I asked what makes your instructor valuable to you as you've learned this trade, how does Mr. Giles's knowledge shape you as his student?

- When I asked you about a memorable moment in the classroom, you mentioned learning about a starter, saying "he shows us this and that on the starter. So, I get my hands on it so I learn what the starter is". Given these experiences in the academic classroom, how does Mr. Giles's academic teaching change how you see yourself as a student?

- Given that you talked about how Mr. Giles show you what to do, like working with the big tires on the tire machine and that "[Mr. Giles] showed me exactly what to do so I didn't get hurt" when I asked you what the most effective teaching approach in the shop was for you, how does Mr. Giles's approach to teaching shop help you evolve as a newer mechanic?

- You mentioned that Mr. Giles will tell you to keep up the good work and if you have questions you should ask him. How does the feedback Mr. Giles provides change how you see yourself as a student?

- During your second interview, I asked about how you knew, for yourself, that you can do a shop task, and you replied, "For me, when I try something I think I did it right, or I think I know I did it right, I almost second-guess myself, but when [Mr. Giles] comes over and tells me I did a good job, that makes me feel overall better because I know I did it and I can do it, again." How do your conversations with Mr. Giles change how you see yourself in the future?

- Given that you told me Mr. Giles's approach to positive relationships is "if you're going to be respectful to him, he's going to be respectful to you." How does the attitude Mr. Giles displays when working with you help you evolve as a newer mechanic?

- Given that you told me there are no real "tests" only "challenges" out in the shop area when I asked about assessments in the shop, how does Mr. Giles's approach to judging your shop skills affect your confidence in knowing, for yourself, what you can and cannot do?

- You mentioned that Mr. Giles puts up a slideshow on the board and, "it had words on the side of it and a picture. You really had to read the words to be able to figure out what the fill-in was" How does Mr. Giles's teaching of vocabulary knowledge help you evolve as a newer mechanic?

- When I asked about how Mr. Giles motivates you not to give up on a difficult task, you said, "Giles always has a solution." How has problem solving alongside Mr. Giles changed how you see a difficult task in his program?

- You mentioned that sometimes the class gets off topic and Mr. Giles goes with it a bit, but then he's like, "Okay. We've gotten off topic. Let's bring it back now." How does Mr. Giles's approach to school rules shape you as one of his students?

- Given that you told me it is a belief of Mr. Giles that you folks should become future mechanics and that he wants you to do something big. How does Mr. Giles's beliefs change the way you approach learning in his program?

- Why do you think that so few women enroll in your program?

- What could be, or should, be done to alter this?

Okay, those are my questions. Is there something I might not have asked about that occurred to you during this interview that you'd like to share? Something important?

Is there something else you think I should know to understand your how you came to choose your program at NERSAT?

Is there anything else you would like to ask me?

APPENDIX H

OBSERVATION PROTOCOL

General: What are the experiences of NERSAT students as they learn from their CTE instructor? What verbal and non-verbal behaviors are demonstrated by the instructor while teaching? (Knowledge (K), Skills (S), Dispositions (D))	
Date:	

Activities Key						
1	2	3	4	5	6	
Descriptive Notes						**Reflective Notes**

APPENDIX I

CODING DICTIONARY

MASTER CODE: **MASTERY EXPERIENCES (ME)**
Mastery Experiences (Bandura, 1986) are sources of information used by informants to judge personal vocational capabilities that come from the interpreted results of their performances while learning the automotive technology trade. The "Mastery Experiences" master code includes descriptions, analysis, or evaluations of either positive or negative interpretations of these task accomplishments, as well as perceptions of increased or decreased confidence in accomplishing similar tasks in the future.
> o Example: I'm an expert. I have to say, I'm an expert on the tire machine. Seriously, I've really learned how to use that thing.

