THE RELATIONSHIP BETWEEN PERSONALITY TYPE AND LEARNING STYLE: A STUDY OF AUTOMOTIVE TECHNOLOGY STUDENTS

A Dissertation in
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by

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ABSTRACT

Research has suggested that teachers tend to teach the way they were taught (Gardner, 1999; Jonassen, 1981). A finding such as this presents a problem that requires attention since everyone learns differently. In an effort to provide career and technical education (CTE) professionals with additional insight on how to better meet the individual educational needs of the learner, this study first sought to identify the predominant personality type of postsecondary automotive technology students and second examined whether there was a relationship between the participant’s predominant personality type and learning style. The findings suggested that the majority of participants had a predominant Realistic personality classification. Additional analysis revealed a relationship between personality and learning style in participants with both a Realistic and Accommodating classification.
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Chapter 1

INTRODUCTION

Historical Perspectives

Throughout our educational pursuits, many of us have had a teacher from whom it was difficult to learn. We may have had trouble understanding an educational subject that didn’t particularly correspond with our personality, or it may have been a pedagogy related issue. According to Gardner, (1999) educators tend to teach the way they were taught. Another study by Jonassen (1981) identified that there is a strong relationship between teacher’s learning style and preferred teaching style. This creates a problem because we all learn differently. Unfortunately, there is not a “one-size fits all” approach to teaching and or learning (Jorgensen, 2006).

Over the years, the topic of learning has been examined extensively and has received considerable attention. A large portion of past research has focused on identifying learning styles/intelligences, or on adaptive strategies of teaching to meet the learning needs of students. One example of this can be seen in Gardner’s Theory of Multiple Intelligence.

According to Gardner (1999) there are eight diverse intelligences that explain the range of human potential in individuals which include: (a) Linguistic intelligence - the ability to learn and develop through spoken and written language; (b) Logical-mathematical intelligence - the ability to identify patterns and think logically; (c) Spatial intelligence - the ability to identify and use patterns of wide and confined space; (d) Bodily Kinesthetic intelligence - the ability to use the mind to coordinate physical movement; (e) Musical intelligence - the ability to perform, compose and appreciate
music; (f) Interpersonal intelligence - the ability to comprehend the intentions, motivations and needs of others; (g) Intrapersonal intelligence - the ability to understand information and knowledge of ourselves in order to regulate our life; and (h) Naturalist intelligence - the ability to recognize, categorize and draw upon certain aspects of the environment (pp. 41-43). While information such as this theory is invaluable, it is also limited in a sense because it does not correspond specifically with the personality of the individual.

Several studies have examined the relationship between personality and learning via the Myers-Briggs Type Indicator (MBTI). One such study by Fallan (2006) suggested that a student’s personality type relates to the most effective form of learning and if ignored can present a conflict in the educational process. A study conducted by Rothschild and Piland (1994) identified that there was a significant relationship between personality types and learning styles in a community college setting.

The focus of this research study was the topic of learning styles. More specifically, this study examined whether there was a relationship between personalities and learning styles of postsecondary automotive technology students. While the aforementioned studies provide valuable insight about the relationship between learning style and personality, they do not directly correspond with the trade and industry sector of Career and Technical Education (CTE).

*Overview of the automotive technology industry.* While the focus of this paper is on the relationship between personalities and learning styles of postsecondary automotive technology students, it may be extremely difficult to comprehend without a brief overview of the automotive technology industry within the United States.
The first American automobile that ran on gasoline was built in 1892, however it wasn’t until 1898 that any form of mass production in the United States was attempted by automobile manufactures (Barber, 1917). Since that time there has been a need for qualified professionals to perform preventative maintenance and repairs in the automotive industry. Over the years, the work of an automotive mechanic has evolved from mechanical repair to a highly technological field and as a result these workers are usually referred to as “technicians” (U.S. Department of Labor Bureau of Labor and Statistics, 2007). The Occupational Information Network (O-Net) website (2007) suggested that the traditional trade and industry automotive technician works on automobiles, trucks, buses, and other vehicles and repairs virtually any part or system on the vehicle. This profession requires a great deal of occupational specific knowledge and experience including academics skills such as reading comprehension, writing/recording, mathematics and additional skills such as active listening, speaking and problem solving (O-Net, 2007).

The Problem

According to Gardner (1999), teachers tend to teach the way they were taught. This critical finding presents a problem that requires attention. We do not all come from the same mold in regard to our specific learning style or personality. Hickcox (2006) suggested that all learning style research and application efforts need to stress the development of the individual and the whole learner. Learning styles, as well as personalities should be accounted for when considering the topic of pedagogy. With the overload of curricular assessment demands and a vast amount of learning style models, educators may find themselves in a state of confusion regarding the use of learning style models in the classroom (Hickcox, 2006). While research studies have examined the
relationship between learning style and personality type, few have examined the trade and industry sector of CTE. Thus, this research study sought to determine whether there was a relationship between personality and learning style of postsecondary automotive technology students. This topic was examined for the purpose of providing more information regarding how to better serve the educational needs in preparing this student population for the world-of-work. The dependent variable in this study was the learning style of the postsecondary automotive technology student. The independent variable in this study was the personality of the postsecondary automotive technology student.

Significance of the Study

Is there a predisposition for our personality to correspond with a particular learning style? This study sought to answer this question. If the answer to this question is yes, educators need to re-think how they are teaching students. A study such as this may have the ability to help educators understand the value in adapting curriculum and pedagogy to meet the educational needs of students. Not only does a study such as this give educators a comprehensive understanding of students’ learning styles, but it may have the ability to reinforce the need to educate to each personality in order to successfully prepare postsecondary automotive technology students for the world of work.

Research Questions

This study sought to answer the following questions by utilizing Holland’s Theory of Vocational Personalities and Environments and Kolb’s Experiential Learning Theory (ELT) as a foundation:
1. What is the predominant personality type of postsecondary automotive technology students?

2. Is there a relationship between the postsecondary automotive technology student predominant personality type and their learning style?

Limitations

While it is difficult and often times dangerous to generalize when it comes to the topic of personalities, Holland’s Theory of Vocational Personalities and Environment seems to do a very nice job of encapsulating these items. However, a 1996 study by Rounds and Tracey (Evans, Forney, & Guido-Dibrito, 1998, p. 239) found that out of 18 countries as well as ethnic groups in the United States, Holland’s hexagon was only a good fit for two of them. Thus, this study cautioned against applying Holland’s Theory of Vocational Personalities and Environment cross-culturally. While using Holland’s Theory might be a problem in this study if the plan was to survey postsecondary automotive technology students in other countries, this research was conducted in the center region of Pennsylvania in postsecondary technical institutions. Since automotive technology students have traditionally been found in the Realistic section of Holland’s hexagon (O-Net, 2007), there was a potential for a portion of the hexagon to be unrepresented in the results section.

Assumptions

Prior to conducting the study it was the belief of the primary investigator that there was a relationship between the predominant personality and learning style of postsecondary automotive technology students. Furthermore, it was the assumption of the
The theoretical framework that was used for this research study includes Holland’s Theory of Vocational Personalities and Environment and Kolb’s Experiential Learning Theory (ELT). One of the most popular and effective career development models to date is John Holland’s Theory of Vocational Personalities and Environment. Holland’s Theory naturally aligned with this study since the research examined both an occupational area (automotive technology) and personality type. Holland’s Theory (Niles & Harris-Bowlsbey, 2002) was based on four basic principles:

(a) In our culture, most persons can be categorized as one of six personality types: realistic, investigative, artistic, social, enterprising, and conventional. (b) There are six kinds of environments: realistic, investigative, artistic, social, enterprising, and conventional. (c) People search for environments that will let them exercise their skills and abilities, express their attitudes and values, and take on agreeable problems and roles. (d) A person’s behavior is determined by an interaction between his personality and the characteristics of his environment. (p. 49)

Brief explanations of Holland’s personality and environmental types are listed below and represented in his legendary hexagon (see Figure 1).

**Realistic (R):** “preference for activities that entail the explicit, ordered or systematic manipulation of objects, tools, machines and animals and to an aversion to educational or therapeutic activities” (Holland, 1997, p. 21).
Investigative (I): “preference for activities that entail the observational, symbolic, systematic and creative investigation of physical, biological and cultural phenomena and aversion to persuasive, social and repetitive activities” (Holland, 1997, p. 22).

Artistic (A): “preference for ambiguous, free, unsystematized activities that entail the manipulation of physical, verbal or human materials to create art forms or products and to an aversion to explicit, systematic and ordered activities” (Holland, 1997, p. 23).

Social (S): “preference for activities that entail the manipulation of others to inform, train, develop, cure or enlighten and an aversion to explicit, ordered, systematic activities involving materials, tools or machines” (Holland, 1997, p. 24).

Enterprising (E): “preference for activities that entail the manipulation of others to attain organizational goals or economic gain and an aversion to observational, symbolic and systematic activities” (Holland, 1997, p. 25).

Conventional (C): “preference for activities that entail the explicit, ordered, systematic manipulation of data and to an aversion to ambiguous, free, exploratory or unsystematized activities” (Holland, 1997, p. 26-27).

![Holland’s hexagon](image-url)  
*Figure 1. Holland’s hexagon (Holland, 1997)*
The second theory that served as a foundation in the research study was Kolb’s ELT (1984). Kolb’s ELT naturally aligns with the study since the research focused on the learning style of postsecondary automotive technology students. Kolb’s ELT was built on six propositions (Kolb & Kolb, 2005b) that include:

(a) Learning is best conceived as a process, not in terms of outcomes. To improve learning in higher education, the primary focus should be on engaging students in a process that best enhances their learning a process that includes feedback on the effectiveness of their learning efforts. (b) All learning is relearning. Learning is best facilitated by a process that draws out the students’ beliefs and ideas about a topic so that they can be examined, tested, and integrated with new, more refined ideas. (c) Learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world. Conflict, differences, and disagreement are what drive the learning process. In the process of learning one is called upon to move back and forth between opposing modes of reflection and action and feeling and thinking. (d) Learning is a holistic process of adaptation to the world. Not just the result of cognition, learning involves the integrated functioning of the total person thinking, feeling, perceiving, and behaving. (e) Learning results from synergetic transactions between the person and the environment. (f) Learning is the process of creating knowledge. (p. 194)

Kolb’s ELT (2005b) identified two dialectically related modes of grasping experience: Concrete Experience (CE) and Abstract Conceptualization (AC) and two dialectically modes of transforming experience: Reflective Observation (RO), Active Experimentation (AE). Thus, based on the preferences for one of the polar opposites of
each of the aforementioned modes appears four learning styles (Evans, Forney & Guido-Dibrito, 1998) (see Figure 2). These learning styles are briefly defined as follows:

**Converging:** Converging style has AC and AE dominant learning style abilities, tend to excel at finding pragmatic mythologies of working with ideas and theories and are inclined to be good at problem solving and technical tasks (Kolb & Kolb, 2005b).

**Diverging:** Diverging style has CE and RO dominant learning style abilities and tend perform well in situations that call for generation of ideas (brainstorming) (Kolb & Kolb, 2005b).

**Assimilating:** Assimilating style has AC and RO dominant learning abilities, tend to excel at understanding and organizing a range of information and would often times rather work with concepts than people (Kolb & Kolb, 2005b).

**Accommodating:** Accommodating style has CE and AE dominant learning abilities, tend to excel at hands on learning activities and enjoy completing new experiences and complex tasks (Kolb & Kolb, 2005b).
The theoretical framework that was used for this research study included Holland’s Theory of Vocational Personalities and Environment and Kolb’s ELT. Both of these theories are well established in their respective fields and have stood up to an extensive amount of scrutiny over the years.

**Definition of Terms**

The following terms are specialized vocabulary closely associated with Holland’s Theory of Vocational Personalities and Environment:

**Consistency**: Consistency refers to the degree to which personality/environmental types within Holland’s Theory are related (Evans et al., p. 230).
Differentiation: Differentiation refers to the extent to which a particular type within Holland’s Theory describes a person or an environment (Evans et al., 1998, p. 230).

