ADULT CIGARETTE SMOKERS:
HOW THEY LEARN ABOUT AND USE ELECTRONIC CIGARETTES

A Dissertation in
Adult Education

by
Sharilee Myer Hrabovsky

©2018 Sharilee Myer Hrabovsky

Submitted in Partial Fulfillment
of the Requirements
for the degree of

Doctor of Education

May 2018
The dissertation of Sharilee Myer Hrabovsky was reviewed and approved* by the following:

Elizabeth J. Tisdell  
Professor of Adult Education  
Dissertation Advisor  
Chair of Committee  
Professor-in-charge, Lifelong Learning and Adult Education

Robin Redmon Wright  
Associate Professor of Adult Education

Jonathan Foulds  
Professor of Public Health Sciences and Psychiatry

Christopher Sciamanna  
Professor of Medicine and Public Health Sciences

*Signatures are on file with the Graduate School
ABSTRACT

The purpose of this mixed methods study was to examine how a cigarette smoker learns about and uses an electronic cigarette (EC), perhaps as a way to quit smoking or reduce cigarette consumption. The study focused on evaluating the body connections to smoking and its relationship to the EC, investigating the social and material experiences related to learning to use an EC. Two theories framed this study: embodied adult learning theory and Actor Network Theory. The quantitative portion of the study utilized a longitudinal survey analysis of two surveys: the first survey looking at the use and characteristics of 53 dual EC users and smokers and the second survey analyzing this cohort for changes in EC device use. Qualitative data included two open-ended questions on the survey and in-depth interviews with 16 of the 53 survey participants with emphasis on investigating how a smoker came to know about and learn to use an EC. Qualitative data were analyzed with NVivo software. The findings of the quantitative analysis revealed that 74% of dual users intended to quit smoking with 66% quitting by the follow up. There was a significant difference in EC device use between surveys with quitters changing from a cigalike to mod device (p=0.01). The qualitative interviews added to the quantitative results, revealing three main themes around learning about and using ECs: a) sensory embodied connections to smoking and EC use; b) learning through the synergy of social and non-human systems; and c) using an EC as a step towards quitting. The study’s findings provide insight on the intention of EC use and how it changes with experience, and the importance of choice and personalization for ECs to be a step towards quitting smoking. The study provides a model for how adult educators and health care providers can help smokers progress through stages of EC use in their quitting journey. It also offers implications for tobacco regulation, a better
understanding of how to balance the issues with ECs while not isolating former smokers who quit with these devices, and suggestions for further research.
# TABLE OF CONTENTS

LIST OF FIGURES........................................................................................................... viii

LIST OF TABLES............................................................................................................... ix

ACKNOWLEDGEMENTS................................................................................................... x

CHAPTER ONE: INTRODUCTION...................................................................................... 1

A BRIEF STORY: AN EMBODIED CONNECTION TO THE TOPIC................................. 1

BACKGROUND TO THE PROBLEM.................................................................................. 3

Background of Smoking in the United States................................................................. 3
Electronic Cigarette Use ................................................................................................. 6
Nicotine Dependence and Smoking Cessation ............................................................... 8

PROBLEM STATEMENT, PURPOSE, AND RESEARCH QUESTIONS............................... 11

Research Questions ...................................................................................................... 12
Study Purpose and Research Questions ....................................................................... 12

THEORETICAL FRAMEWORK......................................................................................... 13

Embodied Learning ....................................................................................................... 13
Actor Network Theory .................................................................................................... 16

OVERVIEW OF RESEARCH METHODOLOGY............................................................... 17

Mixed Methods ............................................................................................................... 17
Design of the Study ........................................................................................................ 19

SIGNIFICANCE OF THE STUDY..................................................................................... 19

ASSUMPTIONS, LIMITATIONS AND STRENGTHS OF THE STUDY............................... 22

Assumptions .................................................................................................................. 22
Limitations of the Study ................................................................................................. 22
Strengths ........................................................................................................................ 23

PERSONAL REFLECTIONS IN LIGHT OF THE OPENING STORY................................. 24

DEFINITION OF TERMS................................................................................................. 25

CHAPTER TWO: LITERATURE REVIEW........................................................................... 28

THEORETICAL FRAMEWORK: EMBODIED LEARNING AND ACTOR NETWORK THEORY . 29

Embodied Learning ....................................................................................................... 29
Actor Network Theory ................................................................................................... 33

CIGARETTE SMOKING AND SMOKING CESSION.......................................................... 36

US Adults Smoking Prevalence ..................................................................................... 38
Smoking Cessation .......................................................................................................... 40
Relapse and Long Term Cessation ................................................................................ 44

LEARNING IN TOBACCO USE....................................................................................... 46

Embodiment of Smoking ............................................................................................... 49

ACTOR NETWORK THEORY AND THE ELECTRONIC CIGARETTE............................... 51

ELECTRONIC CIGARETTES............................................................................................ 54

Rationale, Branding, and Use of Electronic Cigarettes .................................................. 55

GAPS, IMPLICATIONS, AND CONCLUSIONS ............................................................... 83

Implications for my Study ............................................................................................. 83
Conclusion ...................................................................................................................... 85

CHAPTER THREE: METHODOLOGY................................................................................. 88
Corroboration in a Joint Display for an Explanatory Sequential Design ................................................. 189
Intention of Using the EC .................................................................................................................. 190
EC as a step towards quitting ........................................................................................................... 194
INTERPRETATION OF MIXED METHODS FINDINGS .............................................................................. 196
Embodiment of Smoking and EC use .............................................................................................. 197
EC Learning and Actor Network Theory ......................................................................................... 199
A MODEL OF ADULT LEARNING FOR EC USE ..................................................................................... 203
  Rationale and Background ........................................................................................................... 203
  The Model Itself .......................................................................................................................... 206
  A Model for Learning about and Using the EC ............................................................................. 208
  The Significance of the Network: Insights and Questions ............................................................ 213
IMPLICATIONS FOR THEORY AND PRACTICE .................................................................................. 215
  Adult Learning Theory and Practice ............................................................................................ 216
  Adult Learning ............................................................................................................................. 220
  Tobacco Treatment ....................................................................................................................... 221
  Tobacco Regulation ...................................................................................................................... 222
LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH ...................................................... 223
CONCLUSION AND FINAL REFLECTIONS ......................................................................................... 225
REFERENCES ....................................................................................................................................... 228
APPENDICES ..................................................................................................................................... 253
APPENDIX A: ELECTRONIC CIGARETTE PICTURES .............................................................................. 253
  CIGALIKE: ......................................................................................................................................... 253
  ADVANCED GENERATION WITH A BUTTON: ............................................................................... 253
  MOD VERSIONS, FIRST TWO WITH LARGE BATTERY: ............................................................... 254
APPENDIX B: SURVEY QUESTIONS USED FOR THIS STUDY ............................................................. 255
  First survey ................................................................................................................................... 255
  Second survey .............................................................................................................................. 255
APPENDIX C: INTERVIEW GUIDE ....................................................................................................... 257
  SEMI-STRUCTURED INTERVIEW GUIDE ..................................................................................... 257
List of Figures

Figure 4-1. Use Behavior at Follow Up.........................................................120

Figure 4-2. Device use at baseline and follow up, quitters.............................123

Figure 4-3. Device use at baseline for continuing smoking............................124

Figure 6-1. Learning Model..............................................................................208
List of Tables

Table 2-1. Current Adult Smokers by Characteristic and Prevalence..........................38
Table 2-2. 2015 Prevalence of EC use in U.S. Adult Population........................................56
Table 4-1. Difference in Baseline Characteristics quitters and continued smoking........118
Table 4-2. Participant groups at follow up...........................................................................119
Table 4-3. Difference between baseline and follow up device use.......................................122
Table 4-4. Qualitative responses to open ended questions.............................................127
Table 5-1. Demographic Information of Interviewees.......................................................139
Table 5-2. Data Display of Themes..................................................................................141
Table 6-1. Corroboration of findings................................................................................189
Acknowledgements

So here I am, finishing my terminal degree, though I will always be learning there is great joy in my heart to reach this milestone. Of course, it was not done alone.

John, my husband, has been with me through every degree that I have attained, and there have been many. He has supported my efforts with kindness and thoughtfulness. He was particularly helpful in making sure that I always had a nutritious meal and a hug to keep me going.

Johnny, Emma, and Adam, my three children, have always inspired me to be a better person. Whether it was to be a better mom or better as a community member, their trials and successes gave me the encouragement I needed to improve myself and to obtain something difficult.

To be a practicing Nurse Practitioner in the state of Pennsylvania, you need a collaborative physician. Chris has been there for me as a collaborator in my practice and he has pleasantly supported my efforts in attaining this degree. He kindly participated on my dissertation committee and provided meaningful feedback and guidance on my journey.

When it came to a topic to study, Jonathan’s words resonated in my head. He has said “learn one thing really well, and become the expert”. That statement led me to wanting to understand how smokers learn about and use electronic cigarettes. I thank him for guiding me in my research topic.

I came into this program with a goal in mind, to be able to write better. And that I learned with tremendous support from Robin. She has taught me to appreciate critique and feedback and to understand that the purpose of feedback is to give the project more power. Her critical thinking mind is a blessing to me. Thank you Robin!
When I started this program, I did not go alone as is evident in the above paragraphs, but I never realized how valuable going through it with a colleague and a friend would be. Sharing an office and many discussions and debates with Susan has allowed this program to make more of an impact in my life and profession. I will always be grateful to have shared this experience with her.

And to my advisor, Libby, WOW, I didn’t know how much my life would change with your encouragement and support. From the first day I met you, I think it may have been the spring of 2011 when you and Ed gave an orientation to the Adult Education program at the hospital, until today, you have always approached me as if I had already achieved the degree. You always knew that I could do this and I grew from your confidence in me.

So in respect to Libby, who has become my friend, I leave this work with a quote from the book Together is Better by Simon Sinek.

Though there are many paths to follow into the unknown future, there is one way that dramatically increases the chances we will enjoy the journey. To travel with someone we trust.

Thank you to Dr. Libby Tisdell, my academic advisor and now a friend, my husband and children, Dr. Redman Wright, Dr. Foulds, Dr. Sciamanna, and Dr. Veldheer who have traveled this doctoral path with me, made it more enjoyable, and whom I have trusted the entire way.
CHAPTER ONE: INTRODUCTION

The purpose of this chapter is to provide background to a research study that explores cigarette smoking and smoking cessation from an adult education perspective. It examines how a cigarette smoker learns about and uses an electronic cigarette (EC), perhaps as a way to quit smoking or reduce cigarette consumption. In particular, the study focuses on evaluating the body connections to smoking and its relationship to the EC, and investigating the social and material experiences related to learning to use an EC. In that sense, it is related to learning through the body. To set the context of the study, I begin this chapter with a brief story of embodied learning and its relationship to my own connection to the topic. Next, I will provide background to the problem, and then discuss the purpose and research questions. This will be followed by a consideration of the theoretical framework of the study, an overview of the methodology; the significance; a discussion of the assumptions, limitations, and strengths, and the chapter ends with a brief conclusion to the opening story.

A Brief Story: An Embodied Connection to the Topic

Adults learn in many contexts and learning through the body is one of those ways. Freiler (2008) discusses this alternate way of knowing as embodied learning or learning via a connection between the mind and body. Niedenthal (2007) adds to this definition by describing embodied learning as a learned way of being related to the perceptions and experiences of the body’s senses, motor actions, and emotions. Through the lyrics of a song I describe my embodiment of dancing and performing. At the end of this chapter, I complete the story by reflecting on my embodiment of inspiration through the learning I have experienced by treating tobacco dependence and by participating in this adult education program.
**What I did for love** (lyrics in italics) is the name of the song from the Broadway musical, *A Chorus Line*. The words reflect a dancer’s thoughts on her performance and embodiment of dancing that was disrupted after suffering a career ending injury. In 1979, I danced my last stage performance to this song. Although I did not suffer a career ending injury, I did feel the loss when my performances stopped. The hard work and dreams of an artistic profession had come to an end. I questioned briefly, was *what I did for love* worth it?

*Kiss today goodbye the sweetness and the sorrow*. All the work, perseverance, sweat and determination of the years of dance practices culminated into this one moment. The dancers whispering “*wish me luck, the same to you.*” I loved performing and hearing the applause. I worked countless hours to provide a near flawless performance. I was emotionally tied to the feeling I received from the performance. When I heard the sound of the applause, I felt satisfied. I knew in my body what I was meant to be: a performer of the arts. I learned through my body that I inspire others through dance, and I thought I would never stop performing. But I did, and I missed it. The applause ended and I was lost. I didn’t know what to do for love. How do I inspire now that dance is gone? The applause ended, and the pain of heartbreak ensued. I realized that I was done performing, done inspiring. Time moves on but I can't regret *what I did for love*.

Years later, I find myself in a different performing art and the feeling of satisfaction returns. My body feels happier, and I have learned that I like to inspire others. Now, my performance is that of a healthcare provider, a nurse-practitioner, and smoking cessation researcher; the inspiration is in what I do to motivate tobacco users to quit by providing healthcare interventions which teach and inform about risk of tobacco use.

*What I did for love* or now what I do for love is to educate another to perform at their best, to accomplish one of the most difficult things a smoker can do for their health—quit
smoking. What I do for the love of hearing not the applause but the declaration that a smoker has quit (and knowing that their health and lives will improve). I work hard and spend countless hours learning about the health effects of smoking, understanding current tobacco treatments, motivations to quit, and how to overcome barriers to quitting. My performance has given a smoker a chance to quit. Again, when the performance has ended, it hits me and the pain returns, the pain of realizing the ease with which relapse to smoking can occur. Oh, the relapse to smoking is prevalent and heart breaking. Is my performance here done too?

Smoking is detrimental to the most precious thing we have, our health, yet so many of us continue to participate in the activity and behavior of tobacco use. How is this harmful activity learned? Can it be unlearned?

**Background to the Problem**

Adults learn and unlearn in many contexts. A percentage of the adult population has learned that smoking cigarettes delivers a good feeling to their body. They have learned that going too long between smoking a cigarette can be uncomfortable, and they experience moodiness, stress, and agitation. Many of these same smokers also learn that quitting the use of cigarettes is challenging because of all the ways in which smoking a cigarette supports their social and physical experiences. In this section, I give a background on smoking, the use of electronic cigarettes, and smoking cessation.

**Background of Smoking in the United States**

In 2014, the three leading causes of death in the United States were heart disease, cancer, and chronic obstructive pulmonary disease or COPD (CDC Statistics, 2016). All of these conditions have modifiable risks that many of us try to change. There are massive amounts of consumer products on the market targeting ways to increase exercise, to improve nutritional
intake, and to reduce exposure to products which cause harmful health effects. The one central modifiable risk in all of these disease states is tobacco use. Smoking is the major cause of cardiovascular disease, lung cancer, and COPD (United States Department of Health and Human Services, 2014)

In addition to causing disease and early death, tobacco use is costly and contributes to very high physical, societal, and health care costs. Over the twelve year period between 2000 and 2012, those costs added up to over $133 billion in resources spent treating tobacco related illnesses with that number totaling $289 billion when the cost to society is added in. Even more profound is the statistic that $6.36 spent on a pack of cigarettes equates to $35 in health-related costs, such as missed work time, provider visits, and treatments (USDHHS, 2014). Just these statistics alone should inspire smokers to quit tobacco use. Health care providers and public health professionals are in the forefront in providing and educating the general public and smokers about the risks and costs of smoking. Since my participation in the Adult Education Program, I have come to realize that adult educators are also positioned to enlighten and intervene with novel ways to help inform learning about methods to reduce or quit tobacco use.

Smoking cessation is one of the most important and most difficult things a person can do to protect their health. The US Department of Health and Human Services publishes reports and statistics regularly regarding the risks of smoking. It is known that people who smoke every day have an increased risk of cancer, heart disease, lung disease, diabetes, and general health detriments and shorten their life expectancy by 13 to 14 years (USDHHS, 2014). The Centers for Disease control (CDC) lists on their website site that 18 percent of the United States adult population (close to 56 million) smoke cigarettes and 16 million Americans are living with a disease caused by smoking. Cigarette smoking is the leading cause of preventable death
worldwide, and, in the United States, it is responsible for one in five deaths annually, or about 1,300 deaths every day (USDHHS, 2014).

Many smokers make a quit attempt yearly. In 2010, 69% of adult smokers indicated a desire to quit smoking and 52% tried to make a quit attempt in the past 12 months (Babb, Malarcher, Schauer, Asman, & Jama, 2017). The unfortunate reality is that most smokers who make a quit attempt relapse. On an annual basis, only four to six percent of the smoking population successfully quit. Not only that, “most people who quit smoking will eventually relapse and may require repeated attempts before achieving long term abstinence” (USDHHS, 2000, p. 22). The U.S. Public Health Service (PHS) Clinical Practice Guidelines have consistently framed tobacco use in the same terms, stating in the 2008 update, “Tobacco dependence is a chronic disease that often requires repeated intervention and multiple attempts to quit” (Fiore et al., 2008, p. vi). Therefore, the current problem in tobacco treatment is that we are providing the same treatment over and over again with similar results—relapse to smoking. Additional learning is required to fully understand the dependence on cigarettes and how smokers perceive current options to quit or reduce their tobacco dependence. In the past several years, more and more smokers are using a fairly new product, an electronic cigarette, to reduce or quit smoking. What they learn from the use of an electronic cigarette can help smokers and those who treat tobacco dependence better understand alternate methods that smokers are using to treat nicotine and smoking addiction.
Electronic Cigarette Use

Recently, the electronic cigarette (EC) has entered the tobacco use market, and it has grown in popularity exponentially over the last several years, particularly among current cigarette smokers. It was first introduced into the United States in 2006 (Benowitz, 2014; Foulds, Veldheer, & Berg, 2011), and, by 2014, over 55% of former smokers and 47.6% of current smokers tried an EC. Even more interesting is the statistic that 22% of recently quit smokers regularly use an EC (Schoenborn & Gindi, 2015). This is in significant contrast to the 25% of those trying to quit smoking by using a United States Food and Drug Administration (FDA) approved medication, such as a nicotine replacement product (Shiffman, Brockwell, Pillitteri, & Gitchell, 2008). It is important for researchers to understand why cigarette smokers are using ECs.

Tobacco smoking satisfies a nicotine addiction, and, according to Pearson, Richardson, Niaura, Vallone, and Abrams (2012), cigarette smoking is the most highly addictive form of nicotine self-administration, exposing smokers to high concentrations of toxic combustible products. ECs provide nicotine via a vapor that is drawn into the mouth, upper airways and lungs. This vapor is heated but not combusted; therefore, it has significantly less toxic products (Bullen et al., 2010). The EC has been described as a harm reduction product or a “clean nicotine delivery device” (Benowitz, 2014, p. 231) because it does not combust while delivering nicotine in a way that can allow cigarette smokers to stop smoking cigarettes (Benowitz, 2014). Nicotine is the addictive chemical in cigarettes, but in most cases it is not the harmful product to the smoker. It is the combustion of the cigarette that causes dangerous chemical reactions and inhaling these chemicals into lungs is toxic to the body. Although there are other less toxic nicotine delivery products available in the United States, such as chew, dip,
snus (similar to chew), in addition to FDA approved nicotine replacement products, such as patch, gum, and lozenge, ECs continue to increase in popularity. Biener and Hargraves (2015b) reference Hargraves and McInerney’s discussion of ECs, and they state that the EC is preferred over other products which are advertised as less harmful, such as low nitrosamine smokeless tobacco (snus). The acceptability of the EC grew, and, by 2013, it is considered by many smokers as an alternative, less harmful choice than a cigarette (Biener & Hargraves, 2015a). In the two subsections, here I discuss the awareness and perception of the EC as a harm reduction product, and the existing research on the EC, though is also discussed further in Chapter Two.

**Awareness and perception.** Much of the research on electronic cigarettes is in population survey form, which means that a representative sample of a population completes either binary data (yes or no answers) or a Likert style survey and means and frequencies are derived related to categories of topics. Many surveys have been completed on the awareness and perceptions of ECs. Characteristics of people more likely to be aware of ECs include current and former smokers, male, younger, and higher educated (Pearson et al., 2012; Pepper, Emery, Ribisl, Southwell, & Brewer, 2014). Several surveys provide data on the high acceptability of ECs and the perception that they are less harmful than traditional cigarettes (Baeza-Loya et al., 2014; Choi & Forster, 2013; Pearson et al., 2012; Tan & Bigman, 2014). Other studies capture the perception that government regulation is an important component of the EC market and that the government plays an important role in controlling the safety and marketing of ECs (Berg, 2016; J.-F. Etter, 2016a; Simmons et al., 2016). It is evident that the EC has developed a network of awareness, use, and discussion among smokers and researchers.

**Research and the electronic cigarette.** As the previous section indicates, I found several research topics covered perceptions, uses, and smoking cessation with electronic
cigarettes (ECs). However, what is missing in the literature is rich description on how body connections to cigarette smoking affects the cigarette smokers decision to try an EC, learning to use an EC in general and in place of a cigarette, and how that compares to the use of a combustible cigarette. What is not understood is the lived and embodied experience of smoking, better explained as the body’s connection to smoking’s effect on the senses, actions, and emotions, and how that experience is or is not maintained in EC use. Many studies discuss the senses, motor actions, and emotions connected to daily smoking (Benowitz, 2010; Dawkins, 2013), but how this embodied experience is maintained in EC use is missing. By answering yes or no to a survey which asks the question “do you think an EC is less harmful than a cigarette?” or, “Have you used an EC in the past 30 days?” is lacking the rich, thick, description required to understand the beliefs and reasons around the use of an EC. How a person comes to choose to use an EC in relationship to body cues, social experiences, knowledge of use of the device and confidence to effectively use it are not well understood. These are important questions to answer so that adult education practices used to reach the individual and the public are related to what tobacco users believe is happening which provides for more effective and acceptable treatments of addictions such as smoking and nicotine.

**Nicotine Dependence and Smoking Cessation**

A recent survey by the Center for Disease Control (CDC) documents that 80% of smokers see a health care provider every year and the majority of them want to stop smoking (USDHHS, 2014). A CDC task force developed the 5 A’s (Ask about tobacco use, Advise quitting, Assess readiness to quit, Assist in quit attempt, and Arrange follow up) which are intended to be used by health care providers to encourage quit attempts by smokers (Fiore et al.,
Quit attempts are most successful when medications and counseling are offered concurrently.

Nicotine is the primary addictive drug in cigarettes and nicotine replacement therapy is a primary Food and Drug Administration (FDA) approved tobacco treatment medication (USDHHS, 2014). Of the 52% of the United States smoking population who tried to quit, 31.7% used counseling and/or FDA-approved medications. Conversely, 69.3% of smokers attempted to quit cold turkey which is without any medication or counseling assistance (CDC, 2011). The success of smoking cessation is usually measured in quantitative ways, such as percentage quit verses those not quit, with or without a medication. This method does not account for the lived experiences of being a smoker. These FDA approved methods for treatment of tobacco use are based on medication use and specific behavior change strategies. What is lacking in tobacco use treatment is an understanding of the true learned experiences of smoking and how these experiences effect how a quit attempt is made.

Nicotine dependence is the physical addiction to smoking. When nicotine levels drop, a smoker does not feel normal and experiences psychological withdrawal symptoms, such as anxiety, irritability, nervousness, and restlessness (Benowitz, 2010). The administration of nicotine by smoking quickly relieves the physical dependence and, consequently, the psychological discomforts, giving the smoker a good feeling. Nicotine is quickly metabolized and requires frequent smoking during the day or withdrawal symptoms return. By smoking several times a day, a smoker’s body learns to expect the feeling a cigarette provides and associates that feeling with activities, people, and specific events, such as work breaks, drinking coffee, eating dinner, or waking up (Dawkins, 2013) and solidifies a way of life that a smoker’s body is comfortable with.
The use of medications to treat smoking dependence certainly has value, but it only acknowledges the dependent state of physical nicotine addiction and has little effect on the social (smoking with friends) and sensory (smelling a cigarette, inhaling the smoke, and seeing plume on exhalation) experiences of a person who smokes. The behaviorist interventions to treat smoking such as medications, trigger avoidance, and reduced access to cigarettes all support behavioral strategies to quit smoking. However, current smoking cessation treatments lack self-reflection and the connection to smoking that the body learns through repeated actions, senses, and emotions created from years of smoking. It is important to see other avenues of quitting tobacco use which account for the body’s connection to smoking. While behavioral approaches can be effective, these techniques do not support the sensory and motor connections that are learned and have become a way of life in the smoker. Think about the ingrained ritual (lighting a cigarette first thing in the morning or as soon as you get in the car) that is likely subconscious behavior in a daily smoker; to treat this way of being with strictly behavior techniques (taking medication and resisting urges and cravings to smoke) ignores the body’s habit or way of being. A smoker’s body learns to use a cigarette to relieve stress, relax, socialize, and occupy time. Possibly, incorporating these motor and sensory techniques can help people who are not ready to quit or able to adapt to the behavior techniques.

New methods of quitting may consider the strength of the habits of the body. In studying the body’s experiences to smoking and the smoker’s perceptions to smoking, we can investigate the relationship between smoking and the body’s senses, actions, and emotions. The significance of the role of the body in smoking is a concept that may provide in depth understanding of the physical experiences of a smoker. The experience of smoking and the awareness around that
experience, such as feeling relaxed and less stressed after smoking, influences smoking behaviors and contributes to the continuation of smoking (Dawkins, 2013).

In recent years the electronic cigarette (EC) has been used as a smoking cessation device (Etter & Bullen, 2011; Etter, 2016a; Farsalinos et al., 2013). Users of ECs have said that it gives them a way to satisfy their body’s cues, triggers, and habits to smoke with a product that is perceived as less harmful (Dawkins, 2013). Learning to use an electronic cigarette to quit or reduce smoking may reflect and support the embodied behaviors in smoking. Stolz (2015) explains Merleau-Ponty’s account of embodied learning which is how the human experience contributes to human learning. We come “to understand our own point of view as a result of experiencing it” (Stolz, 2015, p. 479). Relating to what Stolz draws from Merleau-Ponty’s work that human experience contributes to human learning, helps to guide an investigation to what tobacco smokers are learning through the experience of using an electronic cigarette. We can improve tobacco treatment programs and public health initiatives by studying a smoker’s perceptions, body connections, learning, and experiences of smoking and how that relates to using an electronic cigarette.

**Problem Statement, Purpose, and Research Questions**

Cigarette smoking is a proven risk for illness, disease, and early death. Many smokers have quit, but the rate of smoking over the last several years has remained steady (USDHHS, 2014). Current FDA approved tobacco treatment methods have limited success and current smokers who use them often return to smoking (Fiore et al., 2008). While this has yet to be proven, the electronic cigarette (EC) is perceived as less harmful than tobacco cigarettes because it does not burn, and is being used by smokers to quit combustible cigarette use. Still, because EC’s effects on health are yet to be fully understood, health care providers are not encouraged to
support it as a smoking cessation device (Tomashefski, 2016). Although the EC is not a federally approved smoking cessation product, and many in the tobacco treatment community do not consider it an acceptable smoking cessation device, smokers are using it to quit smoking (Schoenborn & Gindi, 2015; Shiffman et al., 2008). Understanding how and why smokers chose to use an EC by gaining a perspective on their social and material networks will provide a deeper understanding to the problem of smoking and quitting.

Many smokers want to quit, but find traditional tobacco treatments unhelpful in staying quit. They are using an unregulated nicotine delivery device (ECs) to quit smoking despite or potentially in spite of the lack of support from the tobacco treatment community. Understanding, from the smoker’s perspective, how they come to learn about and use an EC can provide a more accurate account of their learned tobacco dependence and inform the search for alternative treatments.

**Research Questions**

The specific research questions that guide the study include:

1) How do adult smokers learn about electronic cigarettes through their social (family, friends, peers, work place, etc.) and material (vape shops, blogs sites, forums, advertisements, etc.) networks?

2) What is the initial intended use of an electronic cigarette and does the intent change with the experience of using an electronic cigarette?

3) Does embodied learning impact a cigarette smoker’s use of an electronic cigarette?

**Study Purpose and Research Questions**

The purpose of my study is to understand how a cigarette smoker learns about and uses an electronic cigarette (EC) by evaluating the body connections to smoking and how that is
transferable to using an EC, and by investigating the social and material experiences related to learning to use an EC. The following goals guide this study and data collection.

1. Identify body (senses, movements, and emotions) connections to smoking that makes it difficult to stop.
2. Understand through what avenues smokers come to learn about and use an electronic cigarette (through social [friends or family] and material [vape shops, blogs] networks).
3. Gain a clearer perspective of the smoker’s account of their tobacco dependence and their need for alternate tobacco products.

**Theoretical Framework**

My research draws on an understanding of how knowledge is gained through the body’s experiences and how learning can occur through human and nonhuman networks. Two theoretical frameworks guide this study. One is informed by embodied learning theory and combines how learning occurs through the body’s senses, motor actions and emotions. The second is informed by Actor Network Theory, which suggests that adults form knowledge through the dynamic realm of social (e.g. friends, family members, work, etc.) and material (e.g. electronic cigarettes and its components, vape shops, forums and blogs, etc.). I begin by describing embodied learning and smoking.

**Embodied Learning**

Embodied learning is a theoretical perspective in adult education that examines learning through body experiences (Freiler, 2008). When considering this in terms of a smoker, I need to briefly discuss the experience of nicotine dependence. Smoking cigarettes leads to an increase of nicotine levels in the body. The presence of nicotine is associated with increased nicotine
receptors in the brain which, when activated, create a direct feeling or experience for the smoker and leads to eventual nicotine addiction (Benowitz, 2009). Once a smoker is biologically addicted to nicotine, physical body reactions occur in response to nicotine administration and metabolism. When nicotine levels drop, psychological withdrawal symptoms are experienced, such as anxiety, irritation, restlessness, and nervousness (Benowitz, 2009). Receiving nicotine from a cigarette relieves these symptoms and makes a smoker feel happier and less stressed. Smokers like the feeling of nicotine in their body because they can avoid experiencing withdrawal symptoms. The administration and metabolism of nicotine happens multiple times throughout a smoker’s day and causes peaks and valleys of nicotine levels. These levels are experienced as peaks of feeling good and valleys of feeling anxious, nervous, and irritable (Benowitz, 2009). When nicotine levels are low, a smoker craves a cigarette. Smoking several times a day relieves the craving for and withdrawal from nicotine.

The frequency of smoking allows the smoker to associate the actions of their bodies with activities around smoking a cigarette such as driving, talking on the phone, drinking coffee, taking a break from work, or relieving stress. The administration of nicotine (e.g. smoking a cigarette) relieves the physical desire for and the psychological withdrawal from nicotine, but the activities, emotions, and actions that regularly coincide with smoking teach a smoker’s body to connect those habits and feelings to smoking. The body learns that when it feels stressed, experiences driving a car, or needs to take a break, it craves a cigarette. This embodiment of smoking accounts for how a daily cigarette smoker uses a body’s senses, motor actions, feelings, and emotional experiences related to smoking as cornerstones of their day. Sometimes the body “just knows” something. This is embodied learning (Freiler, 2008; Merriam & Bierema, 2014). Although the tobacco treatment community does not always consider that smoking cigarettes
creates knowledge, I argue that by smoking cigarettes the body senses or feels something and that sense is learned.

The knowledge in a smoker’s body is expressed as “just knowing” how deep to inhale a cigarette and how many puffs to take to relieve the nicotine desire (Benowitz, 2009). Smokers use cigarettes throughout the day to relieve nicotine withdrawal symptoms by reacting to body cues to smoke, such as feeling anxious. The smoker “just knows” that they will feel better after a smoke. The smoker’s body has learned that getting in a car means smoking a cigarette, awakening from sleep means smoking a cigarette, or relieving stress after an argument means smoking a cigarette.

Current tobacco treatment medications are in pill form such as Chantix or Zyban, or as a nicotine replacement product, such as patch, gum, lozenge, or inhaler. All of the learned experiences in a smoker’s body do not go away with tobacco treatment medications and some of the experiences learned by the body as associated with smoking are so strong that quitting is too uncomfortable for a smoker so they continue to smoke (Lucchiari et al., 2016). Giving a smoker nicotine replacement medications, such as a nicotine patch, may affect the nicotine receptors in their brain and help alleviate physical nicotine and psychological withdrawal symptoms, but it does nothing for the learned body connections to smoking (Rose, Behm, Westman, & Johnson, 2000). There are other things that create a desire to smoke, such as driving in a car or having an argument. Although these desires are not symptoms of nicotine withdrawal, the smoker associates smoking with relief of the stress or anxiety of these situations.

The experiences of a specific movement, action, sense, thought, or emotion, around smoking are repeated multiple times a day and solidify a certain way of being in the world (Gregorc, 1979), described as “being a smoker” by those who use cigarettes on a daily basis.
That becomes part of a smoker’s identity. The theory of embodied learning accounts for the multiple body experiences that occur with the use of cigarettes. Therefore, I will use embodied learning as a theoretical framework through which to analyze the data on a smoker’s use of electronic cigarettes.

**Actor Network Theory**

I also use Actor Network Theory (ANT) as a second lens to view the data. ANT provides a way to understand humans and their interactions with inanimate objects (Cresswell, Worth, & Sheikh, 2010). Although ANT is discussed in more depth in Chapter Two, a brief definition follows. ANT supports that all things that are given to be natural, social, or technical are really a combination of all of these things and come about by a network of interactions, or webs, that create energy, meaning, and associations that allow them to persist, grow, mutate, and decline (Law, 1992). By using ANT, I explore how the EC mixes together natural (a smoker), social (fellow smokers, family), and technical things (EC components) to create a web or a network associated with using an EC (Fenwick & Edwards, 2010). I will use ANT to identify whether the EC acts together with other forces such as friends and family, embodiment of smoking, vape shops, and social networking to create the experience of using an electronic cigarette. All of these networks tangle together to form knowledge about ECs and form a structure to support a smoker’s use of an EC.

The EC came onto the United States market in 2006 and by 2015 had become widely used by tobacco smokers. ANT provides a framework for understanding how cigarette smokers came to know about and use an electronic cigarette. Some smokers say they feel more support and experience increased confidence to stay quit when they use an EC (Barbeau, Burda, & Siegel, 2013). This research provides guidance to the tobacco treatment community.
(researchers, government, health care providers and educators) about the use of an EC from a smoker’s perspective. Therefore, through the lens of ANT, I focused on social and material networks to view how a smoker learns about and uses an EC.

**Overview of Research Methodology**

To gain an in-depth understanding of how cigarette smokers learn about and use an electronic cigarette (EC), I used a mixed method research process. Mixed methods design utilizes more than one research method in a single study as a strategy to investigate an area of interest or a phenomenon that is difficult to explain with a single method (Janice Morse & Niehaus, 2016). As detailed in Chapter Three, the design of the study utilizes a longitudinal observational survey approach to identify and examine characteristics of cigarette smokers who also use electronic cigarettes over time and basic interpretive interviews to further explain the use or stopped use of ECs. The following section provides an overview of mixed methods, including the quantitative and qualitative methods I used, and an overall design of the study.

**Mixed Methods**

This is a mixed methods research study, which is the particular framework of this project. The framework of a study is described as the process and activities which support the structure of a research project (Plowright, 2011). The framework includes the model or method which is defined around the designing and planning needed to carry out the research. In my study, I integrated quantitative data from two surveys to describe characteristics and formulate a group of dual users (cigarettes and EC) users; then I offered to this group of individuals an opportunity to participate in qualitative interviews. This method of using quantitative and qualitative data collection methods or mixed methods in research has the advantage of integrating different
processes into a research project (Plowright, 2011) to produce a stronger more credible study (Plano Clark & Ivankova, 2016).

**Quantitative component: Longitudinal observation survey.** The quantitative design I used in this study is a longitudinal observational survey. This design involves repeated observations of the same cohort of people over time (Rindfleisch, Malter, Ganesan, & Moorman, 2008). Because the same participants are observed at two separate times, a significant benefit of this design is that there is less variability in cohort characteristics to affect the impact of the variable or behavior being observed over time (Rindfleisch et al., 2008). This design provides the researcher useful data of a cohort, the behavior change over time, and related characteristics. One disadvantage of this design for the researcher to consider is dropout rate. Some of the participants did not complete the follow-up survey which reduced useable data. My greatest concern regarding this design is that although I can measure change in behavior, such as dual use to EC only use, it does not account for what happened in between the two time points being observed. To explain the change in behavior, such as increased EC use, a qualitative inquiry was employed.

**Qualitative interviews.** I used basic interpretive research for the qualitative portion of my study. The central characteristic of qualitative research is that all individuals create their own knowledge based on their experiences, activities, and interaction with their social world (Merriam & Tisdell, 2016). In a basic qualitative interview, the researcher is interested in understanding how people make sense of their experiences. Since I investigated how a cigarette smoker uses an EC and how that use may change over time, I looked into and specifically asked about how the cigarette smoker interprets the experience of using of an EC and what meaning they gave the use of an EC.
Design of the Study

I used quantitative methods to identify and analyze cigarette smokers who also use electronic cigarettes (ECs), also referred to as dual users. The data from two pre-existing surveys (Penn State Electronic Cigarette Survey and the Follow up Penn State Electronic Cigarette Survey) were used by me to characterize dual users. I employed a longitudinal cohort study design of the participants to track the use and change of use of ECs among dual users. My topics of interest on the first survey were age, gender, income, occupation education level, nicotine dependence, type and frequency of cigarette use and EC device used. On the second follow-up survey, I analyzed change in dual use and placed dual users in the potential categories of continued dual use, EC use only, cigarette smoking only, quit all tobacco use, and other. This quantitative data helped to identify changes of EC use over time.