MASTER CODE: **VICARIOUS EXPERIENCES (VE)**
Vicarious Experiences (Bandura, 1986) are sources of information used by informants to judge personal vocational capabilities that come from the interpreted results of observing others perform vocational tasks. The "Vicarious Experiences" master code includes descriptions, analysis, or evaluations of observing others' challenges, successes, or failures which, in turn, are used to inform informants' judgements about their own capabilities of performing similar tasks in the future.

- Instructor (VE-*Inscr*) This sub-code identifies descriptions, analysis, or evaluations of observing their instructor perform automotive related tasks to inform their own capabilities or performances.
  > o Example: [Mr. Giles] struggles, but he sticks with it. So, I'm learning from him to just keep going with it and to try other things of what it could be.

- Peers (VE-*Peer*) This sub-code identifies descriptions, analysis, or evaluations of observing peers perform automotive related tasks to inform their own capabilities or performances.
  > o Example: Honestly, at first, I hated the idea of working with others. Like, 'No. Stay away.' But, after a little bit of working with the guys out in the shop, I realized it wasn't going to be as bad as I though.

- Social Comparison (VE-*Soc Comp*) This sub-code identifies descriptions, analysis, or evaluations of comparative judgments to others. The "Social Comparison" sub-code includes comparative judgments against peers and does NOT include evaluations made of a peer's ability to perform particular tasks which help boost informants' confidences.
  > o Example: They're judgmental, sometimes, because I'm a girl. And, it's not fair because I've done more stuff than a guy has done, in my eyes.

MASTER CODE: **SOCIAL PERSUASIONS (SP)**
Social Persuasions (Bandura, 1986) are sources of information used by informants to judge personal vocational capabilities that come from the interpreted meanings of messages offered by others about their ability to accomplish a vocational task. The "Social Persuasions" master code

included descriptions, analysis, or evaluations of messages that may encourage informants to exert the extra effort to succeed on a particular task, as well as derogatory statements that may decrease their efforts to perform a vocational task. Interpretations of messages received by others upon completion of vocational tasks are also included in the "Social Persuasions" master code. These messages may positively or negatively inform informants of their capabilities to accomplish similar tasks in the future.

- *Instructor (SP-Inscr)* This sub-code identifies descriptions, analysis, or evaluations of messages informants received from their instructor that may encourage them to exert the extra effort to succeed on a particular task, may decrease their efforts to perform a vocational task, or may positively or negatively inform their capabilities following performances.
  - Example: He told me he was impressed at how fast I got the break line out.

- *Peers (SP-Peer)* This sub-code identifies descriptions, analysis, or evaluations of messages informants received from their peers that either encourage them to exert the extra effort to succeed on a particular task or that decrease their efforts to perform a vocational task.
  - Example: One of the guys in my class, he's like, 'Okay. I'm being totally honest with you. I don't know what I'm doing exactly with it.' I think it was tearing down an engine. He's like, 'I don't know exactly how to do this. What I'm doing and you're so good at it. Can you please help me?'

MASTER CODE: **PHYSIOLOGICAL STATES (PS)**

Physiological States (Bandura, 1986) are sources of information used by informants to judge personal vocational capabilities that come from the interpreted meanings of emotional arousals while in the automotive technology program. The "Physiological States" master code included either positive or negative interpretations of energizing arousals (e.g., excitement, joy), or debilitating emotions (e.g., anxiety, fear)
  - Example: It made me feel really good knowing [Mr. Giles] could actually trust me to be by myself and work on a car.

MASTER CODE: **CONTENT KNOWLEDGE (CK)**

This master code identified the reported influence of the instructor's common or specialized content knowledge that may initiate, support, or extend student learning. The "Content Knowledge" master code included general knowledge as well as highly specialized knowledge that structured the subject of automotive technology content and allowed the instructor to facilitate the methods of inquiry for teaching this trade.

- Common Content Knowledge (CK-*Com Cont Knwl*) This sub-code identifies descriptions, analysis, or evaluations of an instructor's basic knowledge of the subject he instructs, which students may know before entering the program, and included the use of correct basic automotive terminology and diagnostic procedures, as well as basic tools (e.g., screwdrivers, plyers, hammer) and routine maintenance tasks (e.g., washing and

waxing, checking fluid levels and tire pressure, locating gas cap, windshield wipers, or emergency brake leaver).