Congruence: Congruence refers to the degree of match between a person and an environment within Holland’s Theory (Evans et al., 1998, p. 230).

The following terms are specialized vocabulary closely associated with Kolb’s ELT (1984) which define three stages:

Acquisition: “from birth to adolescence, where basic abilities and cognitive structures develop” (Kolb & Kolb, 2005b).

Specialization: “from formal schooling through the early work and personal experiences of adulthood where social, educational, and organizational socialization forces shape the development of a particular, specialized learning style” (Kolb & Kolb, 2005b).

Integration: “in midcareer and later life, where nondominant modes of learning are expressed in work and personal life” (Kolb & Kolb, 2005b).
Chapter 2

REVIEW OF RELATED LITERATURE

Over the years, the topic of learning style has been examined extensively and has received considerable attention. While there is a large body of research on learning styles, further dialog regarding this subject is still needed (Sims & Sims, 2006). A large portion of past research has focused on identifying learning styles/intelligences, or on adaptive strategies of teaching to meet the learning needs of students. Gardner (1999) found that educators tend to teach the way they were taught. A study by Jonassen (1981) identified that there is a strong relationship between a teacher’s learning style and preferred teaching style. Findings such as these are alarming since there is not a “one-size fits all” approach to teaching and or learning (Jorgensen, 2006).

“It is clear that a learning style body of knowledge has been accepted into the education literature and professional development agenda since the 1980s” (Hickcox, 2006). Learning style research has also provided valuable insight regarding the relationship between learning style and personality. While the research does not in most cases specifically relate to career and technical education (CTE), it can still be considered invaluable since it is relevant in all educational contexts.

Hickcox (2006) suggested that all learning style research and application efforts need to stress the development of the individual and the whole learner. With this in mind, this literature review will focus on the information pertaining to personality and learning style, which has the ability to assist CTE professionals in meeting the learning needs of their students. The first section will define CTE and explain why the topic of learning style has become increasingly important in this profession. The second section will define
learning style and explain why the topic is important. The remaining sections will address the more specific topic of the relationship between personality and learning styles. Theories such as Jung’s Theory of Personality Type, Gardner’s Theory of Multiple Intelligence and Kolb’s Experiential Learning Theory to name a few, will be examined in this chapter. The findings cited in this literature review are drawn from 42 sources pertaining to the topics of learning style, personality and CTE.

CTE and the Increased Importance of Learning Style

CTE, formerly termed vocational education, is a “collective term to identify curriculum programs designed to prepare students to acquire an education and job skills, enabling them to enter employment immediately upon graduation” (Lynch, 2000, p. 155). CTE prepares both youth and adults for a broad range of diverse careers from automotive technicians to registered nurses, that require varying levels of education ranging from high school to postsecondary certificates to two- and four-year college degrees (ACTE, 2006b). A significant development and federal priority includes strengthening the academic skills of CTE students by integrating academic instruction (Walter & Gray, 2002).

Due to curricular assessment demands the topic of learning styles has become increasingly important (Hickcox, 2006). With the pressure to respond to the “No Child Left Behind” (NCLB) legislation all areas of education in the U.S. are at a crossroad (Sims & Sims, 2006). The NCLB legislation has raised the bar in all educational settings (Hull, 2004). One such example of the bar being raised in CTE can be seen in the Carl D. Perkins CTE Improvement Act of 2006 (PL 109-270), also known as Perkins IV. Perkins IV was recently passed by Congress and was signed into law by President Bush. Perkins
IV has been authorized for six years and is expected to allocate approximately 1.3 billion dollars in federal aid to CTE programs in all 50 states (ACTE, 2006a). This legislation places greater accountability on integration of academic standards, which is aligned directly with the NCLB movement (“Carl D. Perkins,” 2006).

Perkins IV is ultimately intended to strengthen the focus on responsiveness to the economy while tightening up the accountability statement in regard to the integration of academics and technical standards. Due to recent curricular assessment demands (i.e., Perkins IV) the topic of learning style has become increasingly important in CTE. Teachers and schools must increase their understanding of how individuals learn including the diversity surrounding learning styles, instrumentation and the implications of individual learning styles that contribute to success in the learning process (Sims & Sims, 2006).

Learning Styles and their Importance

While not specifically targeted at CTE, there is a vast amount of literature surrounding the topic of learning style, which is relevant in all educational contexts. CTE professionals should consider this information earnestly due to the curricular assessment demands of Perkins IV.

Kolb, (1984) defined learning as a “process whereby knowledge is created through the transformation of experience” (p.38). A learning style on the other hand is defined as a “mode and/or environment(s) in which individuals learn most effectively and efficiently“ (Howell & Wikoff, 1984, p. 119). Sims and Sims (2006) explained that the phrase learning style is often used interchangeably with terms such as “cognitive style”, “learning ability”, and techniques for assessing individuals “learning characteristics”.


There is not a “one-size fits all” approach to teaching and or learning (Jorgensen, 2006). However, Hartel (1995) identified that an educator’s teaching style is often determined by his or her own learning style rather than on the learning style of the pupil. A study by Jonassen (1981) identified that a strong relationship exists between the learning style of the educator and their preferred teaching style. Additional literature has revealed that educators cannot give a substantial reason as to why they utilized a particular teaching and or learning style technique (Barkley, 1995). While findings such as these could be considered alarming, Whittington and Raven (1995) identified that teaching styles can be altered with conscious effort. Heimlich and Norland (1994) indicated that:

It is often asserted that educators should adapt their teaching style to the learning style of the students. This advice appears to be a contradiction of the basic meaning of style, which is a function of an individual’s personality, experience, ethnicity, education and other individual traits. An educator cannot and should not “change” personality to satisfy each and every learner. Instead, the teacher can adopt - and - adapt classroom methods, strategies, techniques, and processes to be more consistent with his or her individual style. (p. 45)

With this “adopt - and - adapt” principle in mind several studies have provided a pragmatic look at such a concept. Ausburn and Brown (2006) noted that “studies of individual differences in preferred instructional methods and approaches to learning have shown that student learning tends to benefit from identifying such differences and from using them to customize instruction” (p. 17). An example of this includes a meta-analysis of 42 studies conducted between the 1980s and 1990s which found a positive relationship
between academic achievement and instruction that matched students’ learning styles (Dunn Griggs, Olsen, Gorman, & Beasley, 1995). Another study by Munday (2002) found that knowledge of the learning strategy preference enhanced academic performance and as a result is beneficial to adult students as well as the instructor.

This literature reinforces the importance of the topic of learning styles and personal differences (i.e., personality) in the teaching and learning process. While not specifically targeted at CTE, there is a vast amount of literature surrounding the topic of learning style, which is relevant in all educational contexts. The remainder of this chapter will address the more specific topic of the relationship between personality and learning styles. Theories such as Jung’s Theory of Personality Type, Gardner’s Theory of Multiple Intelligence and Kolb’s Experiential Learning Theory to name a few, will be examined followed by several research studies which deal specifically with the topic of personality and learning style.

Relevant Theory

There is much invaluable literature pertaining to the topic of learning and personality. When examining the topic of personality, one should understand that a relationship between personality type and academic ability, self-rating of personality characteristics, involvement in activities, academic interests, personal achievements and personality traits has been established (Evans, Forney & Guido-DiBrito, 1998). Moreover, research has revealed that a correlation between learning style and personality exists (Lawrence, 1993).

Personality theories. There are several theories that directly relate to the topic of personality and learning styles. For example, Jung identified psychological types in
individuals. He identified four personality types which include two “irrational and an additional two “rational” types that direct mental activity (Myers & McCaulley, 1985). Jung’s work was eventually formed into a theoretical foundation known as Jungian Theory, which categorized individuals into stable groups according to combinations of preferred methods of perception and judgment (Ausburn & Brown, 2006).

The personality research conducted by Jung was expanded upon by Myers (Evans et al., 1998), which explains that:

There are eight preferences arranged along four bipolar dimensions: extraversion-introversion (EI), sensing-intuition (SN), thinking-feeling (TF), and judging-perception (JP). These preferences can be organized into sixteen different types (ISTJ, ISFJ, ENTP, ENTJ, and so forth). Individuals will differ from others in ways that are representative of their types. (p. 246)

This expanded research lead to the creation of a personality assessment instrument known as the Myers - Briggs Type Indicator (MBTI). The MBTI instrument is often seen as byproduct of Jungian Theory. The MBTI is an assessment tool used in applying Jung’s Theory, which identifies personality type (Claxton & Murrell, 1987). The MBTI gained enormous attention following its publication by Consulting Psychologists Press in 1976 thus, today it is the most extensively utilized tool in identifying personality (Evans et al., 1998).

Keirsey and Bates (1984) believed that the Myers-Briggs preferences could better represent the behavior of an individual if they were classified into four distinct temperaments, which include artisan, guardian, rational and idealist. These temperaments outlined in Keirsey’s Theory identify characteristics, which relate to preference in the
learning process (Evans et al., 1998). Keirsey’s Theory utilizes an instrument known as Keirsey’s Temperament Sorter. Directly related to the topic of personality is a model identified by Dunn and Dunn (1992) which uses a learning style inventory to assess an individual in five areas (environmental, emotional, sociological, physical and psychological) to determine learning style.

Another personality related theory developed by Holland identified six personalities and environmental types. While most closely associated with the career development domain of education, John Holland’s Theory of Vocational Personalities and Environments is one of the most popular and effective career development models to date. Holland’s Theory (1997) explained that personalities and occupational environments can be classified into six different categories (realistic, investigative, artistic, social, enterprising, and conventional) thus, individuals search for an environment in which to express their interest, abilities and values. Holland identified that people in most cases cannot be classified as a pure type, but rather are a combination of two or three. Holland’s (1997) six personalities and environment types include:

(a) Realistic - a preference for activities that entail the explicit, ordered or systematic manipulation of objects, tools, machines and animals and to an aversion to educational or therapeutic activities; (b) Investigative - preference for activities that entail the observational, symbolic, systematic and creative investigation of physical, biological and cultural phenomena and aversion to persuasive, social and repetitive activities; (c) Artistic - preference for ambiguous, free, unsystematized activities that entail the manipulation of physical, verbal or human materials to create art forms or products and to an aversion to explicit,
systematic and ordered activities; (d) Social - preference for activities that entail the manipulation of others to inform, train, develop, cure or enlighten and an aversion to explicit, ordered, systematic activities involving materials, tools or machines; (e) Enterprising - preference for activities that entail the manipulation of others to attain organizational goals or economic gain and an aversion to observational, symbolic and systematic activities; (f) Conventional - preference for activities that entail the explicit, ordered, systematic manipulation of data and to an aversion to ambiguous, free, exploratory or unsystematized activities. (pp. 21-27)

One of the most popular instruments used to identify an individual’s personality and environmental type based on Holland’s Theory is the Self Directed-Search (SDS). The SDS is a self-administered, scored and interpreted educational assessment tool which attempts to identify a three letter code in order to determine the personality and environmental type which best represents the interests, abilities and values of the individual (Holland, 1971). Table 1 presents the SDS normal distribution of predominant personality type for male and female college students, as reported in the technical manual.

<table>
<thead>
<tr>
<th>Personality Type</th>
<th>Male (n=399)</th>
<th>Female (n=716)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Realistic</td>
<td>79</td>
<td>19.80</td>
</tr>
<tr>
<td>Investigative</td>
<td>63</td>
<td>15.79</td>
</tr>
<tr>
<td>Artistic</td>
<td>39</td>
<td>9.77</td>
</tr>
<tr>
<td>Social</td>
<td>103</td>
<td>25.81</td>
</tr>
<tr>
<td>Enterprising</td>
<td>96</td>
<td>24.06</td>
</tr>
<tr>
<td>Conventional</td>
<td>19</td>
<td>4.76</td>
</tr>
</tbody>
</table>

(Holland, Fritzsche & Powell, 1997, p. 85 & 86)

*Note.* "predominant" denotes the first letter of the Holland code within the SDS.
In a national CTE study, which utilized the SDS as the primary research instrument, female carpenters (n= 423) in the 1990s were predominantly classified as Realistic, Social and Conventional (RSC) (Swan, 2005). The results of this study support earlier findings of samples within the CTE population. However, Swan (2005) identified that there appears to be a lack of congruence between participant’s second and third letter codes. Thus the results of this study identified the Realistic type as the predominant participant personality classification with the highest SDS numerical score.