I used the narratives from basic interpretive interviews to explain the smoker’s experience of electronic cigarette use. I found my participants in the database of those who completed both surveys and agree to be contacted for future research. Those participants who agreed to be interviewed were sent a brief description of my study so that they were familiar with what I was studying and given time to think about the topic of interest. I used semi-structured questions to interview the participants and thematic analysis to analyze the interview data.

Significance of the Study

As mentioned previously, cigarette smoking causes many diseases and reduces the health of smokers. Quitting smoking can add years to the life of a smoker by lowering the risk of smoking related diseases (USDHHS, 2014). FDA approved treatments for tobacco cessations are not effective in helping the majority of smokers to stop smoking (Fiore et al., 2008). Better treatments are necessary to provide effective methods and support. Quitting smoking is at the
core of a smoker’s health concerns and by studying successful alternatives to quit from a smoker’s perspective can enhance health care providers’ understanding of the learned processes of smoking. Many smokers have found that they can use an electronic cigarette (EC) to replace or reduce their cigarette use (Farsalinos, Poulas, Voudris, & Le Houezec, 2016). The EC is not an FDA approved device and smokers who use ECs are met with resistance from health care providers, and government agencies (Tobacco Policy Center, 2016). Adding to the scientific method in tobacco treatment research by exploring personal narratives that can only be captured with qualitative methods will allow researchers to consider the smokers’ insights into alternatives to cigarette smoking. Therefore, researchers can benefit from looking to the field of adult education and lifelong learning to help understand the ontological beliefs of smokers and how those experiences and beliefs impact their use of ECs. By better understanding these beliefs individualized interventions to reach the smoker, in particular those who we are not currently able to reach, can be considered by providing better products and opportunities to improve tobacco treatment.

This study is significant to the field of adult education in its examination of learning situated around exploring and describing how an adult cigarette smoker learns about and uses an electronic cigarette (EC). Unlearning a risky behavior or changing it to a less harmful behavior is important to adult education. By investigating the embodiment of smoking and how a smoker comes to learn about and use an EC, adult educators can better understand how a smoker comes to change a learned behavior. Through the perceptions and discourse of participants, this study may provide a better understanding of how smoking contributes to a bodily experience and way of knowing that is centered on smoking. Exploring the body connections to smoking and how that contributes to ongoing smoking will add to the body of knowledge in adult learning and
entice new methods to reduce or stop smoking. Learning how smokers quit can help adults in large, such as not being exposed to second hand smoke.

By better establishing how smokers use ECs, by developing interventions around the frameworks of embodied learning and ANT, we can take this protocol and establish other treatments for other addictions, such as overeating and illicit drug use, and other fields that are difficult for people to quit or adapt to.

People and environments contribute to adult learning. Working with Actor Network Theory, adult educators can understand how people learn through their combined social systems and material interactions. One aim of this project is to understand how the EC has come into smoker’s lives and enabled them to reduce or quit tobacco use. By understanding the material and nonmaterial experiences which contribute to learning, adult educators can start to acknowledge when entities come together and connect to form links of learning and potentially create behavior change. Understanding how a cigarette smoker learns about and uses an EC can assist educators, smokers, and healthcare providers discern how the EC is used by a smoker.

In addition, this research may add to the body of knowledge in tobacco regulation. Understanding how the adult smoker forms knowledge about the use of an EC through their association to social and material networks can benefit researchers and government agencies and enhance public health pedagogy around tobacco use and treatments. This enhanced perspective can illuminate why and how adult smokers are using an EC and will assist government regulators in how they educate the public regarding EC use.

This research is personally significant to me as I am a nurse practitioner with a primary interest in providing tobacco dependence treatment to adult smokers. I have worked with tobacco dependent smokers for many years and I have seen people unable to quit with traditional
tobacco dependence treatments. I am personally interested in why smokers are using electronic cigarettes and how that relates to their use of combustible cigarettes. I am concerned that the smoker’s perspective is not considered in the development of new tobacco treatments or in the decisions about new regulations on novel tobacco treatment products. Therefore, by investigating the smoker’s use of the electronic cigarette, I have acknowledged and shared their perspective and grown from it.

Assumptions, Limitations and Strengths of the study

Every study is based on certain assumptions, and also has limitations and strengths.

Assumptions

As it relates to the purpose of my study, the following assumptions are embedded within the research:

1. Although the act of using an electronic cigarette is analogous to using a combustible cigarette, it provides the user a nicotine delivery product with less exposure to toxins delivered in a combustible cigarette.

2. Most cigarette smokers care about their health and want to be healthy, live longer, and avoid heart disease, lung cancer, emphysema, and other smoking related illnesses.

3. If smokers are presented with a device that provides the drug they are addicted to (nicotine) and mimics enough of the actions and habits of cigarette smoking, but that may have far fewer health risks, most will be motivated to switch to that device.

Limitations of the Study

Considering that all research contains weaknesses in varying degrees, the following limitations for this study include:
1. The understanding that a person’s motive for engaging in health behavior change can vary significantly, depending on the context. As such, it may be difficult to ascertain the degree to which the electronic cigarette alone motivated the smoker to reduce or quit smoking.

2. This study is dependent upon voluntary participation among current or previous electronic cigarette users who respond to a survey asking about electronic cigarette (EC) use. As a result, there may be a degree of selection bias in that EC users who volunteered to complete the surveys may have done so as a result of particularly positive experiences with EC use.

3. This study is using a mixed method research design to observe behavior change of dual (cigarette and electronic cigarette) users over time. Other combustible tobacco use, such as pipes and cigars, by EC users will not be considered in the participant selection.

**Strengths**

In spite of the limitations noted above, the study also has much strength. Most importantly, understanding how smokers learn about and use electronic cigarettes can improve the tobacco use and treatment community’s understanding of how new products can inspire health behavior change. Determining what motivates a smoker to use an EC related to embodiment of smoking helps to describe new understandings of the smoking addiction and treatment. This study gives a voice to the smoker and provide to them way to give their perspective on how to change behavior. Better tobacco use treatment can be developed when the smoker defines what they need to be able to stop cigarette smoking. Consideration of the perspective of the smoker’s use of an EC can make a difference in how government regulates it.
In addition, this study contributes to the investigation of the ongoing reasons for EC use but also continued smoking even when it is known to be bad.

**Personal Reflections in Light of the Opening Story**

In designing the study, I couldn’t help but reflect on my own adult learning experience. Through dance I learned that body movements connected strongly to my feelings of inspiration and motivation. As an adult learner in the adult education program, I learned that my actions and thoughts challenged my emotions and senses. Learning through these embodied ways gave me insight into the strong purpose that my body movements and actions gave to my perceptions, feelings, and intentions. I want to find out if cigarette smokers experience a similar embodied response, particularly in those adult smokers who learn to use an electronic cigarette.

*Look my eyes are dry* even though the gift of not smoking is gone. I now spend countless hours researching, studying, and writing about embodiment of smoking and how that may affect a smoker’s use of electronic cigarettes. *The gift was ours to borrow.* My performance didn’t help every person I treated to stop smoking, but what I have learned in the Adult Education Program and, the required work for this dissertation, is that I discovered a little bit more of what is learned from smoking, quitting, and the use of electronic cigarettes. *Love is never gone.* *As we travel on, Love’s what we’ll remember.* Exposure to the smoker’s pain of multiple failed quit attempts and the smoker’s joy of maintaining a quit status inspires me to reach for knowledge, to learn what makes a difference in tobacco use and to provide that knowledge to all who want to quit.

*Kiss today goodbye and point me toward tomorrow.* Smokers will try to quit again. There will be new ways, better ways to quit. *We did what we had to do.* I reflect on what I need to do. I need to keep performing, learning, studying, and inspiring. It is who I am, a performer. I won’t give up on myself, this dissertation, my research, and those who want to quit smoking. I know
that to embody the journey, to persevere, is the way to gain understanding. Tobacco treatment, much like writing these chapters, presents to me as an emotional experience with feelings of failure and of success. Just as a smoker experiences the weakness in multiple failed quit attempts and the joy in the accomplishment of one day quit, I too react with heartache to the weaknesses and critique of my writing but I am uplifted when I finalize a chapter. The struggle of learning to write better, or to quit smoking, and the joy I experience when a smoker quits, or when I finish a chapter, drives me to continue to study and inspire. The embodiment of the performance is real to me and I won’t forget, can’t regret what I did for love.

**Definition of Terms**

1. **Actor Network Theory** - defined by Latour (1987) as starting with a translation which describes what happens when entities, human and nonhuman (smoker and electronic cigarette), come together and connect; change one another to form links (smoker uses the EC), and eventually form a chain or network of actions and things (vape shops, EC components, blogs, forums) (Fenwick & Edwards, 2010) See page 32 for more detail.

2. **Advanced electronic cigarette device** - EC devices larger than a regular cigarette or with a button to press prior to inhalation (Yingst et al., 2015).

3. **Cigalike** - E-cig devices that were the same size or smaller than a regular cigarette that did not have a button to press prior to inhalation (Yingst et al., 2015).

4. **Combustible cigarette** - see definition of traditional cigarette.

5. **Dual use** - a person who users traditional cigarettes and electronic cigarettes regularly.

6. **Electronic cigarette (EC)** - may also be called e-cigarette, e-cig, electronic nicotine delivery system (ENDS), or vaping device; are battery operated devices that deliver nicotine via inhaled vapor, also termed a harm reduction product because it delivers
nicotine to the body without the harmful chemicals present in cured tobacco or those that are created during combustion.

7. E-liquid - also called nicotine liquid, is liquid containing propylene glycol and vegetable glycerin with various levels of nicotine doses and flavors. They are generally purchased over the internet or at a specialty vape shop.

8. Embodiment of smoking – Relating smoking to Niedenthal’s (2007) definition of embodied learning which is a learned way of being related to the perceptions and experiences of the body’s senses, motor actions, and emotions. See page 28 for more detail.

9. Harm reduction product - use of a noncombustible product, such as an electronic cigarette, to deliver nicotine to reduce the risk of the toxic effects of nicotine that is delivered through a combustible cigarette (J. F. Etter & Eissenberg, 2015)

10. Mod Device - Devices larger than a cigarette, different shape than cigarette, with large rechargeable batteries.

11. Nicotine - the addictive chemical in tobacco (Benowitz, 2010)

12. Nicotine addiction - by smoking cigarettes, the brain is exposed to frequent effects of nicotine which after time develops tolerance and physical dependence

13. Propylene glycol (PG) – chemical in electronic cigarette liquid that is generally accepted as safe. Thinner in viscosity than propylene glycol. Considered a humectant (collects moisture) so using it may dry the throat. It is what gives an EC user the throat hit, felt to be the nicotine hit. (Polosa, Rodu, Caponnetto, Maglia, & Raciti, 2013)

14. Quitting - an attempt to stop using combustible or traditional cigarettes.

15. Quit - refers to an individual act in which a person stopped cigarette smoking.
16. **Relapse** - Is defined as returning to regular smoking after a smoker was considered quit.

17. **Slip** – One or two cigarettes after a smoker has quit.

18. **Smoker** - A person who participates in the direct inhalation of tobacco smoke from a combustible or traditional cigarette (USDHHS, 2014)

19. **Smoking Cessation** - stopping smoking. May be aided by medical professionals or organized support groups.

20. **Tobacco use and treatment community** - professionals who make policy around the use of cigarettes, provide treatment for tobacco use, and develop methods and guidelines for treating tobacco use, such as government officials, health care providers, and researchers.

21. **Tobacco use disorder** - the medical term used to diagnose tobacco dependence and use.

22. **Traditional cigarette** – the tobacco cigarette which is lit, on fire, and inhaled, delivers nicotine to the body.

23. **Vaping** – inhaling aerosol from an electronic cigarette device

24. **Vape shop** - store which sells electronic cigarettes and components (batteries, tanks, chargers), and nicotine liquids.

25. **Vegetable glycerin (VG)** - is the ingredient in electronic cigarette (EC) liquid which produces the smoke-like vapor when EC exhaled. Thicker and stickier than propylene glycol and gives mouths feel to the vape. VG can be responsible for the side effects of dry mouth, sore throat, and increased thirst when using an EC. Often EC liquid uses a combination of VG and propylene glycol (Polosa et al., 2013)
CHAPTER TWO: LITERATURE REVIEW

The purpose of my study is to understand how a cigarette smoker learns about and uses an electronic cigarette (EC) by evaluating the body connections to smoking and how that is transferable to using an EC, and by investigating the social and material experiences related to learning to use an EC. The following goals guide this study and data collection.

1. Identify body (senses, movements, and emotions) connections to smoking that makes it difficult to stop.

2. Understand through what avenues smokers come to learn about and use an electronic cigarette (through social [friends or family] and material [vape shops, blogs] networks).

3. Gain a clearer perspective of the smoker’s account of their tobacco dependence and their need for alternate tobacco products.

As an introduction and to set the context, a brief history of the modern day electronic cigarette (EC) is in order.

The modern day EC was invented in China in 2003 and introduced into the American market around 2006 (Fagerstrom, Etter, & Unger, 2015; Foulds et al., 2011) and their popularity has grown exponentially since then. In 2014, over 55% of former smokers, and 47.6% of current smokers have tried an electronic cigarette while 22% of recently quit smokers regularly use an electronic cigarette. Hon Lik (a Chinese Pharmacist, inventor and smoker) is frequently credited with the creation of the first commercially successful electronic cigarette (Dutra, Grana, & Glantz, 2016). After watching his father (also a heavy smoker) die of lung cancer, he was inspired to create a less toxic device with the goal of mimicking the action of smoking, including nicotine delivery (Cahn & Siegel, 2011; Foulds et al., 2011; Wagener, Siegel, & Borrelli, 2012).
To understand how the popularity and use of electronic cigarettes among daily tobacco smokers came to be, it is paramount to investigate the learned process and knowledge of tobacco smokers and in particular, those tobacco smokers who use electronic cigarettes to quit or reduce tobacco cigarette use. In this chapter, I review the literature that describes the use of tobacco in cigarettes and the emergence of EC use among daily traditional cigarette smokers.

This literature review is divided into four sections. I begin with a discussion of the theoretical framework of the study as rooted in the adult education theory of embodied learning and the social theory of Actor Network Theory to investigate how adults learn to use electronic cigarettes. But this is best understood in light of the general literature about smoking behavior and smoking cessation in the US which is discussed next. Third is a consideration of ECs, and a consideration of the research that focuses more specifically on learning. Finally the chapter ends with a consideration of the gaps, implications for the study and a conclusion.

**Theoretical Framework: Embodied Learning and Actor Network Theory**

The inter-related theories of embodied learning and Actor Network Theory inform this study. I provide an overview of each here along with a consideration of how they inform each other and how an adult cigarette smoker came to learn about and use an electronic cigarette.

**Embodied Learning**

Embodied learning is a theoretical perspective in adult education that examines learning through body experiences (Freiler, 2008). Learning is often about doing, and doing involves both the body and brain. For a person to learn an action, it often requires multiple repeated and specific attempts. The learner must experience a movement, sense, thought, or emotion, and repeat, to solidify a certain way of being in the world (Gregorc, 1979). Dirkx (2008) discusses the role of emotions in constructing the experiences of certain body states. He discusses the
impact of positive or negative emotional experiences on learning by explaining situations that can arise from the embodiment of an emotion, such as feeling anxiety at a meeting, and how that is experienced in the body as tight shoulders and neck. The experience of these embodied states effects the learner’s understanding and interpretation of the meeting and mediates different learning experiences (Dirkx, 2008). Dewey (1938) also expressed great interest in experiential learning and wrote the foundational work on it. He noted that experience alone did not produce knowledge; rather, knowledge was produced in us through our thoughts or critical reflection on what we have experienced. For instance, if someone attempts to quit smoking but experiences withdrawal symptoms such as anxiety, irritability, and restlessness which cause them to fight with their spouse, the advice to quit smoking will raise concern in the smoker that they may end up fighting with their spouse if they attempt to quit. This experience of quitting smoking will likely become a learned barrier to quitting.

How learning occurs through the body is limited, particularly in educational settings. Merriam and Bierema (2014) write that “attention to the body as a site of learning has been sporadic” (p. 129) and “embodied learning is embedded in experiential learning” (p.132). I am using embodied learning as a framework because of my philosophical underpinnings of individual and progressive learning. This philosophy recognizes the learner’s needs, interests, and experiences as key elements in learning (Elias & Merriam, 2005).

There are many ways to define the word “embodied” as it relates to learning. The use of the body by way of sensory responses, emotions, body action or movements, and the brain’s perception of these experiences entail most definitions of embodied or embodiment related to learning or acquiring knowledge (Freiler, 2008; Merriam & Bierema, 2014; Niedenthal, 2007; Swartz, 2012). Johnson and Rohrer (2007) offer the term embodied realism or meaning to
illustrate learning through physical, organic, and social environments; much like Dewey’s work in 1938 in describing a linguistic (verbal) verses imminent (or sense) meaning as embedded in quality, feeling, selective attention and habits of the activity (Dewey, 1938). This embodied type of learning explains how our thoughts, ideas, and concepts represent our body movement and actions (Johnson & Rohrer, 2007). Embodied learning is evident in athletes and their muscle memory or learned sense for the game, such as a basketball player knowing where to be on the court because she has played the game many times before (Lawrence, 2012), or a cigarette smoker who just knows how much smoke to inhale to relieve a nicotine craving (Benowitz, 2009). This embodied knowledge is used by a cigarette smoker when they inhale from an electronic cigarette; the inhalation of the vape is not thought through or defined, but is done with ease due to the hours spent inhaling smoke from a cigarette. This skilled embodiment allows a cigarette smoker to easily inhale the aerosol from an EC and appreciate the feeling it creates in their lungs and the nicotine absorption. This imminent or sensory meaning arises when a smoker successfully vapes or uses an electronic cigarette to pull nicotinized aerosol into their lungs and exhale a large plume of vapor. This activation of the senses gives meaning or knowledge to the smoker in a way that just talking (linguistic meaning) about the act of vaping does not.

Freiler (2008) defines embodied knowing or embodiment as “being perceptively attuned to their environment” (p. 37) by example when describing the culture of the Moken’s and their survival in extreme weather conditions. She describes experience as embodiment to learning:

The nature of experiencing and the learning drawn from the experience are more deeply related to subjective meaning and interpretation. Embodiment and embodied learning generally refer to a broader, more holistic view of constructing knowledge that engages
the body as a site of learning, usually in connection with other domains of knowing (for example, spiritual, affective, symbolic, cultural, rational) (p. 39).

Merriam and Bierema (2014) reference several sources that refer to embodied learning such as embodied cognition, intuition, emotional learning, and tacit knowledge (Merriam & Bierema, 2014). Paula Niedenthal (2007) uses similar terms, such as embodied cognition, to describe how humans acquire and use knowledge. These terms suggest that researchers and educators use multiple terms to talk about human learning through embodiment. I further discuss embodied cognition and related terms in the following paragraph.

Experiential learning can be referred to as embodied cognition or learning through action (Johnson & Rohrer, 2007), particularly in the way that experiences affect our thoughts and decisions on how to act in certain situations. Embodied cognition as discussed by Niedenthal (2007) is a term that is often used interchangeably with embodiment. She references Galesse (a social scientist researcher) “in theories of embodied cognition, using knowledge as in recalling memories, drawing inferences, and making plans, is thus called embodied because an admittedly incomplete but cognitively useful re-experience is produced in the originally implicated sensori-motor systems “(p. 2003). For instance, when a person re-experiences an event through body movements, sensory stimulation, and perceptions surrounding the event, that person has experienced embodiment (Niedenthal, 2007). Embodied cognition suggests that the body is closely tied to the processing of sensory and emotional information, and that perception is used to process this information. Niedenthal further defines perception as organization, identification, and interpretation of sensory information in order to represent and understand the environment we inhabit. Theories of embodied cognition, which view knowledge acquisition and knowledge use as processes grounded in the body’s actions and senses, and the brain’s perceptions to
interpret the knowledge, are much like embodied learning (Barsalou, Niedenthal, Barbey, Ruppert, & J, 2003). All of these terms describe a way of knowing that is an important construct in understanding why and how people smoke cigarettes. For the purposes of this research, I am combining elements of these various definitions and terms and using “embodied learning” to define the way learning occurs as a result of the body’s actions, sensory responses, and the brain’s perceptions surrounding these acts. Later in this chapter I discuss brain and body learning in smoking.

**Actor Network Theory**

In addition to embodied learning, I review Actor Network Theory (ANT) as a second framework. This theory emphasizes how nonhuman assemblages of things can produce knowledge. ANT emerged in the early 1980’s at the Centre de Sociologic de l’Innovation (CSI) of the Ecole Nationale Superieure des mines de Paris (Fenwick & Edwards, 2010). The theory development is credited to three professors of sociology, who have written extensively on science and technology, named Bruno Latour, Michael Callon, and John Law (Jackson & Sharon, 2015). These researchers saw a need to reveal and discuss the connections of human and nonhuman elements in creating objects and meanings. These three social scientists tried to define how technology and nonhuman entities in humans produced knowledge. They were interested in how the everyday practices of humans are impacted by the socially material world. ANT supports that all things that are given to be natural, social, or technical are really a combination of all of these things and come about by a network of interactions, or webs, that create energy, meaning, and associations that allow them to persist, grow, mutate, and decline (Law, 1992). The source of these actions, whether human or nonhuman, is referred to as the actor, and in philosophical terms, this actor has agency, the ability to create an action.
ANT includes personal and social aspects but more importantly, it emphasizes the learning that takes place from the social-material (Fenwick & Edwards, 2010). ANT assumes that humans and nonhumans have equal impact and neither should be privileged over the other as actors in the learning process (Law, 1992). ANT is an extremely effective tool for describing the processes by which inventions and technological systems come into being, or fail to materialize. Everyday things and processes have importance and as they assemble together, they create associations and networks that can cover broad spaces and long periods of time (Cresswell et al., 2010).

Humans would not last without nonhuman things. Everyday experiences and their smaller parts, like memories, feeling, intentions, cigarettes, tables, plants, and so on, are “assumed to be able to create force and joining together, changing and being changed by each other. As these non-human actors assemble together, they form associations or networks to the human that can keep expanding to extend across broad spaces becoming more or less durable” (Fenwick & Edwards, 2010, p. 3).

The epistemological position of ANT is that the world consists of networks. These networks can include humans, things, ideas, concepts which are referred to as actors in the network (Latour, 2005). ANT rejects the assumption that human action and meaning alone constructs society. Rather, this theory considers that society is constructed by the performative interactions of both human and nonhuman (technologies). Thus, by using ANT to study technology provides a view that humans are not impacted externally by technology rather it came about from social interests (improved healthcare delivery, less harmful products such as e-cig compared to cigarette) which gives agency to the actor to shape social interactions (Prout, 1996).
This embedding of social and technological by ANT proposes an expanded form of human and nonhuman entities to constitute and shape life.

Three key concepts are used to examine the relationship of human and nonhuman entities. Law (1992) labels these concepts as punctualization, delegation, and translation. The first of these, punctualization, claims that in any specification of a thing or being, there is a point of interaction of a network behind the specification, such as the network used to start a car. Usually these networks go unnoticed so life runs smoothly. It would be inefficient for a person or machine to recreate every action required to start a car, but with the use of the concept of delegation in ANT, the social and technical aspects of starting a car come together and the car starts with the turn of the ignition or push of the start button. There is no thought to the networks of people, things and organizations that are behind the interaction of a human and nonhuman objects that occurs when starting the car (Prout, 1996). The networks behind the starting of a car can be referred to as device packages. These packages contain a network and translate it to product (the car) use. This translation creates a mutual relationship between machine and people. This mutuality is not always stable and can be contested and changed as different human actors interact with the package or device. If the car didn’t start, then the unnoticed part, translation, of the network would be revealed and challenged as a mechanic is called on to fix the problem. ANT, then, presents a way to reconceptualize the technology-society relationship by tracing the processes of translation and unpacking the process of punctualization. So the meaning of translation is often noticed in the afterthought although the actors involved in translation have already made the process or change occur.

ANT is used in studies published in sociology, healthcare, and technology. In 2010 ANT was discussed by a group of researchers as a potential theory to inform the understanding of the
association between humans and technology, specifically related to the use of electronic medical records. Cresswell et al (2010) wanted to provide a view of technology which explains how technology can shape social processes. In their study, they reflected on the agency, or the ability to create change, of the software used when introducing electronic health record. By doing this, the researchers felt that insight into the active role of objects (computers with electronic medical records) and how they create unpredictable outputs and actions can be recognized. They also recognized that cultural and economic environments were important implications to consider in this study. They concluded that the main value of using an ANT approach in their research was the way in which electronic medical records can be used to show the active and fluid role of objects and how the objects contribute to shaping reality and social relationships (Cresswell et al., 2010). In the next section, I discuss the prevalence, treatment and cessation of cigarette smoking and incorporate the theories of embodied learning into the embodiment of smoking and ANT into the use and views of electronic cigarettes.

Cigarette Smoking and Smoking Cessation

The Centers for Disease Control (CDC) lists on their website site that close to 18 percent of the adult population smokes cigarettes and 16 million Americans are living with a disease caused by smoking. Cigarette smoking is the leading cause of preventable death worldwide, and in the United States it is responsible for one in five deaths annually, or about 1,300 deaths every day (USDHHS, 2014).

The following paragraphs highlight the national statistics of tobacco use in the United States. This data was retrieved from the CDC 2015 population survey. The surveying agency is defined below.
The Centers for Disease Control and Prevention (CDC), through the Office on Smoking and Health (OSH), is the lead federal agency for comprehensive tobacco prevention and control. OSH is a division within the National Center for Chronic Disease Prevention and Health Promotion, which is located within the CDC’s Coordination Center for Health Promotion. Originally established in 1965 as the National Clearinghouse for Smoking and Health, OSH is dedicated to reducing the death and disease caused by tobacco use and exposure to secondhand smoke (National Center for Health Statistics, 2016b).

The following data exhibits the numbers of tobacco users who continue to smoke tobacco products. Tobacco smoke contains a deadly mix of more than 7,000 chemicals; hundreds are harmful, and about 70 can cause cancer (National Toxicology Program, 2014; USDHHS, 2014). Smoking increases the risk for serious health problems, many diseases, and death (USDHHS, 2014).

Current smokers are defined as persons who reported smoking at least 100 cigarettes during their lifetime and who, at the time of the survey, reported smoking every day or some days. In 2014, 40 million people, or 16.8% of adults, smoked cigarettes which statistically broke down into 18.8% of the adult male population and 14.8% of the adult female population. In addition to gender, there is a difference between age, race, and socio-economic status and the prevalence of smoking. The following section lists the prevalence and characteristics of smoking in the United States adult population retrieved from the national health survey (National Center for Health Statistics, 2016b).
**US Adults Smoking Prevalence**

The National Center for Health Statistics (2016b) offers information about the prevalence of adult smoking behavior. This section provides information on this based on demographics.

**Table 2-1**

Current Adult Cigarette Smokers by Category and Prevalence

<table>
<thead>
<tr>
<th>Category</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>16.7%</td>
</tr>
<tr>
<td>Female</td>
<td>13.6%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>18-24 years old</td>
<td>16.7%</td>
</tr>
<tr>
<td>25-44 years old</td>
<td>20.0%</td>
</tr>
<tr>
<td>45-64 years old</td>
<td>18.0%</td>
</tr>
<tr>
<td>65 and older</td>
<td>8.5%</td>
</tr>
<tr>
<td><strong>Race/Ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic American Indians/Alaska Natives</td>
<td>29.2%</td>
</tr>
<tr>
<td>Non-Hispanic multiple race</td>
<td>27.9%</td>
</tr>
<tr>
<td>Non-Hispanic Whites</td>
<td>18.2%</td>
</tr>
<tr>
<td>Non-Hispanic Blacks</td>
<td>17.5%</td>
</tr>
<tr>
<td>Hispanics</td>
<td>11.2%</td>
</tr>
</tbody>
</table>
Non-Hispanic Asians | 9.5%
---|---

**Education**

GED certificate | 43.0%
No high school diploma | 22.9%
High school diploma | 21.7%
Some college, no degree | 19.7%
Associate degree | 17.1%
Undergraduate degree | 7.9%
Graduate degree | 5.4%

**Poverty status ($23,850 for family of 4)**

At or below | 26.3%
At or above | 15.2%

**U.S. Regions**

Midwest | 20.7%
South | 17.2%
Northeast | 15.3%
West | 13.1%

**Disability/Limitation**
<table>
<thead>
<tr>
<th>Report disability</th>
<th>21.9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No report of disability</td>
<td>16.1%</td>
</tr>
</tbody>
</table>

**Sexual orientation**

| Lesbian/gay/bisexual adults | 23.9% |
| Straight adults             | 16.6% |

**Psychiatric illness**

| With mental health condition | 36.0% |
| Without a mental health condition | 21.0 |

National Center for Health Statistics (2016b)

**Smoking Cessation**

CDC survey documents that 80% of smokers see a health care provider every year and the majority of them report wanting to quit smoking (USDHHS, 2014). The 5 A’s (Ask about tobacco use, Advise quitting, Assess readiness to quit, Assist in quit attempt, and Arrange follow up) were developed by a task force supported by the CDC and are intended to be used by health care providers to encourage quit attempts by smokers in addition to using seven FDA-approved medications for treating tobacco use - bupropion sustained release (SR), nicotine gum, nicotine inhaler, nicotine lozenge, nicotine nasal spray, nicotine patch, and varenicline or Chantix (Fiore et al., 2008). The smoker uses daily actions to meet the smoke-free goal. Behaviorist interventions to treat smoking such as medication use, trigger avoidance, and reduced access to cigarettes all support behavioral strategies to quit smoking. These behavioral techniques often
lack meaning to the smoker, and could be painful, such as losing friends which makes the meaning of quitting not worth it, therefore learning often does not stick. In addition to the 5A’s and FDA-approved nicotine replacement medication, other programs exist.

The American Lung Association Freedom from Smoking (American Lung Association, 1981; Davis, Faust, & Ordentlich, 1984) is a program designed to help smokers learn what triggers their desire to smoke and then avoid those cues. In some of the sessions, the smoker makes an attempt at critical reflection by journaling and discussion to bring their motivations to the conscious level. An aim of the program is to review the strength of the physical addiction and to discuss with the participants that the physical dependence on nicotine will dissipate with time. The 2008 Tobacco Treatment Guidelines (Fiore et al., 2008) explain that avoiding smoking is the best way to abate the dependence and use of FDA approved medications (nicotine replacement in patch, gum, lozenge, inhaler, nose spray, and oral medications of Chantix and Zyban) will reduce the severity of the physical withdrawal symptoms. The use of an EC offers a way to avoid smoking too, so it seems that it can be used in the context of tobacco treatment because a smoker switches to an EC to not smoke.

The Centers for Disease Control and The United States Department of Health and Human Services offer quit programs through phone support and computer programs (CDC, 2014; Fiore et al., 2008; USDHHS, 2014). Quit lines offer phone counseling and support and often offer free nicotine replacement products. Although the service of a phone quit line is rated acceptable, most state quit lines currently reach only 1% to 5% of their states’ smokers (CDC, 2014).

Current treatments for tobacco dependence encourage adherence to behavioral and pharmacotherapeutic regimes (Fiore et al., 2008) without consideration of the bodily learning that exists with tobacco dependence, particularly smoking cigarettes. The basic belief in tobacco
treatment programs is that if you are a traditional cigarette (TC) smoker, then there is no other healthier lifestyle change than to quit smoking, and smoking is a socially unpopular habit (Fiore et al., 2008; Schudson & Baykurt, 2016). Many smoking cessation programs assume that the smoker can quit with nicotine replacement or oral treatment, and behavior therapy. This assumption continues today even though the relapse rate to tobacco use after a treatment program is very high (Etter & Stapleton, 2006). It is the disappointment of the tobacco smoker when cessation is not achieved that might affect the desire to try again, and often the smoker decides that the strength of the addiction to nicotine and the behavior around smoking is too strong making complete cessation unachievable (Lucchiari et al., 2016; Piasecki, 2006).

Smoking cessation is one of the most important and most difficult things that a person can do to protect their health. The US Department of Health and Human Services publishes reports and statistics regularly regarding the risks of smoking. People who smoke daily have an increased risk of cancer, heart disease, lung disease, diabetes, and general health detriments and shorten their life expectancy by 13 to 14 years, but if they quit they quickly reduce their risk of these diseases (USDHHS, 2014).

Many smokers make several quit attempts before quitting for good (USDHHS, 2014). Smoking cessation is challenging and often proves too difficult for the tobacco user and relapse to smoking occurs. Many different techniques can be explored and used before the smoker eventually quits. A major part of the 2008 Tobacco Treatment Guidelines (Fiore et al, 2008) is the use of the 5A’s (Ask about tobacco use, Advise to quit, Assess willingness to make a quit attempt, Assist in quit attempt, and Arrange follow up) and FDA medication, but they do little to support long term smoking abstinence. These are evidence based practices (Fiore et al., 2008),
but unfortunately the publication of this guideline has not changed the long term quit rates which remain abysmal.

**How many try to quit.** This refers to smokers who reported they stopped smoking for more than one day in the past 12 months because they were trying to quit. The percentage of adult daily cigarette smokers who attempted to quit in the past 12 months, 2014= 52.1, data source National Health Interview Survey (National Center for Health Statistics, 2016b) and 68.9% adult smokers want to stop (USDHHS, 2014).

**How many do quit.** Adult smokers who successfully stopped smoking within past 6 months to 1 year equals 7.6% , data source, National Health Interview Survey (National Center for Health Statistics, 2016b)

**How many continue in the face of death.** 16 million Americans live with a smoking related disease (Babb et al., 2017).

**How many adults die each year from a smoking related death?** Cigarette smoking is the leading cause of preventable death accounting for nearly 480,000 deaths per year, or 1 in 5 (USDHHS, 2014).

To combat the smoking harms, nicotine replacement products have been developed and recommended to be used for treatment of nicotine addiction (Fiore et al., 2008). It has been known that nicotine is addictive and causes physical and psychological discomfort in the user. “Nicotine addiction robs people of choice” (Kessler, 2001, p. 155) unless nicotine is administered in another way. To combat the smoking harms, nicotine replacement products (patch, gum, lozenge, nasal spray, and inhaler) and oral medications (Bupropion and varenicline) have been developed and recommended to be used for treatment of nicotine addiction (Fiore et al., 2008). With the advent of these products, smokers still smoke but more are making attempts
to quit. A report from the CDC documents that 31.7% of smokers used counseling and/or FDA-approved medications when they tried to quit. Conversely, 69.3% of smokers attempted to quit cold turkey which is without any medication or counseling assistance (CDC, 2011). The reluctance to use or continue the use of medications to treat nicotine addiction is likely due to the nature of nicotine delivery and no medication replaces the swift and efficient delivery of nicotine that a cigarette gives (Benowitz, 2009). Nicotine is delivered to the brain quickly after a cigarette is smoked and the effects are felt within seconds. Nicotine replacement products provide some nicotine but in a slower absorbed, less effective delivery to the smoker and only 25% of those trying to quit smoking use nicotine replacement products (Shiffman, Brockwell, Pillittere, & Gitchell, 2008). Due to the chronic nature of nicotine addiction and the learned way of life of a smoker, quitting tobacco use does not equal abatement of the addiction and once quit relapse is prevalent.

Relapse and Long Term Cessation

Many adults relapse after periods of quitting, though many are also successful at long term cessation.

**Relapse.** Is defined as returning to regular smoking after a smoker was considered quit (Zhou et al., 2009). In 1992 Garvey, Bliss, Hitchcock, Heinold, and Rosner found that 76% of smokers relapsed within one month after quitting and 87% relapsed within a year of quitting (Garvey, Bliss, Hitchcock, Heinold, & Rosner, 1992). This statistic represents an unsatisfactory success rate in current tobacco treatment programs. Even in a more recent study of internet users who gave data regarding their smoking patterns and attempts to quit, Zhou, Nonnemaker, Sherill, Gilsenan, and West (2009) found similar relapse rates. In 2014, a national health interview survey was conducted and it showed that 92.4% of smokers who quit relapse to smoking within
six to twelve months (National Center for Health Statistics, 2016b). This relapse rate is the specific reason why it is important to understand why smokers continue to smoke and to search for alternative ways to provide smoking cessation or at minimum, harm reduction interventions.