- o Sub-sub-codes: basic knowledge of components, tools, equipment, and tasks, basic maintenance.
- o Example: We started off with things I already know, like washing and waxing cars. We do that a lot. I've done that before, but he still showed me little things I'd forgotten.

- Specialized Content Knowledge (CK-*Spcl Cont Knwl*) This sub-code identifies descriptions, analysis, or evaluations of an instructor's deeper knowledge of specialized content such as specific diagnostic and maintenance procedures, and included providing explanations of the operation of mechanical systems and analyzing task failures. The "Specialized Subject Matter Knowledge" sub-code included knowledge gained through the instructor's participation in formal education and accumulated through professional experiences.
  - o Sub-sub-codes: specialized terminology, diagnostic applications, problem solving, specialized components, tools, equipment, and tasks, formal education, professional experiences.
  - o Example: He knows what tools you need for the job. So, if he assigns us something, and it's something new we're learning, he's like, 'You're going to need these tools.'

MASTER CODE: **DISPOSITIONS (DISP)**
This master code identified the reported influence of the instructor's statements and behaviors that may promote or dissuade student learning, develop or restrict their career interests, or encourage further educational pursuits in post-secondary education.

- Beliefs (DISP-*Belf*) This sub-code identifies descriptions, analysis, or evaluations of statements of perceived truth regarding student learning, automotive technology careers, or career and technologies education instruction.
  - o Sub-sub-codes: career prospects, value of career knowledge, females in automotive vocation, vocational instruction
  - o Example: He always tells us we're the next generation. All the mechanics these days are really old so they need people, young people to go in and do some mechanics stuff, because, if not, we're not going to have any.

- Attitudes (DISP-*Attd*) This sub-code identifies descriptions, analysis, or evaluations of behaviors or emotions displayed toward students and their learning, the automotive technology field, or career and technologies education instruction.
  - o Sub-sub-codes: personability, integrity, gender sensitivities
  - o Example: Well, definitely one thing would be, he would be really patient with me. He wouldn't get ticked off, or whatever. If I had a question, or if I was doing something wrong, he would be willing to, even if it took twenty minutes, he would be willing to explain it over until I got it.

MASTER CODE: **PEDAGOGICAL CONTENT KNOWLEDGE (PCK)**
This master code identified the reported influence of the instructor's practices where a combining of content knowledge with the knowledge of his students produces interested, engaged, and challenged learners. The "Pedagogical Content Knowledge" master code includes descriptions, analysis, and evaluations of practices employed by the instructor in both the academic setting, as well as in the live work environment. This master code captures not only the instructor's knowledge of strategies and techniques, but also the applications of these strategies and techniques.

- Instruction (PCK-*Inst*) This sub-code identifies descriptions, analysis, or evaluations of knowledge or strategies of instruction that structure or sequence student learning of both academic and practical automotive knowledge.
    - Sub-sub-codes: multimodal approach, lecture, read aloud, note taking, guided practice, independent practice, task demonstration, task explanation
    - Example: [iCar] is big slideshow with a bunch of facts on it, and he reads through it and we fill in paperwork. There are pictures and diagrams and stuff on it. We just scroll through it and he reads about it.

- Motivation (PCK-*Motv*) This sub-code identifies descriptions, analysis, or evaluations of knowledge or applications of motivational techniques that encourage, promote, and/or extend students' pursuits in learning both academic and practical automotive knowledge.
    - Sub-sub-codes: help availability, anticipating outcomes, determining task difficulties, recognition
    - Example: He always makes me the Tour Master. That's what he calls it. So, I'm the one that goes through the tour and explains stuff. He always tells me I do a great job. He leaves me a little note that says, 'Great job on the tours.'