While Holland’s Theory and the SDS are most commonly used in linking personality to career choice, the six different personality and environmental types identify specific characteristics which have the ability to relate to the learning and developmental process of an individual.

Learning style theory. There are several learning style theories that have been identified over the years. While not officially termed a learning style theory, Gardner’s Theory of Multiple Intelligence serves as an invaluable resource that directly relates to the topic of learning style. Gardner, (1999) found that educators tend to teach the way they were taught. This creates a problem because there is not a “one-size fits all” approach to teaching and/or learning (Jorgensen, 2006). According to Gardner (1999) there are eight diverse intelligences which have been identified that explain the range of human potential in individuals which include: (a) Linguistic intelligence - the ability to learn and develop through spoken and written language; (b) Logical-mathematical intelligence - the ability to identify patterns and think logically; (c) Spatial intelligence - the ability to identify and use patterns of wide and confined space; (d) Bodily Kinesthetic intelligence - the ability to use the mind to coordinate physical movement; (e) Musical
intelligence - ability to perform, compose and appreciate music; (f) Interpersonal intelligence - the ability to comprehend the intentions, motivations and needs of others; (g) Intrapersonal intelligence - the ability to understand information and knowledge of ourselves in order to regulate our life; (h) Naturalist intelligence - the ability to recognize, categorize and draw upon certain aspects of the environment (pp. 41-43).

Gardner’s Theory of Multiple Intelligence explains the strengths and weaknesses of individuals in the learning and development process. A theory such as this identifies that different learning conditions are better suited to different types of intelligences (Komives & Woodard, 2001).

Kolb’s Experiential Learning Theory (ELT) has steadily gained acceptance and popularity in education and serves as an invaluable resource for teaching and learning (Kolb & Kolb, 2006). Kolb draws upon the works of Dewey, which stressed the role of experience in the learning process (Rudowski, 1996). Thus, this learning style model is grounded in the theoretical framework of personal experience (Ausburn & Brown, 2006). Kolb’s ELT is built on six propositions (Kolb & Kolb, 2005b) that include:

(a) Learning is best conceived as a process, not in terms of outcomes. To improve learning in higher education, the primary focus should be on engaging students in a process that best enhances their learning a process that includes feedback on the effectiveness of their learning efforts. (b) All learning is relearning. Learning is best facilitated by a process that draws out the students’ beliefs and ideas about a topic so that they can be examined, tested, and integrated with new, more refined ideas. (c) Learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world. Conflict, differences, and
disagreement are what drive the learning process. In the process of learning one is called upon to move back and forth between opposing modes of reflection and action and feeling and thinking. (d) Learning is a holistic process of adaptation to the world. Not just the result of cognition, learning involves the integrated functioning of the total person thinking, feeling, perceiving, and behaving. (e) Learning results from synergetic transactions between the person and the environment. (f) Learning is the process of creating knowledge. (p. 194)

Kolb’s ELT (2005b) identified two dialectically related modes of grasping experience: Concrete Experience (CE) and Abstract Conceptualization (AC) and two dialectically modes of transforming experience: Reflective Observation (RO), Active Experimentation (AE). Thus, based on the preferences for one of the polar opposites of each of the aforementioned modes appears four learning styles (Evans et al., 1998). Kolb’s learning styles are briefly defined as follows:

(a) Converging - converging style has AC and AE dominant learning style abilities, tend to excel at finding pragmatic mythologies of working with ideas and theories and are inclined to be good at problem solving and technical tasks; (b) Diverging - diverging style has CE and RO dominant learning style abilities and tend perform well in situations that call for generation of ideas (brainstorming); (c) Assimilating - assimilating style has AC and RO dominant learning abilities, tend to excel at understanding and organizing a range of information and would often times rather work with concepts than people; and (d) Accommodating - accommodating style has CE and AE dominant learning abilities, tend to excel at hands on learning activities and enjoy completing new experiences and complex tasks (Kolb & Kolb, 2005b).
Kolb’s ETL uses an instrument known as the Learning Style Inventory (LSI) to assess individual learning style. The LSI is set up in a simple format, which usually provides an interesting self-examination, and discussion that identifies valuable information regarding the individual’s approaches to learning (Kolb & Kolb, 2005b).

Table 2 presents a distribution summary of Kolb’s learning styles by educational specialization, which was reported within the LSI technical manual. More specifically, this table presents the normal distributions of both undergraduate and graduate students as well as adult learners according to their learning style classifications and particular educational specialization as observed after completing the LSI (see Table 2).

<table>
<thead>
<tr>
<th>Educational Specialization</th>
<th>Accommodating</th>
<th>Diverging</th>
<th>Converging</th>
<th>Assimilating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting</td>
<td>39 (26.2%)</td>
<td>26 (17.4%)</td>
<td>42 (28.2%)</td>
<td>42 (28.2%)</td>
</tr>
<tr>
<td>Agriculture</td>
<td>6 (31.6%)</td>
<td>6 (31.6%)</td>
<td>6 (31.6%)</td>
<td>1 (5.3%)</td>
</tr>
<tr>
<td>Architecture</td>
<td>2 (28.6%)</td>
<td>0 (0%)</td>
<td>1 (14.3%)</td>
<td>4 (57.1%)</td>
</tr>
<tr>
<td>Business</td>
<td>290 (31.2%)</td>
<td>165 (17.8%)</td>
<td>215 (23.1%)</td>
<td>259 (27.9%)</td>
</tr>
<tr>
<td>Computer Sci./IS</td>
<td>54 (26.2%)</td>
<td>35 (17%)</td>
<td>55 (26.7%)</td>
<td>62 (30.1%)</td>
</tr>
<tr>
<td>Education</td>
<td>92 (38.3%)</td>
<td>46 (19.2%)</td>
<td>41 (17.1%)</td>
<td>61 (25.4%)</td>
</tr>
<tr>
<td>Engineering</td>
<td>103 (23.6%)</td>
<td>50 (11.5%)</td>
<td>145 (33.3%)</td>
<td>138 (31.7%)</td>
</tr>
<tr>
<td>App. &amp; Fine Arts</td>
<td>23 (30.7%)</td>
<td>20 (26.7%)</td>
<td>12 (16%)</td>
<td>20 (26.7%)</td>
</tr>
<tr>
<td>Health</td>
<td>82 (31.4%)</td>
<td>48 (18.4%)</td>
<td>59 (22.6%)</td>
<td>72 (27.6%)</td>
</tr>
<tr>
<td>Humanities</td>
<td>28 (25.2%)</td>
<td>24 (21.6%)</td>
<td>19 (17.1%)</td>
<td>40 (36%)</td>
</tr>
<tr>
<td>Language</td>
<td>8 (30.8%)</td>
<td>4 (15.4%)</td>
<td>5 (19.2%)</td>
<td>9 (34.6%)</td>
</tr>
<tr>
<td>Law</td>
<td>29 (26.4%)</td>
<td>16 (14.5%)</td>
<td>23 (20.9%)</td>
<td>42 (38.2%)</td>
</tr>
<tr>
<td>Literature</td>
<td>5 (13.2%)</td>
<td>15 (39.5%)</td>
<td>8 (21.1%)</td>
<td>10 (26.3%)</td>
</tr>
<tr>
<td>Medicine</td>
<td>88 (27.8%)</td>
<td>50 (15.8%)</td>
<td>96 (30.4%)</td>
<td>82 (25.9%)</td>
</tr>
<tr>
<td>Other</td>
<td>301 (31.8%)</td>
<td>213 (22.5%)</td>
<td>185 (19.5%)</td>
<td>248 (26.2%)</td>
</tr>
<tr>
<td>Phys. Education</td>
<td>12 (50%)</td>
<td>5 (20.8%)</td>
<td>3 (12.5%)</td>
<td>4 (16.7%)</td>
</tr>
<tr>
<td>Psychology</td>
<td>53 (33.1%)</td>
<td>40 (25%)</td>
<td>15 (9.4%)</td>
<td>52 (32.5%)</td>
</tr>
<tr>
<td>Science/Math</td>
<td>53 (18.5%)</td>
<td>35 (12.2%)</td>
<td>88 (30.8%)</td>
<td>110 (38.5%)</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>68 (29.7%)</td>
<td>51 (23.3%)</td>
<td>38 (16.6%)</td>
<td>72 (31.4%)</td>
</tr>
<tr>
<td>Total</td>
<td>1390 (29.7%)</td>
<td>866 (18.5%)</td>
<td>1076 (23%)</td>
<td>1347 (28.8%)</td>
</tr>
</tbody>
</table>

(Kolb & Kolb, 2005a, p. 71)

Note: the sample within this table includes both undergraduate college students, graduate students and adult learners with an approximate age range of <19 to >55.
Personality and Learning Style Related Research

Several studies have examined the relationship between personality and learning via the MBTI. One such study by Fallan (2006) suggested that a student’s personality type relates to the most effective form of learning and if ignored can present a conflict in the educational process. Another related study conducted by Rothschild and Piland (1994) identified that there was a significant relationship between personality types and learning styles in a community college setting. Moody (1988) measured personality and learning style preferences of first and second year language students by using the Myers-Briggs Type Indicator. Moody identified that there were more thinking and intuitive types in the sample and that there was a need to account for diverse personality and learning styles in an educational setting. A study (Geisler-Brenstein, Schmeck & Hetherington, 1996) of 325 university students examined the correlation between personality and learning style. The results of this study identified that there is a strong relationship between self-concept variables, personality, and learning style dimensions. Kalsbeek (1986) measured the relationship between personality and learning via the MBTI in tracking a retention and integration learning style program at a Saint Louis University. The results indicated that intuition and introversion types tended to have a higher grade point average (GPA) in the first-term, while judging types tended to have a higher long-term GPA.

Another noteworthy study, somewhat related to CTE, conducted by Ritchie (1975) sought to determine if there was a relationship between personality type and the learning style of nursing students and registered nurses via the MBTI and the Media Effectiveness Chart (MEC). The MEC instrument was utilized within this study to
correlate preferred instructional media (learning style) with the Jungian personality types. The study findings suggested that there was a relationship between personality and learning and that nursing education programs should be structured to accommodate student development and educational needs. Moreover, Ritchie found that the majority of participants represented within this study are of the Sensing type thus they were identified as needing specific objectives spelled out for learning and evaluation. The results of this study further suggested that the majority of nursing students and registered nurses preferred lecture, discussion, small group work, reading articles, and laboratory work as methods of teaching.

Aragon (2004) explored the information processing patterns of postsecondary American Indian/Alaska Native students via Kolb’s learning style inventory, MBTI and the Oltman, Raskin, and Witkin Group Embedded Figures Test. Aragon (2004) reported that three major items were identified:

First, the students described their learning as a combination of learning by thinking and learning by watching. . . Second, the “ISTJ” from the MBTI best described the personality influences on learning for these students. These students are practical, orderly, logical, and earn success by concentration and thoroughness. Finally, the results suggested that these students can draw equally from both analytical (field-independent) and global (field-dependent) forms of information processing. (p. 1)

A thought provoking study conducted by Highhouse and Doverspike (1987) examined the relationship between measures of cognitive style, occupational preference and learning modes of 111 psychology students (i.e., 48 males and 63 females) at the
university level utilizing Kolb’s LSI (i.e., the modes of grasping experience dimension), the Group Embedded Figures Test (GEFT) and Holland’s Vocational Preference Inventory (VPI). With the means, standard deviations and intercorrelations measured, the results of this study revealed that there were no significant correlations between the LSI and the GEFT. However, there were some noteworthy correlations found between Kolb’s LSI and Holland’s VPI which parallels the SDS instrument. Kolb’s Concrete Experience (CE) scale significantly correlated with Holland’s Artistic (A) personality type. Kolb’s Active Experimentation (AE) scale significantly correlated with Holland’s Realistic (R), Social (S), Conventional (C) and Enterprising (E) personality types. Furthermore, Kolb’s Reflective Observation (RO) scale significantly negatively correlated with Holland’s R, C and E personality types. Finally Kolb’s Abstract Conceptualization (AC) did not correlate with any of Holland’s personality types.