The success of smoking cessation is usually measured in scientific ways. In a different approach to investigate smoking cessation success rates, a qualitative study of smokers’ attitudes regarding quitting attempts assisted verses unassisted, Morphett, Partridge, Gartner, Carter, and Hall (2015) suggest a tailored sensitive approach by health care providers particularly when patients want to try to quit unassisted because of adversity to medications. “Probing patients about their views on nicotine addiction and their attitudes towards medications may aid doctors in designing individualized treatment plans for patients who have tried and failed to quit cold turkey on a number of occasions” (p. 6602). This stance from the provider may give opportunity for critical reflection in the tobacco user so that new ways to learn how to quit smoking and maintaining a smoke-free lifestyle for a longer time can be explored.

**Long term smoking cessation.** Very few treatments have attempted to identify and support long term quit attempts. Vangeli and West (2011) used an identity scale to assist with behaviors needed to stay quit for long period of time. Two qualitative studies reviewed, Vangeli and West (2011) and Wang, Gjengedal, and Larsen (2014), used a behavior change model to distinguish the levels of nonsmoker identity and coping mechanism which increases confidence to stay quit as described by the participants. Participants with a higher identity to not smoking, such as those who can see themselves as a nonsmoker and state that this this is how they want to live, were more likely to stay quit for a longer period of time.

In an effort to give voice to the smoker, Wang et al (2014) used focus groups and personal interviews with 28 smokers quit for greater than one year and found that “willpower,
decision and control were described as essential to mastering smoking cessation. Being able to change a habit they had for so long, and been so dependent on, gave the former smoker confidence and improved self-esteem” (p. 60). Redding, Prochaska, Paiva, …and Sun (2011), Collins, Eck, Torchalla, Schroter, and Batra (2010), and Segan, Borland, Hannan, and Stillman (2006), all use behavior change models to quantify a change in a newly quit smoker’s confidence to resist urges and cravings which occur early on in the quit attempt. The later stage urges to smoke (urges presenting after one month) may have more to do with a social identity and the smoker's community of practice than to a biological craving to smoke. It is clear in these studies that more than nicotine drives a person to continue or relapse to smoking. An individual’s experiences around smoking, perceptions about smoking and context of their surroundings while smoking all have influence on their smoking behavior and contribute to their continued use of cigarettes.

**Learning in tobacco use**

In tobacco use, there is a learned behavior that results in a conditioned response to cues to smoke. These responses cause bodily reactions in urges and craving to smoke, in which the user begins to associate specific moods, situations, or environmental factors with the rewarding effects of the drug (Dawkins, 2013). Additionally, there are uncomfortable physical nicotine withdrawal symptoms which include depression, reduced sleep, irritability, restlessness, reduced concentration, and anxiety (Benowitz, 2009; Benowitz, 2010). Once smoking is a learned behavior, the user orients the senses to cigarette use and often doesn’t even realize the somatic or body effects of the physical addiction. The smoker does not realize the magnitude of these effects of smoking until an attempt to quit produces nicotine withdrawal symptoms and a heightened attention of the associated conditioned cues to smoke (Dawkins, 2013). Respiratory
tract sensory cues (how deep of a breath used or feeling the warm smoke go into the lungs) associated with tobacco smoking represent a type of conditioned reinforcement that has been shown to play an important role in the regulation of smoke intake and the craving to smoke, as well as the rewarding effects of smoking (Rose et al., 2000).

In recent years, long after researchers proved that nicotine is addictive (Benowitz & Henningfield, 1994) and that continuing to smoke is not a personal choice (Kessler, 2001), investigators start to look at neuroscience to give additional answers to the study of cigarette use (Benowitz, 2008; Dawkins, 2013). Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric (2005) describe learning as happening in more than the brain; it is an embodied process which includes “peripheral (body senses and motor actions) and central (brain based) processes” (p. 186). Embodiment refers “both to actual bodily states and to simulations of experiences in the brain’s specific systems for perception, action, and introspection,” (Niedenthal et al., 2005, p. 184). The way that Niedenthal et al. define embodiment gives a glimpse into how smokers give meaning to smoking. She acknowledges that learning occurs through body experiences and brain perceptions of senses, motor actions, and conscious experiences. Thus, I use the term embodied learning to describe smokers learned embodiment of smoking.

Smokers learn through embodied learning and their senses to interact with their world in a way that satisfies their nicotine addiction (Benowitz, 2014; Dawkins, 2013). Cigarette smoke delivers nicotine rapidly to the bloodstream, achieving high concentrations in arterial blood in a manner that optimizes reinforcement and self-administration. Thus far, no medicinal nicotine devices match the rapid nicotine delivery characteristics of cigarette smoking; only 25% of
smokers use nicotine medications when they try to quit smoking, and of those 25% most fail (Shiffman et al., 2008).

Freiler’s (2008) description of embodied learning, that it happens in the multiple ways that our bodies interact with our world, rings true with smokers. After several experiences of smoking cigarettes, smokers’ bodies figure out how to inhale the smoke, how long to hold a drag from a cigarette to allow the smoke to fill their lungs, and how often to give themselves doses of nicotine. Smokers also relate stress relief and calmness with cigarette smoking. The ritual of smoking provides an experience of relaxation and stress management through purposeful body movements and can give subjective meaning to smoking. Similar to Freiler’s description of embodied learning as a way to give meaning to our experiences of specific actions (Freiler, 2008), a smoker gives the action of smoking subjective context to relieve stress, alleviate boredom, or end a meal. Smokers have a way of interacting in their world with the learned actions, senses, thoughts and emotions from smoking cigarettes.

There is a vast amount of empirical evidence regarding nicotine addiction as the force that drives continued smoking (Benowitz et al., 2002; J.-F. Etter, 2016b; Perkins, Karelitz, & Michael, 2015) and cues to smoke (Dawkins, Kimber, Puwanesarasa, & Soar, 2015; King et al., 2016; Schmidt, Reidmohr, Harwell, & Helgerson, 2014), but there is very little discussion on what I am calling embodied learning or the learning that takes place in a smoker due to specific actions, sensory stimulation, and perceptions that are experienced while puffing on a cigarette thousands of times a year for many years and how that affects choices and ways to quit smoking.

According to Pearson, Richardson, Niaura, Vallone, and Abrams (2012) cigarette smoking is the most highly addictive form of nicotine self-administration, exposing smokers to high concentrations of toxic combustible products. Several tobacco researchers have said that the
combination of the smell and taste of tobacco, and other sensations associated with smoking
together with the nicotine ‘hit’ – that is the lethal addictive cocktail (Benowitz, 2009; Dawkins, 2013; West, 2006). Lucchiari, Masiero, Veronesi, Maisonneuve, Spina, … & Pravettoni (2016) argue that smokers who are both motivated to start a quitting attempt and aware of smoking-related risks, yet continue consuming several tobacco cigarettes a day, need an integrated antismoking strategy that combines physiological, behavioral, and psychological interventions.

**Embodiment of Smoking**

The experience or embodiment of smoking impacts the smoker’s senses, body movements and associations, emotions and perceptions. It is learning by way of experience and this learning in a smoker is embodied. Not only is the smoking experience a way to relieve nicotine withdrawal, it is also subjectively interpreted as a way to enjoy a beverage or food, occupy time, socialize with friends, feel peace, calm, and relieve stress (Lucchiari et al., 2016). This interaction between the body and social encounters is felt in a smoker’s way of being. Breaks are taken with other smokers, life revolves around cigarette breaks, and cigarettes are used as rewards after completing a task.

Smoking is a learned and experienced process. It generally starts in early teen years with nearly nine out of ten smokers starting before the age of 18 (CDC, 2014). Living life as a smoker from the teenage years to well into adulthood teaches a person to be a smoker and live as a smoker on a daily basis. This also gives stronger precedence and longer time for embodiment to take hold and ANT to take place. Many older current smokers started smoking in their teenage years to identify with the cool crowd. They started smoking due to increased external pressure to smoke and now they are quitting for similar reasons (Wang et al., 2014). Younger people start
smoking to experiment, feel powerful, look older, or to fit in a group (USDHHS, 2000). Young or old, these smokers do not realize that once addicted to nicotine, a host of actions, thoughts, body connections and sensory stimulation around the nicotine administration through a cigarette creates a way of living which is embodied learning of smoking. This learning becomes apparent when a smoker tries to quit and realizes how uncomfortable and difficult it becomes to live without cigarettes. The embodiment of smoking is who they are. They have learned to be a smoker and an attempt to become a nonsmoker requires a shift or change in this learning to create a new way to live. A quit attempt is often abandoned, or the recently quit smoker relapses because it is too difficult or scary to maintain abstinence (Hughes, 2003). The complexity in changing a smoking way of being is apparently very difficult as is evident in the relapse rate to smoking once quit.

Embodied components of learning are often overlooked in treatment and education programs (Merriam & Bierema, 2014). The body learns through repetitive acts (such as smoking multiple times a day at certain times-such as with dinner, or out with friends, or while performing another activity like drinking coffee or driving), response to comfort or pain (smoking in response to nicotine withdrawal symptoms or stress relief), and desired results (to look cool, rebel, get a throat hit or boost of energy and concentration). Adult learning theory of embodied learning may increase understanding of why current tobacco users can use an electronic cigarette to quit traditional cigarette use. When studying tobacco treatment interventions, it is important for researchers and health care providers to consider embodied learning theory in an effort to provide better tobacco treatment strategies.

In addition to being a nicotine addiction, it is thought that tobacco use is a habit or ritual (Dawkins, 2013; Lucchiari et al., 2016). Traditional tobacco treatments such as nicotine
replacement therapy (NRT) provides the addictive chemical, nicotine, so then the smoker should be able to quit if the treatment gives them a distraction to overcome an urge or craving to smoke (Fiore et al., 2008). In this behaviorist stand to treatment, the focus in on external stimuli to create a desired behavior change (Merriam & Bierema, 2014). Take your nicotine replacement product and drink a glass of water when you have an urge to smoke is a treatment from American Lung Association which provides just this type of framework for smoking cessation, and the rate of success is under eight percent! (National Center for Health Statistics, 2016b). This behaviorist mentality to tobacco treatment is obviously not working. The tobacco treatment community of researchers, healthcare providers, and tobacco regulators would benefit by asking themselves “What if the smoker had a way to satisfy the long learned embodiment to smoking in a less harmful and more self-fulling way?” and “What if there was a treatment that allowed for personal fulfillment of improved health without the deprivation of learned habits and cognition around tobacco use to be completely ignored?” By asking these question and searching for the answers, the tobacco treatment community could find a more humanistic or individual approach to nicotine use and addiction. It is also beneficial for all people involved in the use and regulation of tobacco to understand the effects of a technological device, such as the electronic cigarette, on the knowledge and use of traditional cigarettes.

**Actor Network Theory and the Electronic Cigarette**

Alan Prout in his work regarding the metered dose inhaler (MDI), a handheld device that delivers asthma medication to the lungs, uses Actor Network Theory (ANT) to describe how medical devices prompt social action (Prout, 1996). He traces networks embedded in the use of a MDI and illustrates the relationship and processes between it and humans. The MDI is a device produced by a pharmaceutical company to provide a treatment for asthma via a device
that can administer an aerosolized medication though the mouth to the lungs. I like this study in particular how it seems to relate directly to what is happening with electronic cigarettes (EC). Prout reflects on the contradiction to treating asthma because the medication needs to be administered at specific times and becomes ineffective and even harmful if given to often and incorrectly. This makes the administration solely the responsibility of the patient or guardian of the patient but the understanding of the use of the device lies with the health care provider. A similar viewpoint is taken with the use of EC in the argument that they can create a new method of nicotine addiction among the young and may not be effective as a tobacco cessation device (Chapman, 2014; Voigt, 2015; Weaver et al., 2016; Yang, Rudy, Cheng, & Durmowicz, 2014). The use and administration of an EC is often used for medical therapy, to quit smoking, but the responsibility regarding how to administer the drug, nicotine, from the EC is not in the hands of the healthcare provider; therefore, there is no standardized management of the information given to cigarette smokers about the EC. This topic is discussed further in the section on learning about and using the EC.

The metered dose inhaler (MDI) is acknowledged as a major innovation with a more direct application of the medication to the lungs, therefore reducing systemic effects of the drug and making the treatment safer (Prout, 1996). This can be seen as delegating biomedical work and giving agency, ability for an object to make an action, to the MDI by giving it control over the dose. The same is said of the harm reduction effects of the EC since nicotine can be administered via the lungs through a device that does not combust, therefore giving the user far less toxic chemicals (Lopez & Eissenberg, 2015). The EC user can also take advantage of differing levels of nicotine liquid which would allow for controlled withdrawal from nicotine (Rahman, Nik Mohamad, & Jamshed, 2015; Yingst et al., 2015). The work of controlling the
dose available is given to the device but it is in the control of the user. Through trial and error and close observation of the user, explicit instructions on how to use the MDI were developed and frequently changed. This interaction is an example of a human actor enrolled into the network as it develops (Prout, 1996). As these instructions changed, new tasks were added to the work of the clinicians. Research and publications were disseminated enforcing the importance of the clinicians’ explanation of use of the MDI in the treatment of asthma. This forced a change of practice among health care providers. The ANT explains the force that the MDI has over the patient with asthma and the providers by acknowledging the punctuation-time in which the patient receives the MDI, the delegation-provider giving the MDI to the patient and telling them how to use it, and the translation-when the patient uses the device. The disruption occurred when the translation was unpacked because the MDI was being overused and became ineffective. I am using ANT in a similar way to unpack the punctualization, delegation, and translation of the EC in adult cigarette smokers.

ANT shows how something like an EC can affect tobacco use; it is viewed as a single element but it has many entities. The use of an electronic device to simulate the smoking experience without the exposure to thousands of harmful chemicals created by the combustion of a cigarette is supported by network.

By using the three concepts of ANT which were discussed earlier, I explain the learning about and use of an EC. The actual use of the EC is the punctualization component of ANT. Delegation has occurred in part by the networks created by those who want to continue the use of a hand held device which delivers nicotine, stimulates senses, body actions, and perceptions of smoking but without the harmful exposure to the harmful chemicals from a combustible cigarette. These people were the first to try the electronic cigarette and participate in this
network. The acceptance of this device by the smoking community created interest in research and publications around the awareness and use of EC. Government showed a change in behavior when vape shops and online enthusiast started making claims that the EC can help smokers to quit. Soon FDA deeming rules and regulation, taxation, and public health education became important issues relating to EC. All the while, a network of social support (cigarette smokers, vape shop owners), creative interest (gaming and hobbyist), and network of publication (researchers, writers, blogging, and websites) was developed and took hold in the tobacco use and treatment communities. ANT is used to unpack the punctualization, or use, and translation, or how networks developed to delegate its use, of EC in adult cigarette smokers in my study.

**Electronic Cigarettes**

ECs provide nicotine via an aerosol or vapor that is drawn into the mouth, upper airways and or lungs (Bullen et al., 2010). It has three basic components: a battery to heat liquid, liquid containing nicotine and flavoring, and a cartridge that houses the wiring (called a coil) used to heat the liquid and a filament to absorb the liquid (Fraser, Weier, Keane, & Gartner, 2015; Yingst et al., 2015). These cartridges can be closed, meaning that once the liquid is used it is discarded, or open which allows the user to add liquid to and reusable tank (tank houses the heating element and filament) (Tackett et al., 2015). ECs are increasing rapidly in popularity: prevalence of ever-use among smokers in the United States and appears to have increased from approximately 2% in 2010 to more than 30% in 2012 (Pearson et al., 2012). Although ECs are not FDA approved smoking cessation devices, many studies elicit its use as a way for traditional cigarette users to quit smoking (Bullen et al., 2010; J. Etter & Bullen, 2011; Farsalinos, Romagna, & Voudris, 2015). In particular, ECs are a potential as a clean nicotine delivery system by providing nicotine without generating toxic tobacco combustion products (Benowitz,
2014; Farsalinos et al., 2013). This is an important construct to understand, as it gives smokers a way in which they can maintain a smoker lifestyle with less exposure to the harmful constituents in a traditional cigarette (TC).

**Rationale, Branding, and Use of Electronic Cigarettes**

There are many issues to consider in doing a research study on EC and to understand the literature on EC. Here I discuss some of these issues, namely: harm reduction, its uses in the US, and product diversity.

**Harm reduction.** ECs are looked at as a newer safer alternative to TCs. In a systematic review by Farsalinos and Polosa (2014) of currently available clinical and laboratory evidence, they found an indication that ECs are a less harmful alternative to smoking and significant health benefits, such as improved breathing and reduced cardiac disease risk, are expected in smokers who switch from TCs to ECs. The harm reduction platform of ECs compared to use of traditional cigarettes is in the way that they provide nicotine. TCs burn and it is in the combustion that many harmful chemicals are created. ECs do not combust, the liquid is heated but *not burned*, which means that the user can get a nicotine boost and simulate the smoking experience with significantly reduced exposure to harmful chemicals (Benowitz, 2014; Drummond & Upson, 2014; Farsalinos et al., 2014; Hajek, Etter, Benowitz, Eissenberg, & McRobbie, 2014).

**Current electronic cigarette uses in the United States.** Schoenborn and Gindi (2015) provide the following statistics on EC use. In the following table, prevalence of EC use in the U.S. adult population is listed:
### Table 2-2

#### 2015 Prevalence of EC use in U.S adult population

<table>
<thead>
<tr>
<th>Adults currently using an EC</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>3.7%</td>
</tr>
<tr>
<td>Current smokers</td>
<td>15.9</td>
</tr>
<tr>
<td>Former smokers, &lt; 1 year quit</td>
<td>22%</td>
</tr>
<tr>
<td>Long-term former smoker, one year quit or &gt;</td>
<td>2.3%</td>
</tr>
<tr>
<td>Have never smoked</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adults who have ever tried an e-cig</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>12.6%</td>
</tr>
<tr>
<td>Former smokers</td>
<td>55.4%</td>
</tr>
<tr>
<td>Current cigarette smokers</td>
<td>47.6%</td>
</tr>
<tr>
<td>Long term former cigarette smoker</td>
<td>8.9%</td>
</tr>
<tr>
<td>Never cigarette smoker</td>
<td>3.2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adults who tried to quit smoking used an e-cig</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>At least one quit attempt ever tried and e-cig</td>
<td>55.3%</td>
</tr>
<tr>
<td>Currently trying to quit and use an e-cig</td>
<td>20.3%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adults who use cigarettes and e-cig</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Current smokers ever tried e-cig with no quit attempts</td>
<td>40.2%</td>
</tr>
<tr>
<td>Currently use an e-cig</td>
<td>11.8%</td>
</tr>
</tbody>
</table>

Current use =every day or some days
Ever use =have you ever tried even once
**Product diversity.** There is some concern that population surveys may not represent real world use of electronic cigarettes (EC), particularly use related to preferred electronic nicotine delivery systems. Currently there are closed systems or first generation models which have disposable liquid cartridges and open systems which use refillable tanks and have varieties of flavors and nicotine strength liquid to choose from (Cooper, Harrell, & Perry, 2016). The appeal of an EC is thought to be the similarity in looks between it and a traditional cigarette (TC).

Cigalikes (EC that looks like a TC) were the first generation of EC to hit the market and most EC users start with this. They are generally the same size or smaller than a cigarette. Interestingly, the ECs that look the most like a cigarette are the least likely to be continually be used (Yingst et al., 2015). Just like Yingst et al (2015), Cooper, Harrell, and Perry (2016) found that smokers who switched to an EC started with a closed (cigalike) system but moved to an open system, or advanced device, with more features which allowed them flexibility in flavors and nicotine level in the e-liquids. Yingst et al (2015) describe the types of ECs in the following way: In addition to the cigalikes, there are ECs called advanced devices which are larger than cigarettes and have a button to push prior to inhalation. This button activates the system that heats the liquid. Mod devices have interchangeable tanks that can hold varying amounts of nicotine liquid and very large batteries. These devices can heat liquid to higher temperatures more quickly and the battery charge is much longer. The shape is often much different than the cigalike or advanced design. The device gets its Mod name from its tendency to attract tinkerers because of the ability to modify the design. The product diversity leads to more control over liquid flavors and nicotine concentration by the user. See APPENDIX A for pictures of a cigalike, vape pen, and mod device.
**Electronic cigarette uses among cigarette smokers.** The majority of electronic cigarette (EC) users are current or former traditional cigarette (TC) smokers. In the past year, over 50% of cigarette smokers have tried an EC and more than 20% of them have continued to use the EC on a regular basis (Centers for Disease Control and Prevention, 2014). A common perception related to EC use is that it is a useful smoking cessation technique (Etter & Bullen, 2011). One of the main reasons for this is that EC users perceive that the act of using an EC directly mimics traditional cigarette smoking and addresses many cigarette smokers’ oral fixation (Barbeau et al., 2013, Dawkins, 2013).

ECs have gained momentum among TC smokers and it is likely due to the similarities an EC has to a TC. Newberg and Waldman (2016) consider a “ritual as a biological desire to form a united community” (p. 228). By practicing “specific sound and movement rituals you can alter your perception of the world” (Newberg & Waldman, p. 21). TC users perceive that the EC will reproduce similar physical, behavioral, and social cues. Barbeau, Burda, and Siegel (2013) found that EC users felt that the act of using an EC directly mimicked TC use and satisfied many TC users’ oral fixation. This same group also found that many TC users did not want to give up nicotine and found the EC to be a safer alternative to nicotine (Barbeau et al, 2013). EC users experience similar cues to smoking that are derived from a TC. The user can manipulate a device, see a vape that resembles smoke, and can experience the taste of the vapor in their mouths; all of this is missing from other forms of nicotine replacement therapy (Dawkins, 2013, Benowitz, 2014).

The switching from a TC to an EC may suggest a transformation in the user. Newberg and Waldman (2016) refer to enlightenment as an intense experience that changes your life from the inside out (p. 80). When a TC user quits smoking, their perception of reality has
transformed. Their increased awareness in another possibility to quit is heightened. In a survey given to EC users in Philadelphia PA, Foulds, Veldheer, and Berg (2011) found that “Most (73%) started using ECs with the intention of quitting smoking and almost all (99%) felt that the EC had helped them to succeed in quitting smoking” (p 1040). “Smokers had tried to quit smoking an average of nine times before they started using e-cigs and two-thirds had previously tried to quit smoking by using an FDA-approved smoking cessation medication” (p. 1038). This new way of smoking cessation created much interest among scientists and many studies were implemented to find out how and why EC were being used by cigarette smokers.

**Nicotine delivery.** For years and in current time, the practice of smoking is viewed by many scientists and researchers as no more than a nicotine addiction (Benowitz et al., 2002) that can be treated with nicotine replacement therapies (Fiore et al., 2008). Cues to smoke are addressed and the idea that smoking is a habit comes up in discussion, (Fiore et al., 2008) but usually around the context of nicotine addiction. These scientists view nicotine as the culprit by reporting on the evidence that nicotine changes the brain of the smoker and is the reason for the addiction to smoking (Benowitz, 2008; Benowitz & Henningfield, 1994); Therefore, many smokers are told by health care providers and researchers that an effective way to stop smoking is with nicotine replacement (Bullen et al., 2010; Farsalinos et al., 2014; Fiore et al., 2008) Smokers use nicotine replacement to reduce the desire to smoke and manage urges and cravings to smoke. Why do most nicotine scientists and researchers ignore the ways that the body and embodied learning have impacted the smoker’s behavior when it comes to tobacco dependence? Could it be that once science found nicotine to be addictive (Benowitz & Henningfield, 1994) all efforts to replace the addictive chemical took place and social science took a back seat to this empirical evidence?
Electronic cigarettes (ECs) provide nicotine via a vapor that is drawn into the mouth, upper airways and lungs (Bullen et al., 2010). According to Pearson, Richardson, Niaura, Vallone, and Abrams (2012), cigarette smoking is the most highly addictive form of nicotine self-administration, exposing smokers to high concentrations of toxic combustible products. “Clean nicotine delivery devices can allow cigarette smokers to stop smoking and reduce or eliminate the harm of traditional cigarettes” (Benowitz, 2014, p. 231). Biener and Hargraves (2015a) reference Hargraves and McInerney discussion of ECs, stating that although ECs appeared on the US market in 2006 around the same time as low nitrosamine smokeless tobacco (snus), it was becoming clear by 2013 that in spite of heavy marketing by major tobacco companies, smokers were not very receptive to snus or smokeless tobacco, but that ECs were gaining more and more users” (Biener & Hargraves, 2015a, p. 128).

**Population health impact.** Public health concerns about second hand smoke have created a more mindful approach to tobacco use. Since the amendment of the Federal Clean Air Act in 1990, many states have developed laws to improve and protect air quality. An outcome of improved air quality is making smoking illegal in public places. Schudson and Baykurt (2016), state that the nonsmokers rights movement is a strong component of the culture related drivers of tobacco control. This paper also refers to Allan Brandt’s 2007 book *The Cigarette Century* in which he observes that the American society has become far more health conscious and more risk adverse. In discussing the use of a traditional cigarette (TC) he states that “The product and its consumer had moved from the normative to the stigmatized “ (Schudson & Baykurt, 2016, p. 2). In recent years, it has been found that the social perception of an EC is that it is less harmful than a TC (Farsalinos et al., 2014; Tomashesfski, 2016), and the social acceptability of EC compared with TCs likely contributes to the number of TC users trying ECs (Sherratt, Marcus,
After many efforts to educate the public of the danger in using TC, the EC emerges and is thought of as a safer alternative to TC use (Caponnetto, Saitta, Sweanor, & Polosa, 2015; Foulds et al., 2011; Hummel et al., 2015; Manzoli et al., 2015).

**Harms/safety/risks.** The majority of electronic cigarette (EC) users are current or former traditional cigarette (TC) smokers (Dawkins, Turner, Roberts, & Soar, 2013; Farsalinos & Polosa, 2014). In 2014, 16.8% of those 18 years or older, or 40 million adults, smoke TC (Ahmed et al., 2015). Many of these smokers also used an EC. Schoenborn and Gindi (2015) analyzed a 2014 population health survey and found that 15.9% of current smokers are also using an EC, 22% of recent former smokers (those who are quit less than one year) are currently using an EC, and 2.3% of long-term former smoker (quit one year or longer) are using an EC.

The appeal of an EC is thought to be the similarity in looks between it and a TC. Cigalikes (EC that looks like a TC) were the first generation of EC to hit the market and most EC users start with this. Interestingly, the ECs that look the most like a typical cigarette are the least likely to be continually used (Yingst et al., 2015). The most popular use of ECs is with a second or third generation EC. 64% of smokers who try ECs continue to use an EC (Yingst et al., 2015), but one that has a higher nicotine liquid, larger battery, and a button to press which heats up the liquid (Farsalinos et al., 2014).

The reason for changing devices is often related to the nicotine delivery of the device. The stronger the battery the more heat is generated. This heat allows the e-liquid to be heated to a higher temperature which can deliver nicotine more readily to be absorbed by the body (Farsalinos et al., 2014; Hajek et al., 2014).

Using an EC to quit smoking is more common than nicotine replacement therapy among young adults. This finding likely represents a belief in the younger population that ECs are a
safe and an effective cessation device (Thrul & Ramo, 2017). The EC is thought of as a harm reduction product (Labonté & Lencucha, 2015) but there is concern around the risk of normalizing smoking (Voigt, 2015). Many smokers advocate for acceptance of the EC stating that it helped them quit their TC use (Rahman et al., 2015; Rutten et al., 2015); however, others have found that EC use did not lead to a successful quitting attempt (Camenga et al., 2015; Pokhrel, Herzog, Muranaka, & Fagan, 2015) and lead to more frequent quit attempts and dual use of cigarettes and EC (Cheney, Gowin, & Wann, 2016; Fraser et al., 2015; Rass, Pacek, Johnson, & Johnson, 2015). The controversy around EC use leads to a need for clear statements from researchers, health care providers, and government agencies regarding the potential benefits and harms of EC particularly related to vulnerable populations such as pregnant women (Mark, Farquhar, Chisolm, Coleman-Cowger, & Terplan, 2015), homeless people (Stewart, Stevenson, Bruce, Greenberg, & Chamberlain, 2015), and youth (Tan, Lee, & Bigman, 2016). It is important for the tobacco treatment community to understand how learning about and using an EC happens with the adult tobacco smokers to better set a baseline understanding before reaching to these vulnerable populations. In the next section, I review articles specific to learning about and using ECs.

**Research on Learning and Electronic Cigarette (EC)**

We have limited understanding of how people learn about and how to use electronic cigarettes. Hence a review of literature specifically about the research related to learning and electronic cigarettes is in order. The search yielded 24 relevant research articles from the data bases Medline, and Psys Info-Proquest, sociological abstracts-Proquest, communication mass media, American History and life, business source premier, and CINAHL, all from EBSCO, using the combined the search terms vape, vaping, e-cig, e-cigs, e-cigarette, e-cigarettes,
electronic cigarette, electronic cigarettes, and smoking as located in the title or abstract. After removing duplicates, this search revealed 602 articles, but only 24 were included, based on the following criteria: a focus on adults (over 18 years old); and if they presented evidence of learned behaviors or sensorimotor connections to EC use, how the smoker gained knowledge, developed perceptions, or intentions to use the EC, and how their social life and community effects the use of EC. Finally, 24 articles, 14 quantitative, 9 qualitative and one conceptual, satisfied the inclusion criteria and primarily investigated learning about an EC by discussing awareness of EC, using EC, or social support of an EC.

Five themes related to gaining knowledge about and learning to use an EC became relevant as I read these articles. These five themes are; (1) exposure to the EC, (2) perception of EC, (3) experiencing the EC, (4) continuing to use the EC, and (5) advocating for the EC. In the following pages I discuss the articles which support these themes of learning about and how to use an EC.

**Exposure.** Exposure to electronic cigarettes (EC) happens in a variety of ways such as personal contacts (friends, coworkers, etc.), media outlets (television, internet, newspapers, etc.), and public encounters (seeing someone using EC, passing a vape shop, etc.). Several studies examined how smokers became aware of the EC through exposure (Borderud, Li, Burkhalter, Sheffer, & Ostroff, 2014; Dawkins, Turner, Roberts, et al., 2013; Emery, Vera, Huang, & Szczypta, 2014; J. Etter & Bullen, 2011; Lechner, Tackett, et al., 2015; Li, Newcombe, & Walton, 2014; Maloney & Cappella, 2016; McDonald & Ling, 2015; McQueen, Tower, & Sumner, 2011; Pokhrel et al., 2015; Popova et al., 2017; Spindel & McEvoy, 2016; Thrul & Ramo, 2017).
An analysis of a 2011-2012 online survey of current EC users, revealed that these users learned about the EC primarily from the internet (41%), then a personal contact (35%), with other media (10%), and finally 8% saw it being used (Dawkins, Turner, Roberts, et al., 2013). Another online survey in 2013 found similar results with 86% of most adults knowing of the EC and 47% of those hearing of EC via media channels such as television, Facebook, Twitter, YouTube, email, and search engines (Emery et al., 2014). Contrary to these findings, an early qualitative study of exclusive EC users at an EC convention found that many of these users learned of the product through friends first, then advertisements, and internet sites (Pepper, Emery, Ribisl, & Brewer, 2014). This discrepancy can be due to the lower public awareness of the EC in 2011 and enthusiasm of early adopters of the EC to get the word out. In just a few years, companies which sell EC and the components (batteries, e-liquid, chargers) realized there was a market for the product and, by 2013, EC users were more likely to be exposed to EC information through channels of individually targeted marketing, such as television viewing, Facebook, twitter, YouTube, email, and internet search engines (Emery et al., 2014).

In addition to specific marketing tactics, smokers are exposed to EC from other smokers (Hall, Pepper, Morgan, & Brewer, 2016; Pokhrel et al., 2015; Thrul & Ramo, 2017), and smoking coworkers who use an EC influence other coworkers exposure to the EC by encouraging them to try it (Pepper, Emery, Ribisl, & Brewer, 2014; Thirlway, 2016; Thrul & Ramo, 2017). In addition to ways that people hear about an EC, these studies found that women, nonwhites, and lower educated people are less likely than white high educated men to see or hear about EC information on media sites (Emery et al., 2014), and younger adults are more likely to use online sources (Pokhrel et al., 2015).
More recent literature discusses hearing about or exposure to an EC happens more frequently through personal contact (Li et al., 2014). These researchers found that in New Zealand, smokers and former smokers were most frequently exposed to ECs from seeing or knowing someone that uses one. Social learning through seeing someone use an EC is suggested as a reason for use in smokers who recently made a quit attempt by using an EC since they are most likely to know someone or see someone using an EC (Li et al., 2014) or being supported in their community through local shops in the village (Thirlway, 2016). Another study by McDonald and Ling (2015) supports the idea of social learning by finding that adult smokers increase learned smoking expectancies, such as urge to smoke, when they see someone using an EC. The smoker’s embodiment of smoking, such as the act of inhaling and exhaling smoke, and holding a cigarette, is felt when exposed to visual cues from seeing someone using an EC such as seeing smoking like behavior on television (McDonald & Ling, 2015). This personal exposure to ECs is similar in the general population. Pepper et al (2014) found that in the general adult population interpersonal exposure is the first way that adults become aware of ECs followed by sale in stores, seeing the product on television, and lastly online sources. The highest conversation around ECs are with friends with 45% of smokers talking to at least one person about an EC in the last month (Hall et al., 2016). Most of these discussions center on the health benefits of using as EC such as quitting or reducing cigarettes use (Hall et al., 2016; Pokhrel et al., 2015; Thrul & Ramo, 2017).

Current EC users are advocates for the device and share their enthusiasm with other smokers (Dawkins, Turner, Roberts, et al., 2013; Emery et al., 2014) and most, 94 %, of those who use an EC would recommend it to a friend (J. Etter & Bullen, 2011). Coworkers using an EC contribute to the exposure of other smokers to an EC (Etter & Bullen, 2011; Thrul & Ramo,
This enthusiasm is evident in the currently using EC population but is not always the primary reason that smokers try an EC. In a longitudinal survey over four years, Sutfin, Reboussin, Debinski, Wagoner, Spangler, and Wolfson (2015) found that in college students, curiosity is the primary reason given to try an EC. This reason is followed by seeing a friend use one (Sutfin et al., 2015).

Tobacco users, younger adults, college educated, Latino, and Lesbian Gay Bisexual (LGB) are more likely to personally share EC related information (Emery et al., 2014). What young adult smokers know about EC is often what is reflected in messages in EC marketing campaigns (McQueen et al., 2011) and because this is known, EC manufacturers use different strategies to target different segments of the population (Li et al., 2014). Advertising exposes adults to ECs by seeing it being used and this has a greater engagement effect, such as actually buying, using, and promoting the product, on recently quit smokers (Li et al., 2014) and online advertising is a strategy used by EC manufacturers to expose adults to the device (Dawkins, Turner, Roberts, et al., 2013; Emery et al., 2014; Li et al., 2014; McQueen et al., 2011). People who use social media and are more likely to search for more information about ECs are younger adults, current smokers, female, those with some college education, and income > $20,000 (Emery et al., 2014). In the next section, I will discuss smokers’ reasons, intentions, and expectancies as perceptions of EC use.

**Perception.** Once exposed to an electronic cigarette (EC) the smoker develops a perception (second learning theme) about using an EC (Dawkins, Turner, Roberts, et al., 2013; Etter & Bullen, 2011; Li et al., 2014; Pokhrel et al., 2015). This perception often precedes using an EC and may be worded in the articles I reviewed as intention, expectancy, motivation, reason, or desire to use an EC.
Most smokers exposed to an EC believe that it will help them to quit or reduce cigarette use (Cooper et al., 2016; Dawkins, Turner, Roberts, et al., 2013; Etter & Bullen, 2011) and like that it mimics the behaviors of smoking (Dawkins, Turner, Roberts, et al., 2013; McDonald & Ling, 2015; Pokhrel et al., 2015). Although quitting or reducing the use of tradition cigarettes is the primary reason given for using an EC, other reasons exist. In a qualitative study using focus groups, Pokhrel, Herzog, Muranaka, and Fagan (2015) and several other researchers found that young adults who use EC daily did so for the smoking cessation potential but they also liked it for its sense of fashion and that it represents an identity (Baweja et al., 2016; McDonald & Ling, 2015; Popova et al., 2017; Sutfin et al., 2015; Tackett et al., 2015; Thrul & Ramo, 2017). Many of these youth like the EC as a type of hobby. Being able to personalize the EC to make the vapor bigger, smell different, or have varying levels of nicotine is appealing to the younger user (Pokhrel et al., 2015). Young adults, particularly men (Dawkins, Turner, Roberts, et al., 2013), like the customization of an EC (McQueen et al., 2011). In a study of college students, curiosity about the device was found to be the primary reason for wanting to experience using an EC. These smokers were lighter smokers with 80% of the study population using cigarettes 15 days or less per month but were exposed to EC use through regular activities (weekend parties). A study of younger smokers in New York City found similar results in that they are attracted to the technology of the EC and like the idea of tinkering with the device (McQueen et al., 2011), and younger men with more money to spend are likely to see the EC as a recreational device more than a specific tobacco reduction product (Thirlway, 2016; Thrul & Ramo, 2017). The concept of EC use becoming a hobby is why public health professionals may be concerned about the recreational motives to use an EC in the younger population (Sutfin et al., 2015) because it can
perpetuate the nicotine addiction, particularly in the nonsmoking population and is one of the primary concerns with EC usage in general.