- Student Management (PCK-*Std Mgnt*) This sub-code identifies descriptions, analysis, or evaluations of knowledge or techniques of student management that organize learning environments and establish student expectations that foster favorable learning outcomes.
    - Sub-sub-codes: groupings, rules, warnings
    - Example: At the beginning of class, he always assigns us a project. I don't think that he has a certain way of putting people together because I've worked with pretty much everyone before.

- Assessment (PCK-*Asmt*) This sub-code identifies descriptions, analysis, or evaluations of knowledge or assessment strategies that measure and document students' growth in learning academic and practical automotive knowledge.
    - Sub-sub-codes: conventional exam, self-reflection, similar task, diagnosis, inspection
    - Example: We mainly do ASE certified testing. It's automotive testing, but it's like, sort of, technician talk.

MASTER CODE: **PARTICIPANT PERSONAL FACTORS (PPF)**
This master code identifies explicit references to informants' personal factors that may influence their learning and learning outcomes. In their descriptions of personal factors, informants may

address their influences and interests in automotive technology, expectations of their learning, as well as the attitudes and beliefs guiding their efforts in learning this trade. The "Participant Personal Factors" master code includes informants' reflections on their own learning while in the automotive program. These transformations are informants' efforts to make sense of their experiences in the automotive program.

- Influences (PPF-*Infl*) This sub-code identifies descriptions, analysis, or evaluations of influences the informants perceives that may development their career interests or program participation.
    - o Sub-sub-codes: family, friends, culture, employment, prior mastery experiences
    - o Example: [My mom] was like, "I really wish I had the opportunity to go to a technical school like that and learn the way that they're offering you to." So, she's kind of the one that said, "That would really be an awesome idea." And I was, "Yeah. It would." So, my mom was even an influencer. She was like, "That's awesome that they give you that."

- Expectations (PPF-*Exp*) This sub-code identifies descriptions, analysis, or evaluations of expectations the informants perceives that may influence their engagement or disengagement while learning the automotive technology trade
    - o Sub-sub-codes: program, career
    - o Example: That was the goal from the beginning, was being able to work on my own car.

- Dispositions (PPF-*Disp*) This sub-code identifies descriptions, analysis, or evaluations of beliefs or attitudes the informants perceives that may influence their engagement or disengagement while learning the automotive technology trade. The "Dispositions" sub-code also includes beliefs and recommendations about why few women enroll in their program and what should be done to increase enrollment of females in the automotive technology program.
    - o Sub-sub-codes: beliefs about females in automotive, recommendations for increasing female participation, personal learning abilities, attitudes toward instructor, attitudes toward learning
    - o Example: I believe that if I set my mind to it, I can get it done. And, if I don't, I'll try to get it done next time.

- Personal Changes (PPF-*Pers Chgs*) This sub-code identifies descriptions, analysis, or evaluations of the personal changes informants experienced by participating in the automotive technology program.
    - o Sub-sub-codes: motivation, confidence in performance, knowledge of trade, view of career
    - o Example: I remember when I first showed up I wasn't really thinking I was going to be all that into it. I mean, yes, I would pay attention, but I wasn't sure I was actually going to, maybe, enjoy it. But, I do now. So, wanting to be there makes it easier to learn.