Finally a similar study conducted by Penney and Cahill (2002) examined the work personality and learning style of 60 adult male correctional institution parolees on the Avalon Peninsula of Newfoundland utilizing Holland’s SDS (Form E), Kolb’s LSI (i.e., the modes of grasping experience dimension) and a Career Counseling Preferences Questionnaire (CCPQ). The results revealed: (a) a positive relationship between the LSI and the CCPQ Thinker score; (b) Holland’s I personality type was positively correlated with Kolb’s AC and AC - CE score; (c) Holland’s I personality type was negatively correlated with Kolb’s AE score; (d) Holland’s A personality type was found to be negatively correlated with Kolb’s RO score; and (e) Holland’s C personality type was negatively correlated with Kolb’s AE and AE - RO score. Penney and Cahill were forthcoming in identifying that “none of the significant correlations found by Highhouse
and Doverspike between the LSI styles and Holland type were replicated in this study” (p. 33). These studies have served to highlight the research conducted on the relationship between personality and learning style. CTE professionals should take this information seriously due to the curricular assessment demands of the day.

Chapter Summary

Over the years, the topic of learning styles has been examined extensively and has received considerable attention. Yet despite the large amount of research on learning styles, further dialog regarding this subject is still needed (Sims & Sims, 2006). This literature review focused on the information pertaining to personality and learning style. While the literature in this chapter didn’t directly relate to CTE, the topic of learning style and its relationship to personality is relevant in all educational contexts. This literature has the ability to provide CTE professionals with invaluable insight regarding how to better meet the educational needs of their students in preparing them for the world-of-work. CTE professionals should take this information earnestly due to the curricular assessment demands of Perkins IV.

There are several themes that can be observed by examining this literature review. First, a relationship between personality and learning style has been identified in select educational settings. Second, the majority of the research studies, which found a relationship between personality and learning style, used the MBTI. Third, besides the research study conducted by Ritchie (1975) on nursing students and registered nurses, research on the relationship between personality and learning styles in CTE is virtually nonexistent.
While the literature examined in this chapter is valuable, it is limited in a sense because it does not correspond specifically with CTE. Furthermore the majority of the studies were conducted using the MBTI as their assessment instrument. It is the recommendation of the author that further research on the relationship between personality and learning style be conducted in an educational setting such as CTE using an assessment instrument other than the MBTI. Such studies may yield valuable data regarding how to better meet the educational needs of students in preparing them for the world-of-work.
Chapter 3

METHODOLOGY

Over the years, the topic of learning has been examined extensively and has received considerable attention. The focus of this research study was the topic of student preferred learning styles. More specifically, the study examined whether there is a relationship between personality and learning style in postsecondary automotive technology students. Is there a predisposition for student personality to correspond with a particular preferred learning style? If yes, educators need to re-think how they are teaching students. This topic was examined for the purpose of providing more information regarding how to serve the educational needs of postsecondary automotive technology students in preparation for the world-of work. The study further provides career and technical education (CTE) professionals to better understand the value in adapting curriculum and pedagogy to meet the educational needs of individual students.

The Problem

Jonassen (1981) identified a strong relationship between a teacher’s learning style and preferred teaching style. Gardner (1999) also found educators tend to teach the way they were taught. These critical findings present a problem requiring attention since we are not all from the same mold in our specific learning style or personality. With the overload of curricular assessment demands and a vast number of learning style models, educators may find themselves in a state of confusion on how to use learning style models in the classroom (Hickcox, 2006). While research studies have examined the relationship between learning style and personality type, few have examined the trade and industry sector of CTE.
Target Population

Since there is a lack of research on the relationship between personality and learning style in CTE, the study examined this topic through the lens of the trade and industry sector of the profession. The target population for this study was postsecondary automotive technology students in the center region of Pennsylvania (see Figure 3).

Figure 3. County map of the center region of Pennsylvania.

Postsecondary automotive technology students eligible to participate in the study were defined as: (a) first or second year students currently enrolled in a postsecondary automotive technology program providing career preparation in the automotive technology field (i.e., general certificate programs, associate of applied science degree programs, and automotive manufacturer GM Asset programs); (b) students currently learning to repair automobiles, trucks, buses, and other vehicle repairs on virtually any
part or system through a combination of classroom instruction and hands-on experience at Pennsylvania College of Technology, Harrisburg Area Community College or Thaddeus Stevens College of Technology; and (c) currently enrolled students are at least 18 years of age or older.

There are three public postsecondary colleges offering automotive technology programs in the center region of Pennsylvania, including Pennsylvania College of Technology, Harrisburg Area Community College, and Thaddeus Stevens College of Technology. According to registrar offices, automotive technology enrollments for the spring of 2008 were 195 students attending Pennsylvania College of Technology, 85 students at Harrisburg Area Community College and 30 students enrolled at Thaddeus Stevens College of Technology. During the spring semester 2008, there were a total of 310 postsecondary automotive technology students in central Pennsylvania. A minimum sample size of 172 was required for the study to represent the population with no more than a 5% margin of error with 95% confidence (Isaac & Michael, 1997). In order to obtain an acceptable sample size, postsecondary automotive technology students completed a survey administered by the researcher in the participant’s classroom setting.

Research Questions

This study sought to answer the following questions by utilizing Holland’s Theory of Vocational Personalities and Environments and Kolb’s ELT as a foundation:

1. What is the predominant personality type of postsecondary automotive technology students?

2. Is there a relationship between the postsecondary automotive technology student predominant personality type and their learning style?
Variables

**Dependent variable.** The dependent variable in this study was the learning style of the postsecondary automotive technology student. The Experiential Learning Theory (ELT) (Kolb & Kolb, 2005b) identifies four diverse learning styles utilized in the study including: Converging, Diverging, Assimilating and Accommodating. Converging learners tend to excel at finding pragmatic mythologies of working with ideas and theories and are inclined to be good at problem solving and technical tasks. Diverging learners perform well in situations that call for generation of ideas (brainstorming). Assimilating learners excel at understanding and organizing a range of information and would often times rather work with concepts than people. Accommodating learners excel at hands on learning activities and enjoy completing new experiences and complex tasks.

The study collected data on learning styles in order to identify whether there was a relationship between personality and learning style of the survey respondents. The data for this variable were considered nominal since the survey respondents were placed into categories representing their unique characteristics (Williams & Monge, 2001).

**Independent variable.** The independent variable in this study was the personality of the postsecondary automotive technology student. Holland (1997) identified six diverse personality types utilized in the study including:

(a) Realistic - a preference for activities that entail the explicit, ordered or systematic manipulation of objects, tools, machines and animals and to an aversion to educational or therapeutic activities; (b) Investigative - preference for activities that entail the observational, symbolic, systematic and creative investigation of physical, biological and cultural phenomena and aversion to
persuasive, social and repetitive activities; (c) Artistic - preference for ambiguous, free, unsystematized activities that entail the manipulation of physical, verbal or human materials to create art forms or products and to an aversion to explicit, systematic and ordered activities; (d) Social - preference for activities that entail the manipulation of others to inform, train, develop, cure or enlighten and an aversion to explicit, ordered, systematic activities involving materials, tools or machines; (e) Enterprising - preference for activities that entail the manipulation of others to attain organizational goals or economic gain and an aversion to observational, symbolic and systematic activities; and (f) Conventional - preference for activities that entail the explicit, ordered, systematic manipulation of data and to an aversion to ambiguous, free, exploratory or unsystematized activities. (pp. 21-22)

The study collected data on the six personality types to identify whether there was a relationship between personality and learning style of the survey respondents. Data on personality were considered nominal since the survey respondents were placed into categories that represent their unique characteristics (Williams & Monge, 2001)

Instrumentation

Quantitative research methodology was used to conduct the study. The specific method chosen to investigate the research questions was a series of three paper form questionnaires. The first questionnaire was a participant background information survey, containing a series of questions relating to: gender, age, career plan, automotive work experience, secondary auto-tech course completion and program satisfaction (see Appendix A). The survey packets also included the SDS and LSI.
Self-Directed-Search (SDS). Holland (1997) explained that personalities and occupational environments may be classified into six different categories (realistic, investigative, artistic, social, enterprising, and conventional). Individuals search for an environment to express their interest, abilities and values. This theory was utilized since this study is dealing with aspects of both occupation and personality. One of the most popular instruments used to identify personality and environmental type is the Self-Directed-Search (SDS). The SDS is a self-administered, scored and interpreted educational assessment tool using a three letter code to determine the personality and environmental type best representing the interests, abilities and values of the individual (Holland, 1971).

Validity and reliability for SDS. The SDS is available in several versions by age as well as for youth and adults (Holland, Powell & Fritzsche, 1994). The study utilized the adult Form R, 4th edition of the SDS since the sample is drawn from a population of adult postsecondary automotive technology students (see Appendix B). Based on a sample of college males and females, Holland et al. (1994) identified the internal consistency reliabilities of the SDS as ranging from .90 to .93. Evans, Forney and Guido-Dibrito (1998) pointed out the test-retest reliabilities ranged from .76 to .89 over a four to twelve-week period for high school, college and adult respondents.

According to Rayman and Atanasoff (1999), the SDS has well documented empirical validity. In fact, the SDS instrument is offered in several different languages and has reported similar results in different countries (Holland & Gottfredson, 1992). Concurrent validity is measured by “hits” that “equals the percentage of a sample whose high point code and one-letter aspirational or occupational code agree” (Holland,
Fritzsche & Powell, 1997, p. 14). Average interest inventories have validity hit rates ranging from 40 to 55 percent. However, the most recent version of the SDS was found to be at the high end of this range (54.7%) (Holland et al. 1997).

With instrument validity concerns and since the SDS is predominantly used for linking personality to career choice, the primary investigator sent Dr. John L. Holland a copy of chapters 1, 2 and 3 along with a letter requesting his professional input (see Appendix C). Dr. Holland responded with a personal phone call. When asked whether it appeared unwise to use the SDS as the personality instrument in this research study Dr. John L. Holland stated:

I’ve never seen any version of the SDS used for this purpose. However, given that your study is dealing with aspects of both personality and occupational environment in automotive it seems very appropriate to use the SDS for this study. I have no reservations about my instrument being used for this purpose. I would however suggest using the Form R version since your participants are college students. In the past I saw a similar study on the relationship between personality and learning style. I think it used the MBTI as the personality assessment. The results suggested there was a relationship, but the correlation was very weak if I recall. I’ll be interested to see the results of a similar study, which uses the SDS rather than the MBTI. Please send me a copy of your completed study. I’m very curious to see the results. (personal communication, November 28, 2007)
While the SDS has been most commonly used in linking personality to career choice, the six different personality and environmental types highlight specific characteristics, with the ability to identify the personality type of the adult postsecondary automotive technology students within this study.

*Learning Style Inventory (LSI).* Kolb draws upon the works of Dewey, stressing the role of experience in the learning process (Rudowski, 1996). Thus, Kolb’s ELT is grounded in the theoretical framework of personal experience (Ausburn & Brown, 2006). The ELT was utilized in this study because it has gained enormous acceptance and popularity in the education profession. Kolb’s ELT uses a self-administered, scored and interpreted educational assessment instrument, the Learning Style Inventory (LSI) to assess individual learning style which was utilized in the study (3.1 Version) (see Appendix D).

*Validity and reliability for LSI.* The LSI is set up in a simple format, providing an interesting self-examination, and discussion with valuable information regarding the individual’s approaches to learning (Kolb & Kolb, 2005b). Smith and Kolb (1986) identified the reliability Cronbach alpha coefficients of the LSI as ranging from .73 to .88. Watson and Bruckner (as cited in Evens et al., 1998) found the reliability Cronbach alpha coefficients of the LSI ranged from .76 to .85. While the LSI appears to be a reliable assessment tool yielding internally consistent scores, Kolb (1976) has suggested the best measure of his instrument is not reliability but rather construct validity. As an example, Ferrell (1983) conducted a factor-analytic comparison of four learning style instruments and determined a match was present between the factors and learning style
on the original LSI contributing to construct validity. Furthermore, Evans et al. (1998) noted construct and concurrent validity of the LSI have received several endorsements.