Pokhrel et al (2015) found themes around reasons for using or not using an EC. By interviewing 62 young EC users in Hawaii, mean age 25 years old (SD 5.5 years) participants across 12 focus groups over four months, this research team was able to develop several themes related to EC use. The initial engagement questions ask “How did you first to learn about e-cigarettes?” and “What was your first impression of e-cigarettes?” (Pokhrel et al., 2015, p. 1455). These questions were followed up with questions about positive and negative experiences of using an EC. The reasons for liking EC were grouped into 12 concepts. These included 1 smoking reduction and cessation, 2 health improvement, 3 sensory satisfaction, 4 self-regulation, 5 convenience of indoor smoking, 6 discreet smoking or allowing vaping in places where smoking not allowed, 7 professional benefits or being able to vape and not smell bad or have to go outside, 8 recreation, 9 social enhancement, 10 cleaner smoking alternative, 11 control over intake, and 12 cost effectiveness. Reasons for not liking ECs are given as 1 product-related, 2 poor smoking experience, 3 using the EC too much or not knowing when to end a session, unlike smoking a cigarette which has a start and end time, 4 side effects, 5 too expensive, or 6 negative social consequences. Several of these concepts were discussed in other articles and fell into the liking and not-liking categories such as health consequences, cost, and social consequences (McQueen et al., 2011; Pokhrel et al., 2015; Thirlway, 2016; Thrul & Ramo, 2017). Being able to personalize the EC to make the vapor bigger, smell different by changing flavors, and vary the amount of nicotine vaped all rated as good reasons by adults to use an EC (McQueen et al., 2011; Pokhrel et al., 2015; Thrul & Ramo, 2017).
McQueen, Tower, and Sumner (2011) performed an exploratory qualitative study in 2011 with the aim to better understand the motivations of e-cig users. They interviewed 15 experienced adult EC users they met at a Midwest vapors’ group and found that finding a satisfying and safer cigarette replacement and enjoying the benefits of not smoking were motivations to use an EC. Another qualitative study in 2016 found similar reasons related to learning about and using the EC. An ethnography of lower social economic status was performed by Thirlway (2016) to address health inequalities in EC use. In this study, 75 field visits were made and discussed with 41 participants, mean age 42, 28 being men, 13 women and field notes to include observations and conversations around EC use of a working class community in England were collected between 2012-2015. Addiction is discussed in this article as a moral problem and is considered in this article as a division between age, gender, and EC use. Unlike McQueen et al (2011) who found that replacing nicotine in a cleaner way was a good reason for EC use, this study found that the moral implications of using a product that continued to provide the addictive substance did not make it acceptable to use. Older male smokers in this study considered the EC as a functional cessation aid and not for pleasure or play. Many younger participants, like Pokhrel et al (2015) found, considered using the EC because of its technical and recreational appeal.

Thirlway and Thrul found a division in the perceptions around EC use related to age and sex (Thirlway, 2016; Thrul & Ramo, 2017). Like Pokhrel et al. (2015), Thirlway found that younger adults (men) with higher incomes were more likely to use the EC for recreation or pleasure (Thirlway, 2016), and this group was not always interested in tobacco cessation (Al-Delaimy, Myers, Leas, Strong, & Hofstetter, 2015; Tackett et al., 2015; Thrul & Ramo, 2017). Thirlway (2016) found that the older women of the community are less likely to accept using the
EC as a way to quit or reduce cigarette use. These women felt a moral obligation to spend money, energy, and time caring for the young members of the family and were not willing to spend resources on a device that could continue to support an already expensive nicotine addiction. Older men, on the other hand felt that the EC may provide a functional way to quit the nicotine addiction but would use it only for a limited time. Younger men in this study felt that the EC imposed on the pleasure of smoking but in time, and additional exposure to the EC through community markets, did come to accept the EC as a nicotine replacement (Thirlway, 2016; Thrul & Ramo, 2017).

Informal learning can attach different meaning to the use of an EC. When hearing about the EC through a coworker, a smoker can learn of a different or more acceptable way to get nicotine during the work day. Once a smoker perceives the EC as a method to satisfy a meaning in their life, a desire to try or experience the EC is created. Uses of the EC can be considered as functional or recreational. Many articles discussed the desire to use the EC for health reasons, such as to reduce or quit smoking, but recreational activities, such as looking cool or to become familiar with a new technology, were also given as reasons to try an EC. Whatever the intention is, experiencing an EC is happening with adult smokers. The following pages reviews what happens once smokers use an EC.

**Experiencing an electronic cigarette.** The prevalence of EC use is higher in the younger population, with 8.3% of the 18-24 age group using EC compared to 4.2% of the general population (Tackett et al., 2015). Smokers are interested in the experience of mimicking smoking without smoking a traditional cigarette (TC) (Dawkins, Turner, Roberts, et al., 2013; Harrell, Marquinez, et al., 2015) and those who have recently tried to quit TCs are more likely to use an EC (Thrul & Ramo, 2017). Many smokers experience using an electronic cigarette (EC)
with a friend or a coworker who has been a cigarette smoker (Pepper, Emery, Ribisl, & Brewer, 2014; Pokhrel et al., 2015; Sutfin et al., 2015) or by visiting a vape shop (Tackett et al., 2015) or local market (Thirlway, 2016).

TC users may want a way to replace nicotine and they learn of the nicotine effect of EC by seeing friends vape and then asking the friend if they can try it (Pepper, Emery, Ribisl, & Brewer, 2014). This nicotine effect may also be a deterrent to continuing to use an EC, particularly in those who do not want to maintain a nicotine addiction (Thirlway, 2016) and witness the same physical and emotional nicotine withdrawal effects which happen when quitting a cigarette can happen when not using an EC regularly. Although the addiction potential of the EC in not clear, it is seen by smokers as a safer choice because it has fewer chemicals than a cigarette (Spindel & McEvoy, 2016). Spindel and McEvoy (2016) caution that although the EC is thought to have less chemicals than a TC, it is not always a safe replacement for smoking, particularly in pregnancy as nicotine can still be harmful.

The EC is used by many because it is thought of as a less harmful product than cigarettes but there is a misunderstanding of the risks of nicotine in an EC because the dangers and addictiveness of nicotine. This is evident in vulnerable populations, such as pregnant women who switch to an EC because it is thought to be better for the baby than smoking, but nicotine is dangerous to fetal development and its effect is not well understood by some smokers. This is a reason that health care providers need to take on a bigger role in the experience of nicotine containing products. In a study of cancer patients in a tobacco treatment program, researchers found that EC users are more nicotine dependent, have made more quit attempts, and have more head, neck, and thoracic cancer (Borderud et al., 2014). The EC users in this study were less likely to be quit at follow up and more likely to be using both EC and TC than those who did not
use an EC. It is not always the case that EC users are trying to quit (Al-Delaimy et al., 2015) and often it is found that dual use leads to more regular exposure to nicotine through smoking and vaping. This does not mean that EC users have less intention to quit, if fact, Borderud et al (2014) found that in a quitting study using EC, those who could not quit were not less confident or motivated to quit but they were more nicotine addicted. Nicotine is important to TC smokers and they find that the nicotine delivery in the EC can be satisfactory. TC smokers will use the EC in places where a cigarette cannot be used, such as public places, and also in ways that a cigarette is felt to be less desirable, such as before exercise. By being exposed to the EC, TC users have learned that they will not smell of smoke when the EC is used and will choose the EC use for nicotine replacement when they can’t take a shower or when around others that do not smoke (Popova et al., 2017). The dual use of cigarettes and EC is likely a method for a TC user to administer nicotine in places where smoking is not allowed.

In addition to nicotine content, cue responses are also an important reason that TC user tries an EC. In 2012, Dawkins et al (Dawkins, Turner, Hasna, & Soar, 2012) performed a lab study which exposed naïve EC users to nicotine and non-nicotine containing EC. They found that males reported more importance on the nicotine component of the EC but females had more sensorimotor impact. Females also liked sweeter flavors and an EC that looked more like a cigarette compared to males. These characteristics are important when trying to understand learning about EC use in different populations.

There is evidence of specific activity in certain areas of the brain which could be why using an EC is an easy and likable experience for cigarette smokers (Nichols et al., 2016). An analysis of the views of 200 EC users found that the design, ability to control the voltage, durability of, and ease of use of the EC is important (Baweja et al., 2016). Different to this is the
techie idea held by the younger population, who use the EC for a sense of fashion and identity. This group likes the EC as a hobby and are attracted to the toy feel of the EC (McQueen et al., 2011; Pokhrel, Herzog, Muranaka, Regmi, & Fagan, 2015) and frequently use the EC with other tobacco products (Harrell, Simmons, et al., 2015).

The use of an EC gives the TC user an opportunity to learn and experience other perceived self-directed and personal ways to improve their health. Smoking is often referred to as a habit (Bullen et al., 2010; Dawkins, 2013) and when a TC smoker switches to an EC the habits or rituals and meaning of TC can be maintained. Moya interprets Merleau-Ponty’s work on body and behavior and states, “Merleau-Ponty explains that habitual behavior arises on the basis of a set of situations and responses that, despite not being identical, constitute a community of meaning” (Moya, 2014, p. 2). Smoking is often done in a ritualistic or habitual way. Often a smoker will light a cigarette related to where they are in their drive to work, or after a meal or cocktail. This embodied experience is seen by the smoker as a reason to try an EC. The perception of a smoker is that the habits around smoking a cigarette can continue with the use of a less harmful product, the EC.

This concept supports previous discussions on embodied learning and smoking. McQueen et al (2011) found that a group of experienced EC users felt that being able to use a variety of EC products allowed them to learn about the effective delivery of nicotine products between different devices. This study, in addition to others (Cooper et al., 2016; Pokhrel & Herzog, 2015) found that the amount of nicotine delivered to the body affects the liking and use of the EC. For a smoker to learn how the nicotine will satisfy the urge to smoke or the desire to quit can only be accomplished through the actual experience of using an EC.
Younger smokers use their body to gain information about the effects of EC use and gauge the risk and safety of it on how their body feels when and after they use it. Body senses, such as a throat hit, or unsatisfactory feeling, such as lung pain, informs the user of how likely they will be to continue to use the product (Popova et al., 2017). Those who have a positive experience with the EC, such as liking the taste or being satisfied with the throat hit and lung feel, early on will have a positive expectancy of continued EC use and are likely to continue using an EC and potentially quit TC. Those who do not have a positive experience, such as using a poor functioning device or suffering coughing or severe dry mouth and throat, may either not try the EC again or substitute the EC only in places where smoking is not allowed and are not likely to use the EC to quit smoking (Harrell, Simmons, et al., 2015).

If the experience of EC use is acceptable, the TC user will likely continue using an EC. The next pages discuss how and why TC smokers continue to use EC.

**Continued use of an electronic cigarette.** After experiencing an electronic cigarette (EC), a traditional cigarette (TC) smoker solidifies a positive or negative perception about the use of an EC and this drives the continuation or reduction of EC use (Baweja et al., 2016; Cooper et al., 2016; Harrell, Marquinez, et al., 2015; McDonald & Ling, 2015; Pokhrel et al., 2015). The expected positive or negative effects of using an EC have been found to be related to how long someone uses the e-cigarette (Maloney & Cappella, 2016; Popova et al., 2017; Sutfin et al., 2015; Thrul & Ramo, 2017) with the longer the use the more likely a positive EC use expectancy. In a cross sectional survey of over 1800 EC users, Harrell et al (2015) found that exclusive EC users have more positive expectancies for EC use, such as satisfactory taste with acceptable vape size and smell, and see them as a healthy alternative to cigarettes (Harrell, Simmons, et al., 2015). In this same study, dual users of EC and TC had more negative
expectancies related to EC use, such as less stress relief and more dry mouth experience, were found to be less likely to quit cigarette use and they rated them more likely to damage health. This is an interesting finding because it seems to predict the exclusivity or not of EC use but not necessarily the length of EC use since dual use continues despite lower positive expectancies. How the expectancies were interpreted in this study is on a Likert scale. Personal interviews with some of the participants would have given the investigator more insight into the meaning behind the rating and the motives to continue EC use despite lower expectancies.

Expectancies in EC use is partly around the body actions while using an EC and length of time using an EC changes along with the natural body responses related to EC use. Users of ECs learn that the EC puff is different, in that the puff or drag is usually larger and longer than a TC, and that they may puff more frequently (Baweja et al., 2016; Cooper et al., 2016; Dawkins, Turner, Roberts, et al., 2013; McQueen et al., 2011; Tackett et al., 2015). However, the frequency may differ related to how the EC is used, such as those who use the EC to quit cigarettes completely tend to use it more frequently (Al-Delaimy et al., 2015; Borderud et al., 2014; J. Etter & Bullen, 2011; Hall et al., 2016; Li et al., 2014) and the longer someone uses an EC the more efficient they become in puffing (Baweja et al., 2016; Tackett et al., 2015). Those who accept and often continue the use the EC often do so for its sensorimotor feel, how it mimics the act of smoking (Dawkins et al., 2012) and the ability to reduce or quit smoking (Al-Delaimy et al., 2015; Etter & Bullen, 2011). The following group of researchers found that parts of the brain that are activated during smoking are active when using or providing cues or social situations to use an EC and can be a reason the continued EC use by TC smokers is occurring. Nichols, Foulds, Yingst, Veldheer, Hrabovsky, Richie, …and Wilson (2016) conducted a functional MRI study to assess the compulsive use of ECs in relationship to cues, cravings, and
use. In addition to the nicotine dependence potential with ECs, these researchers found that “in this pilot study, experienced e-cigarette users showed a pattern of cue-reactivity with activity in visuospatial, auditory, and memory processing areas” (Nichols et al., 2016, p. 32), thus providing some evidence of the brain’s involvement in learned expectancies.

Women like the EC for the choice of sweeter flavors (Harrell, Marquinez, et al., 2015); many younger adults continue EC use for the sense of fashion (Pokhrel et al., 2015); and many use EC to reduce bad health effects (Pokhrel et al., 2015) and to use nicotine in places that are smoke free (Tackett et al., 2015), such as in a car or the home. Reasons that EC is not continued most often is because of negative expectancies created while experiencing the EC such as bad side effects, dry mouth or cough, dissatisfaction with the quality of the product, or the users inability to give up or reduce TC use (McDonald & Ling, 2015; Popova et al., 2017).

Once an EC user experiences an EC and wants to continue to use it they often search for more information about EC. This information can be garnished from online sources or retailers which serve as sources of knowledge about EC product selection and customization (Popova et al., 2017). Often EC users start with a closed, cigalike device which is one that looks like a traditional cigarette, but after a short period of time change to a second or third generation device which is an open system, bigger device with tank to add e-liquid and removable and modifiable parts, allowing the user personalize the EC (Cooper et al., 2016). In a qualitative study which interviewed 50 EC users, Cooper, Harrell, and Perry found that most first time users did not continue with a closed or cigalike system because they found it cheap, unsatisfying and not producing enough vapor. With experience, the first time EC users progressed to an advanced device which allows the user to alter the wrapping of the heating coil, experiment with different batteries and voltages (Cooper et al., 2016). Men more than woman and younger verses older
EC users are drawn to the hobby or technical learning that occurs with continued EC use which optimizes the personal experience of the EC and inspires support of EC experimentation (Pokhrel et al., 2015; Sutfin et al., 2015).

Markets and vape shops serve as resources related to experimenting with different types of EC batteries, components, e-liquid flavors, and e-liquid nicotine content (Thirlway, 2016; Thrul & Ramo, 2017). Here is where users often experiment with different types of EC devices and discuss what they may be having difficulty with and what they like. In addition to blogging and referencing internet sites, the vape shops and markets where these products are sold serve as a source for continued learning about the benefits of and concerns about EC (Emery et al., 2014; Popova et al., 2017; Thrul & Ramo, 2017). In a group of participants ranged in age from 20 to 60 and had been using an EC for around one year, McQueen, Tower, and Sumner (2011) found themes around learning to use an EC, such as finding a satisfying product, switching to the product solely to enjoy benefits of not smoking, and then sharing these benefits with others. These researchers found that most EC users at that time started with a ‘starter kit’ which provided a cigarette looking EC device with tobacco or menthol flavor e-liquid with one size battery. With more experience, many vapers started using a device with a stronger battery, different flavor of e-liquid, and greater ability to modify or tinker with the device (Baweja et al., 2016; Cooper et al., 2016). Early adopters, those who were the first to try and continue to use an EC, are defined as an evangelist for the EC because they were likely to open their own vape shops or start online forums to get the word out to smokers; they also expressed an interest in working with researchers to discover more about the EC, and advocate for the use of EC to quit or reduce TC use (McQueen et al., 2011).
Another qualitative study in 2016 found similar themes related to learning about the electronic cigarette (EC) and using it. An ethnography of lower social economic status was performed by Thirlway (2016) to address health inequalities in EC use. In this study, 75 field visits were made and discussed with 41 participants, mean age 42, 28 men, and 13 women. Field notes to include observations and conversations around EC use in a working class community in England were collected from 2012 to 2015. Addiction is discussed in this article as a moral problem and is considered as a division between age, gender, and EC use. Unlike McQueen et al (2011) who found that replacing nicotine in a cleaner way was a good reason for EC use, Thirlway found that the moral implications of using a product that continued to provide the addictive substance did not make it acceptable to use. Some smokers used the EC with the moral implication that it is strictly used as a functional cessation aid and not for pleasure or play.

Many younger participants use the EC because of its technical and recreational appeal (Pokhrel et al., 2015). Thirlway (2016) found a division between older and younger EC users related to the moral use of an addictive product. Like Pokhrel et al (2015), Thirlway found that younger adults, particularly men, with higher incomes were more likely to use the EC for recreation or pleasure (Thirlway, 2016) and, along with other authors, found that this group was not always interested in tobacco cessation (Al-Delaimy et al., 2015; Tackett et al., 2015; Thrul & Ramo, 2017). In addition, if the EC was presented as a medical product or intervention, such as a way to quit smoking because quitting is what you should do for your health, it lost some of its attractiveness as a masculine accessory (Thirlway, 2016).

How users are informed about, discuss, and experience different types of EC has been investigated in several research studies but Thirlway (2016) is the only author that discusses the different ways that markets and vape shops set up their stores depending on the customers.
reasons to use an EC. The store owners are aware of different reason for EC use depending on characteristics and expectancies of the user and to avoid conflicts among these different user groups, the shops are designed to attract either a user that wants to quit smoking with an EC or wants a store that displays the technical or hobby side of the EC. These are two different markets and store owners make the appearance very different. Distinct door colors on the shops separate medicinal vs hobby vape shops to make it clear to the customers which shop to enter. Once inside it is obvious that the store for the person looking to using an EC as a hobby is stocked with many different e-liquids and EC components compared to the medicinal store which stocks limited but very practical EC devices (Thirlway, 2016).

An example of the benefit of separating shops purposes is this, if a user wants to use the EC for specific health reasons, and it is known that they would have an easier transition to EC if they stayed with tobacco flavor (Cooper et al., 2016), then that user would go to a shop which is more medicinal and has EC product and experienced employees who can give instrumental advice related to the customers expectation in using an EC. This finding of different vape shops offering different support is important and should be considered in the United States.

Whatever the intention of the EC user is, continued use of the EC is prevalent among cigarette smokers and they are finding their information regarding continued use in the networks formed from other EC users, such as media sites, word of mouth, and vape shops. This network of information is important and it alleviates concerns from the TC smokers because they can learn how to use an unregulated but effective tobacco product from EC advocates. The TC users concerns about not be able to quit or reduce smoking are alleviated with the realization that avenues exist which support learning about a device which simulates smoking and provides nicotine. The user continues to be a slave of sorts to nicotine but if the sensory effects are
acceptable, the use of an EC over a TC can reduce exposure to harmful combusted chemicals. Those that have experienced the positive effects of EC use and are able to reduce or quit their TC use are likely to become advocates for using the EC.

**Advocating for use of EC.** Often people who continue to use an EC for a longer period of time become advocates (fifth theme) for the EC, expose others to the EC, and share information about the EC via word of mouth, Facebook, and other online or social context (Emery et al., 2014; J. Etter & Bullen, 2011). There is a community created around sharing of information about the effectiveness and usefulness of ECs. This information is centered on personal experience and has tremendous value to others who are searching for information related to an unregulated product that is perceived as a good thing to the user and a potential for improved health (Popova et al., 2017; Tackett et al., 2015).

Proponents of the EC have tremendous influence over its use. EC users believe that the EC is an effective smoking cessation product and that it is more effective than NRT, Zyban, and Chantix (Baweja et al., 2016; J. Etter & Bullen, 2011; Harrell, Marquinez, et al., 2015). One group of authors found, through a survey of 215 vape store customers, that the EC is incorrectly perceived as safer than FDA nicotine replacement products (Tackett et al., 2015). In a study by Harrell et al. (Harrell, Simmons, et al., 2015), it was found that even when FDA approved medications and cognitive feedback are made available, 17% of participants will use an EC instead of the other options. Smokers who quit find that they can use an EC longer than nicotine replacement therapy (NRT) and can stay quit longer on an EC than with current FDA approved NRT (Baweja et al., 2016; Harrell, Marquinez, et al., 2015). This extended period of use of an EC is considered a non-issue to the smoker while NRT has instructed periods of time to use
them. Given the chronic nature of tobacco dependence, this is an important finding and needs to be considered by the tobacco treatment community.

In a qualitative study of 32 young adults age 18-26, Popova et al (2017) found that people in EC retail shops provided a lot of information about product selections and customization and this information can be skewed to support continued use of EC. These shops are generally run by early adopters of the EC who have had multiple experiences with the EC and are genuinely interested in helping others to gain information about the EC (McQueen et al., 2011). Blogs, websites, the government, and health care providers are not the source for information which may be why there is so much ambivalence in the public health arena. Few EC users state that they learn of EC harms or benefits through government agencies or healthcare providers. This may be because of the lack of support, or even “opposition” as with the last Surgeon General’s report, by government agencies for those using the product. Using semi-structured interviews with young adults in Colorado, Popova et al (2017) found that this group does not look to government for information related to EC because of the conflicting information they hear. When they are experiencing positive effects from using an EC, there is discontent when the same sentiment is not supported by government and health care agencies, and if they are being told not to use the EC. Therefore, this group goes to other sources to garner information about EC use (McQueen et al., 2011; Pepper, Emery, Ribisl, & Brewer, 2014).

There is an underlying distrust of authority among many smokers who have switched to ECs when it comes to government smoking cessation recommendations and EC use. Government agencies, health care providers and organizations are not used as resources for information regarding use and safety of EC (Hall et al., 2016) and conflicting information given by these agencies creates doubt in the EC consumer that the government understands EC use and
can be looked at for guidance and recommendation for use of the EC (Sutfin et al., 2015). This mistrust by EC consumers is harmful to our culture because it doesn’t support education of EC use by health care professionals and misperceptions then arise. Government action is required to address misunderstanding of nicotine in EC and the use of nicotine in cigarettes. This became evident in a study by Spindel and McEvoy (2016) which found that pregnant women think that the EC is an acceptable substitute for smoking and were not aware of the danger of nicotine to fetal development.

At times, smokers use an EC in place of a cigarette. They do not have an intention to quit smoking with the EC. This is termed opportunistic use and smokers do this to work around clean indoor air laws and use it in places where they can’t smoke (Popova et al., 2017). Several concerns have arisen regarding the dual use of cigarettes and ECs in that dual user are less likely to quit smoking with an EC which may expose them to more harm, via more nicotine and other chemicals (Borderud et al., 2014; P Pokhrel et al., 2015).

Government and public health officials need to become involved in education campaigns around EC use to counter act the doubt among EC users. The consumer needs to know that ECs are not completely safe in that they are unregulated, contain and produce carcinogens and toxicants, but can be helpful in reducing or quitting tobacco use (Harrell, Simmons, et al., 2015). There is research that supports the use of the EC for cigarette reduction and cessation. Government and health care providers need to become advocates too for the use of EC so that those seeking information can find appropriate direction for use and congruent answers to their questions. It is concerning, to me, that in this country, no government recommendations and education programs regarding EC have surfaced, even though the prevalence of EC use among
TC smokers is high and the research findings support that the EC is used more frequently and is perceived as a more effective way reduce or quit cigarettes than FDA tobacco treatments.

**Gaps, Implications, and Conclusions**

There is a great deal of learning going on in the electronic cigarette (EC) community, particularly related how the EC can help a smoker reduce or quit tobacco use. How adult cigarette smokers have been exposed to the EC and how they experience the use of EC through friends, coworkers, vape shops, and markets have been expressed in objective measureable ways, akin to population surveys and secondary analysis of clinical trial data. There is interest in the intention of EC use and how this changes with the experience of using an EC although it is not effectively investigated to realize the embodiment of smoking and the learning and meaning behind initiating and continuing to use an EC to quit or reduce cigarette use. To fill this gap, I am investigating the effects of the embodiment of smoking and how that contributes to the initiation and continued use of ECs. I will also investigate how the EC has developed a network of links, human and nonhuman, that creates a force that persuades a shift in actions, particularly in those involved in cigarette use, regulation, and treatment.

**Implications for my Study**

By investigating the embodiment of smoking and how that effects the use of electronic cigarettes, I can extend the knowledge related to the experience of smoking and its effects on the body’s senses, movements, perceptions, and motivations (Dawkins, 2013) to how those experiences are effected in EC use. By switching to an EC a person can continue their usual association to cues and associations of smoking with less harmful exposure. The learned perceptions with smoking remain, the motor body actions are similar, and the conscious experience of smoking in relationship to emotions of stress and anxiety are present in EC use.
Social support for the switch to an EC is evident in the multiple ways that traditional cigarette (TC) users are exposed to messages and experiences of EC use which presents EC as less harmful than a TC and the TC user who switches to an EC may feel empowered for doing so. Therefore, investigating the origination and ongoing support of these social support or networks under the framework of Actor Network Theory (ANT) will well enlighten the investigator to the multiple ways that a device can be learned about and used by humans.

Dawkins et al (2013) showed that EC users believe that vaping mimics that act of smoking, dramatically reduces cravings for a cigarette (senses of taste, smell, and sight of vape satisfied), and learned that the EC can be used as a long term nicotine replacement product (motor movement). The networks that support the use of and learning about an EC have not been closely studied. This investigation will document how these networks allow the TC smoker to learn of a way to switch to an EC.

Cigarette smokers are looking for a way to maintain their associations with smoking but use a less harmful product for their health. Several tobacco researchers have said that it may be the combination of the smell and taste of tobacco and other sensations associated with smoking together with the nicotine ‘hit’ that is the lethal addictive cocktail and make it difficult to quit smoking (Benowitz, 2009; Dawkins, Turner, & Crowe, 2013; West, 2006). Lucchiari et al (2016) argue that smokers who are both motivated to start a quit attempt and are aware of smoking-related risks yet continue consuming several tobacco cigarettes a day need an integrated antismoking strategy that combines physiological, behavioral, and psychological interventions. The idea that the EC is a nicotine delivery device and that it mimics the act of smoking can be a reason that some will not use it (Thirlway, 2016) but considering this device as an acceptable
treatment for smoking cessation can be another alternative for some who are unsuccessful with NRT or other methods. This study will provide an interpretation of the intentions of EC use once an EC is experienced.

Although the EC is not an FDA approved smoking cessation device, many studies elicit its use as a way for TC users to quit smoking (Pokhrel & Herzog, 2015; Rahman et al., 2015). In particular, ECs have potential as a clean nicotine delivery system by providing nicotine without generating toxic tobacco combustion (Benowitz, 2014). This is an important construct to understand as it will subject smokers to a way in which they can maintain a smoker lifestyle with less exposure to the harmful constituents in a TC.

When TC users switch to ECs, many of the learned embodied activities from smoking are replicated. Several studies have found that the taste of the EC and the inhalation are two main reasons why EC users continue to remain abstinent from TC (Benowitz, 2009; Dawkins et al., 2012; Foulds et al., 2011). Other studies suggest that EC use continues and is effective as a TC replacement because of the ability of the smoker to respond to the cues learned as a TC user but with a less harmful (EC) product (Bullen et al., 2010; J. Etter & Bullen, 2011; Farsalinos et al., 2013). Although many TC users state that they continue to use TC because the stress of quitting is too much, many EC users are happy with the knowledge that ECs are likely a less harmful product than TCs and they can use these successfully to stay off of TCs.

Conclusion

It is critical for the tobacco treatment community to understand electronic cigarette (EC) use for many reasons. It is important for tobacco regulation to understand how people come to know about these novel products, how to use them effectively, and why they are accepted by the smoking population? How do smokers learn about relative risks of these novel products and
what role do health care providers and educators have in their learning? What decisions need to be made by health care providers and educators about how to educate both the public and individual patients in the face of imperfect and changing evidence regarding the use of novel tobacco products (one being electronic cigarettes) and their own ethical guidelines? Providers may recommend against the use of EC because it is believed that there is not enough empirical evidence of the safety in use of EC (Tomashefski, 2016). This may challenge ethics of many providers even though EC constituents are significantly less than TC (Farsalinos & Polosa, 2014; Hajek et al., 2014).

The safety of ECs compared to use of TCs has been investigated and the evidence provided is that ECs are not as harmful as TCs (Drummond & Upson, 2014; Farsalinos & Polosa, 2014). Indication that ECs are perceived and used as a harm reduction product in place of TCs is provided. The FDA’s jurisdiction over the tobacco industry supports educating the public on claims of reduced harm tobacco products which includes ECs. Therefore; understanding how the public learns about the effectiveness of an EC and how to use an EC fits in the framework of tobacco regulation. Research in this area is needed to provide FDA data on how to assess the public’s learning and education regarding use, risk, and perceived knowledge of ECs.

Research should aim to understand adult education and social theories related to how a person comes to be able to use an EC in relationship to body cues, social experiences, knowledge of use of the device and confidence to effectively use it. Assumptions about the effectiveness of an EC, such as it is healthier than a TC or it can help smokers quit or reduce tobacco use are evident, but how the assumption came to be and continues to proliferation has not been
investigated. These are important questions to answer so that adult education practices used to reach the individual and the public are related to what tobacco users believe is happening.
CHAPTER THREE: METHODOLOGY

The purpose of this study is to understand how an adult smoker learns about and uses an electronic cigarette (EC) by evaluating the body connections to smoking and how embodied learning may relate to using an EC. In addition, this study will investigate the social and material experiences related to learning to use an EC. The specific research questions that guide the study include:

1) How do adult smokers learn about ECs through their social (family, friends, peers, work place) and material (vape shops, blogs sites, forums, advertisements) networks?

2) What is the initial intended use of an EC and does the intent change with the experience of using an EC?

3) How does embodied learning impact a cigarette smoker’s use of an EC?

As purpose guides methodology, this study will employ a mixed methods research design to define characteristics and variables of interest in a purposeful sample of dual users, defined as those who have used a cigarette and an EC in the last 7 days, and to investigate this population’s way of learning to use an EC. To evaluate body connections to smoking and how that relates to EC use, I will identify a specific population of dual users (cigarette and EC users), follow them over time, and interview them to determine what happened to their EC use. This chapter is divided into several parts. It begins with an overview of the mixed methods research paradigm, including a discussion of qualitative and quantitative research. Next, I discuss the plan for participant selection. Third is an explanation of data collection, and then data analysis and verification strategies. Finally, I offer my background as a researcher followed by a summary of the chapter.
Mixed Methods Research Paradigm

Creswell (2014) defines mixed methods research (MMR) as “an approach to inquiry involving collecting both quantitative and qualitative data, integrating new forms of data, and using distinct designs that may involve philosophical assumptions and theoretical frameworks” (Creswell, 2014, p. 4). As such, it is important to first consider the purpose of both quantitative and qualitative research.

Creswell (2014) defines quantitative (QUANT) research as an approach for testing “objective theories by examining the relationship among variables” (p.4). These variables are either independent, meaning that they “cause, influence, or affect outcomes” (p.52) or dependent variables which “depend on the independent variables: they are outcomes or results of the influence of the independent variable” (Creswell, 2014, p. 52).

In quantitative research variables are often given number values and described via statistical analysis of means, standard deviations, and ranges of scores often obtained from scales, or some instrument of measurement. The theory used for the research is in the hypothesis of how these variables relate to each other either in a descriptive or experimental way (Creswell, 2014). For example, I can quantitatively describe many factors of cigarette and EC use among a population of dual users with quantitative analysis, such as nicotine dependence, nicotine withdrawal symptoms, or frequency of use of medications to treat nicotine dependence.

By contrast, qualitative (QUAL) research is different from quantitative in its approach to scholarly inquiry. Qualitative research is defined by focusing on meaning and understanding, uses the researcher or open ended survey questions (not questionnaires) as the primary data collection instrument, relies on text and image data, and uses an inductive and comparative process to develop themes and build concepts from general statements which focus on individual...
meaning (Merriam, 2009). Qualitative research gives value to the participant in constructing meaning of a situation (Creswell, 2014). Qualitative research recognizes that humans can have many different perspectives of the same experience and researchers who use this method are interested in understanding how people interpret their experiences (Merriam, 2009).

In the research, I identified a group of dual users (cigarette and EC users), followed them in an observational survey design which used two surveys at different times to evaluate the changes in a cohort of people. This was an innovative approach for addressing contemporary health care issues, such as learning to use an EC, because I looked at the change in use and what characteristics of the dual user may affect the use of an EC. The strengths of quantitative measures to identify and describe a specific population and qualitative designs to explore concepts from a personal perspective more completely answered my research questions (Fetters, Curry, & Creswell, 2013). Although this method represents an alternative approach to explore complex phenomena in detail, it is still sometimes difficult to understand how the mixing of data is applied to research questions (Halcomb, 2015). This is best explained after laying out some of the assumptions and history of mixed methods design.

Assumptions, History, and Value of Mixed Methods Design

The core assumption of mixed methods design is that the “combination of qualitative and quantitative approaches provides a more complete understanding of a research problem than either approach alone” (Creswell, 2014, p. 4). Another assumption is that qualitative, open ended data, and quantitative, closed ended data, provide different types of information or data. Merriam & Tisdell (2016) describe the differences as “qualitative research is generally based on the assumption that reality is constructed by individuals, in light of their experiences, hence in this view, there is not one reality but many realities; in contrast, some argue that the positivist
underpinning of quantitative research is based on a belief that there is only one reality that can be measured” (Merriam & Tisdell, 2016, p. 3). In this project, the collection of demographic and specific quantitative data related to cigarette and electronic cigarette use identified those to be interviewed. I explain the selection process in more depth later in this chapter.

The philosophic position to mixed methods research is that it rejects the either/or stance in the research process. The lines between objectivity and subjectivity in mixed methods research can be blurred (Plano Clark & Ivankova, 2016). It can be repeated and changed, giving the researcher multiple ways to better answer their research questions (Plano Clark & Ivankova, 2016). Although the position of increasing the researcher’s flexibility and adaptability in the research method can be a benefit, it is often the source for criticism of the mixed method design (Cameron, 2011), partly related to the history of its development.

Merriam and Tisdell give a brief history of mixed methods research (MMR) by referring to Creswell and Plano Clark (2011) to explain different time periods related to stages of development of the research style. The late 1960’s and early 1970’s were the formative years of MMR. At this time, researchers began combining “quantitative surveys and interviews to answer research questions” (p. 45). The next period of time, paradigm debate, happened in the 1970’s and 1980’s and “focused on the differences in epistemological assumptions of qualitative and quantitative research” (p. 45). During this time period, the purists argued to keep QUANT and QUAL research separate; by contrast, the situationalists argued that it is possible to conduct QUANT and QUAL research in one study as a method to answer a question, and the pragmatists believed that it is possible to use both QUANT and QUAL as a single research design. The 1990s is the period of procedural developments in mixed methods and researchers recognized the possibilities of MMR to answer their questions (Merriam & Tisdell, 2016).
Some current researchers question the paradigmatic need for another research design; therefore, it is important for the researcher to know the value of mixed methods design in their field of study (Cameron, 2011). MMR offers more data and new frameworks to answer the research question therefore making the research more comprehensive. MMR also provides a broader perspective on the overall issue (Plowright, 2011). Still, some researchers think of MMR as a combination of quantitative and qualitative research instead of a third framework of research design. Cameron (2011) outlines issues and criticisms surrounding what she calls the 5Ps (paradigm, pragmatism, praxis, proficiency, and publication) of MMR to offer a framework for MMR design. The following summarizes her view of the 5Ps.

1) Paradigm- the researchers needs to take an epistemological stance on MMR design and understand how it will affect the lens or world view and philosophy of the researcher and the way it directs the data collection. The researcher needs to understand how this design is contributing something that an individual quantitative or qualitative study can’t.

2) Pragmatism- the practical approach to a problem which can be derived from the interface between philosophy and methodology. The use of plurality (quantitative and qualitative methods) in MMR is often criticized and the researcher needs to be well grounded in the intension of the mixed method research design.

3) Praxis- the practical application of mixed methods theory. The researcher should provide the rationale as to why this is the best way to answer the research question.

4) Proficiency- it is important to understand the types of quantitative and qualitative research design and to be able to present the data in these two designs but also be able to integrate mixed methods design and data analysis.
5) Publishing-can get long and wordy. The researcher must be able to report findings with proficiency and accuracy within the context allowed by the publishing journal. This method does not neatly fit the conventional format.