APPENDIX J

CODING MAP

Coding Map	
Vocational Self-Efficacy Master and Sub-Codes	
MASTERY EXPERIENCES (ME) Reported influence of informants' interpretations of their prior vocational performances.	
VICARIOUS EXPERIENCES (VE) Reported influence of informants' interpretations of others' vocational performances.	
•VE-*Inscr* (Instructor)	Observations of instructor
•VE-*Peer* (Peers)	Observations of peers
•VE-*Soc Comp* (Social Comparison)	Comparisons of peers to self
SOCIAL PERSUASION (SP) Reported influence of informants' interpretations of others' verbal messages.	
•SP-*Inscr* (Instructor)	Messages from instructor
•SP-*Peer* (Peers)	Messages from peers
PSYCOLOGICAL SATES (PS) Reported influence of informants' interpretations of their emotional arousal while in vocational program.	
Inductive Master and Sub Codes	
CONTENT KNOWLEDGE (CK) Reported influence of instructor's knowledge of what he knows.	
•CK-*Com Cont Knwl* (Common)	basic knowledge of components, tools, equipment, and tasks
•CK-*Spcl Cont Knwl* (Specialized)	specialized terminology, diagnostic applications, problem solving, specialized components, tools, equipment, and tasks, formal education
PEDAGOGICAL CONTENT KNOWLEDGE (PCK) Reported influence of instructor's skills of what he can do.	
•PCK-*Inst* (Instruction)	multimodal approach, lecture, read aloud, notetaking, guided practice, independent practice, task demonstration, task explanation
•PCK-*Motv* (Motivation)	help availability, anticipating outcomes, determining task difficulties, recognition (awards/commendations)

•PCK-*Std Mgnt* (Student Management)	groupings, task assignments, rules, warnings
•PCK-*Asmt* (Assessment)	conventional exam, self-reflection, similar task, diagnosis, inspection
DISPOSITIONS (DISP) Reported influence of instructor's beliefs and attitudes.	
•DISP-Belf (Beliefs)	career prospects, value of career knowledge, females in automotive vocation, vocational instruction
•DISP-Attd (Attitudes)	personability, integrity, gender sensitivities
PARTICIPANT PERSONAL FACTORS (PPF) Informants' personal factors that may influence their participation in the automotive technology program.	
•PPF-*Infl* (Influences)	family, friends, culture, employment, prior mastery experiences (prior knowledge)
•PPF-*Exp* (Expectations)	from program, from career
•PPF-*Disp* (Dispositions)	beliefs about females in automotive, recommendations for increasing female participation, personal learning abilities, attitudes toward instructor, attitudes toward learning
•PPF-*Pers Chgs* (Personal Changes)	motivation, confidence in performance, knowledge of trade, view of career

APPENDIX K

SCRIPT FOR REQUESTING STUDENT ASSENT

Hello, my name is Mr. Healy. I am a teacher at Seven Hills High School; I am also a graduate student at the University of Maine in Literacy Education. I am conducting research on the effective teaching qualities possessed by instructors at the NERSAT. I am especially interested in what young women have to share about their NERSAT teacher. I am inviting you to participate because your parent has agreed to let me talk with you and you attend NERSAT.

First, though, it is important for me to note that your participation is completely voluntary. Also, it is extremely important for me to tell you that everything you do for this study is confidential. If you decide to agree to participate in this study, I will not tell your teacher, other students, or anyone else the things you tell me. If at any point during the study you would like to withdraw as a participant that is okay, too. Again, your participation is voluntary.

Would you like to hear more about my study and how you could participate if you agree? Participation in this research includes taking an appraisal inventory about your level of certainty to have your effective instructor teach you something. For example, you might be asked how confident you are with the statement: *Use my instructor's motivational techniques to do my best*. The appraisal inventory will take approximately 15 minutes and can be done at a time most convenient to you. I will have them in the Learning Center at NERSAT from January 3, 2018 to January 21, 2018.

There is also a potential for you to be part of three individual interviews where I will ask you to describe some of your interactions with your NERSAT teacher. Informants will be selected randomly by a computer generated number, however, so you may or may not be selected. If you are, the interview will last up to an hour and be scheduled at a time most convenient to you. They will be recorded, but when I write them up I will switch your name with a fake name so no one will know who you are. If I use anything you said in my paper, I will let you review your quotes to make sure they are accurate. I will notify you on, or about, February 26, 2018 if you are selected. An example of a question you might be asked is: *What does your NERSAT instructor say that makes you believe in your skills as a beginning tradesperson?* Interviews will take place in a conference room here at NERSAT.

Do you have any questions for me at this point?