Review of Procedures

An expert panel was used to review the research study for content validity, format and clarity. The expert panel included:

Dr. Richard Walter: Associate Professor of Education in the Workforce Education and Development Program and the Director of the Professional Personnel Development Center for Career and Technical Education at the Pennsylvania State University.

Dr. Cynthia Pellock: Assistant Professor of Education in the Workforce Education and Development Program and the Associate Director of the Professional Personnel Development Center for Career and Technical Education at the Pennsylvania State University.

Dr. Kenneth Gray: Emeritus Professor of Education in the Workforce Education and Development Program at the Pennsylvania State University. He teaches both graduate and undergraduate courses and is widely published. He has authored books such as Other Ways to Win: Creating Alternatives for High School Graduates, Workforce Education: The Basics and Getting Real: Helping Teens Find Their Future.

Dr. Edgar Yoder: Professor of Agriculture and Extension Education at the Pennsylvania State University. He teaches graduate courses in data analysis and applications.

Data Collection

The data collection phase of this research study was conducted during the spring of 2008 at the three public postsecondary institutions in central Pennsylvania offering
automotive technology as a program of study. The appropriate clearance was obtained from the Pennsylvania State University Office for Research Protections regarding the inclusion of human subjects in this research study (see Appendix E). Access was also granted by the automotive technology faculty members at the participating institutions. These faculty members selected specific automotive technology classes to participate in this study. Five classes (N=98) were identified at the Pennsylvania College of Technology and six classes (N=64) were from Harrisburg Area Community College. Thaddeus Stevens College identified two classes (N=27). Faculty allotted 90 minutes of in class time for data collection.

Beginning January 25, 2008 thirteen face-to-face data collection sessions were conducted with automotive technology students at each of the three institutions. After a brief introduction and explanation of the research purpose, students were invited to participate in the study. The students were informed participation was voluntary and their identity would be kept confidential. A signed informed consent form was obtained from each participating adult postsecondary automotive technology student prior to completing the survey instruments. In order to minimize the time needed for the data collection phase of the study, the background information survey was placed directly inside the front cover of the SDS booklet and the LSI was paper clipped inside the back cover of the SDS booklet. This allowed the investigator to pass out all three instruments at one time. Participants were informed that there were three separate instruments placed in the SDS booklet. For organizational purposes each SDS booklet was labeled with a hand written numeric code in the top right hand corner.
First, the participants were instructed to complete the general background information survey. Second, students were asked to complete and self-score their SDS (Form R 4th Edition) instrument. After all SDS instruments were scored the primary investigator briefly explained each of Holland’s six personality and environment types to the participants. Each participant was given an occupation finder booklet aligning their three-letter Holland code with specific career choices based on their interests, abilities and values. Third, students were asked to complete and self-score their LSI (3.1 Version) instrument. After all LSI instruments were scored the primary investigator briefly explained each of the learning styles to participants. The investigator stressed throughout the presentation it is very important for all automotive technology students to understand their individual learning style, and to keep up with the technological advancements in the profession a technician must be dedicated to life-long-learning. Fourth and finally, participants were extended a thank you and the primary investigator collected the survey packets from each student.

Analysis of Data

Quantitative research methodology was used to conduct this study. First, this study sought to determine the predominant personality type of the subjects. This is clearly stated in the first research question. This first research question was answered by calculating the frequencies and percentages of the personality data collected from the completed SDS instruments. The personality type with the highest frequency and percentage was identified as the predominant.

Second, the study sought to identify whether there was a relationship between the respondent’s personality and learning style. To answer the second research question
participants first completed the LSI to identify their learning style. In order to determine whether a relationship existed between personality and the learning style, the predominant personality types were compared to the learning style by examining the completed SDS and LSI instruments. Question two was specifically answered by examining the completed SDS and LSI data through a Chi-square ($\chi^2$) analysis of independence. Chi-square is a “statistic used to compare observed and expected frequencies in sample data” (Urdan, 2005, p. 166) and to examine the degree of dependence/association between nominal variables. Finally, the background information was analyzed by calculating the frequencies and percentages of the data collected from the background information survey.

Additional analysis beyond the scope of the research questions included a Chi-square test between Kolb’s four learning styles and background information including: work experience status, high school auto-tech course completion status, and career plan. Multinomial logistic regression is a regression statistic designed to be used with categorical dependent variables of more than two levels. A multinomial logistic regression analysis was used to examine whether the four dependent variable learning styles are explained by age and level of auto-tech work experience. The data were analyzed using the Statistical Package for the Social Sciences (SPSS v16, 2008) and the findings were reported in chapter four.

Chapter Summary

Over the years, the topic of learning styles has been examined extensively and has received considerable attention. Despite previous research on learning styles, further investigation of the subject is still needed (Sims & Sims, 2006). Given the parameters
outlined in chapters 1, 2 and 3, the study sought to determine whether there was a relationship between personality and learning style that might provide CTE professionals with additional insight on how to meet the individual educational needs of postsecondary automotive technology students better in preparing them for the world-of-work.
Chapter 4

ANALYSIS OF DATA

The purpose of the research study was to determine the predominant personality type of postsecondary automotive technology students and examine whether there was a relationship between predominant personality type and learning style. A quantitative research methodology was used to conduct the study. Three questionnaires were administered and provided data to address the questions posed by the study including the participant background information survey, the SDS (Self-Directed-Search, Holland 1994) Form R 4th edition and the LSI (Learning Style Inventory, Kolb 1993) 3.1 version. The material in this chapter is presented in four sections. The sections include the descriptive data, the SDS results, and the LSI results. In addition to the basic descriptive statistics and Chi-square inferential techniques a multinomial logistic regression analysis was conducted to examine whether the four dependent variable learning styles are explained by age and level of auto-tech work experience. The Statistical Package for the Social Sciences (SPSS v16, 2008) was used to complete the analysis for the study.

Rate of Return

The total population of postsecondary automotive technology students within the center region of Pennsylvania during the spring semester of 2008 was 310 and the minimum sample size of 172 was required for this research study to statistically represent the population with 95% confidence at the \( p<.05 \) level (Isaac & Michael, 1997). Thirteen face-to-face data collection sessions were conducted with automotive technology students at three central Pennsylvania educational institutions. Faculty members from these institutions selected specific automotive technology classes to participate in the study,
with a total enrollment of 189 possible subjects. The face-to-face data collection sessions yielded 188 participants/instruments (i.e., 99% response rate) or approximately 60% of the total population. However, twelve survey packets were removed from the study due to incomplete information. Thus the total count of usable instruments within this study was 176 or 56.7% of the target population. The usable response rate from the sample of 189 subjects was 93%.

Background of Participants

Demographic data collected for the study involved participants completing a survey asking participants six questions about their gender, age, career plan, automotive work experience, secondary auto-tech course completion status and current program satisfaction (see Appendix A). The following summarizes results of the background information survey.

*Gender of participants.* Participants were first asked to identify their gender. Of the 176 participants, 173 (98%) reported they were male while 3 (2%) identified themselves as female (see Table 3).

<table>
<thead>
<tr>
<th>Gender</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>173</td>
<td>98</td>
</tr>
<tr>
<td>Female</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

*Age of participants.* For the second question participants were asked to identify their age. Participant ages ranged from a minimum of 18 to a maximum of 45 years (see Table 4). Eighty percent of the respondents reported being between 18 and 20 years of age and 14% were between 21 and 23 years of age. There were only 5 individuals between 31 and 45 years of age (3%).
Career plans of participants. The third question asked participants if they had plans to pursue a career in automotive technology after completing their course work. Of the 176 participating postsecondary automotive technology students 166 (94%) reported they planned to pursue a career in automotive technology after completing their course work. However, it is noteworthy that 10 (6%) did not think they would pursue working in the field (see Table 5).

<table>
<thead>
<tr>
<th>Age</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-20 yrs.</td>
<td>141</td>
<td>80</td>
</tr>
<tr>
<td>21-23 yrs.</td>
<td>24</td>
<td>14</td>
</tr>
<tr>
<td>24-26 yrs.</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>27-30 yrs.</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>31-45 yrs.</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

Experience of participants. The fourth survey question asked participants to identify their years of automotive technology work experience since age 16. Of the 176 participating postsecondary automotive technology students 31 (18%) had no experience, 43 (24%) had less than one year of experience, 98 (56%) had one to five years of experience, 2 (1%) had six to ten years of experience and another 2 (1%) reported having 16 or more years of experience (see Table 6).
Table 6  
*Years of Auto-Tech Work Experience Since Age 16 (n=176)*

<table>
<thead>
<tr>
<th>Experience</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>31</td>
<td>18</td>
</tr>
<tr>
<td>&lt; 1 yrs.</td>
<td>43</td>
<td>24</td>
</tr>
<tr>
<td>1-5 yrs.</td>
<td>98</td>
<td>56</td>
</tr>
<tr>
<td>6-10 yrs.</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>11-15 yrs.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16 or &gt; yrs.</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

*High school course of participants.* The fifth question on the demographic survey asked participants to identify whether or not they had completed an automotive technology course in high school. Of the 176 participating postsecondary automotive technology students, 55 (31%) reported they had completed at least one secondary school automotive technology course, and 121 (69%) reported they did not (see Table 7).

Table 7  
*Completed an Auto-Tech Course in High School (n=176)*

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>55</td>
<td>31</td>
</tr>
<tr>
<td>No</td>
<td>121</td>
<td>69</td>
</tr>
</tbody>
</table>

*Overall satisfaction of participants.* The sixth descriptive question asked participants to identify the level of overall satisfaction with their current automotive technology program. An overwhelming majority of participants reported that they were either moderately (47%) or very satisfied (51%) with their current postsecondary automotive technology program (see Table 8).
Table 8

*Overall Satisfaction with Current Auto-Tech Program (n=176)*

<table>
<thead>
<tr>
<th>Level of Satisfaction</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Satisfied</td>
<td>90</td>
<td>51</td>
</tr>
<tr>
<td>Moderately Satisfied</td>
<td>82</td>
<td>47</td>
</tr>
<tr>
<td>Low Satisfaction</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>No Satisfaction</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Predominant Personality Type

*Research Question 1*

What was the predominant personality type of postsecondary automotive technology students? The first research question was answered by calculating the frequencies ($f$) and percentages (%) of the personality type data collected via the SDS instrument. The personality type with the highest frequency and percentage was identified as the predominant classification. After calculating the results of the SDS, it was determined that of the 176 participants 148 (84.1%) were classified as Realistic, 3 (1.7%) were classified as Investigative, 6 (3.4%) were classified as Artistic, 3 (1.7%) were classified as Social, 14 (8%) were classified as Enterprising, and 2 (1.1%) were classified as having a Conventional personality type. Therefore the Realistic personality type was the predominant classification of 148 (84.1%) participants within this study (see Table 9).
Table 9

*Distribution of Participant Personality Types (n = 176)*

<table>
<thead>
<tr>
<th>Personality Type</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Realistic</td>
<td>148</td>
<td>84.1</td>
</tr>
<tr>
<td>Investigative</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>Artistic</td>
<td>6</td>
<td>3.4</td>
</tr>
<tr>
<td>Social</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>Enterprising</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>Conventional</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>176</td>
<td>100</td>
</tr>
</tbody>
</table>

*Note.* (a) Realistic types usually have mechanical and athletic ability; (b) Investigative types usually have mathematical and scientific ability; (c) Artistic types usually enjoy creating original work; (d) Social types usually have strong social skills and enjoy working with people; (e) Enterprising types usually have leadership and speaking skills; and (f) Conventional types usually enjoy working with words and numbers (Holland, 1997).