Using Cameron’s (2011) 5Ps approach, I further support my rationale for using mixed methods design by discussing the paradigm, pragmatism, and praxis of my MMR design.

Rationale and Summary of this Mixed Methods Design

Mixed methods design utilizes more than one research method in a single study as a strategy to investigate an area of interest or a phenomenon that is difficult to explain with a single method (Janice Morse & Niehaus, 2016). Mixed methods philosophy can be pragmatic in that it offers a practical and outcome-oriented method of inquiry which is based on actions that can lead to further actions (Plano Clark & Ivankova, 2016).

I used mixed methods design as the paradigm to gain an in-depth understanding of how cigarette smokers learn about and use an electronic cigarette (EC). My study utilized a pragmatic design of longitudinal observational survey to identify and examine characteristics of cigarette smokers who also use electronic cigarettes over time, an embedded open ended question in the second survey to help to inform questions for the qualitative interview, and basic interpretive interviews to further explain the use or stopped use of ECs. By following a cohort of dual users over time, documenting changes in their EC use, then investigating how and why their EC use changed through a basic interpretive qualitative interview gave me a practical understanding of how cigarette smokers learn about and use an EC.

To summarize the design of the study then, I used an explanatory sequential mixed methods approach. This method “is one in which the researcher first conducts quantitative research, analyzes the results and then builds on the results to explain them in more detail with
qualitative research” (Creswell, 2014, p. 15). For the quantitative portion of the design, I analyzed two already existing surveys developed at the Penn State Tobacco Center of Regulatory Science in a longitudinal observational study. I did this through secondary analysis of electronic cigarette surveys developed at Penn State College of Medicine. The surveys were administered though and responses are stored on REDCap (Research Electronic Data Capture). REDCap is a secure, web-based application designed to support data capture for research studies (Harris et al., 2009)

I used the first survey to define a population of dual users (using both cigarettes and electronic cigarettes), and describe their demographics and characteristics. In the second survey, I categorized the change in EC use by organizing the participants into groups related to their EC use. This analysis was completed in a longitudinal observation design of a cohort of dual cigarette and electronic cigarette users to identify changes of EC use over time. The second survey also included an open ended question related to what people learn when they use an EC. The question asked “if you were advising a current smoker who is interested in switching to e-cigs but has never tried them, what would be your main recommendations, based on what you personally have learned?” This question was analyzed for themes and used to guide some of the questions in the qualitative interview. I also analyzed the use of FDA approved tobacco treatment medication and the intention given to using an EC by asking “is it your intention to quit smoking with the EC” in my population. The analysis of these questions informed questions for the qualitative interviews

I used qualitative interviews to use the dual users’ narrative to explain what happened between the two time points of the surveys. The qualitative data described changes in a way of life and shift in perspective given by a tobacco dependent person who uses an EC. This research
design allowed me to follow a cohort of cigarette and EC users over time and identify changes in EC use. Using a MMR design to analyze a cohort of dual cigarette and EC users, gave me a better understanding of cigarettes smokers’ connections to EC use.

To summarize, the data collection methods that I used take place in the following order:

1. Quantitative analysis - I first performed a secondary analysis of two previously administered surveys as a longitudinal observational study of dual users (cigarette and electronic cigarettes).

2. Qualitative analysis – I then performed thematic analysis of two open ended survey questions.

3. Next, I developed additional questions for semi structured interviews using data from survey and my theoretical framework.

4. Once the above three steps were completed, I contacted eligible participants for interviews.

5. I performed analysis of interview data.

6. Then I integrated data from quantitative survey results, open ended question from the second survey, and qualitative interviews.

Participant Selection in Light of Pre-existing Surveys

As stated previously, for this study, I used an explanatory sequential mixed methods approach. This method “is one in which the researcher first conducts quantitative research, analyzes the results and then builds on the results to explain them in more detail with qualitative research” (Creswell, 2014, p. 15). Quantitative data was obtained from a secondary analysis of two current surveys. I analyzed two already existing surveys developed at the Penn State Tobacco Center of Regulatory Science in a longitudinal observational study. I used the first
survey to define and categorize my population’s demographics and characteristics related to their dual use of cigarettes and electronic cigarettes (EC) use. I used a second survey to classify the change in the dual use group and factors that might have affected the change.

**Surveys**

The first survey was a Penn State Electronic Cigarettes Survey conducted of EC users. From December 2012 until August 2014 EC users, ≥18 years of age, were invited to complete a 158 item survey about their EC use. This survey aimed to improve the understanding of the use of ECs, including types of ECs, frequency of use, reasons for use, and important characteristics. The first publication from this survey is the Development of a questionnaire for assessing dependence on ECs among a large sample of former smokers now using ECs (J. Foulds et al., 2015). This study reports that EC users are less dependent on their EC than what they retrospectively report having been dependent on cigarettes. This survey has also been used for publications regarding views of experienced EC users (Baweja et al., 2016), factors associated with electronic cigarette users' device preferences and transition from first generation to advanced generation devices (Yingst et al., 2015) and characteristics, use patterns and perceptions of electronic cigarette users who were never traditional cigarette smokers (Hammett, Veldheer, Yingst, Hrabovsky, & Foulds, 2017).

I used the first survey to characterize a cohort of dual users of traditional cigarettes (TC) and EC and analyze the survey results to find the characteristics of dual tobacco users. The cohort of dual user was followed up for their continued or change in use of an EC along with analysis of variables of interest to me (such as use of FDA approved medications, intent of EC use) in the results from the second survey.
The second survey is the Penn State Electronic Cigarette follow up survey which asked questions similar to those in the first survey. In January 2017, those who responded to the initial survey were asked to complete a follow up survey about their EC use. This survey was developed by Dr. Ping Du at Penn State College of Medicine to establish a cohort study of EC users to investigate nicotine dependence, cigarette smoking behaviors, and EC use behaviors among long-term EC users. Dr. Du has analyzed the second survey for change in the use of EC in the dual use group. I received permission from Dr. Du to use her survey to further investigate and analyze dual users’ answers to questions on the survey that guided me in developing questions for body connections to cigarettes and EC use in addition to how EC users learn about and use EC.

**Participant Selection for the Quantitative Analysis**

Participants were identified as dual users from the first survey. This group was determined by using the following questions, “have you used an electronic cigarette in the past 7 days?” (Yes/No) and “have you smoked a cigarette in the past 7 days?” (Yes/No). Those who answer yes to both questions were then further analyzed for no other use of tobacco products. The secondary analysis of the surveys required the following criteria to be met:

1) The participant must have taken the first survey and been categorized as a dual user (a person who is using cigarettes and electronic cigarette only).

2) The participant must have completed the first and second survey.

I categorized the change in EC use by organizing the participants into groups related to their responses to EC use in the second survey. This analysis was completed in a longitudinal observation design of a cohort of dual cigarette and electronic cigarette users to identify changes of EC use over time. The second survey also included two open ended question related to what
people learn when they use an EC (see above). The responses to these questions were analyzed for themes and used to guide the questions in the qualitative interview. I also analyzed the use of FDA approved tobacco treatment medication and the initial intention to use an EC in this population and further explore these responses for an explanation in the qualitative interviews.

**Participant Selection for the Qualitative Interviews**

The qualitative data described changes in a way of life and shift in perspective given by a tobacco dependent person who uses an EC. This research design allowed me to follow a cohort of cigarette and EC users over time and identify changes in EC use. By using a QUANT and QUAL mixed method to analyze a cohort of dual cigarette and EC users, I can better answer the question of cigarettes smokers’ connections to EC use.

To participate in the follow up qualitative portion of my study:

1) The participant must have consented to be contacted for future research on the second survey and be at least 18 years old.

2) Participant could not be incarcerated.

3) The participant must be willing to be interviewed either in person or electronically.

4) For an in person interview, the participant needs to be in a reasonable travel distance to me and agree to meet in a comfortable public place for the interview.

5) If the participant lives too far away for an in person interview, consideration of a form of electronic communication for the interview (such as Skype, Facetime, or Zoom) will be offered to the participant.

6) After I described the study, the participants interested in the study purpose, willing to discuss their perceptions and experiences around cigarette and EC use, were able to schedule and participate in an interview were consented and interviewed.
Data Collection Procedures and Methods

Data collection for the quantitative portion of my study was from two already administered surveys. Both surveys have been explained in detail above. The questions I analyzed are provided in Appendix B. I chose characteristics of interest, different from Dr. Du’s analysis of dual users, to describe my dual use population from the first survey.

Quantitative: Longitudinal Survey

The quantitative portion of the design of the study I used is longitudinal observational survey. This design involves repeated observations of the same cohort of people over time (Twisk, 2013). Because the same participants are observed at two separate times, a significant benefit of this design is that there is less variability in cohort characteristics to affect the impact of the variable or behavior being observed over time (Twisk, 2013). This design provided the researcher useful data of a cohort, the behavior change over time, and related characteristics. One disadvantage of this design for the researcher to consider was dropout rate. Some of the participants did not complete the follow-up survey which reduced useable data. My greatest concern regarding this design was that while it described characteristics of those who use ECs, it did not explain the learning (how did the cigarette smoker come to learn about an EC) or body connections (why does a cigarette smoker continue or discontinue use of an EC) to smoking and how that influences EC use. The way a cigarette user learns about and uses an EC was further explored and explained in a qualitative study design with my basic interpretive interviews.

From the first survey, in addition to describing characteristics of my population, I collected the dual users’ answers to the following questions;

What is the single most important reason you use an e-cig?

When you started using your e-cig, was it your intention to quit soon?
Which of the following e-cig characteristics are important to you? Variety of liquid flavors, shaped like a cigarette, provides good vapor quality?

At the second survey, participants’ responses to the following questions were analyzed:

Have you used electronic cigarette in the past 30 days? (Yes/No)

Have you smoked cigarettes in the past 30 days? (Yes/No)

Have you used any other tobacco or nicotine products in the past 7 days?

From the responses to these questions, the original dual users were placed into one of two groups, continuing to smoke or quit smoking, and placed into one of the following five categories:

1) Those who quit cigarettes,
   a. And are exclusive EC users,
   b. Or use no product.

2) Those who continue to smoke cigarettes,
   a. Are dual users,
   b. Only smoke cigarettes,
   c. Other (EC, cigarettes, and other tobacco product).

These two groups were analyzed for change in factors associated with EC use by comparing their answers to the following questions from the first to the second survey.

What is the single most important reason you use an e-cig?

Are you planning to continue using your e-cig for at least the next year, or quit within that timeframe?

Which of the following e-cig characteristics are important to you? Variety of liquid flavors, shaped like a cigarette, provides good vapor quality?
Have you ever tried to quit smoking? (Yes/No)

Are you currently using or have you ever used a nicotine replacement medication? (patch, gum, tablet, inhaler, or nasal spray) (Yes/No)

Are you currently using or have you ever used the smoking cessation drug called bupropion? (Zyban, Wellbutrin) (Yes/No)

Are you currently using or have you ever used the smoking cessation drug called varenicline? (Chantix) (Yes/No)

**Qualitative**

There were two open ended questions that were asked on the second survey that are relevant to this study. These are:

- Please add any additional information you think a public health researcher should know about electronic cigarettes. (Open ended response)
- If you were advising a current smoker who is interested in switching to e-cigs but has never tried them, what would be your main recommendations, based on what you have personally learned? (Open ended response)

The responses to these questions were analyzed thematically to help develop questions for the QUAL interviews.

I interviewed those who completed survey two, and agree to be contacted, to further investigate how they learned about EC use and how any potential body connections to EC use described as nicotine dependence, smoking habits, withdrawal symptoms, or in some other way, contributed to their EC use. I used embodied learning as a theoretical framework and Niedenthal’s (Niedenthal et al., 2005) definition of embodied learning to assist in guiding the data collection. She uses the inclusion of three systems to describe embodied learning, “the
sensory system that underlies perception of a current situation, the motor system that underlies action, and the introspective system that underlies conscious experiences” (Niedenthal et al., 2005, p. 186). This framework helped organize responses to specific questions in the survey and in analyzing participants’ stories told during the qualitative interviews.

I am also using Actor Network Theory as a framework to consider the social and material networks that support the use of ECs. Using semi-structured interviews to guide the qualitative basic interpretive portion of this study and selecting EC users with different experiences to EC over time adds depth to the investigation of the phenomenon of electronic cigarette use.

Data collection for the qualitative basic interpretive portion of the study, were put in the form of recorded interviews. Participants were selected from the inclusion criteria indicated above. Once eligible participants were identified, they were screened for study participation over the phone. When I contact the participant, I explained the study to them and they were asked if they are interested in participating in an interview. Those participants who agreed to participate in the interview either met me in person, this was only one person and I met her at a coffee shop near her home, or because distance prohibited meeting in person the other participants were interviewed via Zoom meeting on the computer or by telephone.

Prior to conducting the interview, participants were fully consented to the study. The participants were provided a copy of the IRB approved study consent to read, and I described the study procedures. Participants were given the opportunity to ask questions and the interview was not conducted until all questions were answered to the satisfaction of the participant. The most frequent question I received regarded asking me if I had any connection with tobacco companies or government agencies. Participants freely reasoned this question with their desire to find out if I was supporting EC use before they continued with the interview. Once this was complete, the
participant was interviewed. The IRB deemed this study of low risk and it did not require a signed consent form. During the consent process, participants were informed that their participation in the study is voluntary and that they were free to not answer any questions that make them uncomfortable and they were able to stop their participation in the study at any time.

Once the participant gave consent to participate in the study, an ID number was created and stored in password protected files on the secure network at the Penn State Hershey Medical Center. I was the only one able to access this personal information. Under the ID number and a code name, I used this database to store the participants personal contact information, such as name, phone number, email, and physical address.

Semi-structured open ended questions were used in the basic interpretive qualitative interviews of participants in this study. This design gave the participants an opportunity to express their experience of cigarette and electronic cigarette (EC) use and allowed me to react to the responses. Using a semi-structured design allowed me to compare results between individuals and groups since the participants were asked to respond to the same general topics (Nohl, 2009) and to develop themes that may emerge from the responses.

The following is the list of guiding question used during the interviews. I used the survey data first to develop questions and then used the following questions if needed to make sure all interviewees discussed the topics of interest for the study. The complete interview guide can be seen as appendix C.

1) Can you tell me a story about the first time you used an (their preferred name for EC)?

2) Next I would like to talk about the time between the 2 surveys? What happened to your EC and cigarette use in the middle?

3) Tell me about your EC use now and what a typical day in your life looks like?
4) Has there been any changes in your health that led you to use an EC the way that you do? Tell me more about these health changes.

5) If you were writing a book about quitting smoking with an EC, what do you think would be the 3 main lessons to learn?

**Data Analysis**

I collected my data through secondary analysis of two surveys, interviews, and observations. Data analysis will took place in several parts including the survey analysis in quantitative statistics, and thematic analysis of the qualitative open ended question embedded in the second survey and the interviews.

**Quantitative**

The quantitative data were analyzed with descriptive and comparative statistics using SAS software version 9.3 (SAS Institute Inc., 2011). The first survey I used means and frequencies to illustrate demographic and electronic cigarette use characteristics of the dual user sample. From the second survey I looked for change in the use of EC in the original dual use group and characteristics of interest in each group. Then I looked for differences between the groups (continued smokers verses quitters) using Chi square tests and independent two tailed t-tests. I used paired t-tests to compare means and a McNemar test to look at changes in proportions over time. Additional characteristics were described from the second survey to illustrate a change from dual use or continued dual use.

In a comparative design using paired t-tests (two-tailed) I compared continuous variables (nicotine dependence, nicotine withdrawal symptoms), and chi squared tests were used to compare categorical variables (same individuals current to previous use of EC, cigarettes, FDA approved tobacco treatment medications) (Creswell, 2014). This data can be used to
understand the changes between groups, such as those who changed from dual use at survey one to EC only use at survey two and a comparative group of all others. I also analyzed the open ended question embedded in the second survey and use the themes derived from that to develop questions for qualitative interviews and use a semi-structured basic interpretive interview to further explain the quantitative results.

**Qualitative**

For the dual users who responded to the open ended question embedded in the second survey, responses were analyzed for themes using the constant comparative method (Glaser, 1965; Merriam & Tisdell, 2016). Initially I read through all the survey responses and compared them against one another to identify themes in the data. Once I developed an initial coding theme around what an EC user has learned about using ECs, categories were formed. Then I developed a question around the theme to further explore during the interview. The information below guided this process.

The open ended question and the qualitative interviews were analyzed though an inductive and comparative method. Merriam and Tisdell (2016) stated the goal of data analysis is making sense of the data. My interpretation of the data involved developing findings which can be in the form of “organized descriptive accounts, themes, or categories that cut across the data, or in the form of models or theories that explain the data” (Merriam & Tisdell, 2016, p. 202). Boeije (2002) has developed a purposeful use of the constant comparative method which I also refer to when developing my analysis.

As Boeije explains there is comparison within the interview. She refers to this as description. Each interview was transcribed by me and I used open coding to label each passage of the interview with an appropriate code. This activity looked for consistency to what has been
said during the interview by comparing different parts of the interview. For instance, clarification is needed if an interviewee says that he has no dependence on the use of an EC but elsewhere in the interview he says he could not go longer than 24 hours without using the EC. Once one fragment is given a label such as dependence, the researcher studies the interview for more fragments that can be given the same code. Then the fragments are compared and studied for new information related to the code, such as how they are different, how they are related, and in what context were they said by the interviewee (Boeije, 2002).

Merriam and Tisdell (2016) state the importance of using the research purpose statement and research question in the data analysis process. I began my analysis by identifying fragments in the data that are responsive to my research questions. Taking units of information as fragments and comparing them with each other helped me to develop and sort my categories. Comparing fragments within the interview itself gave me a core understanding or consensus of what was said in the interview (Boeije, 2002).

The focus of my study drove the way I developed and named my categories (Merriam & Tisdell, 2016). Once one analysis was complete, I kept in mind what codes were extracted from the first transcript and checked if they were present in the next set of data. Both Boeije (2002) and Merriam and Tisdell (2016) refer to this as axial coding or conceptualizing the subject or topic to cover. This concept was repeated with each new data set and was a process by which categories, which cover many individual examples, were made.

Once categories were made, the data was triangulated by comparing interviews within the group with a different perspective. I compared what was said about themes within these groups, such as what things have similarities and differences. This comparison can allow me to hypothesis about patterns and types of EC users and produce a typology (Boeije, 2002).
In addition, during this analysis I kept the purpose of my study, my theoretical framework, and my research questions in front of me so that the analysis was focused. After several transcript interpretations I stepped back from the study and reflected on what I had gleaned so far. I named categories that reflected the purpose of my research and that held all the data relevant to my study. I worked to refine my categories so that my data only fit in that category. I worked to make the name of my category was clear and sensitive to what data was in the category and congruent in the content of the data (Merriam & Tisdell, 2016).

Merriam and Tisdell (2016) explain theorizing the data as “a circumstance when the researcher knows that the category scheme does not tell the whole story” (p. 216) and by linking the conceptual elements, categories and findings, more meaning can be made of the data (Merriam & Tisdell, 2016). I used my categories to look for interrelatedness of the findings which could be presented in the form of a model or a diagram.

**Verification of Mixed Method Design**

It is important that I ensure trustworthy and believable results when conducting research, “particularly to professionals in applied fields because practitioners intervene in people’s lives” (Merriam & Tisdell, 2016, p. 237) by paying attention to the reliability and validity of my research method (J Morse, Barret, Mayan, Olson, & Spiers, 2002). Users of mixed methods designs have developed independent ways to ensure reliability and validity.

In mixed methods, quality can be difficult to assess due to the mixing of data sets and different collection and analysis tools (Teddie & Tashakkori, 2009). Clark and Ivankova (2016) outline key concepts to help in understanding quality, or also referred to as validation, of mixed methods research. They state that first I needed to separately evaluate the quality of the quantitative and qualitative data results. Then I needed to assess the credibility of the inferences
made from my interpretation of the joint finding from the surveys and interviews. Therefore, in the next section I discuss how I assured that my QUANT and QUAL analysis is both reliable and valid.

**Quantitative**

The primary verification factors in quantitative research methods include reliability and validity (Creswell, 2014). Reliability, or the accuracy of the measurement instrument, basically tells us that the results of a study can be reproduced under a similar methodology (Golafshani, 2003). Validity answers the question, did the research measure what it intended to; or in my case, did the quantitative analysis of my study design measure cigarette use, electronic cigarette (EC) use, and factors impacting the use. In my study, I am using a quantitative design to identify a study population of dual cigarette and EC use, measure EC use of dual users over time, and investigate any factors (such as nicotine dependence, cigarettes per day, number of past quit attempts, and use of FDA approved tobacco treatment medications) that might affect EC use among dual users.

In the quantitative analysis I performed a secondary analysis of two previously analyzed surveys. I used the first survey (aimed to improve understanding of the use of EC) to identify and describe characteristics of my study population. I used the second survey (designed to follow the cohort of EC users from the first survey over time) to document cigarette and electronic cigarette (EC) use compared to continuous and categorical variables of interest to my study (such as perceived stress, intent of EC use, FDA medication use, and withdrawal symptoms). I analyzed my study population’s (dual users) characteristics from the first survey by using descriptive statistics. Independent t-tests and chi square analysis were used to determine differences between those who quit at follow-up and those who continued smoking. Paired t-
tests and McNemar’s test (Morrison, 2010) were used to determine within group differences between baseline and follow-up. Part of my analysis involved results related to the Fagerstrom nicotine dependence and nicotine withdrawal questionnaires. These questionnaires have established internal reliability and validity as they have been psychometrically evaluated (Twisk, 2013), meaning that they have been validated to be measuring what they state to be measuring.

Due to the small size of my study population it may not externally generalize to the larger population. I used purposeful sampling of the study population (Merriam, 2009; Twisk, 2013) to assure that dual users of cigarettes and electronic cigarette users were my study population. Therefore, to further explain the findings from the quantitative analysis, I performed a qualitative thematic analysis of an open ended question embedded in the second survey and basic interpretive qualitative interviews with members of this study population.

**Qualitative**

Lincoln and Guba (1985) introduced trustworthiness as a measurement of quality or worth in qualitative research. They use credibility to describe confidence in the findings, transferability to show that findings can be applied to other contexts, dependability to validate consistent and repeatable results, and confirmability to show that the study results are shaped by the participant and not the bias of the researcher. Merriam and Tisdell (2016) also discuss credibility, transferability and dependability as strategies that can be used to ensure trustworthiness in QUAL research. In the following section I will discuss how I ensured the trustworthiness in my research with the use of credibility, consistency or dependability, and transferability.

Credibility or internal validity deals with how well the research matches reality (Merriam & Tisdell, 2016). For example, when I interviewed a participant and analyzed my findings, how
did I make sure that I was reflecting the actual experiences of a cigarette smoker using an
electronic cigarette (EC)? As the primary data collector, I used my own perspective to view the
perceptions of the participants. Therefore, to ensure correct interpretation of the meaning, I
restated parts of the conversation that needed clarification during the interview so that I was sure
that I understood the reality that the participant was trying to convey. I used triangulation by
having another investigator independently analyze my qualitative data. I compared our findings
for consistency of the interpretation of the data.

This method of triangulation I used is also called peer debriefing. Creswell (2014)
defines peer debriefing as a process that involves using a person (peer) to review my data and
analysis, ask questions, and come to an independent interpretation. I contacted a colleague to
read through my transcripts, coding, and category development. My peer reviewed my work and
asked questions about the study. This process was done and repeated until my interpretation was
accounted for as valid and reasonable and my peer came to similar conclusions and outcomes as
I did. I used peer debriefing to ensure that my view of the research data resonated with people
other than me (Creswell, 2014).

Reliability or dependability of a research study is what generates an understanding of the
phenomenon being studied (Golafshani, 2003) and refers to the repeatability of the study
(Merriam & Tisdell, 2016). This concept is challenging for a researcher in social science
research as personal experiences are different and often not replicable (Merriam & Tisdell,
2016). Therefore, ways that I established credibility and reliability were through peer debriefing
and triangulation or multiple methods of data collection. Triangulation is a way that researchers
use multiple data collection methods (Merriam & Tisdell, 2016). One of the strengths of this
study was triangulation as I used multiple data sets of quantitative survey data analysis and
qualitative interviews. The data from the surveys helped me to develop my questions for the interviews. The questions from the interviews explained the results from the surveys and worked to ensure that my research was robust and comprehensive.

Transferability or external validity deals with the application of one study findings to other situations (Merriam & Tisdell, 2016). Two ways I addressed this in my qualitative research was with the use of purposeful sampling of the participants and detailed description of the narratives from the interviews. I described the context of the interview, such as where and how the interview took place. I also clearly detailed the use of ECs and how the participants of the study learned to use ECs. Merriam and Tisdell (2016) refer to this as “detailed description of the findings with adequate evidence presented in the form of quotes from participant interviews, field notes, and documents” (p. 257). Clearly describing the context of the interview and the participants narratives were valuable components of my study and allowed me to provide a meaningful account of smokers’ EC use.

**Mixed Methods**

Quality conclusions or inferences are a critical point of the mixed method research process and “should be ongoing from the study design to results’ interpretation” (Plano Clark & Ivankova, 2016, p. 167). Similar to quantitative and qualitative research, mixed methods requires validity or transferability as well. Teddie and Tashakkori (2009) refer to the term *inference transferability* as the effect mixed methods study conclusion has on similar settings, contexts, and people. To validate the inferences posed from my research, I considered legitimation as a strategy.

Legitimation as defined by Onwuegbuzie, Johnson, And Collins (2009) is a strategy that researchers can use to approach the quality of inferences made from a mixed methods design. It
is a process that includes continuous evaluation of mixed methods study procedures for consistency between research purpose and resulting inferences. Clark and Ivankova (2016) discuss using peer debriefing, or balancing insider’s and observer’s views, to guide the quality assessment of mixed methods inferences.

**Background of the Researcher**

As a health care professional with years of experience in practicing medicine, I have experienced tremendous shifts in the way in which knowledge is transferred from the healthcare provider to the patient. Working as a Registered Nurse for 13 years and then as a Nurse Practitioner for an additional 20, exposed me to years of different ways to administer educational practices in health care. Although I appreciated the human touch and self-care theories prevalent in nursing practice, I was not sure that was real knowledge. I thought that it is my duty as the “expert” or the “holder of the knowledge” to transfer knowledge to the patient so that the patient will do as I say and be healthier (Palmer, Jackson, & Tucker, 2007). I thought for years that my approach to this transfer of knowledge was working. My patients were doing as I said by taking their medications as directed and by using the information I gave them and incorporating it into their life. I thought my knowledge was working because I transferred it to the patient.

Years after attaining my advanced nursing degree, I ventured into a research position. I came to this position as a practitioner rather than a researcher and maintained the idea that I am the holder of knowledge which I will transfer to those patients or research participants with whom I work. In this position I experienced how quantitative research is developed. I began to understand the QUANT process in which there is a question asked, a hypothesis made, protocol written, an internal review board’s approval, and a research trial. I thought, this is where real
knowledge is formed, with a question, hypothesis, research, and clinical trial. This positivist view gave me even more concrete data to solidify the truth in my practice.

I continued my work using the concrete information learned from the data collected in quantitative research to treat tobacco dependent people. I transferred my new found knowledge in tobacco treatment to those who needed it – smokers. I met regularly with tobacco users, developed a treatment plan for them, and told them what medications to take and how to avoid triggering the urge to smoke. This worked in research trials and it worked with some smokers, but not the majority and even the smokers who quit smoking didn’t stay quit. I started to ask myself why.

In the Adult Education Program, I was exposed to other avenues of acquiring and understanding new knowledge. It was during the classes that I took in this program that I learned the value of experiential and social cultural learning, progressive and humanistic philosophies and their impact on behavior and education they hold. I realized I had always held a humanistic philosophy which values the individual learner, but only through the Adult Education Program did I come to understand it and its value. I started to wonder why smokers don’t quit when they hear expert knowledge. What did the smoker learn by smoking, what do smokers know? I also wondered why we aren’t investigating the smoker’s learning experience. These questions are what drove my research. Although the quantitative component of mixed methods provides descriptions of specific populations, the individual view and contribution of learner drove the qualitative portion of the study.

Chapter Summary

The quantitative component to a mixed method design allowed me to collect demographic data related to smoking and electronic cigarette (EC) use, describe characteristics
of EC users, and to compare variables over time. My design followed a cohort of dual users and allows me to analyze changes in EC use over time. The qualitative portion helped me to understand how the dual user learns about and uses ECs. By interpreting the QUANT data I informed the types of questions I used in the QUAL interviews to help explain the QUANT analysis. This sequential explanatory mixed method design gave multiple avenues for understanding knowledge construction. The quantitative part of the study gives measureable objective data to the researcher, but this form of research does not inform researchers about the learning and meaning-making made by the tobacco user. The qualitative interviews give the researcher a method of describing the tobacco users’ reality and how they form knowledge around the use of an EC. There are multiple ways to construct knowledge and mixing the data (Creswell, 2014) of this research design provides a way to investigate how tobacco users who use EC construct knowledge.

This balance between quantitative and qualitative research is not equal. In mixed method designs one form of data is often more primary than another (Merriam & Tisdell, 2016). There is generally one component of the study which has more impact on the investigation than the other. In my study design, the basic qualitative interviews were the dominant component of the study. Morse and Niehaus (2016) refer to mixed research driven by a quantitative component with a qualitative supplementary project as QUANT-qual. Although I first used a quantitative analysis to describe and formulate groups of electronic cigarette users, and to inform the qualitative questions, I did not emphasis the quantitative data as more informative. I did not describe my research the way the Morse and Niehaus did. The interviews were the backbone of my project and informed the theoretical conception of my project. Therefore, I call my mixed methods a
quant-QUAL study because the qualitative component had a greater importance in answering the research questions;

1) How do adult smokers learn about electronic cigarettes through their social (family, friends, peers, work place) and material (vape shops, blogs sites, forums, advertisements) networks?

2) What is the initial intended use of an electronic cigarette and does the intent change with the experience of using an electronic cigarette?

3) Does embodied learning impact a cigarette smoker’s use of an electronic cigarette?

Penn State IRB approval was requested and given prior to starting this research. Chapter four will provide the results of my quantitative analysis.
CHAPTER FOUR: SURVEY RESULTS

This chapter provides the results of the analysis of the surveys. As I described in previous chapters, this study is a sequential explanatory mixed method analysis investigating the electronic cigarette (EC) use by studying a cohort of dual, EC and cigarettes users. The purpose of this study is to understand how a cigarette smoker learns about and uses an EC by evaluating their body connections to smoking and how that is transferable to using an EC and by investigating the social and material experiences related to learning to use an EC. This chapter analyzes survey data related to EC use and characteristics, and open ended responses to two questions related to learning about EC use. The purpose of these open ended questions was to help me to gain an understanding of what cigarette smokers were learning about EC use which helped to guide the questions I used in the personal interviews.

Results

First, a descriptive analysis of the sample is presented. Then, quantitative analyses of the sample are presented to describe EC use of the cohort. Finally, qualitative analyses of the open ended questions in the second survey are presented.

The specific research questions that guided the study include:

1) How do adult smokers learn about electronic cigarettes through their social (family, friends, peers, work place, etc.) and material (vape shops, blogs sites, forums, advertisements, etc.) networks?

2) What is the initial intended use of an electronic cigarette and does the intent change with the experience of using an electronic cigarette?

3) Does embodied learning impact a cigarette smoker’s use of an electronic cigarette?
The Study Sample

The follow-up survey started with a sample of 1863 participants from the first electronic cigarette use and characteristics survey who agreed to participate in future research. Among those, 1797 (96.5%) completed the question from the first survey necessary to determine their tobacco use status. From this sample, 359 (19.98%) of them were dual users (reported EC and cigarette use in the past 7 days and no use of other tobacco products). Of the 359 dual users at baseline, 53 (14.8%) completed the necessary questions on the follow-up survey. Thus, these 53 make up the sample analyzed in this section.

The sample of 53 dual users was largely white (83%), male (52%), reported college degree or higher (58%) and had an average of age of 41 (SD 12.18) years. The majority of participants had used nicotine replacement products (patch, gum, or lozenge) in the past (60%), although less of the sample (32%) used oral FDA approved tobacco treatment meds (Chantix or Zyban). The reason given for EC use is primarily for health related reasons (45%), such as believing that the EC is less harmful or toxic to self, followed by to reduce or quit smoking (32%), and to replace smoking (21%).

This group of 53 was then divided into two groups based on their smoking status at the second survey (those who quit smoking traditional cigarettes and those who continued to smoke traditional cigarettes), and differences among the two groups were analyzed.

When comparing baseline (first survey) characteristics of those who quit smoking at the follow up (second survey) to those who continued to smoke, there were no significant differences found between the groups in intention to use an EC, nicotine dependence scores, demographics, and EC use characteristics. This may be due to the small sample size. Table 4-1
presents differences between those who quit smoking at follow up and those who continue smoking.

**Table 4-1**  
Differences in baseline (survey 1) characteristics between those who quit smoking and those continued smoking at follow-up

<table>
<thead>
<tr>
<th></th>
<th>Quit cigarette smoking at follow up, (n=35)</th>
<th>Continued smoking at follow up, (n=18)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>When you started using e-cigs, was it your intention to quit tobacco soon? (% yes)</td>
<td>80.0</td>
<td>61.1</td>
<td>0.14</td>
</tr>
<tr>
<td>Mean *PSECDI Score</td>
<td>8.7</td>
<td>8.6</td>
<td>0.94</td>
</tr>
<tr>
<td>Mean **PSCDI Score</td>
<td>13.1</td>
<td>13.8</td>
<td>0.61</td>
</tr>
<tr>
<td>Mean Age</td>
<td>41.4</td>
<td>40.7</td>
<td>0.84</td>
</tr>
<tr>
<td>% college graduate</td>
<td>50.0</td>
<td>72.2</td>
<td>0.12</td>
</tr>
<tr>
<td>% male</td>
<td>54.3</td>
<td>50.0</td>
<td>0.77</td>
</tr>
<tr>
<td>% white</td>
<td>85.3</td>
<td>77.8</td>
<td>0.50</td>
</tr>
<tr>
<td>% Income level &gt;$2500 per month</td>
<td>70.59</td>
<td>56.25</td>
<td>0.32</td>
</tr>
<tr>
<td>Mean E-cig use in days</td>
<td>271.2</td>
<td>332.5</td>
<td>0.56</td>
</tr>
<tr>
<td>Baseline reason for use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% to quit or reduce</td>
<td>31.4</td>
<td>33.3</td>
<td>0.89</td>
</tr>
<tr>
<td>% to replace smoking</td>
<td>17.4</td>
<td>27.8</td>
<td>0.37</td>
</tr>
<tr>
<td>% health related</td>
<td>48.6</td>
<td>38.9</td>
<td>0.50</td>
</tr>
<tr>
<td>% Current use ***NRT</td>
<td>5.7</td>
<td>0.0</td>
<td>0.30</td>
</tr>
<tr>
<td>% Current use ****FDA medication</td>
<td>2.9</td>
<td>5.6</td>
<td>0.63</td>
</tr>
<tr>
<td>% Past use NRT</td>
<td>57.1</td>
<td>66.7</td>
<td>0.50</td>
</tr>
<tr>
<td>% Past use FDA medication</td>
<td>34.3</td>
<td>27.9</td>
<td>0.63</td>
</tr>
<tr>
<td>Mean Importance to stay off tobacco</td>
<td>8.2</td>
<td>7.0</td>
<td>0.19</td>
</tr>
<tr>
<td>Mean Confidence to stay off tobacco</td>
<td>7.6</td>
<td>6.4</td>
<td>0.13</td>
</tr>
<tr>
<td>% using cigalike device</td>
<td>42.9</td>
<td>50.0</td>
<td>0.62</td>
</tr>
<tr>
<td>% using advanced device</td>
<td>31.4</td>
<td>22.2</td>
<td>0.48</td>
</tr>
<tr>
<td>% using mod device</td>
<td>25.7</td>
<td>27.8</td>
<td>0.87</td>
</tr>
<tr>
<td>Mean nicotine liquid concentration (n=44)</td>
<td>16.6</td>
<td>17.9</td>
<td>0.65</td>
</tr>
<tr>
<td>Mean Cigarettes per day</td>
<td>20.7</td>
<td>21.2</td>
<td>0.88</td>
</tr>
</tbody>
</table>
Mean E-cig puffs per day | 22.6 | 18.2 | 0.48

*PSECDI- Penn State electronic cigarette dependence index
**PSCDI-Penn State cigarette dependence index
PSECDI and PSCDI are tools used to measure dependence on electronic cigarette use and smoking (Jonathan Foulds et al., 2015).
***NRT-Nicotine Replacement Therapy (patch, gum, lozenge, inhaler)
****FDA medication-Zyban or Chantix (both oral medications)

Descriptive Analyses

**Primary data sample.** As stated, 53 dual users completed the first and the follow-up surveys. The findings of the quantitative analysis revealed that 74% of dual users (n=39) intended to quit smoking at baseline. At the follow up survey, 35 (66%) had quit smoking and 18 (34%) continued to smoke cigarettes. Table 4-2 presents the breakdown of what the dual users at the first survey were doing by the time of the second survey.