I would like to review with you the Student Assent Form. This is a form that will explain in greater detail my study and will provide more examples of questions you might encounter if you decide to participate. It is also the form that you will sign if you agree to participate in my study. After we're done looking over the form, you can decide to sign it, or take it with you without signing it in case you want more time to review it.

If you have any questions, I've included my email address on the Student Assent Form and you can contact me at any time.

APPENDIX L

SCRIPT FOR REQUESTING INDIVIDUAL INTERVIEWS

Hello, again. It has been awhile since I last spoke with you. I want to meet with you today to remind you of the three individual interviews I mentioned to you when you volunteered for this study. It is important for me to remind you that your participation is completely voluntary and I want to find times that works best for you to participate.

I want to remind you, too, that everything you say in the interview is confidential. I will not tell your teacher, other students, or anyone else the things you tell me. I'll recording the interview, but the recording will be locked up and I'll be the only person who listens to it. I'll be transcribing the interview into a word document. When I do that, I'll change your name to a pseudonym or fake name and I'll also be disguising or taking out any information that might be used to identify you or any other student. If I use a quote from you in my paper I will want you to review it to make sure it is what you said. When I write my final paper or give any presentations about this study, I will not use actual names or other identifying information.

I also want to stress to you that you will be free to skip any questions I ask or to stop the interview altogether, at any point, if you want, and that will not affect your standing with me or your teacher in any way.

The purpose of these interviews is to find out about how you perceive the effectiveness possessed by your vocational teacher. I want to emphasize that I am not judging what you say in any way. I'm only interested in your honest thoughts and feelings. An example of a question I will ask you is: *How has your NERSAT teacher made you feel like you belong in the classroom? Explain why you think NERSAT teachers make students feel like they belong.*

Would you like to schedule an interview for a time convenient for you?

APPENDIX M

INFORMED PARENTAL CONSENT

Dear Parent or Guardian:

Your daughter is invited to take part in a research project being conducted throughout the spring semester by Mr. Christopher Healy, a graduate student in the College of Education and Human Development at the University of Maine and a teacher at Seven Hills High School. This research will be carried out in order to inform Mr. Healy's doctoral dissertation in Literacy Education. The research will be conducted under the guidance of Dr. Susan Bennett-Armistead, an Associate Professor of Literacy Education in the College of Education and Human Development at the University of Maine.

The purpose of this research is to listen to female Career and Technical Education students' perspectives regarding the effectiveness possessed by their instructor. More specifically, I am interested in hearing from female adolescents who have chosen to enter traditional male career paths. I will explore the influences and persuasions that affect these young women as they gain the skills necessary to enter the skilled labor market.

What will your daughter be asked to do?
As part of their regular vocational work, students learn in both a traditional classroom format, as well as hands-on, shop experiences. I am asking for your permission to use information about these instructional practices in my study. All informants will be offered to take a questionnaire and participate in three individual interviews.

➢ A questionnaire of your daughter's unique perspective regarding the experiences she has had in her vocational classroom and with the effectiveness of her instructor will be offered. Questionnaires will be located in the Learning Center at NERSAT and can be completed between January 29, 2018 to February 12, 2018. The questionnaire will take 15 minutes to complete. Questions focus on a student's confidence to do certain tasks in the classroom. Sample questions include:
  o Get my instructor to teach me the central concepts of the technical trade I'm studying.
  o Have my instructor use his knowledge of the trades to help me learn.
  o Get my instructor to use effective teaching strategies.

➢ Three in-person interviews will be conducted between over an eight week period (beginning the week of February 26, 2018 and ending the week of April 23, 2018). I will ask your daughter about her reactions to instructor teaching and about the way she perceives her learning of a skilled vocation. Sample questions include the following:
  o Tell me how you go about learning from your instructor. What does that look like?
  o What do you hope to get out of your vocational program?
  o If I followed you through a typical class session, what would I see you doing?