**Personality Type and Learning Style Relationship**

*Research Question 2*

Was there a relationship between the postsecondary automotive technology student’s predominant personality type and their learning style? The second research question sought to identify whether there was a relationship between the postsecondary automotive technology student’s predominant personality type and his/her learning style. The SDS identified predominant personality type and the LSI determined the preferred learning style of the postsecondary automotive technology students. The Realistic personality type was the predominant classification of 148 (84.1%) participants within this study (see Table 9). Findings for the LSI found 70 (39.8%) participants were classified as Accommodating learners, while 37 (21%) were Diverging learners, 40 (22.7%), were Converging learners, and 29 (16.5%) were Assimilating learners (see Table 10).
Table 10

Distribution of Participant Learning Styles (n = 176)

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodating</td>
<td>70</td>
<td>39.8</td>
</tr>
<tr>
<td>Diverging</td>
<td>37</td>
<td>21</td>
</tr>
<tr>
<td>Converging</td>
<td>40</td>
<td>22.7</td>
</tr>
<tr>
<td>Assimilating</td>
<td>29</td>
<td>16.5</td>
</tr>
<tr>
<td>Total</td>
<td>176</td>
<td>100</td>
</tr>
</tbody>
</table>

Note. (a) Accommodating people have the ability to learn primarily from hands-on experience; (b) Diverging people are best at viewing concrete situations from diverse points of view; (c) Converging people are best at finding practical uses for ideas and theories; and (d) Assimilating people are best at understanding information and putting it into logical form (Kolb & Kolb, 2005b).

Research question two analysis was addressed by using a 4x6 Chi-square ($\chi^2$) test of independence for 2 categorical variables. This test was used to analyze the association of participant predominant personality type and preferred learning style variables in a two-way crosstabulation, which evaluated the assumed model of independence against the observed data. The findings revealed no statistically significant association between the personality types and learning styles ($\chi^2(15,N=176)=2.14, p = .123$) (see Table 11).

Table 11

Crosstabulation of Learning Style by Personality Type (n = 176)

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>Realistic</th>
<th>Investigative</th>
<th>Artistic</th>
<th>Social</th>
<th>Enterprising</th>
<th>Conventional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodating</td>
<td>56 (31.8%)</td>
<td>0 (0%)</td>
<td>3 (1.7%)</td>
<td>1 (0.6%)</td>
<td>10 (5.7%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Diverging</td>
<td>30 (17%)</td>
<td>2 (1.1%)</td>
<td>2 (1.1%)</td>
<td>0 (0%)</td>
<td>2 (1.1%)</td>
<td>1 (0.6%)</td>
</tr>
<tr>
<td>Converging</td>
<td>36 (20.5%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>2 (1.1%)</td>
<td>2 (1.1%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Assimilating</td>
<td>26 (14.8%)</td>
<td>1 (.6%)</td>
<td>1 (.6%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>1 (0.6%)</td>
</tr>
<tr>
<td>Total</td>
<td>148 (84.1%)</td>
<td>3 (1.7%)</td>
<td>6 (3.4%)</td>
<td>3 (1.7%)</td>
<td>14 (8%)</td>
<td>2 (1.1%)</td>
</tr>
</tbody>
</table>

$\chi^2(15,N=176)=2.14, p = .123$.

Note. 19 cells (79.2%) have expected counts less than 5. The minimum expected count is .33.

This 4x6 Chi-square analysis revealed 19 cells (79.2%) with expected counts less
than 5, which invalidates the inferential Chi-square test of association (Utts & Heckard, 2002). The basic descriptive statistics are still valid. The most noteworthy results within Table 11 suggest: 56 participants (31.8%) had both a predominant Realistic personality type and an Accommodating learning style classification, and 30 participants (17%) had both a predominant Realistic personality type and a Diverging learning style classification. There were 36 (20.5%) with both a predominant Realistic personality type and a Converging learning style classification, and 26 (14.8%) participants were both a predominant Realistic personality type and an Assimilating learning style classification. Ten of the participants (5.7%) were both predominantly an Enterprising personality type and an Accommodating learning style classification.

To address the issue of too many cells having expected frequency counts of less than 5, a 4x2 crosstabulation analysis was conducted using the four learning styles with Realistic type classification and an “all other type” personality type category. The “all other type” personality category consisted of the five remaining personality types, with the exception of the Realistic classification. This 4x2 Chi square analysis was conducted to correct for expected frequency cell counts of less than 5 exceeding the 20% criterion (Utts & Heckard, 2002, p. 460). The results of the second Chi-square analysis revealed no statistically significant association between the personality types and learning styles ($\chi^2(3,N=176)=2.84, p = .417$) (see Table 12).
Table 12
Crosstabulation of Learning Style by Personality Type (n = 176)

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>Personality Type</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Realistic</td>
<td>All Other Types</td>
</tr>
<tr>
<td>Accommodating</td>
<td>56 (31.8%)</td>
<td>14 (7.9%)</td>
</tr>
<tr>
<td>Diverging</td>
<td>30 (17%)</td>
<td>7 (4%)</td>
</tr>
<tr>
<td>Converging</td>
<td>36 (20.5%)</td>
<td>4 (2.3%)</td>
</tr>
<tr>
<td>Assimilating</td>
<td>26 (14.8%)</td>
<td>3 (1.7%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>148 (84.1%)</td>
<td>28 (15.9%)</td>
</tr>
</tbody>
</table>

$\chi^2(3, N=176)=2.84, p = .417$.

*Note.* 1 cell (12.5%) has expected counts less than 5. The minimum expected count is 4.61.

This 4x2 Chi square analysis revealed one cell (12.5%) with expected counts less than 5, which is within the acceptable range of less than 20% (Utts & Heckard, 2002, p. 460). While this analysis revealed no statistically significant relationship between the personality types and learning styles, there were 56 participants (31.8%) with both a predominant Realistic personality type and an Accommodating learning style classification. There were 30 participants (17%) with both a predominant Realistic personality type and a Diverging learning style classification and 36 (20.5%) had both a predominant Realistic personality type and a Converging learning style classification. There were also 26 (14.8%) participants with Realistic personality type and an Assimilating learning style classification. Additionally, 14 participants (7.9%) had an Accommodating learning style and a predominant personality in the “all other types” classification.

Since the results within Table 12 revealed no statistically significant association, a 4x1 Chi-square analysis was conducted between the four learning styles and the predominant Realistic personality type. This 4x1 Chi-square analysis was conducted to
determine the significance/non-significance status. The results of the third Chi-square analysis revealed that there was a statistically significant relationship between the predominant Realistic personality type and the Accommodating learning style of 56 participants (37.8%) ($\chi^2(3,N=148)=14.38, p = .002$) (see Table 13).

Table 13
Crosstabulation of Learning Style by Realistic Personality Type (n = 148)

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>Realistic Personality Type</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodating</td>
<td></td>
<td>56</td>
<td>37.8&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td>Diverging</td>
<td></td>
<td>30</td>
<td>20.3&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
<tr>
<td>Converging</td>
<td></td>
<td>36</td>
<td>24.3&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
<tr>
<td>Assimilating</td>
<td></td>
<td>26</td>
<td>17.6&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>148</td>
<td>100</td>
</tr>
</tbody>
</table>


Note. Percentages with no subscript in common differ at $p < .05$ using Holm's sequential bonferroni post-hoc comparisons (1979).

Holm's sequential bonferroni post-hoc (1979) method was used to control for type 1 error at $p<.05$ across all comparisons.

In addition Table 13 found 56 participants (37.8%) had both a predominant Realistic personality type and an Accommodating learning style classification and 30 participants (20.3%) were a Realistic personality type and a Diverging learning style classification. There were also 36 (24.3%) with a Realistic personality type and a Converging learning style classification and 26 (17.6%) of the participants were a Realistic personality type and an Assimilating learning style classification. It should be noted that 148 of the 176 participants (84.1%) were classified as Realistic. Thus 56 (31.8%) of the overall sample of postsecondary automotive technology students have a statistically significant relationship between the predominant Realistic personality type
and the Accommodating learning style.

Additional Analyses

Additional analyses for this study included three Chi-square crosstabulations examining the association between the students’ learning styles and selected background information: years of auto-tech work experience, high school auto-tech course completion status, and career plan. A multinomial logistic regression analysis was also conducted examining the four learning styles as the dependent or predicted variable and using the independent or predictor variables of age and level of auto-tech work experience.

*Chi-square analysis 1.* The first Chi-square crosstabulation consisted of a 4x2 analysis between the four learning styles and whether participants planned to pursue an automotive technology career after completing their current program. The results revealed no statistically significant association between the learning styles and whether participants planned to pursue an auto-tech career ($\chi^2(3, N=176) = .120, p = .989$) (see Table 14).

Table 14
*Crosstabulation of Learning Style by Auto Tech Career Plan Status (n = 176)*

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>Do you Plan to Pursue an Auto Tech Career?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (40%)</td>
</tr>
<tr>
<td>Accommodating</td>
<td>66</td>
</tr>
<tr>
<td>Diverging</td>
<td>35 (21%)</td>
</tr>
<tr>
<td>Converging</td>
<td>38 (22.8%)</td>
</tr>
<tr>
<td>Assimilating</td>
<td>27 (16.2%)</td>
</tr>
<tr>
<td>Total</td>
<td>166 (100%)</td>
</tr>
</tbody>
</table>

$\chi^2(3, N=176) = .120, p = .989.$

*Note.* 4 cells (50.0%) have expected counts less than 5. The minimum expected count is 1.65.
The basic descriptive statistics in Table 14 are still valid. An overwhelming majority (166 of 176) of students were planning to pursue an auto-tech career. Of those planning to pursue an auto-tech career it included 66 (40%) Accommodating participants, 35 (21%) Diverging, 38 (22.8%) Converging, and 27 (16.2%) Assimilating. Of those 10 not planning to pursue an auto-tech career, 4 (40%) were Accommodating participants, 2 (20%) Diverging, 2 (20%) Converging and 2 (20%) Assimilating.

Chi-square analysis 2. The second Chi-square crosstabulation consisted of a 4x2 analysis between the four learning styles and the status of automotive technology work experience since age 16. The results of Chi-square crosstabulation revealed that there was a statistically significant association between those with auto-tech experience since age 16 and learning style ($\chi^2 (3, N=176)=1.03, p = .016, Cramer’s V=.016$) (see Table 15).

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>Auto Tech Work Experience Since Age 16</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Experience</td>
<td>Experience</td>
</tr>
<tr>
<td>Accommodating</td>
<td>7 (22.6%)</td>
<td>63 (43.5%)</td>
</tr>
<tr>
<td>Diverging</td>
<td>9 (29%)</td>
<td>28 (19.3%)</td>
</tr>
<tr>
<td>Converging</td>
<td>5 (16.1%)</td>
<td>35 (24.1%)</td>
</tr>
<tr>
<td>Assimilating</td>
<td>10 (32.3%)</td>
<td>19 (13.1%)</td>
</tr>
<tr>
<td>Total</td>
<td>31 (100%)</td>
<td>145 (100%)</td>
</tr>
</tbody>
</table>

$\chi^2(3, N=176)=1.03, p =.016, Cramer’s V=.016$.

Note. 0 cells (.0%) have expected counts less than 5. The minimum expected count is 5.11.

In examining the percentages within the experience versus no experience, the primary investigator noticed the following patterns. First, participants with work experience by a ratio of approximately 2 to 1 were accommodating learners. Second, those with no
experience by slightly more than a 2 to 1 ratio were Assimilating learners as compared to experienced Assimilating learners. The basic descriptive statistics in Table 15 are still valid. The majority of the participants (145 of 176) had auto-tech experience since they were 16 years of age including 63 (43.5%) Accommodating, 28 (19.3%) Diverging, 35 (24.1%) Converging, and 19 (13.1%) Assimilating. Only 31 had no experience, and the majority of participants with no experience were classified as 10 (32.3%) Assimilating followed by 9 (29%) Diverging.

Chi-square analysis 3. The third and final Chi-square crosstabulation consisted of a 4x2 analysis between the four learning styles and whether participants had completed an automotive technology course in high school. The results revealed no statistically significant association between learning styles and whether participants completed a secondary auto-tech course ($\chi^2(3,N=176)=3.71, p = .294$) (see Table 16).