<table>
<thead>
<tr>
<th>Status at Follow-up</th>
<th>Quit cigarette smoking - % (n)</th>
<th>Continued cigarette smoking - % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exclusive E-cig</td>
<td>Dual user (EC and cigarette [cig])</td>
</tr>
<tr>
<td></td>
<td>No tobacco use</td>
<td>Cigarette only</td>
</tr>
<tr>
<td></td>
<td>97.1 (34)</td>
<td>83.3 (15)</td>
</tr>
<tr>
<td></td>
<td>2.9 (1)</td>
<td>5.6 (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11.0 (2)</td>
</tr>
</tbody>
</table>

Of those who quit smoking (n=35), only one was not using any product (2.9%). The majority of the 53 dual users became exclusive EC users by the time of the follow-up survey (64%, n=34) with 28% (n=15) of the sample continuing dual use. Of those who continued to smoke, the majority continued as dual users (83.3%), two had also added another tobacco product (11.0%) and one (5.6%) had returned to cigarette smoking only. It is interesting that only two participants (3.8% of the cohort) had quit EC use at the time of the second survey. This is likely due to the preference of EC use and biased sampling of this group.
Figure 4-1 represents the change in the cohort from baseline dual use to the second survey. Almost the entire cohort continued to use an EC at the follow up survey (96%).

**Figure 4-1**
**Use Behaviors at Follow-Up among Baseline Dual Users**

There was no difference between baseline characteristics to help explain why most dual users quit smoking. It is for this reason that personal interviews were performed to more completely explain why some of the dual users quit smoking and others did not. I will discuss those results in Chapter Five. Before performing the interviews, I wanted to see if there was any difference in the use of and characteristics of the EC devices including type of device, e-liquid concentration levels, and frequency of use of EC between my two groups to see if device type could be predictive of EC use and to help establish qualitative questions.

Therefore, to try and understand the quantitative data more completely, I compared the number of cigarettes per day (CPD), nicotine level, and the type of EC used at baseline and
follow up within the groups. To do this, I analyzed the change in CPD, nicotine liquid concentration level, EC puffs per day, and EC device use by comparing changes in these categories from the first survey to the second survey. The type of EC participants used was classified in three categories, cigalike, advanced, or mod device. Participants were asked the following question on the Survey “Thinking about your preferred device…Does your e-cig look like any of the following devices?” and categories of device use were made from their answers. Three choices of device were offered and the participant chose the EC device from the pictures and the description that best met their preferred device. Table 4-3 and Figures 4-2 and 4-3 used the following EC descriptions to categorize participant data.

The following devices are discussed in Chapter 2 but a brief review is provided. Appendix A also provides pictures. For the data presented here, ECs that look like cigarettes are called cigalikes. They are generally the same size or smaller than a cigarette. Advanced devices are larger than cigarettes and have a button to push prior to inhalation. This button activates the system that heats the liquid; and mod devices have interchangeable tanks that can hold varying amounts of nicotine liquid and very large batteries. These devices can heat liquid to higher temperatures more quickly and the battery charge is much longer. The shape is often much different than the cigalike or advanced design. The device gets its Mod name from its tendency to attract tinkerers because of the ability to modify the design.

Table 4-3 displays means and percentages from baseline to follow up for EC device use, nicotine concentration levels, EC puffs per day, and CPD. These findings indicate a significant decrease of cigarette consumption from the first survey to the second survey within the entire sample and significant changes in EC types used. Differences between baseline and follow-up
among those who quit smoking and those who continued to smoke were compared using paired t-tests if it is a mean. I used a McNemar test to look at changes in proportions over time.

**Table 4-3**

*Differences between baseline and follow-up among those who quit smoking and those who continued to smoke*

**Among those who quit (n=35)**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Baseline</th>
<th>Follow-up</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>% using cigalike device</td>
<td>42.9</td>
<td>20.0</td>
<td>0.047</td>
</tr>
<tr>
<td>% using advanced device</td>
<td>31.4</td>
<td>26.4</td>
<td>0.74</td>
</tr>
<tr>
<td>% using mod device</td>
<td>25.7</td>
<td>52.9</td>
<td>0.01</td>
</tr>
<tr>
<td>Mean nicotine concentration (in mg/ml)</td>
<td>16.6 (n=30)</td>
<td>9.3 (n=27)</td>
<td>0.017</td>
</tr>
<tr>
<td>Mean E-cig puffs per day</td>
<td>22.6</td>
<td>29.1</td>
<td>0.27</td>
</tr>
<tr>
<td>Mean Cigarettes per day</td>
<td>20.7</td>
<td>0.0</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

**Among those who continued smoking (n=18)**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Baseline</th>
<th>Follow-up</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>% using cigalike device</td>
<td>50.0</td>
<td>27.8</td>
<td>0.046</td>
</tr>
<tr>
<td>% using advanced device</td>
<td>22.2</td>
<td>44.4</td>
<td>0.16</td>
</tr>
<tr>
<td>% using mod device</td>
<td>27.8</td>
<td>27.8</td>
<td>1.0</td>
</tr>
<tr>
<td>Mean nicotine concentration (in mg/ml)</td>
<td>17.9 (n=18)</td>
<td>9.5 (n=14)</td>
<td>0.004</td>
</tr>
<tr>
<td>Mean E-cig puffs per day</td>
<td>18.2</td>
<td>17.3</td>
<td>0.90</td>
</tr>
<tr>
<td>Mean Cigarettes per day</td>
<td>21.2</td>
<td>10.2</td>
<td>0.001</td>
</tr>
</tbody>
</table>

**Quit smoking.** Results from simple means and frequencies found that among those who quit cigarettes, there was a significant change between both time points in all categories except use of an advanced EC device and in the mean e-cig puffs per day. Many dual users who became exclusive EC users at the follow up survey changed from using a cigalike or advanced
devices to mod devices ($p=0.01$). The mod devices allow for a bigger battery to be used in addition to flexibility with e-liquid nicotine concentration and flavor. The transition between a cigalike or advanced devices to a mod device requires more attention and technical skill from the user (Cooper et al., 2016). It is obvious that this group is not smoking at the follow-up, so CPD are zero, but it is surprising that the mean increase in E-cig puffs per day is not significant ($p=0.27$). This may be because the majority are using the advanced or mod devices which provide more nicotine per puff (Farsalinos et al., 2014). Figure 4-2 illustrates those who quit smoking and the device used at baseline (first survey) and follow up (second survey).

**Figure 4-2**  
Device use at baseline and follow up among those who quit smoking  
* indicates significance at $<0.05$

![Bar chart](image)

**Continued smoking.** Almost all of those who continued smoking at the follow up survey also continued to use the EC (94.4%). These dual users reduced their use of the cigalike device significantly ($p=0.045$) and increased use of advanced devices, although this was not significant.
Figure 4-3 shows that this group did not increase the use of the mod device. However, their e-liquid nicotine concentration reduced significantly (p=0.004) as did cigarettes per day (p=0.001) in the group that continued to smoke. These data tell me that this group is potentially less dependent on nicotine because they are smoking significantly less cigarettes per day, using lower nicotine concentration e-liquid, with the same number of puffs on their EC. Their overall Penn State Nicotine Dependence Score did decrease between the baseline (mean 8.6) and follow-up (mean 7.9) survey however, these scores were not significantly different (p=0.63).

Many continued dual users changed their device from a smaller battery cigalike to an advanced device which has a bigger battery and button to push which heats the e-liquid while drawing in on the EC. This method of aerosolizing the nicotine liquid can deliver more nicotine per puff which allows the user to lower nicotine concentration e-liquid but receive similar amounts of nicotine (Farsalinos et al., 2014). This could also explain why the dual users could significantly reduce their CPD (p=0.001).

Figure 4-3
Device use at baseline and follow up among those who continued smoking
* indicates significance at <0.05
Adult Learning

In this section, I discuss what I have understood adult smokers to have learned from electronic cigarette (EC) use as expressed through the quantitative analysis.

The majority of the dual use group learned that they can quit smoking and become exclusive EC users (n=34, 64%). What the quantitative data shows is that this learning occurred with the use of different devices. The groups of exclusive EC users at follow up learned that the cigalike will likely not help them stay quit. Most dual users who used a cigalike at baseline (42.9%, n=15) were not using a cigalike at the time of the follow up survey with 20.5% (n=7) using cigalike at follow up. The majority of the exclusive EC group was using an advanced device, 31% (n=11) (bigger battery and ability to use multiple e-liquid flavors) or a modified device, 26% (n=9) (one in which the user can alter battery size and wattage in addition to the wide range of liquid flavors) at baseline (57%, n=20). At the time of the follow up survey the use of advanced or mod device increased to 77% (n=27) in the exclusive EC group but this was due to an increase in the use of the mod device with most of the exclusive EC users using a mod device (52.9%, n=18). It seems that the data is showing that the exclusive EC group is quitting smoking by using different devices and that the mod device is the most effective device to use to quit smoking.

Conversely, if the participant is not using a mod device, the user is more likely to continue to dual use. Even though a significant percentage of continuing smokers reduced the use of a cigalike (50%) at baseline to 27.8% using cigalike at follow up, this did not support quitting smoking. This group transitioned from a cigalike to an advanced device which did not support quitting smoking. There was no change in the use of a mod device in the continued
smoking group which is different from the group that quit smoking (see Table 4-3) which supports that mods might help quitting.

What cannot be revealed to the researcher from the quantitative data is the learning that occurred through the exposure to and experience of using an EC, such as learning from experiencing different devices as significant importance to quitting, and how this learning influenced the use of an EC. It is obvious to me that the dual user who becomes an exclusive EC user is changing the device that they use. What is not obvious from the quantitative data is how they decided to use a different device. Questions still remain: What made the exclusive EC user decide to quit smoking? How did the user learn to engage in the EC to educate them about the way to use the EC to become an exclusive EC user? Who influenced and what affected the EC user’s learning during this transition to quitting smoking? Did anything happen differently in those who quit and those who continued to smoke? Between the two surveys, what people and things influenced the dual user to adjust and adapt to quitting smoking or to continue with dual use? What did the experience between the two time points of the surveys look and feel like to the dual user? To further explore these questions and provide guidance for the types of questions to ask during the personal interviews, I thematically analyzed two open ended questions presented to participants on the follow up survey.

**Qualitative Analysis of Open Ended Survey Questions**

Two open ended questions were coded and thematically analyzed using the constant comparative method and peer review. I also kept my research questions in front of me when I created the nodes for coding and thematic analysis. I discuss how the qualitative responses help to answer my research questions later in this chapter. I evaluated two open ended questions
before performing the personal interviews to give me insight into the EC users learning process.

These two questions were asked at the second survey:

- If you were advising a current smoker who is interested in switching to e-cigs but has never tried them, what would be your main recommendations, based on what you personally have learned?
- Please add any additional information you think a public health researcher should know about electronic cigarettes.

44 of the 53 dual users (83%), 30 of those who quit at and 14 of those who continued smoking at follow up, responded to at least one of the two open ended questions. Three themes emerged when interpreting the data. When the data was being categorized I chose the nodes and, with the collaboration of a peer, placed them into groups. These groups then represented categories of topics which is how the themes emerged. The primary theme is represented in bold letters with the sub themes under it. An overview of the themes identified in the qualitative survey data is presented in Table 4-4.

When I discuss the themes, quotes from the participants are used. The quote is followed by the letter M or F denoting male or female, age, and smoking status as quit or smoking. This information is in parentheses after the quote. After displaying the quotes, how they relate to adult education and my research questions is discussed.

Table 4-4

\textbf{Qualitative response themes to open ended questions:}

- \textbf{Educating} about specifics of electronic cigarettes
  - How to adjust/adapt/switch to using an EC.
  - Product characteristics
- \textbf{Changing} the smoker and society
  - Different nicotine delivery product/health benefits/ quitting
  - Government influence/society acceptance/access of EC
  - Research related to EC
- \textbf{Exposing} user or others to an electronic cigarette
  - Location to try/purchase an EC
  - Advice about the experience of an EC
The most common theme identified in the open ended qualitative data was the importance of **educating** smokers on how to adjust to electronic cigarette use, adapt to a different product, and to switch to using an electronic cigarette (EC). Several responses from those who became exclusive EC users at the second survey included recommendations on how to make the product more effective, suitable, or desirable to use. Many of these responses involved recommendations about EC characteristics. The first series of quotes shown are related to:

**Educating**

Several responses discuss EC design and features. As seen below, the nicotine level, battery voltage, and ease of use are important aspects of learning to use an EC.

“Try a good mod and tank with option such as wattage and different types of atomizers so you can find what works for you and stay off of cigarette” (M, 35, Quit)

“Try something that allows you to vary voltage/wattage” (M, 34, Quit)

“Start slow to find the nicotine level that mimics your cigarette nicotine then lower that over time” (M, 39, Quit).

“Try it with the flavor that you like at the nicotine level you need (based on smoking use) With nicotine levels and flavors, a variety of, one can't fail to quit smoking if one truly wants to do so, so find the flavor/nicotine level that one likes and needs.” (F, 52, Quit)

“I would recommend something that is very easy to use, lower cost, and something that doesn't produce large amounts of vapor to start. Also, smokers trying to transit to vapor products should make sure to use e-liquid that has enough nicotine to provide satisfaction. They should worry first about getting off cigarettes, then later about reducing their nicotine consumption if they desire.” (M, 47, Smoking)

“Start with something easy to use so as not to relapse, find a flavor you like so not to smoke. Recommend making own juice as it's easy, and you know exactly what is in it.” (F, 50, Quit)

This following participant in particular was very specific in what technology to look for in the EC:
“I would recommend a digital device that has protection circuits built in; with a tank that accepts premade coils. I would strongly recommend against mechanical devices and strongly advise learning battery safety” (M, 27, Quit)

One participant was very specific about the brand of EC to use and when to change:
“Start with a small but effective device like LOGIC PRO or KANGERTECH SUBVOID. When you become acclimated to vaping, get a bigger better device” (M, 29, Quit)

Similar comments from Dual users who continued to smoke at the follow up survey were made.
“Buy a quality mod; don’t use cheap e-cigs or flavors.” (M, 22, Smoking)

There was not consistency in how participants felt about nicotine levels. The following comment from a continuing smoker is interesting because it is opposite to what an exclusive EC user said about starting out with high nicotine levels in EC and reducing over time.
“Start with low nicotine level and find a flavor that you like Stick with it and you’ll notice a difference in how you feel over time.” (M, 40, Smoking) but this comment came from an exclusive EC user
“Start with higher mg nicotine and decrease over time. Use a tank system” (M, 51, Quit)

The next theme discussed is around changing, the smoker or society. Most of these comments related to the benefits felt from reducing or quitting smoking by using ECs. Several statements discussed a government and societal change. This section also includes participant thoughts on research practices and involvement in changing the tobacco use landscape.

Changing, Health, and Society

These responses highlight the change in health, mostly related to the smoker themselves but some state how the EC has helped with the health of their family or others.

“This is the only thing that helped me quit smoking. I think the addiction to the physical act of drawing on a cigarette is as addictive as nicotine and I believe that this is why using e-cigs was successful for me.” (F, 69, Quit)

“Vaping has saved my life, my family and I breathe better and have more energy since I quit smoking 2 years ago”. (M, 34, Quit)

“One of my greatest worries as a smoker was the 2nd hand smoke I was creating around friends and loved ones and worrying of the potential health risks involved. Electronic cigarette vapor is completely different to the thick smoke of normal cigarettes and disappears in a matter of seconds. It is mostly an odorless thin mist produced which
means you do not have to worry about people inhaling your toxic 2nd hand smoke anymore. (F, 21, Smoking)

“Smoked for 26 years and although I've been smoking e-cigs longer than planned (3+yrs) I would quit or go gum before ever picking up a traditional cigarette again.” (F, 40, Quit)

“It worked for me; I have been smokefree for over 3 years now after having smoked for 40 years.” (F, 52, Quit)

“I smoked for 20 plus years and I was in poor health before I quit. After starting it became clear that it was working. If the public was properly educated in safety and proper use I think all would be fine.” (M, 33, Quit)

“I went from smoking a pack a day to vaping pretty much only in the evenings. The transition was pretty much painless and I often good a day or two without vaping and without missing it. I think it's worth a shot if you are looking to cut down or quit smoking.” (F, 45, Quit)

“I have quit cigarettes completely for over 3 1/2 years. My health has improved, I feel better, and my respiratory functioning has improved dramatically. It's the easiest way to quit smoking tobacco cigarettes, period.” (M, 43, Quit)

“Healthier and cost savings - it has GOT to be better for you and your health!” (F, 49, Quit)

“I would MOST STRONGLY RECOMMEND switching to e-cigs. I smoked analog cigarettes for over 40 years & switching to e-cigs (& quitting traditional cigarettes) has been, by far, the best life-changing decision I've ever made. Why? Almost entirely due to my much improved health!” (F, 53, Quit)

“I find that the use of e ECs helps me to cut down on the use of regular cigarettes.” (F, 60, Smoking)

“Are e-cigs risk free? Probably not-but e-cigs are most certainly orders of magnitude safer than smoking analog cigarettes. We, as a nation, should be encouraging any and all traditional smokers who desire to switch to e-cigs.” (F, 53, Quit)

Several EC users both who quit smoking and continued smoking at the second survey had commented about change or lack of change in public health policy or research.

“I'm also extremely angry about the efforts of so called 'public health groups' to severely restrict or even ban vapor products, and other reduced harm nicotine products.” (M, 47, Smoking)
“They have ignored the science that shows that they are less harmful than traditional cigarettes. The regulations only serve one purpose which is to shut down an industry that can save millions. They seem to be throwing a temper tantrum that something which was not conceived by one of their precious drug or tobacco companies are making a real difference in the lives of smokers.” (M, 39, Quit)

There are several comments on the way research is being conducted and potential changes it can create.

“I have seen some of the study methods where the testing is using parameters that are not accurate/ wouldn't be tolerated for 'real' usage such as watts/volts that far exceeds what would be used, and then allowed those findings to skew the results.” (F, 30, Quit)

“I’d very much like to see Dr. Fould’s research on addiction of nicotine relative to delivery device expanded. I’d be very interested to see some never smokers studied that initiated with vapor products containing nicotine, though these people are very difficult to find. Prior research indicates that less than 1% of regular users of vapor products are never smokers. (M, 47, Smoking)

“Personal reporting & interviews are the only way to know the personal impact vaping can have.” (F, 39, Quit)

The third theme identified revolved around exposing smokers to ECs. In this section current user comments about recommendations for how to actually engage in EC use are highlighted. Many of these statements reflect the EC user’s thoughts on the best way to experience an EC. Several responses included how to find out about the EC or how to go about initiating the use of or experiencing an EC.

**Exposing**

In this section, comments about how to actually try an EC or what to expect when experiencing one are given. Although this category may seem similar to the first theme, the peer reviewer and I agreed that the guidance of how to actually use an EC is a different category. It is thought that this category relates more to the social or personal needs or preferences required to effectively learn about and use an EC.
“I would recommend going to one of the reputable shops in the area and asking them about starting gear. I don't really keep up on the latest and greatest anymore. Depending on who this was I would also be willing to join them.” (M, 36, Smoking)

“Purchase from a vape shop to get the best advice and guidance” (M, 41, Quit)

“Go to a vape shop and have them show you some options and actually try stuff before buying anything online” (M, 33, Quit)
“Go easy on self - tobacco addiction does not happen in a day or use, neither will finding a healthier habit.” (F, 39, Quit)

“Start with something easy to use so as not to relapse, find a flavor you like so not to smoke. “(F, 50, Quit)

“Start slow, don't try to 'quit' but switch over time.” (M, 39 Quit)

“I've convinced people just by letting them try my brand. It's comparable in price to smoking one pack of name brand tobacco cigarettes daily.” (M, 42, Quit)

“Experiment, find the device that meets your needs at the moment. Buy a cheap starter kit try all the flavors that your local Vape shop has to offer. Once you find the flavor that works for you stick to it and slowly adjust your nicotine levels down. As nicotine levels drop the flavors get better.” (M, 34, Quit)

“You need to give yourself time to transition from cigarettes to e-cigarettes. It took me about 3 months. Begin by using e-cigs a couple of times a day, decreasing regular cigarettes, and then increase the frequency of e-cigs. Also start with high or 2.4% nicotine, and then after you are completely on e-cigs only, you can decrease the nicotine level. I smoked cigarettes for over 50 years.” (F, 69, Quit)

“I have advised many people and given out much information to them to help get them informed. I am an advocate for Vaping to quit smoking.” (F, 49, Quit)

“That they are somewhat like a regular cigarette and will not bother nonsmokers as much” (F, 51, Smoking)

“I would recommend the e-cig model I use and suggest some flavors of liquid they might like.” (F, 54, Quit)

“I hate tobacco flavored juice. Keeping the fruit and candy flavored juices is imperative to keeping people off of cigarettes” (M, 35, Quit)

After thematically analyzing the open ended responses, I discuss what the adult smoker is saying they learned through what they are advising to other smokers. I do this by documenting
what parts of my research questions were answered and what needs to be investigated in the personal interviews. I discuss this and how the data relates to my adult learning theories in the next section.

**Adult Learning Expressed in the Responses to Survey Questions**

My first research question is:

1) How do adult smokers learn about electronic cigarettes through their social (family, friends, peers, work place, etc.) and material (vape shops, blogs sites, forums, advertisements, etc.) networks?

Several comments related to exposing a smoker to an EC supported social networks. Statements such as “start slow but quit over time” (M, 39, Quit) “I've convinced people just by letting them try my brand” (M, 42, Quit), and “You need to give yourself time to transition from cigarettes to e-cigarettes. It took me about 3 months. Begin by using e-cigs a couple of times a day, decreasing regular cigarettes, and then increase the frequency of e-cigs” (F, 69, Quit) represent humans providing a network that supports EC use. This network of information provides an opportunity to the new EC user to learn and form an understanding of the transition to EC use.

The nonhuman or material networks become evident in the comments about going to a vape shop or to purchase from a vape shop. The vape shop is represented as the place where a potential EC user can experience different brands, types of ECs, and flavors of e-liquid. Even though vape shops are staffed by humans, many nonhuman entities exist in it, such as e-liquids and flavors, styles of EC devices and its components. These nonhuman entities are part of the networks that allow for the growth of EC use. Although some of the networks were revealed, there are more to be investigated. A question that can be further explored in personal interviews is; how did the use of the EC actually occur in the user? Although advice on where to
experience an EC is given, real discussion related to the actual use of the EC by the smoker is not clearly discussed. Unpacking the translation of EC use through personal interviews can illuminate the personal and technical aspects of learning about and using an EC. Personal interviews with EC users’ helps to elucidate how these networks developed the product and supported its use.

My second research question wasn’t completely answered in the qualitative responses but it was asked at the initial survey where all participants were dual users (EC and cigarettes) and then compared to their actual use at the second survey to verify who changed their intended use over time.

2) What is the initial intended use of an electronic cigarette, and does the intent change with the experience of using an electronic cigarette?

Results show that 80% of those who quit smoking at the follow up survey answered yes to the question “When you started using e-cigs, was it your intention to quit tobacco soon?” This means that 20% of those who quit were not intending to quit. Contrary to that finding, over 60% of dual users who intended to quit at the first survey are still smoking at the second survey. The quantitative analysis shows that dual users’ intention changes, but it does not provide the reason for the change. Personal interviews will provide more details of the experience of using an EC and how that experience created meaning for the user. The interview will provide the story which allowed them to quit cigarettes or to continue smoking.

My third research question is:

3) Does embodied learning impact a cigarette smoker’s use of an electronic cigarette?

Many participants’ responses focused on how EC use affected the senses, emotions, and habits of the body and are relevant to embodied learning. Several participants responded with recommendation about the nicotine level. These smokers know that nicotine delivery is part of
smoking and to be able to switch to an EC the delivery of nicotine to the body through the EC is important. “Start with higher mg nicotine and decrease over time. Use a tank system” (M, 51, Quit), “Start slow to find the nicotine level that mimics your cigarette nicotine then lower that over time” (M, 39, Quit), and “smokers trying to transition to vapor products should make sure to use e-liquid that has enough nicotine to provide satisfaction” (M, 47, Smoking).

Several references to senses revolve around the importance of taste. “Find a flavor that you like Stick with it and you’ll notice a difference in how you feel over time.” (M, 40, Smoking), “find a flavor that you like so that you don’t smoke” (F, 50, Quit), and “I hate tobacco flavored juice. Keeping the fruit and candy flavored juices is imperative to keeping people off of cigarettes” (M, 35, Quit).

Additional responses consider habits of the body, such as, “This is the only thing that helped me quit smoking. I think the addiction to the physical act of drawing on a cigarette is as addictive as nicotine and I believe that this is why using e-cigs was successful for me.” (F, 69, Quit) Emotional impact of being able to quit with the EC is relevant in these comments. “My health has improved, I feel better, and my respiratory functioning has improved dramatically. It's the easiest way to quit smoking tobacco cigarettes, period.” (M, 43, Quit) “Vaping has saved my life, my family and I breathe better and have more energy since I quit smoking 2 years ago”. (M, 34, Quit).

**Chapter Summary**

Embodiment of smoking and the use of ECs are partially addressed in the responses to the open ended questions. Further exploration of these answers to give a more complete picture of how the EC may or may not be providing body responses similar to smoking is investigated in the interviews.
Although my research questions are partially answered by the survey data, the real meaning for the smoker made by using an EC can be more deeply investigated. Therefore, personal interviews are still required to more completely answer the research questions. One of the survey respondents agrees and states, “Personal reporting & interviews are the only way to know the personal impact vaping can have” (F, 39, Quit). Hence, Chapter Five will provide an overview and qualitative analysis of the interviews which took place after the completion of the surveys. In a sequential explanatory mixed method design, the qualitative interviews follow the analysis of the survey data to explain the quantitative findings and expand on them (E. Halcomb & Hickman, 2015).
CHAPTER FIVE: INTERVIEW FINDINGS

The purpose of this research study was to understand how a cigarette smoker learns about and uses an electronic cigarette (EC) by evaluating the body connections to smoking and how that is transferable to using an EC, and by investigating the social and material experiences related to learning to use an EC. The research questions that guide this study are:

1. How do adult smokers learn about electronic cigarettes through their social (family, friends, peers, work place, etc.) and material (vape shops, blog sites, forums, advertisements, etc.) network?

2. What is the initial intended use of an EC and does that intent change with the experience of using an EC?

3. Does embodied learning impact a cigarette smoker’s use of an EC? If so, how?

To investigate these questions, particularly to gain a general understanding of how adult cigarette smokers were using an EC as well as to gain an understanding of the social and material networks in place to support learning about an EC, a mixed methods research paradigm was used. Initially, two previously distributed electronic cigarette surveys were analyzed. I used the first survey to identify adult smokers who were also using an EC device. I call them dual users. This cohort initially completed the survey between 2012 and 2014 and basic characteristics such as cigarettes per day, EC use, and type of device, nicotine dependence, age, gender, and income were collected. The survey also contained two open ended questions about the perceptions of the participants on what is important to learn about EC use and what they feel is important for a Public Health researcher to know about ECs. The survey also contained a question about willingness to be interviewed. Those that agreed to be re-contacted at the first survey were sent a follow up survey in 2017. Those who completed the follow up survey were again asked about
their willingness to participate in research. The results of the quantitative and qualitative analysis of the surveys can be found in Chapter Four. An email was sent to the 53 eligible participants who completed both surveys and 17 responded to the invite requesting to hear more about the study. Only one participant responded initially but did not follow up once additional information was provided. 16 of the 53 eligible participants who were invited to participate in the research responded to hear more information about the study and after that then agreed to be interviewed. What follows is a discussion of the sample. After that the three primary themes of the qualitative findings are presented, namely that: a) sensory and embodied connections to smoking and EC use; b) learning through the synergy of social and nonhuman systems; and c) EC as a road to quitting.

**Qualitative Participants**

The selection of the interviewed participants was determined by the theoretical framework as well as the survey results. This study was grounded in an embodied learning perspective that attends to the issue of understanding the body as a site of learning and is also interested in the emotional and sensory perspectives and experiences that give meaning to the learner. Therefore, those who were adult cigarette smokers but also using an electronic cigarette at the first survey (considered dual users) were considered for the study. This is important in the research because recent experience in using traditional cigarettes and how that connects to using ECs is a question that was investigated in this study. Additionally, the qualitative methodology sought to gain an in-depth understanding of the people and materials associated with adult cigarette smokers learning when switching to ECs. Another area of the study is how the use of ECs affects the smoker’s intentions to quit smoking regular cigarettes. The survey findings in Chapter Four found that a high percentage of those who switched from the cigalike device or
advanced EC device to a mod device had a higher percentage of being quit. Additionally, the results of the first survey regarding intention of quitting with the use of the EC shows that 74% of those who started to use the EC had the intention of quitting tobacco and 66% were quit at the follow up survey.

Initially, the group of potential interview candidates was those who completed both surveys, were dual users at the first survey, and agreed to be contacted for future research. This group (n=53) was sent an email describing the research project and inviting them to an interview, either in person or if distance prohibited that, by electronic method or phone call. If they did not respond to the email a follow up phone call was made. Of the 53 potential interviewees, 17 were interested in the project and requested more information to participate. Of those 17, one did not respond after receiving more information and 16 consented and agreed to be interviewed. Nine were interviewed electronically via a Zoom meeting, five on the phone, and one in person. 15 were residents of the United States and one lives in Kuwait but was in the United States when he completed the first survey. Table 5-1 presents the demographic profile of the interviewees.

Table 5-1
Demographic Information of Interviewees

<table>
<thead>
<tr>
<th>Alias</th>
<th>Age</th>
<th>Sex</th>
<th>Race</th>
<th>Location</th>
<th>Status</th>
<th>EC device type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Al</td>
<td>65</td>
<td>M</td>
<td>W</td>
<td>CO</td>
<td>Exclusive</td>
<td>Mods</td>
</tr>
<tr>
<td>2-Bob</td>
<td>51</td>
<td>M</td>
<td>W</td>
<td>PA</td>
<td>Poly use</td>
<td>Mods</td>
</tr>
<tr>
<td>3-Cathy</td>
<td>51</td>
<td>F</td>
<td>W</td>
<td>PA</td>
<td>*Exclusive</td>
<td>Mods, penguins</td>
</tr>
<tr>
<td>4-Diane</td>
<td>28</td>
<td>F</td>
<td>B</td>
<td>AL</td>
<td>*Exclusive</td>
<td>Mods, vape pen</td>
</tr>
<tr>
<td>5-Elly</td>
<td>44</td>
<td>F</td>
<td>W</td>
<td>IN</td>
<td>Exclusive</td>
<td>Mods</td>
</tr>
<tr>
<td>6-Frank</td>
<td>66</td>
<td>M</td>
<td>W</td>
<td>GA</td>
<td>Dual</td>
<td>BLU</td>
</tr>
<tr>
<td>7-George</td>
<td>64</td>
<td>M</td>
<td>W</td>
<td>OH</td>
<td>Exclusive</td>
<td>Mod</td>
</tr>
<tr>
<td>8-Helen</td>
<td>56</td>
<td>F</td>
<td>W</td>
<td>AZ</td>
<td>Exclusive</td>
<td>Mark 10, tanks</td>
</tr>
<tr>
<td>9-Ira</td>
<td>44</td>
<td>M</td>
<td>W</td>
<td>PA</td>
<td>Exclusive</td>
<td>Mod</td>
</tr>
<tr>
<td>10-Joe</td>
<td>31</td>
<td>M</td>
<td>W</td>
<td>PA</td>
<td>Exclusive</td>
<td>Juul</td>
</tr>
<tr>
<td>11-Kate</td>
<td>73</td>
<td>F</td>
<td>B</td>
<td>VA</td>
<td>Exclusive</td>
<td>BLU</td>
</tr>
<tr>
<td>12-Larry</td>
<td>35</td>
<td>M</td>
<td>Middle eastern</td>
<td>Kuwait</td>
<td>Exclusive</td>
<td>Mods</td>
</tr>
<tr>
<td>13-Mark</td>
<td>33</td>
<td>M</td>
<td>W</td>
<td>WA</td>
<td>Exclusive</td>
<td>Mods</td>
</tr>
</tbody>
</table>
The qualitative data were obtained through the use of semi-structured interviews using an interview guide that was developed to increase the understanding of individual’s experiences of the use of an electronic cigarette (EC), the learning environment, and how people or material systems supported the use of the EC. While the interview contained a list of questions, interviewees were free to broaden the discussion and follow up questions were asked to clarify a specific topic of discussion. As discussed in Chapter Three, the transcripts of the interviews were analyzed for commonalities using the constant comparative method. The data were managed using the software program NVIVO which helps to organize, analyze, and find insights into text rich data, such as that with interviews.

The qualitative findings are organized in light of three main areas: (1) sensory and embodied connections to smoking and EC use; (2) learning through synergy of social and nonhuman systems; and (3) the EC as a step to quitting. Each of the areas has related sub themes. The main theme and sub-themes are listed in Table 5-2 and discussed under the primary theme as they relate to research questions, beginning with, “How do adult smokers learn about electronic cigarettes through their social and material networks?”, “What is the intended use of an EC and does that intent change with the experience of using an EC?” and “Does embodied learning impact a cigarette smoker’s use of an EC?”

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Gender</th>
<th>Race</th>
<th>Location</th>
<th>Exclusive Use</th>
<th>Tobacco Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neil</td>
<td>40</td>
<td>M</td>
<td>Amer. Indian</td>
<td>OK</td>
<td>Exclusive</td>
<td>Blends</td>
</tr>
<tr>
<td>Otto</td>
<td>58</td>
<td>M</td>
<td>W</td>
<td>VA/DC</td>
<td>Dual</td>
<td>BLU</td>
</tr>
<tr>
<td>Paul</td>
<td>44</td>
<td>M</td>
<td>W</td>
<td>NJ</td>
<td>Exclusive</td>
<td>Mod</td>
</tr>
</tbody>
</table>

Exclusive EC users are those who said that they have used only an EC in the past 7 or more days, and no other tobacco products. * means that they still have an occasional cigarette but primarily use the EC. Poly use is EC, cigarette, and other tobacco product.
Sensory Embodied Connections: Smoking and Electronic Cigarette Use

Embodied learning is a theoretical perspective in adult education which examines body experiences which contribute to learning. This learning is not always obvious, but in adult smokers, several participants are well aware of their embodied experiences when smoking and how that is similar when using an electronic cigarette (EC). When specifically discussing embodied connections to smoking, for example, “How you would say that using an EC is like a cigarette?” almost all of the interviewed participants felt a similar connection to the EC as they had with smoking. In particular, Mark commented “the ones that look like a cigarette definitely have the same mechanics of smoking, and I liked that right off the bat” and Neil liked that the earlier versions of the EC “looked like” a cigarette. George is quite satisfied with the cigarette like feel of his EC saying “Except for the fact that that I am holding an electronic device, it is exactly the same as my cigarette, except it is not a cigarette, it is an electronic device.” Frank mentions that his EC version not only looks like his traditional cigarette, but it also tasted, felt, and sounded like it saying:
They have the same draw, very similar tastes, they are the same size as a 100 cigarette, the long cigarette, and the same diameter and they feel the same in your fingers, and they’ve got something in them that makes some crackle sound like a burning cigarette, they have something in them that, you know, they just really draw a lot like a cigarette.

Nicotine delivery and the connection to the body does not go unnoticed in smokers who use ECs. When considering the way nicotine is delivered in an EC, Cathy states “I probably vape the same way I smoked but more often because it’s a slower release so I can just maintain it all through the day” and Diane mentions that “as far as the nicotine in it, if you choose to, you can still have your nicotine”.

Social interaction is often times part of smoking and it is also noticed when a smoker is using an EC. Joe explains it as:

It’s very similar. You still get all the same social aspects which were a big part of smoking. For most of my life, smoking has been a way that you could take a break with work colleagues and see like people open up more, standing around the smoker circle even if you’re the person just having what I call a secondhand smoke break (and laughs) it opens people up.

Joe is now an exclusive EC user, and he continues to describe how the EC is similar to his smoking by saying:

Yes it is exactly like smoking for me. I primarily use it while sitting at my computer which I used to chain smoke a lot at my computer. I use it when driving, at smoke breaks I use it then and anytime that I’m walking in the woods or whatever hiking I used to smoke cigars and I have with me then.
In general, almost all participants found the EC to be similar to a traditional cigarette in some way. As discussed in Chapter Two, other factors important to embodiment of smoking are the involvement of the senses (sight, taste, smell) and the emotions that are activated when smoking and trying to quit. The actions which simulate smoking (hand to mouth, inhaling and exhaling) seemed to be of high importance to the cigarette smoker also. These were found to be subthemes of the body connections to smoking and are discussed in the next several sections.