> ➢ In-person interviews will be audio-recorded and transcribed. Interviews will require up to sixty minutes of your daughter's time and will be scheduled during the class period or at another time during the school day that is convenient for them. Interviews will be conducted at the NERSAT where the student's responses will not be overheard, and I will remind students that they may choose to answer, or not answer, any questions that I ask. If I use any of your daughter's responses in my paper I will ask that she review them to make sure they are accurate.

> ➢ Observations of classroom instruction will be conducted. The data collected will be in the form of notes written by this investigator. These observations will not be audiotaped, and will employ pseudonyms (fake names) to protect the identity of all informants.

Voluntary

Your daughter's participation is entirely voluntary. She may skip any survey or interview questions, or refuse to participate or withdraw from any of the activities listed above at any time. Withdrawing or refusing to participate in some or all of the activities or refusing to answer interview questions will not affect her standing with her teacher or either her high school or vocational school in any way.

Confidentiality

Your daughter's name will not be on any of the documents used for analysis. Student surveys will be identified with a numerical code and the handwritten list matching these codes to student names will be kept in a locked cabinet. The list will be destroyed on, or before May 20, 2018.

I will store interview audio recordings on a computer hard drive in a password-protected file that only I can access. I will replace students' names with pseudonyms (fake names) when I transcribe audio recordings to interview transcripts. Audio recordings will be erased by June 20, 2018. I will store electronic copies of interview transcripts on a computer hard drive in a password protected file that only I can access. This computer hard drive as well as any paper copies of surveys, interview transcripts, or other documents will be stored in a locked cabinet in my home office. I will hold on to this material for a period of ten years at which time it will be shredded.

Risk

There is a possibility that students may be uncomfortable answering some interview or survey questions. Students will be reminded that they may skip any question at any time. Your daughter also has the right to end interview participation at any time.

Benefits

This study will have no direct benefit to you or your daughter, other than possible increased understanding of herself as a learner in a Career and Technical Education classroom. I do hope that the reported results of the research may add to what we know about females choosing and entering into the more typically male dominated professions and may benefit vocational teachers who train these young women.

Contact Information

   If you have any questions about this study, please contact me, Chris Healy at [phone] or at [email], [address]. You may also contact my faculty advisor, Dr. Susan Bennett-Armistead at [phone] or at [email]. If you have any questions about your child's rights as a research participant, please contact [person], Assistant to the University of Maine's Protection of Human Subjects Review Board, at [phone] or at [email].

Your signature below indicates that you have read and understand the above information. You will receive a copy of this form.

_____ _____
Parent/Guardian's Signature   Date

_____
Student's Printed Name

APPENDIX N

ASSENT FORM FOR STUDENTS

Dear Student:

You are invited to take part in a research project being conducted throughout the spring semester by Mr. Christopher Healy, a graduate student in the College of Education and Human Development at the University of Maine and teacher at Seven Hills High School. This research will be carried out in order to inform Mr. Healy's doctoral dissertation in Literacy Education. The research will be conducted under the guidance of Dr. Susan Bennett-Armistead, an Associate Professor of Literacy Education in the College of Education and Human Development at the University of Maine.

The purpose of this research is to listen to female Career and Technical Education students' perspectives regarding the effectiveness processed by their instructors. More specifically, I am interested in hearing from female adolescents who have chosen to enter traditional male career paths.

What you will be asked to do?

As part of your regular vocational class, you learn in both a traditional classroom format, as well as hands-on, shop experiences. I am asking for your permission to use information about these instructional practices in my study. Specifically, I am asking for your permission to include you in the following activities. You may choose to participate in some or all of these activities, and only a small number of informants will be randomly selected for interviews.

➢ A questionnaire of your unique perspective regarding the experiences you have had in your vocational classroom and with the effectiveness of your instructor will be offered. Questionnaires will be located in the Learning Center at NERSAT and can be completed between January 29, 2018 to February 12, 2018. The questionnaire will take 15 minutes to complete. Questions focus on a your confidence to do certain tasks in the classroom. Sample questions include:
  o Get my instructor to teach me the central concepts of the technical trade I'm studying.
  o Have my instructor use his knowledge of the trades to help me learn.
  o Get my instructor to use effective teaching strategies.