Table 16
Crosstabulation of Learning Style by Secondary Auto Tech Course Completion Status (n = 176)

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>Did you Complete a Secondary Auto Tech Course?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Accommodating</td>
<td>24 (43.6%)</td>
<td>46 (38%)</td>
</tr>
<tr>
<td>Diverging</td>
<td>11 (20%)</td>
<td>26 (21.5%)</td>
</tr>
<tr>
<td>Converging</td>
<td>15 (27.3%)</td>
<td>25 (20.7%)</td>
</tr>
<tr>
<td>Assimilating</td>
<td>5 (9.1%)</td>
<td>24 (19.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>55 (100%)</td>
<td>121 (100%)</td>
</tr>
</tbody>
</table>

$\chi^2(3,N=176)=3.71, p = .294$.

Note. 0 cells (.0%) have expected counts less than 5. The minimum expected count is 9.06.

The basic descriptive statistics in Table 16 are still valid. A majority of participants (121 of 176) did not complete an auto-tech course in high school including 46 (38%) Accommodating, 26 (21.5%) Diverging, 25 (20.7%) Converging and 24 (19.8%)
Assimilating. Only 55 completed an auto-tech course in high school. The majority of those completing an auto-tech course in high school were classified as 24 (43.6%) Accommodating followed by 15 (27.3%) Converging.

*Multinomial logistic regression analysis.* The final analysis was a multinomial logistic regression analysis using the four learning styles as the dependent or predicted variable with age and auto-tech experience since age 16 as the independent or predictor variables. These variables were selected since the primary investigator was interested in examining whether the four dependent variable learning styles are explained by age and level of auto-tech work experience. A multinomial logistic regression model was an appropriate analysis within this study, since it can be used with a categorical dependent variable that has more than two categories such as learning style (Stokes, Davis & Koch, 1995, p. 217). A multinomial logistic regression model with a baseline category is expressed as: \[ \log \left( \frac{\pi_i}{\pi_j} \right) = \alpha_i + \beta_i x, i = 1, ..., I - 1. \]

The first multinomial logistic regression analysis was statistically significant. With Assimilating used as the reference category this analysis revealed that participants with automotive technology work experience since age 16 were 78% less likely to have an Accommodating learning style than an Assimilating classification \( (X^{2}(6,N = 176) = 12.930, p = .009) \) (Tabachnick & Fidell, 2007, pp. 462-463). Furthermore, participants with automotive technology work experience since age 16 were 76% less likely to have a Converging learning style than an Assimilating classification \( (X^{2}(6,N = 176) = 12.930, p = .027) \). There was no statistically significant predictor for the Diverging learning style (see Table 17).
The second multinomial logistic regression analysis was statistically significant.

With the Converging learning style used as the reference category, this analysis revealed that participants with automotive technology work experience since age 16 were 4.1 times more likely to have an Assimilating learning style than a Converging classification \((X^2(6, N = 176) = 12.930, p = .027)\). There were no statistically significant predictors for Accommodating or Diverging classifications (see Table 18).
The third multinomial logistic regression analysis was not statistically significant.

With the Diverging learning style used as the reference category this analysis revealed that there were no statistically significant predictors for Accommodating, Converging or Assimilating classifications (see Table 19).

### Table 18
**Independent Predictors of Participant Learning Style (n=176)**

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>Intercept</th>
<th>SE</th>
<th>Wald</th>
<th>p</th>
<th>Exp(B)</th>
<th>95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodating</td>
<td>2.453</td>
<td>1.492</td>
<td>2.702</td>
<td>0.1</td>
<td>0.784</td>
<td>1.054</td>
</tr>
<tr>
<td>Age</td>
<td>-0.095</td>
<td>0.075</td>
<td>1.588</td>
<td>0.208</td>
<td>0.909</td>
<td>0.784</td>
</tr>
<tr>
<td>&amp;experience</td>
<td>-0.078</td>
<td>0.641</td>
<td>0.015</td>
<td>0.903</td>
<td>0.925</td>
<td>0.263</td>
</tr>
<tr>
<td>Diverging</td>
<td>-0.42</td>
<td>1.112</td>
<td>0.142</td>
<td>0.706</td>
<td>0.909</td>
<td>1.122</td>
</tr>
<tr>
<td>Age</td>
<td>0.01</td>
<td>0.054</td>
<td>0.033</td>
<td>0.856</td>
<td>1.000</td>
<td>0.901</td>
</tr>
<tr>
<td>&amp;experience</td>
<td>0.783</td>
<td>0.631</td>
<td>1.543</td>
<td>0.214</td>
<td>2.189</td>
<td>0.636</td>
</tr>
<tr>
<td>Assimilating</td>
<td>0.472</td>
<td>1.490</td>
<td>0.101</td>
<td>0.751</td>
<td>0.909</td>
<td>1.101</td>
</tr>
<tr>
<td>Age</td>
<td>-0.055</td>
<td>0.074</td>
<td>0.544</td>
<td>0.947</td>
<td>0.818</td>
<td>1.095</td>
</tr>
<tr>
<td>&amp;experience</td>
<td>1.42</td>
<td>0.640</td>
<td>4.922</td>
<td>0.027</td>
<td>4.138</td>
<td>1.18</td>
</tr>
</tbody>
</table>

*p<.05

*Note. The reference category is Converging. *Reference is no auto-tech work experience since age 16.

### Table 19
**Independent Predictors of Participant Learning Style (n=176)**

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>Intercept</th>
<th>SE</th>
<th>Wald</th>
<th>p</th>
<th>Exp(B)</th>
<th>95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodating</td>
<td>2.873</td>
<td>1.468</td>
<td>3.83</td>
<td>0.05</td>
<td>0.779</td>
<td>1.041</td>
</tr>
<tr>
<td>Age</td>
<td>-0.105</td>
<td>0.074</td>
<td>2.011</td>
<td>0.156</td>
<td>0.901</td>
<td>0.779</td>
</tr>
<tr>
<td>&amp;experience</td>
<td>-0.861</td>
<td>0.573</td>
<td>2.264</td>
<td>0.132</td>
<td>0.423</td>
<td>0.138</td>
</tr>
<tr>
<td>Converging</td>
<td>0.42</td>
<td>1.112</td>
<td>0.142</td>
<td>0.706</td>
<td>0.891</td>
<td>1.101</td>
</tr>
<tr>
<td>Age</td>
<td>-0.01</td>
<td>0.054</td>
<td>0.033</td>
<td>0.856</td>
<td>0.99</td>
<td>0.891</td>
</tr>
<tr>
<td>&amp;experience</td>
<td>-0.783</td>
<td>0.631</td>
<td>1.543</td>
<td>0.214</td>
<td>0.457</td>
<td>0.133</td>
</tr>
<tr>
<td>Assimilating</td>
<td>0.892</td>
<td>1.425</td>
<td>0.392</td>
<td>0.531</td>
<td>0.816</td>
<td>1.077</td>
</tr>
<tr>
<td>Age</td>
<td>-0.065</td>
<td>0.071</td>
<td>0.834</td>
<td>0.361</td>
<td>0.937</td>
<td>0.816</td>
</tr>
<tr>
<td>&amp;experience</td>
<td>0.637</td>
<td>0.571</td>
<td>1.244</td>
<td>0.265</td>
<td>1.89</td>
<td>0.617</td>
</tr>
</tbody>
</table>

*p<.05

*Note. The reference category is Diverging. *Reference is no auto-tech work experience since age 16.
The fourth and final multinomial logistic regression analysis was statistically significant. With the Accommodating learning style used as the reference category this analysis revealed that participants with automotive technology work experience since age 16 were 4.4 times more likely to have an Assimilating learning style than an Accommodating classification ($X^2(6,N = 176) = 12.930, p = .009$). There were no statistically significant predictors for Diverging or Converging classifications. (see Table 20).

Table 20

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>$\beta$</th>
<th>SE</th>
<th>Wald</th>
<th>$p$</th>
<th>Exp(B)</th>
<th>95% C.I. Lower</th>
<th>95% C.I. Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diverging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-2.873</td>
<td>1.468</td>
<td>3.83</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.105</td>
<td>0.074</td>
<td>2.011</td>
<td>0.156</td>
<td>1.11</td>
<td>0.961</td>
<td>1.283</td>
</tr>
<tr>
<td>Experience</td>
<td>0.861</td>
<td>0.573</td>
<td>2.264</td>
<td>0.132</td>
<td>2.367</td>
<td>0.771</td>
<td>7.268</td>
</tr>
<tr>
<td>Converging</td>
<td>-2.453</td>
<td>1.492</td>
<td>2.702</td>
<td>0.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.095</td>
<td>0.075</td>
<td>1.588</td>
<td>0.208</td>
<td>1.1</td>
<td>0.949</td>
<td>1.275</td>
</tr>
<tr>
<td>Experience</td>
<td>0.078</td>
<td>0.641</td>
<td>0.015</td>
<td>0.903</td>
<td>1.081</td>
<td>0.308</td>
<td>3.8</td>
</tr>
<tr>
<td>Assimilating</td>
<td>-1.981</td>
<td>1.719</td>
<td>1.328</td>
<td>0.249</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.04</td>
<td>0.087</td>
<td>0.212</td>
<td>0.645</td>
<td>1.041</td>
<td>0.878</td>
<td>1.235</td>
</tr>
<tr>
<td>Experience</td>
<td>1.498</td>
<td>0.572</td>
<td>6.871</td>
<td>0.009</td>
<td>4.473</td>
<td>1.459</td>
<td>13.714</td>
</tr>
</tbody>
</table>

$p<0.05$

*Note. The reference category is Accommodating. *Reference is no auto-tech work experience since age 16.

Chapter Summary

The purpose of this research study was to determine the predominant personality type of postsecondary automotive technology students and second to examine whether there was a relationship between predominant personality type and learning style. The results of the data analysis presented within this chapter revealed that 148 (84.1%) of the postsecondary automotive technology students participating in the study were predominantly a Realistic personality classification. The results of the Learning Style
Inventory (LSI) were much more equally distributed than the personality classifications of the SDS. The Accommodating style was most highly represented (39.8%) while the Assimilating was the least (16.5%) suggesting that the sample of postsecondary automotive technology students was not a homogeneous group of learners. Even when participants reported planning to pursue an auto-tech career, had automotive work experience and did not complete a high school auto-tech course, all four learning style were well represented.

The results of the Chi-square analysis (i.e., Table 13) revealed a statistically significant relationship between the Realistic personality type and the Accommodating learning style of 56 participants or 31.8% of the overall sample of postsecondary automotive technology students within the study. Finally, the results of the multinomial logistic regression analysis suggest that the independent variable of auto-tech work experience since age 16 was the only predictor of learning style.
Chapter 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

In an effort to provide career and technical education (CTE) professionals with additional insight on how to better meet the individual educational needs of postsecondary automotive technology students, this study examined whether there was a relationship between personality and learning style classifications. More specifically, the research study focused on first identifying the predominant personality type of postsecondary automotive technology students and second examined whether there was a relationship between their predominant personality type and learning style.

Summary

Throughout our educational pursuits, many of us have had a teacher from whom it was difficult to learn. We may have had trouble understanding an educational subject that didn’t particularly correspond with our personality or learning style, or it may have been a pedagogy related issue. Past research has suggested that teachers tend to teach the way they were taught (Gardner, 1999; Jonassen, 1981). This is troubling since we do not all come from the same mold in regard to our learning style or personality. Thus learning styles, as well as personalities should be accounted for when considering the topic of pedagogy.

While past research studies have examined the relationship between learning style and personality type, few have examined the trade and industry sector of CTE. In an effort to improve the quality of instruction within CTE, this study sought to answer the following questions by utilizing Holland’s Theory of Vocational Personalities and Environments and Kolb’s Experiential Learning Theory (ELT) as a foundation:
1. What is the predominant personality type of postsecondary automotive technology students?

2. Is there a relationship between the postsecondary automotive technology student predominant personality type and their learning style?

Data were gathered through a series of 13 face-to-face data collection sessions utilizing a participant background information survey, the Self-Directed-Search (SDS), and the Learning Style Inventory (LSI) at Pennsylvania College of Technology, Harrisburg Area Community College and Thaddeus Stevens College of Technology. The total population of postsecondary automotive technology students within the center region of Pennsylvania during the spring semester of 2008 was 310. At the conclusion of the data collection process the total count of usable instruments was 176 or 56.7% of the target population. The usable response rate from the sample of 189 subjects was 93%.