**The Importance of Smokers Senses When Using an Electronic Cigarette (EC)**

The body has senses of sight, smell, taste, feel, and sound. These senses contribute to learning to smoke and creating a way of life around smoking. Smoking has been thought of primarily as a nicotine addiction, but in addition to that, smoking activates body senses which, because of the frequency of smoking, create a pattern of use in the smoker. This pattern of use and activation of the senses is noticed in EC use too. Al talks about “the oral sensation” and how the EC satisfies that for him. Kate is quite aware of her senses when using the EC. She is also an exclusive EC user. She uses the BLU cigalike device. Although she acknowledges that her EC has nicotine in it, she doesn’t believe that is her true addiction:

I think the whole story here is when I started using the e-cigarette I was on the highest dosage of nicotine that they had. I started on the 2.4% and after about a year I transitioned down to the 1.2mg so I cut my nicotine intake but I honestly think if I went to the zero nicotine I would still be okay because I think I’m more addicted to the act of holding and sucking on it and blowing something out of my mouth so that is my story.

Body senses and actions create experiences for people and multiple repeated actions solidify a way of life in the world. Smokers recognize their actions and way of life and when trying to quit, the sensory stimulation similar to smoking is important. In fact, Neil, an exclusive EC user
with a mod device, acknowledges his sensory triggers that were developed when smoking and how the EC relieves his desire to smoke:

Even if I was not using it much, a lot of times I would just kind of have it in my mouth or between my fingers like I would a cigarette. So I think having it cut down on me thinking about it and wanting to smoke. It kind of felt like I had a cigarette with me; I’ve really felt like I could just take a drag on it, but I wouldn’t have to, there wasn’t the commitment of when you light up a cigarette you kind of just want to smoke the whole thing. When I had one of the EC, I could just take a puff or two, and I wouldn’t want any more for quite a while. I could just hold it or have it there so that helped a lot. I don’t think I was really using the EC as much as I was taking drags on a cigarette because I didn’t have to. There was no time restriction; it wasn’t burning down or anything. I would just take a hit off of it whenever I felt like I wanted one.

There were some EC users that were not really paying attention to their EC use because their senses were satisfied, and they just went about their day. Re-experiencing events similar to smoking through body movements and sensory stimulation was helpful in transitioning to the EC. Although many EC users initially were very purposeful about their EC use as Paul states “I used to consciously say ‘all right’ I’m going to do this for this long and this many puffs” as time went on that changed, “but now it is just more or less whenever.” Larry is an exclusive EC user and has noticed that he vapes without even thinking about it. He is somewhat concerned about that and notes:

The problem with e-cigarette is that it’s easier to use. Like, for me, I know when I used to smoke I could not smoke in my house. My wife would just kick me out. I would have to go outside, and, here, the weather outside is very hot. No way will you enjoy the smoke, so I
use to smoke way less. Right now all I have to do is just puff it, and that’s it. If you ask me how much do I use the EC, I can’t tell you. I don’t have an answer because I’m not even noticing myself how much I’m using it.

While some EC users expressed a concern over the ease of using the EC others describe it as a way for them to reduce smoking without uncomfortable sensory withdrawal. As Mark, an exclusive mod user, describes his use of EC in the morning “I guess only because when I vape, just like when I smoked a cigarette, I could feel the sleepiness leave my eyes.” He goes on to explain his transition from a cigarette to an EC by saying:

Yeah I used to mirror my e-cigarette use to my cigarette use, but now heck I barely even hit it since talking to you and if I was still smoking cigarettes, I probably would’ve been outside three times already smoking a cigarette, but with vape, I mean in the beginning, I definitely mirrored every time I smoked a cigarette. I was smoking on my vape, but after a while, once I started cutting down, and I didn’t need as much nicotine I definitely don’t smoke it as much.

At times, that was concerning to those EC users that felt they vaped more because of the ability to vape in their home or at work. Helen had a tendency to use the EC more now that she can vape in her home because to her, it doesn’t smell bad. Cathy, an exclusive mod user, vapes without paying much attention to it. It is just her way of life. She says:

I vape almost mindless, so I always have my vapor with me, at least one if not two. When I leave my house, I often have two. You never know when a coil burns out, then you can’t use that device without changing the coil so I don’t have to do that on the fly, I don't carry coil with me, so I just carry two devices.
Embodiment of smoking creates a way of life around certain activities of the day. They are described as cues to smoke in the literature. This way of life can be altered with EC use and Bob, who had owned a vape shop for three years, tells of his transition to EC use around his habits or rituals of daily living:

The times that I would use cigarettes was ritualistic for me. When I first opened the shop my car still smelled like smoke from smoking in it and the times when I really wanted to smoke was when I was driving to and from work. I would get in the car and smoke. That was the ritual because I was a smoker for years. When I would start my car, the next thing I would do was light a cigarette; so I would say this is less with vaping. Less ritualistic, I think, it’s weird and that’s where a lot of people that I talked to who vape have a hard time in the evening. The most cherished cigarette for a lot of people is their last cigarette of the day before they go to bed and they sometimes find it quite difficult to sleep until they stomp out that last cigarette of the day and with this it’s not so much ritualistic.

This way of being, embodiment of smoking, and how that is the same with an EC shows the sensory dependence learned by cigarette smoking. Bob, Cathy, Elly, and Ira tell of their habit of always having their EC with them, perhaps even more than one as Cathy discusses her ritual when leaving the house. Diane explains the dependence in a different way. She has reduced her EC to zero nicotine and feels much less need for the EC. She can leave her house, and if she forgets her EC, she does not feel the need to turn around and go back to get it. This was not her way when she was smoking or on nicotine EC. She describes this need as “an urge”, and with the zero nicotine EC, the “urge” is gone. It no longer controls her body needs. These learned experiences from cigarette smoking do transfer to EC use and have real meaning to people as Paul further explains:
I don’t really think about it. I usually have it with me. I guess from the time I get up. I have my coffee and instead of a cigarette I want to vape. I drive to work instead of smoking I have a vape. At work, every couple of hours, I’ll take a step out for 5 to 10 minutes to vape. I will vape in the car on the way home and then just kind of sitting around fiddling with stuff. I pick it up more or less absentmindedly. I guess I don’t really pay much attention to it. The only time I pay attention to it is when I’m going out. If I’m going to a restaurant or something like that, I kind of hit it before walking into the restaurant just kind of like a normal smoker I guess I would say.

The sense of taste seems to make a difference and changes in smokers who switch to EC.

Most of the participants stated the importance of flavors when using an EC and all of them but one, Otto, used a flavor in their EC other than tobacco. Three of the participants, Bob, Elly, and Ira, stated that they can’t understand why there are groups against EC candy flavors saying that “I am an adult, but I like candy flavors too.” Contrary to that, Otto expresses concern over the fruity and candy flavors saying “offering sweet and candy flavors, that is targeting young people.” However, choice of flavors is obviously valued when using an EC. This is described in multiple ways with several EC users. Bob, a dual cigarette and EC user, says this about the stark contrast between cigarettes and EC and the importance of flavors when using an EC:

I’ve never known anyone that said “yeah I got to smoke a cigarette because they just taste so great”. They don’t taste great. They taste terrible. You get used to that. You get numb to that terrible taste just from smoking because it reduces your sense of taste. So, yeah, most people start, I think, myself included, with tobacco flavors, and then, after a while, they try something different and say “wow, this taste so much better why would I do this other thing, tobacco flavor, when there are better tasting flavors”. It’s all very personal.
The importance of flavor choices was clearly stated by several of the participants. Cathy describes her choice of flavors and how they affect her senses:

I am all about the fruit flavors. I want to taste like 7-Up or lemon lime. I have one called a lemon vapor, which is very lemony. I am not a huge fan of any kind of a creamy designation to it. They are good, but I can’t do too much of it. It is just too sweet, too rich in my lungs, mouth, and taste so I’m pretty much the fruit or lemon lime, watermelon, cherries, or berries.

For the most part, EC users had some pattern of use that alleviated the expected sensory stimulation. Many users puffed on the EC in a similar way to their cigarette; however, with experience and use of the EC, the frequency of the puffs changed. There is no time limit to using an EC, and it can be turned on and off. Several participants were surprised that they could go longer between vaping episodes and did not require as long of sessions as with a cigarette. Several of those who are exclusive EC users noticed that they can avoid smoking a real cigarette because the EC satisfies the desire to smoke. In addition, sensory desires changed particularly in the sense of taste. Many EC users found that if they did take a drag on a real cigarette, they quickly realize how terrible the taste of the traditional cigarette is and could easily put it down.

In addition to the cigarette tasting bad, the sense that the EC doesn’t smell bad made an impact and was mentioned by several male participants and all five female participants and encouraged two to stop smoking completely. After using primarily an EC but a few traditional cigarettes throughout the day, smelling the smoke from the cigarette on her hair was the catalyst for Kate to stop smoking altogether and only use her EC. Cathy states that she is able to not smoke because “it stinks” and she doesn’t need it. Diane noticed that the EC didn’t “leave a smell on her.”
The sight of vapor on exhalation satisfied several EC users’ sense of seeing a plume of smoke although; Diane and Otto mentioned that the EC is different because there is no smoke coming from the end of it. “It just lights up red.” The sense of having something in your hand, bringing it to your mouth, inhaling and exhaling all mimic the act of smoking for the EC user and is discussed in the following section.

**Embodied Habit or Actions around Smoking and EC Use**

The action of smoking has real learned behaviors. All of the participants in this study have smoked cigarettes for many years with the longest smoking over 50 years. Several mention the importance of the physical actions involved in smoking in particular the hand to mouth action. For example, Kate, is a 73 year black female who smoked for over 50 years, uses a cigalike BLU EC and has been an exclusive EC user now for four years and explains the hand to mouth action as another addiction just as strong as the nicotine addiction: “I found that I was addicted to the actual physical act of holding it in my hand and putting it to my mouth. Like a pacifier for an adult.” Additionally, she describes the cigalike device as satisfying the need of “how I hold it and put it up to my mouth”. Replacing the “experience” of smoking with a specific action was so important that it made a difference in which device she used, saying this about the pen-like advanced model EC: “Oh this isn’t for me, this is too big and didn’t feel right in my hand.” Two participants mentioned the action of holding something and putting it to their mouth as the reason that the nicotine patch didn’t work for them, but the EC did. Mark, a 33 year-old white male who is an exclusive EC mod user says the patch didn’t work for him because of the whole “cigarette effect-having something to suck on and all that.” Helen, a 56 year-old white female who is an exclusive EC user of cigalike and mod devices says:
The habit, just doing that I guess it is the habit of putting it in your mouth. I think, for me, it is way better than the patch because of the habit. You are occupying your hands, you know, when you are smoking you always got something going on with your hands and even if you’re not even smoking you are kind of holding it.

The action of having something to do with your hands “occupying your hands” was so prevalent that every interviewee mentioned it. Paul, a 44 year-old white male and exclusive EC/mod user comments:

What kind of peaked my interest in electronic cigarettes is that a lot of times I just found myself looking for something to do with my hands whenever I tried to quit. So just having that electronic cigarette in my hand was one of the things that kept bringing me back to not going out for a cigarette.

Several interviewees referred to it as the “experience of smoking” while others would say that they just needed something to do with their hands. Frank, a 66 year-old white male dual EC and one cigarette per day says this about his hand to mouth action, “I’m a very nervous type person I’ve got to have something in my hands. I don’t know if you can see it but right now I’m just like twirling the EC in my fingers.” Cathy, a 51 year-old white female exclusive EC user, explains her rationale to considering using an EC by saying:

I was getting more curious about it and wondering since I had successfully quit smoking before, I was wondering if that was a good replacement because I think that I found when I was trying to quit smoking, the nicotine withdrawal is difficult for the first couple weeks, but I think the lasting withdrawal part is the hand to mouth motion that you’re just so habitually into for the number of years that I’ve been smoking, for decades at that point, so missing that movement happening, hand-to-mouth, hand-to-mouth, hand-to-mouth, you
know and blowing something out was harder to overcome than the actual nicotine withdrawal.

In addition to the hand-to-mouth, the action of inhaling and exhaling smoke was mentioned frequently as well. As stated above, the action of smoking is a learned behavior that becomes a comfortable part of life and not one that a smoker wants to give up. When presented with an option to replicate the experience of smoking with something that is not a combustible cigarette, many smokers will try it. The ability to inhale and exhale a vapor satisfies what Neil calls the cigarette sensation of a “throat hit” and the “physical habit” of smoking. As Elly, an 44 year-old white female exclusive EC/mod user says about inhaling and exhaling “especially if the vapor is warm, that helps a lot to replicate the physical experience, the deliberate inhale and exhale, it is almost like meditation.” Several participants described their actual inhalation of the vape as like a cigarette such as Cathy and Ira mentioning “I pull it into my mouth and then inhale much like I did with a cigarette”. Some described it as different from inhaling a cigarette. Neil for example mentions “I inhale it straight into my lungs, what’s called direct to lung vaping. With a cigarette, I would suck it into my mouth then inhale.” Some of these inhalation actions are dependent on the technology of the device. Airflow valves on the more advanced mod devices and battery voltage and temperature are important features to consider when learning about and using an EC. This will be more closely examined under the theme steps to quitting with an EC.

Cigarette smoking is a nicotine addiction and as discussed in Chapters One and Two, nicotine changes the brain of a smoker. It is the reason for the addiction, and this need for nicotine keeps the smoker using cigarettes. Once addicted to nicotine, the smoker’s body becomes accustomed to certain actions and behaviors around receiving the nicotine, such as driving in a car or socializing with friends. This is described as embodiment of smoking and is considered as a
fundamental reason that ECs are being used by cigarette smokers to reduce or quit cigarettes. But it is difficult, if not impossible, to separate the addiction to the nicotine itself from the action or behavior or bodily movements that become associated with nicotine itself, though it is possible that an aspect of the addiction is not the nicotine but the behavior or motion. As will be discussed further later, a potential benefit of the use of the EC is that the user can titrate off the nicotine, but still get the pleasure associated with the physical movements, actions, and behaviors.

In the interviews with EC users, several mentioned the value of being able to adjust nicotine levels when using an EC, as Bob mentions “I know some people adjust their nicotine level by the time of day, using lower strength in the evening” or from Frank “there is a relationship in my case I find that as the stress goes lower I go lower with my nicotine. When the stress picks up, I go higher.” Cathy and Frank talked about potentially going to zero nicotine at some point, and Diane, a 28 year-old black female exclusive EC /mod user, has already made the transition to zero nicotine and has been at that level for several months. She explains that “I went to zero nicotine because I didn’t like the urge of always having to have my vapor on hand.” Frank acknowledges “that is the nice thing about it”, meaning the EC, “you can have the physical acts of smoking with zero nicotine or tobacco.” George and Ira both mention that they are getting less nicotine with the EC than the cigarette, and Paul even stated that there is an equivalency chart that allows the smoker to compare how many cigarettes they smoke a day and about how much nicotine they will need to replace them. From there, the EC user can slowly reduce the nicotine level if they want to. For some people, the ability to wean slowly off nicotine or to adjust nicotine levels to a point that they have no desire to smoke is an emotional boost and allows them to perceive of themselves as being a non-smoker. The next section discusses perceptions and emotions around EC use.
**Perceptions and Emotions around Electronic Cigarette (EC) Use**

Perhaps because all of these participants have tried to quit in the past, they all had some degree of emotional experience tied to using the EC and quitting or reducing cigarettes. Perceptions help us to interpret our sensory information and understand our environment. When switching to an EC this way of knowing did not go unnoticed, and it was expressed in all of the participants and categorized in five groups as (1) believing the EC will work; (2) experiencing a happier feeling in general; (3) seeing the EC as a healthier alternative to smoking; (4) increasing self-confidence; and (5) facilitating unintended quitting, in which several participants didn’t want to smoke because they knew it was bad for them and the EC allowed them to do something about that.

**Believing the EC will work as a step to quitting.** Five of the participants specifically stated the moment when they believed that they could become a nonsmoker. For Kate, it was after several months using both the EC and traditional cigarettes and smelling the smoke on her hair after she had smoked a traditional cigarette. She asked herself “why are you hanging onto these things when you already know that you like EC and can use them? And that is when I said enough is enough.” Mark explains his belief a little differently and relates it to his need to know that he will get what he needs in the EC and that it will work for him. He says “you need to believe that in the beginning you are getting the nicotine that you need and that this is what you are going to be doing from now on. You have to believe that it is going to work.” Diane, a 28 year-old exclusive EC/mod user, is even considering the possibility of not using any products. She tells the thoughts of her journey as “I kind of thought when I started vaping that maybe it was going to eventually allow me to stop smoking.” And after three years on the EC, she is down to zero nicotine EC and says “I still have the mindset of not smoking at all and maybe even quit vaping.”
Perception is reality is often used as an expression, but for George, a 64 year-old almost 2 pack a day smoker who has been smoking since he was 14, had tried to quit several times but could not stay quit, it was his fate to continue to smoke. He describes himself as a hardcore smoker and because of his past experiences of trying to quit and failing, it became inconceivable to him that he would ever stop smoking. But that changed in 2012 when he saw a coworker using a device that looked like a cigarette. Although it wasn’t on his mind to stop smoking at that time, he started using the device to cut down on his smoking and after several years and experimenting with different versions of the EC he came to realize that “once the technology got pretty good and now that I actually like the taste of it, it just happened. It became conceivable to me that I could just quit smoking cigarettes.” At the time of the interview, George was an exclusive EC/mod user.

A happier feeling. The addiction to nicotine but also embodiment of smoking is profound and as George states after failed attempts to quit it becomes inconceivable to be able to stop smoking. Ten participants mentioned a happier feeling in general either because they could get nicotine regularly by using an EC or that they could feel more like a regular human being who is not an outcast. Al is a 65 year-old white male who has been an exclusive EC/mod user for the last four years. He describes this happier feeling by saying:

I mean it’s just like I say I have been vaping since 2009, and I still am enamored with being able to do it….The vaping is just do it anywhere in the house. It is probably the happiest I’ve been you know cigarettes are just so expensive and, you know, it wasn’t a happy addiction ….When I smoked, I would get uncomfortable. I don’t get uncomfortable now. I might wish I’d have the EC, but I don’t feel so fidgety….The EC gives me I would say 150% enjoyment compared to a cigarette because of the fact that I can be right here right now…. Vaping is such a life-changing experience to sit on a couch and occasionally vape.
… If I was smoking I would have to take a break or two and leave this interview. Now that I use vaping I don’t have to go outside…. for years I was not able to enjoy a movie or watch TV in the house. I have always felt at least for the last 15 to 20 years uncomfortable about smoking anywhere in the house.

This happier feeling presented as an internal dialogue and some smokers described it as a relief that by quitting smoking, the body is healthier. Paul states this in respect to his health “personally using the EC makes me feel like I am taking better care of myself…I was beating myself up over not being able to quit.” Cathy expresses “freedom in not needing to smoke,” and she does not feel the guilt with using the EC as she did with smoking. She says “it makes me happy on so many levels, it’s less expensive, it’s healthier for me, and it doesn’t stink.” Elly tells of how she didn’t realize how bad her health had become until she quit smoking and now that she is breathing better she is more active and enjoys life more. In particular, Neil, a 40 year-old exclusive EC user, relates to how he changed this dialogue in his head once he realized how quitting smoking improved his health. He describes the feeling in this way:

I guess the problem was I wasn’t worried about my BP and I should’ve been. Now that I realize it is better controlled, I think about it more. It’s a positive thought because I’ve done something better. I’m doing things that repairs the damage I’ve done whereas before when I was smoking cigarettes, to think about the damage they are doing to my body, that’s depressing stuff to think about especially if you’re having a hard time quitting or not wanting to quit. At that time, you just feel like you’re killing yourself for the stupid cigarette but you’re still smoking anyway so I didn't give it much thought. Now, I don’t have those kinds of things to worry about or think. It is definitely a relief.
As discussed in Chapter One and Two, nicotine is a stimulant and a very strong and addictive chemical. Quitting nicotine can have negative physical and emotional impacts on smokers. Two participants talked of quitting smoking and being in what they described as a fog. Paul says:

There is a point where I went about six months without smoking and during that time period I was in a constant fog. It just never left. I couldn’t concentrate. I couldn’t focus and after a while I started finding that if I have a cigarette I would start being able to focus. I would start being able to pay attention, and so one of the reasons I would go back was because of that. I couldn’t focus at work really. I would function but there was just something I lacked, the ability to kind of really focus and pay attention.

Helen, a 56 year-old white female describes her experience without nicotine as:

When I think about not using the nicotine, it makes me nervous, because I don’t like being in a fog. No energy it’s hard to explain. That’s a bad withdrawal it’s a drug and I’ve been on it most of my life and you know what they say if you could change one thing I think that would be it cigarettes.

Currently both of these participants are exclusive EC users and appreciate that their body functions better on nicotine. They also are happy that they have an alternative to nicotine delivery that is working for them. Even when discussing the use of FDA approved nicotine replacement, Cathy says “I did feel better on the nicotine patch but you know I could only use it for a short period of time. I needed the nicotine longer.”

**The EC as a perceived healthy alternative.** The perception of the EC as a healthier alternative was mentioned by eight of the participants. Paul describes his understanding of the health impact on him psychologically by saying:
For me, it’s definitely made a difference. I knew there was a point I was at, with my health, where things were getting really bad for me. Now my health is a lot better than it ever was. So for me, these things-the ECs, I don’t know if I would call it a lifesaver, but I would say it’s something that has given me the ability to live life.

Life altering interpretations were expressed in the environments of EC users also. Diane is pleased that she is not using something that is “on fire.” She is happy the she doesn’t “smell like smoke.” Al talks of “yellow walls” in his previous home where he smoked inside. He does not have that in his current residence in which he vapes. Since he has been vaping exclusively, George noticed that his windshield in his car is cleaner and his home doesn’t smell like smoke. Elly describes the change in her environment by saying:

I noticed otherwise, in my environment, it targets everywhere. My car is cleaner and nicer, my home is cleaner and nicer. There is no longer that weird yellow stuff that happens on your walls and your floors and curtains in your blinds all that stuff gone. All of the detriment that comes from smoking is gone. Places where I no longer smell like ashtrays that’s all been replaced with fiddling around and cursing the occasional tank.

**Increasing self-confidence.** Achieving a goal increases self-confidence and several participants discussed this feeling when they quit smoking and switched to ECs. Al feels less worry if he runs out of e-juice or forgets his EC. “It is not as big of a deal as when I smoked.” After using the EC exclusively for four years, Kate states “I will never pick up a cigarette again, ever.” Larry bought the EC and promised himself that he would use it. He did have some side effects of coughing when he first started but he continued, and, after about a month, he was fine. ”I promised myself I won’t stop using the EC. I kept going and in a month the coughing was gone. I am now exclusive EC user.” Mark tells of his entire outlook on life changing “All I know is that once I quit
cigarettes my whole outlook on life was different. I wanted to be better, I changed.” Cathy wanted to bring attention to the ease of using EC to quit smoking. “You know, as a smoking cessation program, it’s not so bad at all. It’s great and painless really. I didn’t have any withdrawal. And it didn’t take that long…six months to fully transition” George echoed a similar sentiment by saying “I think it’s great…it was easy, it wasn’t a struggle at all.” But his transition to exclusive EC use took longer than Cathy. “It was a long process. It was probably drawn out over three years.”

**Facilitating unintended quitting.** This increased confidence even spilled over to unintentional quitting. Several participants (Neil, Paul, Mark, and Helen) were not intending to quit smoking. They just wanted to find a way to reduce their cigarettes smoked and use a nicotine device in places where they couldn’t smoke. However, as they used their EC, the desire for a cigarette reduced, and it came as a surprise for some. Neil says “with the EC I just would not really think about wanting a cigarette,” and Mark comments “I bought the Logic Pro because I saw a commercial. It was 50% off. I wasn’t expecting it to work as well as it did. I took a drag on one and thought ‘wow’ this works really well.” And similarly with Helen “once I realized I liked them, it hit me that I can quit smoking.”

Similarly, Paul, an exclusive EC/mod user, had no intention of quitting but was looking for something to help him take a shorter cigarette break at work. There was a spot closer to his office location that the employees were allowed to use an EC but not smoke. The area for smoking was much farther away. Paul saw a coworker using the EC at the closer location and asked more about it. Paul said:

My only intention for using the vaporizer was to make my work breaks shorter but at some point and somewhere along the line, I found myself just not liking the taste of the cigarette. No explanation. It was about three months of doing the vapor that one day I just did not
like the taste of the cigarette. It did not smell pleasant. It didn’t taste pleasant and I found that I just started, you know those people who talk about the first time they had a cigarette and it was disgusting, that’s kind of the way I felt. It felt disgusting; I just didn’t like it and I just kind of naturally progressed into just using the vaporizer all the time.

**Summary.** As discussed in this section, there are several ways that using the EC is like smoking. From the activation of the senses to the “throat hit” of nicotine. The participants made comments about their intentions and feelings around using an EC and they are happier and healthier feeling because of their EC use. Otto explains his feeling about the EC as this “it is like a blanket. It is a good feeling to know there is this nicotine delivery system if you need it.”

The theme of this section was body connections to senses and smoking and how that affected learning about and using an EC. Adult learning also happens in other experiential ways, those that are supported by networks of people and material things. The next section examines the participants’ reactions to learning about the EC and what social and personal experiences supported their understanding and use of an EC.

**Learning through the Synergy of Social and Non-human Systems**

Humans learn through other people and through systems and materials that are available to them. Investigating the social and material experiences related to learning to use a new device, such as an EC, can provide valuable insights to the field of adult education. When specifically investigating how adult cigarette smokers were exposed to the EC, for example, “Tell me a story a story about the first time you heard about an EC?” many communication systems were mentioned, such as the internet or television commercials, or through people, such as coworker or friend. The majority of participants saw or read something through the internet or television although Diane, Ira, and George saw someone using it. Kate read an article in the
newspaper and Cathy walked into a vape shop. At the time of seeing or reading about the EC, most participants were not actively pursuing a way to quit smoking. Only Larry, a 35 year-old Middle Eastern male and an exclusive EC/mod user for the last four years, was actively trying to quit smoking. He tells the story that he was purposefully looking for a way to quit smoking when he found out about ECs:

I was looking for a way to quit my smoking. I went on the internet and was looking for a way to quit. An ad for an electronic cigarette popped up. First of all I never had any clue what is an electronic cigarette. I was looking, googling, searching alternatives for smoking.

Conversely, Kate, Joe, Paul, and Neil, describe their exposure to the EC as something that “peaked their interest” which led to them researching more about it. However, when Frank and Mark saw an ad for the product on television they “went to the store” to buy it.

How smokers continued to learn about and use an EC was supported in a variety of ways. Cigarette smokers searched the internet for websites about the EC. Paul says after he heard of the EC he went “hopping around the internet” to learn more about it. Bob tells of his progression from just knowing of the EC early on “maybe it was 2009 when I got one that was very primitive…basically awful” but 2 years later “I heard from my friend…that the technology had evolved.” In education, mentoring is helpful, and trust is valuable for those who are learning something new. Elly credits her success with using the EC to an online friend who quit smoking with an EC and “swore by it” and would check in and guide her in her progress; “we had somebody cheerleading for us which I think in the end made a lot of difference.” Regardless of how adult smokers learned about an EC, continuing to use an EC was impacted by the people and systems that supported or did not support its use. Many people are touted as being helpful to learning about EC use, but not all of the systems in place are in favor of EC use and the
perceived support or lack of it by the government and healthcare providers is explored. These are
the subthemes of this section and are discussed in more detail in the following sections.

Ongoing Learning and EC Use

It is evident in the interviews that once a smoker is exposed to the EC, ways to learn
more about it becomes important. Understanding the ways that the EC works was mentioned as
imperative in continuing to use it, and EC users are eager to go about this learning. This was
evident in the participants’ answers to the question “What would you say is an important for a
smoker who wants to use an EC to learn?” Most of the participants said education is important
and gave advice about who to ask or where to go to learn more about the device and using it.
Social networks, such as online internet sites, were mentioned most frequently as an informative
place to learn about ECs with Al, Larry, Neil, Paul, and Ira mentioning the value of EC forums.
The value of YouTube videos was mentioned by Neil as a way to learn more about the pros and
cons before buying the device: “I was watching a lot of YouTube videos where people were
reviewing different EC mods.” Kathy uses YouTube videos to “review products,” and Ira
follows YouTube reviewers to get an idea of what new products are available. Mark used
YouTube videos as a way to weed out those who knew what they were talking about and those
who didn’t. He found several valuable resources by doing this. He says:

I did a lot of research…I just looked it up on Google, and the search led me to YouTube.
There are a lot of people on YouTube, and they’re very knowledgeable about these devices.
I just started watching a bunch of them … and started watching the ones that I could tell
had some real knowledge on these things. I found a site called CASAA, [Consumer
Advocates for Smoke-Free Alternatives Association] and they had a lot of good
information on their so just through that website and watching all the YouTube videos.
Brick and mortar stores as sites of learning. In addition to internet sites, brick and mortar stores, such as vape shops, were mentioned as a learning site by Joe and Cathy who both mention the value of being able to talk with a person who is knowledgeable and can answer your questions. Elly thinks it is important to “support” those who “bother to open a brick and mortar” store, and Ira says “go have a chat with them.” Helen mentions the value of being able to “try different flavors” in the vape stores [trying different flavors has unfortunately been disallowed recently].

Interactions with human and nonhuman networks are a support system for adult learners. More specific to adult learning, these systems provide a method to share lessons that are learned thorough life experiences. Bob, who had owned a vape shop for 3 years before having to close down this past year due to the increased Pennsylvania tax burden, responded to his understanding of how smokers learn about ECs by saying:

It’s wonderful how they learn about it actually. It’s a very community centric activity.

There are thousands and thousands of Facebook groups about vaping. The e-cigarette forum…is a big one. So people can ask on social media, or they can connect on message boards where they can ask a vape shop or go and talk to someone at a vape shop, so it’s really knowledge that’s passed down from one generation to the next.

EC features and design are mentioned by every participant and include how the EC looks, e-liquid flavors and nicotine levels, and components of the EC, such as batteries and chargers. How they learned about these characteristics was varied. Joe bought his first EC as a “kit sight unseen from the internet.” He read about the benefits of buying the EC as a kit on a website which sold ECs. Cathy has been an exclusive EC user for the last three years and bought her first EC as kit from a gas station “a Loves truck stop.” It looked like a cigarette, “was rechargeable,
and refillable but it didn’t work. I hated it and threw it out.” She learned of other devices and how they worked through “social media and things on Facebook.”

The following participants, Otto, Frank, Helen, Kate, and Joe all like the cigalike design. Even though Kate, a pack a day smoker, and Joe, a half a pack a day smoker, initially were exposed to the bigger vape pen design by personal encounters, they did not like the need to “fiddle with” the device and appreciated the ease of using a cigarette looking device that was an easy to use design. In addition Frank, who at his peak smoked 20 to 30 cigarettes per day, started with the cigarette looking design but was given a mod device as a Christmas gift. “I did not like it…it made my stomach sick…it may have been the e-juice…it sort of overwhelmed me.” Conversely to the success of the cigalike design for some, George, smoked over a pack a day, and Cathy, a pack a day smoker, did not like the ones that “looked like a cigarette” and felt that “they do not work.” Although they did admit that they “might be okay and work for some people” but “not for me.”

**Taste and learning.** EC juice flavors were frequently mentioned as very important to the use of EC and ways to experience different flavors was mentioned by everyone interviewed. Visiting a vape shop was mentioned by Cathy and Neil as a great way to experience different e-liquid flavors while Ira and mentioned belonging to a “vape club” and sampling different flavors. Surprisingly, not everyone was in favor of the variety of flavors offered. Otto, 58 years, and Frank, 66 years, are both dual users and use tobacco flavor and “prefer” it over other sweet or fruit flavors. Although Al, 65 year-old exclusive EC/mod user of four plus years, would not be using an EC if tobacco was the only flavor saying “I tried tobacco flavor… and if that is all I had I would have gone back to smoking.” This conflict of interest applies to other types of flavors too. Diane saying “you can stick to menthol if you like or you can smoke something sweet or
something dessert.” Elly comments “I like fruit and dessert flavors.” She also mentions her support of candy flavors and the concern that the candy flavors might be banned because they are believed to be targeted towards kids by saying “You can find me online saying ‘cut the crap about advertising kiddy flavors’ I like strawberry.” Mark shares her sentiment saying “I am an adult, but I like bubble gum too.”

In addition to EC liquid flavors, nicotine levels are frequently mentioned by EC users, and many have reduced the level of nicotine in the liquid they use. How they learned about this is varied. Three of the four females (Elly, Cathy, Diane) and George buy their nicotine juice from a vape shop “in town” and work with them to manage or reduce the level of nicotine in their juice. Diane has reduced over the last six months from 6mg to 0 mg nicotine per ml in her liquid. Elly also reduced her “nic level from 30 to 20 mg/ml.”

Al, Bob, Helen, Ira, Larry, Mark, and Neil all buy nicotine liquids online but have also had experience with using different nicotine level liquids. They learned from online forums, visiting vape shops, or talking with other EC users about reducing nicotine levels. George has learned from an online forum how the nicotine he is absorbing from vaping equates to his smoking. He says “I was trying to figure out comparison between e-liquid concentrations and how much nicotine I am getting … so I’m probably doing about the equivalent of 10 to 15 cigarettes per day in nicotine.” Unlike many of the participants who were interested in reducing nicotine levels, George found on the internet that nicotine is not a real health concern to him so he says “I thought about cutting that down but the thing is why? I can’t think of a reason to.”

Battery safety is mentioned as important and not understanding it is a hazard. There are online venues and vape shops that provide support and education of battery safety. Cathy states
that the battery type is important to her and she does not want to risk any danger with one so she purchases her device online from the same company with the battery in it. She says:

I wouldn’t buy a device that had rechargeable batteries besides the lithium ones we have here [she points to her mod EC device] which I find they are not any more dangerous than your cell phone. I don’t like those rechargeable batteries. People don’t know how to store them right. When you hear about most vape accidents are because of those rechargeable batteries. People don’t know how to use them, how to store them, how to carry them around, so I want nothing to do with that

Bob has a similar comment about battery safety, but he defines the importance of face-to-face with a vape shop employee:

I think that’s another aspect of vape shops. If we sold somebody something, such as the battery, we would always give them a box, and there’s a safe way to carry batteries. You put them in a box, a plastic box, and click it shut. If you stick it in your pocket, nothing can short it out. So vape shops are such a great resource for that.

**Learning and support from family, friends, and co-workers.** When learning about how to use an EC, many types of people were mentioned. Understandably, coworkers were frequently mentioned. Hours are spent on the job with most of us spending at least 40 hours per week with our coworkers. So it is not surprising that, what adult education calls, informal learning occurs. Neil says Paul comments that “there was a guy at work who had been using a vaporizer exclusively,” George “my first exposure was somebody at work,” and Ira says “the first time I seen one and tried one was at my place of employment.” Frank’s story is interesting because his coworker was an advocate for not smoking. Frank says:
So the person that raised all the heck to get the smoking out of the office is a reformed smoker, and he is quite glad that I switched to vaping. As a matter of fact, when the big push to switch was made he offered to buy it all.

Other advocates for teaching about ECs and supporting the use are EC users themselves. This makes sense when thinking about how learning occurs, particularly when it is a positive experience for someone. EC users mention their desire to “share the love.” Al supports EC use by talking about it at work and also giving away EC devices. Kate tells of a complete stranger’s enthusiasm about his vaping experience as “he was so great and enthusiastic about how he used to smoke and now he switched to vaping.” That stranger’s enthusiasm inspired her to try it. Mark tells a story about his first experience with the EC:

I did know one person. I didn’t know him very well, but he let me hit it a couple of times on his EC. It was a bigger one with the tank and that was really what made me want to do it. I said okay yeah I like that a lot and that is something that I’m looking for.

And Mark went on to “share the love” by allowing his friends to try his EC.

Not everyone is so confident in sharing their experiences. Although Joe successfully quit he is not comfortable telling others to switch saying:

I don't give health advice to somebody or something. I’m not getting into that territory. I’m not nowhere near health professional so I do my own research and I feel comfortable putting myself through it but I can’t make any recommendations of stuff like that to regular people.

Family members support using the EC and showed support in several ways. Al, Bob, and Kate mention that their family liked that they no longer smelled like cigarettes, and they even enjoyed the smell of the EC. Paul quit, and then his wife quit, and now Paul’s mom is thrilled.
Mark mentions that his mom didn’t mind him using an EC in her car, but would never allow him to smoke in her car.

Adult smokers who are using the EC feel that supporting access to EC information and how it is used to reduce or quit smoking can encourage smokers to use them and reduce confusion and misunderstanding about the reason for ECs. Diane mentions that “some people vape for the curiosity…some have not smoked a day in their life…that’s not what it is supposed to be about.” Cathy mentions the “dripping. I wouldn’t do that because I don’t need to cloud out my car. I have a different purpose.” Joe voiced concern because he witnessed EC being sold to youth without even “checking their ID.” This confusion and misunderstanding about ECs are possibly contributing to negativity towards the device. Many participants note this lack of accurate communication to the public regarding the beneficial reasons for smokers to use the EC.