➢ Three in-person interviews will be conducted between over an eight week period (beginning the week of February 26, 2018 and ending the week of April 23, 2018). I will ask you about your reactions to instructor teaching and about the way you perceive learning a skilled vocation. Sample questions include the following:
  o Tell me how you go about learning from your instructor. What does that look like?
  o What do you hope to get out of your vocational program?
  o If I followed you through a typical class session, what would I see you doing?

➢ In-person interviews will be audio-recorded and transcribed. Interviews will require up to sixty minutes of your time and will be scheduled during the class period or at another time during the school day that is convenient for you. Interviews will be conducted at the NERSAT where your responses will not be overheard, and I will remind you that you may choose to answer, or not answer, any questions that I ask. If I use any of your responses in my paper, I will ask that you review them to make sure they are accurate.

➢ Observations of classroom instruction will be conducted. The data collected will be in the form of notes written by this investigator. These observations will not be audiotaped, and will employ pseudonyms (fake names) to protect the identity of all informants.

Voluntary

Your participation is entirely voluntary. You may skip any survey or interview questions, or refuse to participate or withdraw from any of the activities listed above at any time. Withdrawing or refusing to participate in some or all of the activities or refusing to answer interview questions will not affect your standing with your teacher or either your high school or vocational school in any way.

Confidentiality

Your name will not be on any of the documents used for analysis. Student surveys will be identified with a numerical code and the handwritten list matching these codes to student names will be kept in a locked cabinet. The list will be destroyed on, or before, May 20, 2018.

I will store interview audio recordings on a computer hard drive in a password-protected file that only I can access. I will replace students' names with pseudonyms (fake names) when I transcribe audio recordings to interview transcripts. Audio recordings will be erased by June 20, 2018. I will store electronic copies of interview transcripts on a computer hard drive in a password protected file that only I can access. This computer hard drive as well as any paper copies of surveys, interview transcripts, or other documents will be stored in a locked cabinet in my home office. I will hold on to this material for a period of ten years at which time it will be shredded.

Risk

Other than time and inconvenience, risks to you are minimal beyond those of the regular school day. There is a possibility that you may be uncomfortable answering some interview or survey questions. You will be reminded that you may skip any question at any time. Students also have the right to end interview participation at any time.

Benefits

This study will have no direct benefit to you, other than possible increased understanding of yourself as a learner in a Career and Technical Education classroom. I do hope that the reported results of the research may add to what we know about adolescent girls choosing and entering into the more typically male dominated professions and may benefit vocational teachers who train these young women.

Contact Information

If you have any questions about this study, please contact me, Chris Healy at [phone] or at [email], [address]. You may also contact my faculty advisor, Dr. Susan Bennett-Armistead at [phone] or at [email] . If you have any questions about your child's rights as a research participant, please contact [name], Assistant to the University of Maine's Protection of Human Subjects Review Board, at [phone] or at [email].

Your signature below indicates that you have read and understand the above information. You will receive a copy of this form.

_____   _____

Student's Signature   Date

_____

Student's Printed Name

BIOGRAPHY OF THE AUTHOR

Christopher was born in Salem, Oregon. His family, originally form New York, relocated to Maine after their father, Thomas, who worked for Bell Systems, requested a transfer to, as he put it, "one of the last two frontiers of America" – Maine or Alaska. Every the adventurer, Chris graduated high school in Maine and then spent 10 years with the United State Air Force, stationed at Grand Forks Air Force Base, in Grand Forks, North Dakota, before returning to Maine and taking a B.S. degree in special education from the University of Maine at Farmington. He started his teaching career working with middle school students who were significantly reading impaired. In 2010, Chris received his M.Ed. in Literacy Education from the University of Maine. Currently, Chris teaches English to high school students with learning differences. Chris is a candidate for the Doctor of Philosophy degree in Education from the University of Maine in May 2019.