Conclusions

The majority of postsecondary automotive technology students whom participated in this study had a predominant Realistic personality type resembling the O-Net (2007) classification and with 165 (94%) participants between the ages of 18 and 23 a significant contrast from the norms for traditional college students (i.e., Table 1). While disproportionate, the personality distributions did represent all six categories of Holland’s hexagon. These results identified a very unique sample of participants closely resembling the classification of Realistic female carpenters within Swan’s (2002) study. Therefore the answer to the first research question was: the Realistic personality type (see Table 9).

The results of the Learning Style Inventory (LSI) were much more equally distributed than the personality classifications of the SDS. The Accommodating style was
most highly represented (39.8%) while the Assimilating was the least (16.5%) suggesting that the sample of postsecondary automotive technology students was not a homogeneous group of learners thus indirectly resembling the diversity of learning style classifications by educational specialization within of the LSI technical manual (i.e., Table 2). Even when participants reported planning to pursue an auto-tech career, had automotive work experience and did not complete a high school auto-tech course, all four learning styles were well represented. Care should be taken by postsecondary automotive technology faculty within central Pennsylvania to differentiate instructional techniques to align with all four learning styles since past research has shown that educators tend to teach the way they were taught (Gardner, 1999) and the sample of postsecondary automotive technology students was not a homogeneous group of learners.

While past research studies have examined the relationship between personality type and learning style, few have focused on the trade and industry sector of CTE. Contributing to the void of research in this area, the calculated results of the Chi-square analysis (i.e., Table 13) for the study revealed a statistically significant relationship between the Realistic personality type and the Accommodating learning style (p=.002) of 56 participants or 31.8% of the overall sample of postsecondary automotive technology students. Therefore the answer to the second research question was: yes there was relationship between the postsecondary automotive technology student predominant personality type and their learning style (see Table 13). However, the relationship between personality and learning style was not observed outside of the 31.8% of participants with both a Realistic personality type and Accommodating learning style classification. It is difficult to compare the results of the study to past personality and
learning style correlation studies since, they utilized different instrumentation such as the Myers - Briggs Type Indicator (MBTI) and Kolb’s LSI (i.e., the modes of grasping experience dimension). However, the results of this study indirectly resemble past research on this topic in that a relationship was found between personality type and learning style. The results further identified a very unique sample of Realistic and Accommodating participants whom had the ability to learn primarily from hands-on experience, would rather work with things than people and had an aversion to academic and therapeutic activities (Holland, 1997; Kolb & Kolb, 2005b) (see Figure 4).

**Figure 4.** Characteristics of postsecondary automotive technology with an association between Realistic and Accommodating classifications.

Given that the sample of Realistic and Accommodating participants learn
primarily from hands-on experience, would rather work with things than people and had an aversion to academic and therapeutic activities (Holland, 1997; Kolb & Kolb, 2005b) the educational specialization of automotive technology appears to be a natural fit. However, with these characteristics come some challenges within the automotive technology profession. For example an automotive technician is expected to perform preventative maintenance and repairs on a daily basis within the automotive industry. If they would rather work with things than people they may have a difficult time communicating effectively with a customer while attempting to pinpoint a vehicle drivability problem. Furthermore, if they have an aversion to academic activities they may find it difficult to write a handwritten description of a completed vehicle repair for billing purposes, put forth the effort to read a technical service bulletin (TSB) or calculate their completed flat rate hours to protect themselves from employer fraud.

These examples highlight standard operating procedures within the automotive technology field, which may conflict with the characteristics of 31.8% of participants. The Realistic and Accommodating learners will not in most cases search for opportunities to develop/learn these skill sets without assistance. Therefore postsecondary automotive technology faculty within central Pennsylvania should supply these students with hands-on experience in occupational specific reading, writing and verbal communication (i.e., TSB reading, writing repair descriptions on work orders and customer communication role plays) including specific training on calculating and documenting completed flat rate hours.

Given that the sample of participants statistically represents the population with 95% confidence at the $p < .05$ level and since all four learning styles were collectively
represented by the sample, postsecondary automotive technology faculty within central Pennsylvania should guard against disproportionately teaching to one learning style over another. While the results of the multinomial logistic regression analysis did suggest that having auto-tech work experience since age 16 was a better predictor of learning style than age, these findings should in no way dictate instructional practices or introduce negative stereotyping within the auto-tech classroom or laboratory. Instead a process of “adopting and adapting” instructional techniques and strategies for all learning styles resembling Heimlich and Norland’s (1994) suggestions seem more appropriate. This is particularly important since past research has shown that educators tend to teach the way they were taught (Gardner, 1999) and the sample of postsecondary automotive technology students was not a homogeneous group of learners. A process of “adopting and adapting” instructional techniques and strategies for all learning styles has the ability to enhance the educational experience for the student learner.

This process of “adopting and adapting” instructional techniques and activities can vary greatly depending on the area of educational specialization. Sample auto-tech activities are shown for each of Kolb’s learning styles in Figure 5 to assist automotive technology faculty. A process of “adopting and adapting” instructional lesson plans to align with the sample activities may enhance the educational experience of all four types of learners within the automotive technology program (see Figure 5).
A cautionary note regarding the personality and learning style results of this study: there are no right or wrong classifications and everyone uses each learning style and personality type to some degree. While the results do represent the population with no more than a 5% margin of error with 95% confidence, the findings of this study are limited in a sense because: (a) they are not generalizable outside of the target population; and (b) the instrumentation format was self-reporting in nature and could have been incorrectly reported by participants. Thus the results should be viewed as a tool to assist in better understanding the population of postsecondary automotive technology students in central Pennsylvania. The results of the LSI and the SDS identified the strength of preference not the degree personality and learning style of use. Therefore type biases and or negative stereotyping of this student population as a result of the findings within this study should be avoided at all costs.

Recommendations

We now know that there are practical implications for vocational educators in preparing students for the world-of-work directly related to characteristics of personality...
and learning style within the trade and industry sector of career and technical education.

Based on the conclusions of the study the following recommendations are made:

1. All pre-service career and technical education teachers within central Pennsylvania should be introduced to the practical implications of personality and learning style characteristics within an accredited teacher education program prior to working with students and via ongoing in-service professional development throughout their career.

2. All first year postsecondary automotive technology students within central Pennsylvania should complete both the Self-Directed-Search (SDS) and Learning Style Inventory (LSI) during the first 30 days of the academic year to assist students and faculty members in identifying characteristics critical to the learning process.

3. Postsecondary automotive technology faculty members within central Pennsylvania should implement a continuous process of “adopting and adapting” instructional strategies, and activities to naturally align with their student’s personality and learning style characteristics identified from the completed SDS and the LSI assessments.

4. The distribution of postsecondary automotive technology learning styles within Table 10 should be placed in the learning style by educational specialization section of the LSI technical manual.

Recommendations for Future Studies

1. Since there is a lack of personality and learning style correlation studies within the trade and industry sector of career and technical education this study should
be replicated in specializations such as automotive collision repair, building trades and welding.

2. Since the intercorrelations of Holland’s SDS and Kolb’s LSI modes of experience have never been examined within an occupational specific educational specialization, future studies should be conducted within the disciplines of: automotive technology, automotive collision repair, building trades and welding comparing the findings of Highhouse and Doverspike (1987) as well as Penney and Cahill (2002).
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APPENDIX A

BACKGROUND INFORMATION SURVEY
In the blanks provided, write the letter or fill in the answer that represents the most appropriate response.

___ 1. Select one of the following letters that best represents your gender:
   a. Male
   b. Female

___ 2. What is your age?

___ 3. Do you plan to pursue a career in automotive technology after completing your course work?
   a. Yes
   b. No

___ 4. Number of years of automotive technology work experience since age 16:
   a. None
   b. Less than one year
   c. One to five years
   d. Six to ten years
   e. Eleven to fifteen years
   f. Sixteen or more years

___ 5. Did you complete an automotive technology course in high school?
   a. Yes
   b. No

___ 6. Overall satisfaction with the automotive technology program that you are currently enrolled in:
   a. Very satisfied
   b. Moderately satisfied
   c. Low satisfaction
   d. No satisfaction at all
APPENDIX B

SELF-DIRECTED-SEARCH (SDS)
Note: The Self-Directed-Search (SDS) is available at the following web address:
APPENDIX C

LETTER TO DR. JOHN HOLLAND
Dear Dr. Holland,

I am a graduate student at the Pennsylvania State University in Workforce Education and Development. Prior to my move to Penn State, I was an automotive technology instructor in eastern Kansas. The reason I am writing you is to request your input in my doctoral dissertation because my research will use your typology and Self-Directed-Search (SDS) to profile post-secondary automotive technology students.

The study will examine the relationship between personality and learning style in adult post-secondary automotive technology students currently earning a certificate or two year degree using your Self Directed Search (SDS) and Kolb’s Learning Style Inventory (LSI).

I believe that the study at hand will provide valuable insight on personality and learning style where there is little to no research. I further expect this study to provide valuable data on how to better serve the educational needs in preparing this student population for the world-of-work and to assist teachers in meeting the learning needs of this student population.

My review of the literature did not reveal any similar study involving adult automotive technology students using the SDS and LSI. The personality and learning style studies I found were conducted in traditional educational settings at the university level. I believe my study will provide useful data for review. I have enclosed a copy of my proposal for your perusal.

I have a vested interest in the outcome of this research. I am a product of the automotive technology industry and would like to positively contribute to profession by using the results of this study to better serve the educational needs in preparing this student population for the world-of-work and to assist teachers in meeting the learning needs of this student population.

Again, I would truly value your input. Thank you for your time.

Sincerely,

Mark Threeton
Workforce Education & Development
The Pennsylvania State University
409D Keller Building
University Park, PA 16802
Phone: 814-404-1962
Email: mdt177@psu.edu
APPENDIX D

LEARNING STYLE INVENTORY (LSI)
Note: The Learning Style Inventory (LSI) is available at the following web address: 
http://www.haygroup.com/tl/Questionnaires_Workbooks/Kolb_Learning_Style_Inventory.aspx
APPENDIX E

OFFICE FOR RESEARCH PROTECTIONS APPROVAL LETTER
Date: January 11, 2008

From: Dolores W. Maney, IRB Administrator

To: Mark Threeton

Subject: Results of Review of Proposal - Expedited (IRB #27200)

Approval Expiration Date: December 19, 2008

“The Relationship Between Personality and Learning Style in Post Secondary Automotive Technology Students”

The Social Science Institutional Review Board (IRB) has reviewed and approved your proposal for use of human participants in your research. By accepting this decision, you agree to obtain prior approval from the IRB for any changes to your study. Unanticipated participant events that are encountered during the conduct of this research must be reported in a timely fashion.

Enclosed is/are the dated, IRB-approved informed consent(s) to be used when recruiting participants for this research. Participants must receive a copy of the approved informed consent form to keep for their records.

If signed consent is obtained, the principal investigator is expected to maintain the original signed consent forms along with the IRB research records for this research at least three (3) years after termination of IRB approval. For projects that involve protected health information (PHI) and are regulated by HIPAA, records are to be maintained for six (6) years. The principal investigator must determine and adhere to additional requirements established by the FDA and any outside sponsors.

If this study will extend beyond the above noted approval expiration date, the Principal investigator must submit a completed Continuing Progress Report to the Office for Research Protections (ORP) to request renewed approval for this research.

On behalf of the IRB and the University, thank you for your efforts to conduct your research in compliance with the federal regulations that have been established for the protection of human participants.
VITA

Mark D. Threeton

Instructor/Lecturer 2005 ~ Present
The Professional Personnel Development Center for Career and Technical Education,
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Education

- Doctor of Philosophy (Ph.D.) December 2008
  Career and Technical Teacher Education, Workforce Education and Development
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- Bachelor of Science (B.S.) May 2002
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  eTED Division Bylaws Committee Chair 2006 ~ Present
  ACTE National Bylaws Committee Representative 2006 ~ Present

Selected Publications