**Who and What are Not Supporting EC use**

All of the participants interviewed believe that the EC is healthier for them than a cigarette, and there is some resentment that the rest of society is not appreciating it in the same way. In this section, the responses to systems that make it harder to use an EC, or an underlying sentiment that EC use is just as bad as cigarettes are investigated. Obviously, those interviewed are biased towards using an EC, but there is confusion among EC users because some public opinion is that it is the same as smoking. Elly refers to her thoughts on society’s acceptance of the EC “there’s been some disbelief that it’s helpful. They still treat it as if there it is no different than smoking, which is confusing to me.” Otto comments on the fact that cigarettes are legal may in some way be misconstrued by a smoker as a better choice than an EC. Paul discusses this same idea by stating his dismay in being classified as a smoker by his healthcare provider and how that may discourage those who could benefit from using as EC by saying:
I find that disturbing that I am classified as a smoker because I know what it’s done for my health. I know how much better I feel. How many more things I can do? So I find that really disturbing because it’s for me, myself it doesn’t bother me because I know what this does. I think that it’s going to scare people off, who are similar to me and have such a hard time quitting cigarettes, from something that might help them. Like I said, it’s not safe, but it’s safer than what I was doing, smoking tobacco. I think the attitude that it is bad for you or the same or classifying it as smoking is going to do more damage in the long run to someone who might benefit from this.

Just as family members have supported the use of EC, some have not and as Larry tells of his family saying to him “they say you will die. It’s the same as cigarettes, and you will die from it.” It is discouraging to EC users to hear this from family members. Larry goes on to say “my mom’s telling me ‘you are a smoker’ and I say ‘mom, I am not a smoker.’ I do not use cigarettes.” This may be a result of how the public has been educated about the dangers of smoking and a distrust of anything that resembles smoking a cigarette. Al says “my daughter-in – law…She is on the side of thinking that if it looks bad, it’s got to be bad. So, she does not accept my use of the EC.” Cathy has comments about the public sentiment towards the EC: “it bothers me a lot that ECs are not thought of as a good thing because it should be all good for you, for doing this change.” This public opinion is likely fueled somewhat by social media and the internet.

The internet provides a space for people to voice their opinion against EC as Mark explains “I’ve seen on the internet people saying that a guy who quit smoking but is vaping hasn’t quit anything and I said ‘oh I don’t know about the buddy’ I feel a lot better since I have quit smoking.” Public opinion can be disheartening for EC users. George has researched the
benefits of harm reduction and feels that it is good but some of society has a puritan all or nothing viewpoint “there are people who say you either quit or suffer the health effects still not accepting of anything in between.” EC users try to understand the general public’s point of view but Ira feels that it can be a knowledge problem:

I respect people, but sometimes people have bad knowledge about it or they don’t have any knowledge and when they see a puff of what looks like smoke and they smell the smell and they might think ‘oh what is that?’ I mean I understand vapor is so new that I guess the important people in government are afraid to make a call either way it seems we need more time, more studies and I understand that somebody that doesn’t smoke or doesn’t vape does not want to have to breathe that in, so, for me, it’s understandable.

Where is the knowledge coming from? Cathy wishes that more was said about ECs, especially by the government. She has had success in quitting smoking but is upset that society does not understand the benefits for her to use the EC and therefore is not embracing this technology. She says:

The education of the general public is terrible, just terrible, because I think it’s a combination of the government shutting their eyes to this stuff and the research is not out there yet. I get it, but it’s not that new either. Let’s get real it’s been around for 10+ years. People don’t know enough … I would assume people mostly are not educated about the EC. …It’s a long level of education that has to happen in the general public about what it is, how it is, is it okay for everybody, the effects, does it affect people around them, that kind of stuff generally.
Bob, Al, and Cathy believe that the media has unfairly judged the EC and incorrectly informs the public of its questionable safety. This incorrect information is often centered on exploding batteries as Bob explains:

Typically, when these things have happened [exploding batteries], usually vapors jump all over it because they are vapers [EC users]. They will try and take a look at it. I would say in 100% of the cases of exploding ECs it was from people using products improperly and in an unsafe fashion. This is a big concern because some of the cases we’ve seen actually have been blamed on the e-cigarette exploding in someone’s pocket. It’s not the e-cigarette, it’s the battery.

The media again incriminates the EC and defines it as a gateway to smoking. Cathy adamantly refutes that idea by saying:

People will not go from vaping to smoking because smoking is such a terrible experience. That way, going from vaping to smoking a cigarette, that first puff, the person would say what the heck, I am not smoking this. There’s just no way no way. They are crazy. Those are people who are uninformed and never talk to anybody who vapes. That’s just so ridiculous, they have an agenda, you know, oh, vaping is bad.

Al explains the idea of gateway to EC use as “but to me cigarettes were the gateway to vaping a lot of people are saying that vaping is a gateway to cigarette smoking it is just the opposite.” Whatever way the EC is being explained, EC users believe that more education and support in using the EC is needed, and they definitely notice when EC use is not supported.

The EC is not a cigarette and EC users are doing their best to educate others to support the cause, but they often wonder “where is the government in supporting the use of ECs and improving access to ECs?” and “Why aren’t healthcare providers supporting the use of an EC as a way to quit
smoking?” Neil voices his concern about the access to ECs and states “the easier the availability of the EC, the less likely I am going to actually have a real cigarette.” He also notes that “here in Oklahoma, vaping is looked at as smoking. It would be nice if there was some differentiation…Because it has the same stigma as smoking.” Several of the EC users don’t understand why a product that they give such value to is not supported or promoted by the lawmakers or the government with Al “wishing that these [ECs] would’ve have been available from the get-go. Look at all the time I have wasted.” The feeling of helplessness because your situation is not appreciated or accepted as Neil explains:

Vaping has helped me out a lot, and you feel powerless a lot of times whenever people or lawmakers are saying this or that and sometimes it feels like there’s nobody out there on your side, no matter who you vote for. Everybody is kind of going against this so you kind of feel helpless.

This concept of misunderstanding the EC user often occurs during a visit to the healthcare provider. Usually there is some excitement in the EC user about feeling better and when that is share with the healthcare provider, most EC users would expect support, but often that is not the case. Al tells of his doctors “they have been very anti-smoking and in a way, even though I am now vaping, I feel like they are saying ‘why should I care about you, why are you even here to see me?’ because they see me as a smoker.” And Joe comments “My doctor says it is the same thing as smoking,” and Neil tells of friends whose doctors “have tried to discourage them from using the EC…That’s really frustrating.” The variety of opinions from healthcare providers is not sitting well with EC users as Kate explains:

You know, they always ask when you go in for a physical or any visit do you smoke, and I say I don’t smoke, I vape and some have said that is the same thing and I think to myself
you don’t understand you just don’t understand, and others have said well that’s good but you know you’re still getting nicotine in your system and I say yes I know but I’m not getting the other crap either. I had one doctor who said good for you, good for you. There is a wide variety in the medical profession as I’m sure you are finding out, who you come across who know about actually what this is what it is, and how it is different than smoking.

Because of the way that the EC came into the market, smokers that are using ECs have had to take on an identity to advocate for EC support and use. That comes out in ways that Otto explains as an “early adopter” who likes to “use them [EC] in social situations.” Cathy talks about getting educated and then “talk it up” and, as Elly would agree with her, “spread the love.” Larry, Mark, Paul, Diane, and Bob have all taken on an advocate identity and talked with friends or family members about using an EC with Kate sharing the results of what happened after she shared her story with her hairdresser whose father was a heavy smoker. “I told her a short story about my EC conversion… months later she tells me ‘sharing your story was the best thing’ her father loves them and is on his way to quitting smoking.” Whether the system is supportive or not of EC use, all of these users believe that the EC has tremendous value and the EC is the reason that they have reduced or quit their cigarette smoking.

**Steps to Quitting**

It is often heard by a smoker that they need to quit smoking and these EC users have heard it too. In fact, all of the users have attempted to quit, and 12 of those interviewed mentioned the use of FDA approved medications. Nine used the patch, five used the gum, two mentioned Chantix, and one tried Zyban. Obviously none stayed quit on the FDA meds. Many reasons for this have been discussed in the sensory embodied connections section of this chapter, but Elly describes her
use of the patch as thinking at the time “I failed,” but really “I should be thinking that the patch failed me.” In this section the participants discuss how the EC has not failed them, at least not once they figured out how to use it in their daily life to quit or reduce cigarette use. Learning about the device and its attributes along with experiencing of switching to an EC, is discussed. This is done by recognizing key roadblocks to quitting such as don’t become discouraged or let others discourage you. Many participants noted that being able to slowly reduce cigarettes but still know that it is okay to smoke, allowed them to experience the EC and accept it as an alternative to smoking. Learning about the device including how it operates, e-liquid flavors and nicotine levels is discussed in this section. Following that, I end with how the EC can be misunderstood. It is often considered ‘just another cigarette’ but, it is not a cigarette.

The Experience of Switching to an EC

Regardless of their original intent, by switching to an EC, all of the users have quit or reduced their traditional cigarette use, and they are pleased with their success. For the user to be successful though, it seems that some grit needs to be shown when an EC is first experienced. Don’t be discouraged as Joe says “there is a flavor/device combination for you.” Even if you experience “coughing” as Larry and Cathy did, they still recommended sticking with it. Cathy suggests “stick with it. For a bit it’s going to feel foreign in your lungs and throat… I stuck with it.” Elly concurs “it took me a couple of tries with EC but just keep trying.” Additionally George, who considers himself a hardcore smoker who tried to quit multiple times before using an EC could not conceive of quitting, states that just using the EC and telling someone that they will quit is not the right approach. He comments “If you told me ‘I will give this to you, and you will be able to quit’ that would not have worked at all.” By using the EC and experiencing it, smokers changed their belief about being able to quit and are able to make the transition to being smoke
free. Kate tells her story of using the EC for several years until she made a switch to exclusive EC use:

This is a great help for people who have tried everything and just were not able to quit and you have to have a little bit of persistence. It doesn’t happen you don’t put the cigarettes down and pick up an electronic cigarette and say that’s it. You have to learn and transition yourself. It doesn’t happen overnight at least it did not for me.

Just experiencing the EC encouraged cigarette smokers to switch. Neil states that “I really like the EC…so very quickly I wanted to try to switch over to that and quit smoking.” Helen, an exclusive EC cigalike/mod user, believes “the convenience of it” is what worked for her. She did have an initial reaction to reducing nicotine levels because she wanted to quit smoking and used a very low nicotine level EC. She soon found out how her body reacted to nicotine reduction:

Initially, I started with the intention of quitting the other cigarettes and then quitting altogether. That was my initial start off point. I lowered my nicotine all the way down to 3%, and then I started getting fat. It is like quitting smoking. You are in a daze or a fog for a while. I upped my nicotine a little bit, and I said okay that’s kind of it…When I first did it my initial thing was to just quit the cigarettes then quit everything altogether and now, you know, I have to have the nicotine, and I just kind of resided to smoking these [referring to her ECs].

Not needing to “go all in” or quit all at once was really appreciated and noted as important by 11 of the 16 participants. Al states “it took me about a year before I became satisfied with the vape.” Kate is comfortable saying “It is okay to replace two or three cigarettes with the EC and be aware of the differences.” Neil compares and contrasts relapsing to cigarettes from being quit cold turkey to being quit on ECs as:
There will be times when you relapse or have a cigarette or maybe start smoking again and that’s not the end don’t give up, if you do that you can get right back on to doing the E-cig a lot easier than if you are just trying to stop smoking cold turkey, and then you started smoking again it’s really hard to quit again for a while, but with the e-cigarette’s for me it wasn’t that hard and you should just stick with it even if you have times when you kind of fall off the wagon.

Bob, a dual user and who owned a vape shop, tells how his experience was different than other cigarette smokers who quit with ECs:

I would say of all the people I know from the shop who switched to vaping, most people switch completely, immediately, and effortlessly. For me, when I switched to vaping, I hung on for like probably the first three years. I continued to smoke just a couple cigarettes a day, but that’s down from like a pack and a half.

He acknowledges that the experience is different for everyone again, suggesting the value in the ECs variability. Elly’s story is similar to Bob’s in that it took her some time to quit smoking cigarettes, but she eventually quit although it was somewhat unintentional. She says:

When I first picked up an EC, it took me about a year to decide that I wanted to quit and then a year to make the switch. I just started keeping track and smoke less and less cigarettes and consequently vaped more and more although that was not as much of the purpose as the cigarette reduction it was just kind of natural and I went if we are not getting it from the cigarette then get it from the vape get it get it.

As noted with the stories above, don’t be discouraged really means that when one way isn’t working you can try another way, try something different within the realm of ECs. The intriguing part of the EC is that there is variety in the product. It can be product design, nicotine liquid and
flavors, or battery wattage and power and understanding the device and its characteristics was mentioned by the participants as important when using the EC.

**Knowledge Required: Understanding the Device**

Often times the smoker buys an EC without really knowing how they will react to using it. Almost all of the participants are not using the same product that they started with. Bob tells of the cigalike device that he started with. He says “I got a huge kick out of it and I thought it was great but I never really stopped smoking and I stopped using it after a while.” But he adds “a few years later the device improved, they delivered more nicotine and faster, they worked.” Kate, an exclusive EC/BLU user, started with a something that looked like a “big cigar looking device…With a big battery…And on top was this thing that held the e-liquid that you put in your mouth.” She did not like that experience and stopped using it but looked for different devices and found the BLU cigarettes which gave her the experience that she preferred. Conversely Mark, who started out on the BLU cigalike device, realized that he likes the big outputs of vape that the larger tank variety of ECs can give and found many options once he did his research saying:

I quickly started do my research on other vaping ways or methods and that’s when I found the tanks and the big mods and all that stuff. I started get into that. I bought a Genger Tech mod of some sort in the beginning which gave out you know a pretty good output and a lot of good vape and stuff you can get pretty good hits with it and now I’m up to a pretty big tank with a pretty big mod.

Mark switched to a bigger mod/tank device when he could see them in person. “When a local vape store opened up…I could see the wildly different EC styles and I got more into that and moved away from cigarette size.” Once he switched to the tank style, he “never went back to
smoking” and states that “I have been quit for over a year.” George recommends picking a device that is “reliable and simple to use without a lot of bells and whistles.”

Adjusting air flow from the tank of the device was important. Neil describes it as “on the tanks, they have little parts with slits where you can adjust for more or less air flow,” and Mark reflects on the difference in air flow between a cigarette and an EC by saying “the airflow vents are big enough on some mods that you hardly have to draw on it.” However, not all EC users want a lot of air flow, and Cathy tells of how she altered her device to reduce the air flow;

In this case, this is providing too much air…instead of me having to put my finger over the hole I just basically cover it with tape and poke a couple holes in it. That’s the perfect amount of ventilation. That’s is the only thing is wrong with this device specifically is that they should have some way to regulate that without me putting a piece of tape on it they haven’t fixed it yet, they’ve had plenty of complaints about it from people, so one day we will see something with an adjustable flow.

The EC has different components such as coils, tanks, and chargers but batteries and battery safety takes precedence to all other parts. Paul claims that the most important thing he can tell anyone interested in switching to an EC is “buy good batteries…From a source that you trust.” Al says “there are protected and unprotected batteries…I only buy protected.” Adding to this, Joe explains the dangers of not understanding about batteries:

One thing that’s very important is in the box style mods is that using unregulated lithium style battery and there literally that an unregulated little lithium bomb that people carry around in their pockets and people need to realize that when they when they have these devices they are dangerous that’s all.
In addition to batteries and tanks the participants explain that flavors and nicotine levels also contribute to the EC experience. Many participants considered flavors when using the EC as important to being able to switch to it. It also mattered that different devices allow the user access to different flavors as Mark, who moved from a cigalike device to a bigger tank system, explains that the “Logic [cigarette looking ones] had three or four flavors. I now use the bigger tanks and buy the juices from vape.com. They have over 150 flavors and you can choose a flavor that satisfies your palate.” Bob explains that using the same flavor can create “vape tongue” which affects your ability to taste, so it is “important to have different flavors” but Al says “I have heard it called vape tongue where by using the same flavor you lose the ability to taste that flavor, but I have not experienced that.” Many participants commented on what type of flavor they liked with Elly, Neil, and Cathy liking “fruit flavors,” George “banana nut cream,” and Diane likes a very specific combination of “doughnut ice cream vanilla” and Cathy likes the “candy flavors of gummy bear and Swedish fish.”

In addition to the importance of flavors, being able to continue to receive nicotine but in a less harmful and “cleaner” way was mentioned by Cathy, Frank, and Paul who said “it tasted better than a cigarette. I like to say it is tastier and cleaner.” Nicotine is not the problem was the sentiment of several of those interviewed. Presenting nicotine as a bad chemical is “misinforming” and may contribute to the failure of some who switch to the EC. Bob, who has owned a vape shop, speaks to this problem:

It’s kind of cheesy. There’s so much misinformation about nicotine out there. I guess it’s what bothers me. I know I would see people come into the vape shop that want to switch to this [the EC], and I see people fail trying to switch to vaping because in their minds they have been trained for so long that nicotine is evil. They weren’t really trying to get away
from smoking, they’re trying to get away from nicotine, and they would either start with nicotine free liquid because they thought nicotine was terrible or they would try to get down to zero nicotine. I remember one guy specifically stand out in my mind. He was trying this and went to 0 mg no nicotine for 30 days and the guy went back to smoking. So I think the demonization of nicotine is very widespread.

In fact, having this cleaner nicotine delivery system in which the level of nicotine can be altered is credited as why the EC is successful in helping smokers to quit. Helen, an exclusive EC/cigalike/mod user, thinks that her success in being able to quit smoking was related to being able to continue to smoke and also use another nicotine product:

I think to make it successful would be using both cigarettes and electronic cigarettes around the same nicotine level for a while and then slowly cutting back on your regular cigarettes but keep your nicotine level the same. Then once you’re done with the real cigarettes maybe start lowering your nicotine level in small increments on the e-cigarette. That does work. It worked for me.

Experimenting with different levels of e-liquid nicotine was crediting for being able to make the switch to ECs, but not without caution. Paul, an exclusive EC/mod user, acknowledges that the amount of nicotine in the liquid is important to consider as well as the type of device. He comments “I would say go a little bit higher on nicotine than is suggested, but be careful. For instance, there are so many devices and there are so many different tanks and liquids.” Contrary to that Cathy states “they recommended 24mg/ml e-liquid since I was smoking a pack a day. I almost immediately reduced because 24 mg was too much. I would be dizzy after one or two hits.”

The device in addition to e-liquid flavors and nicotine levels contributed to the over experienced of a cigarette smoker switching to an EC and potentially quitting smoking. Some
participants, such as Al, Bob, and Elly who consider themselves “nicotine addicts” looked at the EC as a better way to give nicotine to their bodies but several, Kate, Larry, Joe, Ira and Mark consider themselves “nonsmokers” and resent still being considered a smoker by healthcare providers or others in society. Still, the EC user is faced with misunderstandings regarding the use of an EC.

**The EC is not a Cigarette**

The EC came into the United States market in 2006 and as discussed in Chapter One and Two has grown in use exponentially. Adult cigarette smokers are the most likely to use the EC and by 2014 the majority of the US population had heard of the EC. As discussed in this chapter, those who have used an EC successfully have a lot to say about the difference between smoking and vaping. In this section, comments regarding perceptions about nicotine, smoking, and the EC, and the health changes noticed by using an EC are revealed.

The idea that the EC is just another form of a cigarette or a way to smoke was mentioned by several of the participants. They had a particular concern that because the EC contained liquid that has nicotine in it is assumed to be as bad as a cigarette. This was concerning to the EC user because as they learned more about the EC they learned more about the effects of nicotine.

Through research of their own and by using the EC as a different nicotine delivery device, smokers learned that it is not nicotine that is the harmful chemical in cigarettes and many EC users are questioning why the EC considered as bad as a cigarette.

What many of these EC users have learned is that there is widespread misunderstanding of nicotine. EC users have found that many people, some are smokers, believe that nicotine is bad for you and because the EC usually delivers nicotine to the user it must be bad too. However Al and Kate have learned through their own research, that although there are health effects of nicotine they
are about as bad as “caffeine.” Additionally Cathy notes the “similarity between a cigarette and vaping is the nicotine.” Joe says “Honestly I will probably never quit vaping…After all my research…I feel it’s about as bad for you as drinking caffeine.” EC users have done their own research, and Mark expresses his comments to what he learned about nicotine as:

I remember when I started reading the research about vaping and nicotine. I started learning that it wasn’t the nicotine that they were afraid of in cigarettes. It’s not the nicotine that is killing you. It was the paper and other ingredients in the cigarette. I started learning that that nicotine actually wasn’t bad for you. In the same sense, I think a lot of Americans really believe, when it comes to cigarettes, that it is the nicotine in the cigarette that’s killing everybody. I think that is a huge urban legend that nicotine kills you as it is not nicotine whatsoever, it is just all the stuff in the cigarette which when you look at the vape the only thing that’s in there is nicotine.

In addition to the misunderstanding about nicotine, vaping looks like smoking and has contributed to the societal dislike of it. As Larry explains, because the EC looks like a cigarette, the same laws that have been put into place to reduce smoke exposure to others are now used to reduce second hand vape exposure. He feels this vilifies the smoker who is trying to do something good. He says:

When I started vaping there were no laws against it, so I felt like a human being again. I can use the EC indoors, I can sit down with the family and vape, and it felt good to be back to normal. But as time has gone by, they are starting to regulate vaping like cigarettes, and we are back to square one, where you feel like you are the devil because smokers are treated like the devil. If you want to smoke, you have to go outside. You’re on an airplane,
you can't smoke. These things make you feel like your lives are less because you are harming other people.

This demonizing of smokers was echoed by Paul who mentions “the way it is now in society, it scares me because it used to be smoking that people didn’t like. Now it is the smoker.” Many of the EC users want to tell of their experience using the EC and how it is not like a cigarette. The vape from the EC doesn’t act like smoke from a cigarette. Cathy says “there is no secondhand vape…it drops very quickly out of your surrounding air.” And, of course as discussed earlier in this chapter and mentioned by several participants that the EC doesn’t smell bad to them or their family. This group has done their research and do not believe that there are detrimental effects to second hand vape exposure and state that it is not smoke exposure. Neil has also found through his research about second hand vape exposure:

It’s better for other people around you at least the way the science seems to hold up. It’s better for you than secondhand smoke is. It’s not even the same thing. It feels like smoking and that’s what helps the smoker but people kind of take the same negative connotation as smoking and just shifted over because it kind of looks like smoking. In particular, using the Blu [cigarette looking EC] type of cigarettes. I think people just don’t understand really. What it is they’re assuming is that the EC is just a different way to smoke.

Even though vapers know that the EC is different than smoking they realize that society looks at vaping as the same as smoking. When in public or at events, vapors realize that they cannot just vape anywhere. Diane says to “be courteous of who you are around, just because you have a vape and it may not smell like tobacco. You still can’t just smoke it anywhere.” Seeing the EC as a cigarette is what Mark, an exclusive EC user, notes “that is a big stigma. I remember when
I started vaping wondering where should I do it. Are people going to get mad at me?” He goes on to say “it is a rule to not vape big clouds around others… it is what they call don’t be a vapehole.”

Although society may not completely accept the value of the EC, all of the participants believe that switching to an EC is a healthier choice than smoking. The most frequently mentioned health improvement by EC users had to do with their breathing or lungs. As Larry, 35 year-old male who plays soccer says” before I couldn’t even run for half an hour, now I feel my lungs are much clearer…and functioning very well,” and Mark feels that his lungs do not harbor a buildup of tar or other chemicals since he has been vaping “I feel like I get a hit in my lungs and once I blow it out I feel like it’s blown out. It’s not lingering in my lungs.” Even others are noticing better breathing. Kate says “my husband says I breathe much better at night.” Paul refers to his insidious health decline which he had not noticed until he stopped smoking and then how his improved lung function, once quit, changed him by saying:

I could not walk up a flight of stairs without getting heavily winded. Now I don’t get winded walking upstairs. I can actually play and do physical activities where before I really couldn’t. I didn’t realize how bad my health had gotten. I just came back from a cruise. I was a zip lining and going down waterslides and climbing up and down stairs. I was doing everything as if I was not a smoker. People would not know I was a smoker based upon my activity where before I would be hacking and coughing and ready to keel over. I couldn’t have this conversation when I was smoking without me choking and coughing my head off.

Neil was surprised how quickly he felt better and says “that really got me interested in trying to stay with it.” Not only does he have less “cough and congestion,” but his blood pressure is lower, and he has been able to lower his blood pressure meds. The objective measurement of a lower blood pressure is reassuring to him that he is doing a better thing for himself. He comments:
The best thing would be my positive health impact of it especially since there something that they can be demonstrated, like I have on my medical records my blood pressure was steadily high for a long time and now I can see it went down, when you have the hard numbers you can see it actually doing some good.

Cathy is really clear about her impression of her health “I just feel better … I know for sure that I am healthier. Point blank.” Elly smoked for over 20 years and even though she has a chronic illness “I have an autoimmune problem,” she appreciates that she is feeling better and says “but I want to say that my health improved dramatically…I notice a much better quality of physical life.”

Diane recognized that her son was heathier since she quit smoking. She tells her story of the guilt she felt from being a smoker but how being able to quit smoking with the EC has helped her son and herself. She says;

I think it’s a lot safer especially for my son. He’s eight; he has asthma. So, me smoking cigarettes was like okay it’s kind of hard for a smoker to just stop smoking cold turkey but I’m like I can’t keep smoking. Even if you don’t smoke around your kids if they have asthma it is still in your clothes you know you’re in the car smoking and an hour later they can still smell it in the car and on your clothes so it’s like this [the EC] can help me and help him at the same time. Now I have a smoke-free home. It’s a vapor home but for some reason the vapor doesn’t trigger his asthma. I do not sit there and talk to him blow smoke or vapor in his face but he can be in the same room and it doesn’t bother him.

Smokers who quit smoking with an EC are not noticing any ill lung effects. Several have stated how their breathing has improved and Al, George, and Ira mention that when they do get a cold or lung congestion, they recover from it much quicker now that they are not smoking. Al and Ira also noticed a weight gain once they quit smoking and used the EC but they were “willing to
accept it” to be able to stay off cigarettes. Conversely, Otto lost weight when he reduced cigarettes with ECs “I think I do have more energy interestingly lost a little bit of weight. I’ve been more interested in walking and riding the bicycle since I reduced analog cigarettes.”

Dental improvement was mentioned by Chris: “my dentist was very happy and noticed a very big improvement in my dental and oral health when I switched,” Diane: “My dentist says my teeth are not as yellow and my potential for gum disease is less,” and Al noted:

When I was smoking I went to the dentist four times a year, and the cleanings were so painful. I thought it was all the coffee I drank, but it wasn’t. It was the tar affected my gums. Since switching to EC and quitting smoking my gums have improved. My gum disease has stopped. Now I only go three times a year. The cleanings used to be so painful. Since I quit smoking… even the cleanings now are much better. I am in and out. I thought coffee was a big reason for teeth stains, and I drink more coffee now that I did 10 years ago. It was the cigarettes. I could see in the mirror the bottom teeth the yellow stains. It wasn’t until I quit that it cleared… Now that I have quit, they say my gums look cleaner better it’s actually a pleasure going to the dentist.

It appears as if switching to an EC may have some social and health misunderstandings; using an EC to quit smoking is perceived as healthier and a better alternative by the smoker but there are several examples of members of society or health care providers considering the EC as harmful as a cigarette. Although the EC user respects others misunderstandings there is concern that the EC may never be an accepted alternative to smoking. Although the EC looks like smoking it is really not smoking but it is a healthier way to have nicotine delivered to the body. The EC user wants health care providers and other members of society to accept their use of the EC as a healthier alternative for them.
Summary

This chapter presented the findings of the qualitative portion of the research study, and, in particular, this research took an in-depth look at adult cigarette smokers who have learned to use an EC to reduce or quit smoking. These findings suggest that body connections to smoking are an important reason the EC is being used successfully by the smoker. Additionally, systems in place that expose smokers to ECs can be in support of the EC or can look at the EC as the same as a cigarette. Supportive systems can be apparent with smokers who have used the EC becoming an advocate for the use of an EC and telling others about its benefits. There are online forums, websites, chat groups, and videos that provide educational opportunities to learn more about the types and varieties of EC that are available. Sometimes, the EC is not supported, and society presents the EC as it is the same as smoking. When this happens, smokers feel penalized or demonized for trying to quit smoking. These feelings create confusion in the smoker when they know that by using the EC, they are doing something better for themselves and don’t understand why society does not recognize their efforts.

When investigating how a smoker uses an EC to quit or reduce smoking, very personal experiences and methods of EC use emerged with many smokers requiring multiple attempts at trying the EC which included trying different types of ECs, and multiple flavors or nicotine levels of e-liquid and not surprisingly smokers wanted make their own choice about how quickly to reduce or quick smoking. These findings combined with the findings from the quantitative portion point to some research avenues worth investigating further. In Chapter Six, these research implications as well as a more thorough integration of the quantitative and qualitative findings are presented.
CHAPTER SIX: DISCUSSION

The purpose of this research study was to understand how a cigarette smoker learns about and uses an electronic cigarette (EC) by evaluating the body connections to smoking and how that is transferable to using an EC, and by investigating the social and material experiences related to learning to use an EC. The research questions that guide this study are:

1. How do adult smokers learn about electronic cigarettes through their social (family, friends, peers, work place, etc.) and material (vape shops, blog sites, forums, advertisements, etc.) network?
2. What is the initial intended use of an EC and does that intent change with the experience of using an EC?
3. Does embodied learning impact a cigarette smoker’s use of an EC?

A mixed methodology was used to gain an overall understanding about dual users (smoking cigarettes and using an EC) perceptions as well as an in-depth understanding of the connection to smoking and how that transfers to using an EC, what social reactions and material networks impact EC use, and how EC use and intention of use changes over time.

One of the strengths of this explanatory sequential mixed methods research design is that the qualitative interview phase builds upon the quantitative survey results. Although this provides the researcher with easily recognizable stages of the study, such as collect and analyze quantitative survey data then interview participants to help explain the survey data, it can be a challenge when trying to determine which quantitative results need further explanation (Creswell, 2015). In the following discussion, it is important for the reader to remember that the quantitative findings did show that over time a majority of a cohort of dual EC users (66%) did become exclusive EC users. In addition, those who remained dual users are changing EC
devices, e-liquid nicotine levels, reducing frequency of EC puffs, and reducing the number of cigarettes per day (CPD) smoked. Although quantitative results show differences from survey one to survey two, in use of and type of EC device, between quitters and continued smokers, these results do not show how the findings occurred. Therefore, a qualitative phase was conducted to help explain the reasons for EC device change, reduced CPD, and ability to quit, or not quit, smoking.

The first section of this chapter integrates, where appropriate and informative, findings from the quantitative and qualitative methods and where they corroborate. Next, is a discussion of an interpretation of the findings in relation to the theory and literature that informs the study. In the third section I present a model based on the findings of the study that relates to the theory and practice of learning to use the EC as a tool of reducing or quitting smoking. The discussion of the model is followed by a consideration of further implications of practice, as well as a discussion of the limitations and suggestions for further research, and final reflections.

**Corroboration of Mixed Methods Findings**

In the current study, there were areas where the quantitative findings were supported by the qualitative findings and the in-depth analysis of the plural findings informed the literature on adult smokers and how they learn about and use electronic cigarettes (ECs). Two areas where the integration of findings provided a better understanding of the issue are: (1) in the intention of use of the EC and how that changes with the experience of using an EC; and (2) how EC use functions as a step towards quitting smoking. A corroboration of the findings is also displayed in Table 6-1 on the next page.
Table 6-1
Corroboration in a Joint Display for an Explanatory Sequential Design

<table>
<thead>
<tr>
<th>Quantitative Results</th>
<th>Qualitative Follow-up Interviews Explaining Quantitative Results</th>
<th>How Qualitative Findings Helped to Explain Quantitative Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>At follow up</strong></td>
<td><strong>Themes</strong></td>
<td><strong>Corroboration</strong></td>
</tr>
<tr>
<td>• The majority of dual users who intended to quit smoking at baseline were quit at follow up.</td>
<td>• The smoker learned that it is possible to quit with the EC.</td>
<td>• Cigarette smokers were able to maintain their intention to quit or gained an intention to by using the EC. Because their initial perception of the EC as a way to quit smoking became even more evident as they continued to experience and use it.</td>
</tr>
<tr>
<td>• 20% of those who didn’t intend to quit were quit at follow up.</td>
<td>• The EC provided a way for the smoker to experience important sensory stimuli and physical behaviors allowing the cigarette smoker to quit smoking.</td>
<td>• Some smokers gained an intention to quit and were able to quit by their learning and experience with an EC.</td>
</tr>
<tr>
<td>• Over time, the majority of dual EC users switched devices, reduced e-liquid nicotine levels, changed frequency of puffs on EC,</td>
<td>• Learning to use the EC is personal and synergistic and happens by social support in addition to learning about the device</td>
<td>• The EC provides for a personal tailored experience for the smoker to reduce or quit smoking. This tailored experience represents</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
and reduced or quit cigarettes. through experiencing device switching and changing EC characteristics such as e-liquid nicotine levels or flavors. choice for the EC user. The EC user can do it (use the EC) in their own way.

**Intention of Using the EC**

A large percentage of dual users who were quit at the follow up survey indicated that they intended to use the EC to quit smoking at the baseline survey. The qualitative interviews corroborated this result by bringing to light how the smoker believed that they could quit smoking by using the EC. The understanding that ECs contain nicotine may increase the smoker’s expectancy to be able to use the EC to quit smoking (Copp, Collins, Dar, & Barrett, 2015). In this study, findings indicate that just by saying the EC contained nicotine affected the smoker’s expectancy that it will help reduce craving for cigarette. Although all of the participants, except one, were not looking for a way to quit smoking when they were exposed to an EC, after experiencing the EC, most answered (on the first survey) that they intended to quit smoking by using it.

This is interesting since there is current research supporting treating smokers who may not have an intention to quit or be ‘ready to quit’ but are willing to reduce cigarette consumption (Ebbert et al., 2015). In this study using varenicline, an oral medication designed to help smokers to quit smoking by reducing the urge or desire to smoke, the researchers found that, after three months on varenicline, smokers not ready to quit had significantly higher abstinence rates than the placebo group (Ebbert et al., 2015). In a different study of smokers with no intention to quit, but
who sampled an EC, researchers found that this group rated the EC as favorable and increased the smoker’s readiness to change (Grace, Kivell, & Laugesen, 2015). My study shows a similar response to quitting in that just by experiencing the EC, for a period of time, dual users (smokers and EC users) can change their intention of use and may be able to quit smoking.

In my study, the intention to quit with an EC was not the first attempt to quit for most of the participants. In fact, the majority of participants stated that they had past quit attempts with clear intentions of quitting with FDA approved tobacco treatments. These FDA approved tobacco treatment as the standard of care (Fiore et al., 2008) yield relatively low success rates in quitting smoking (Lucchiari et al., 2016; USDHHS, 2014), and although tried by the participants, it did not work for them. As discussed in Chapter Two, many of these treatments are behaviorally based. A behaviorist orientation (Merriam, Caffarella, & Baumgartner, 2007) is to design a plan which creates an environment to support the wanted behavior (take the prescribed medication) and extinguish the undesirable behavior (don’t smoke). This behaviorist strategy works for some but it is still striking that only 7.6% of those who attempt to quit actually do (National Center for Health Statistics, 2016a). Many smokers “want to quit” but for some, more than behavioral intervention is necessary.

A connection to the perceived simulation that an EC provides contributed to the expectancy that an EC will help a smoker reduce or quit smoking. Several participants stated that the ability to maintain a connection or “action of smoking”, such as hand to mouth or inhaling and exhaling a vaper, increased their confidence in being able to use an EC to reduce or quit. In a study which looked at long term use of EC (Nelson et al., 2015), greater than six months, verses nicotine replacement therapy (NRT), EC users reported less emotional and physical withdrawal symptoms compared to those on NRT. In addition, those using the EC related more liking of their product and
a stronger smoker identity (Nelson et al., 2015) which may explain why sensorimotor aspects of the EC, particularly ones that look like a cigarette, increase the intention to quit and ability for a smoker to stay quit.

Theories of Adult Education can help to explain how adult smokers can use an EC to reduce or quit smoking. Experiential learning as explained by Dirkx (2008) involves the role of emotions in constructing experiences. It can be argued that an intention can be emotionally fueled and when a smoker intends to use an EC to quit smoking, the experience can be positive. This positive experience by the EC user, particularly positive public acceptance (Trumbo & Harper, 2013) may support the smoker in using the EC and increase their intention of continuing use to reduce or quit smoking.

Experiences solidify understanding and meaning for people. In Adult Education, this is called experiential learning which assumes that adults become more self-directed as they mature and accumulate life experiences that contribute to learning. This is true with adult smokers who have attempted to quit with behavioral treatments and failed. They have learned that they need something else to quit. Smokers who use an EC find the experience more than a behavioral treatment to quit or reduce smoking. Merriam, Caffarella, and Baumgartner (2007) reference Brant, Farmer, and Buckmaster (1993) when they discuss a cognitive apprenticeship model for experiential learning. This model has five phases which consider the role of the model and learner, and key concepts. These are modeling, approximating, fading, self-directed learning, and generalizing (Merriam et al., 2007). This type of learning was expressed by several participants in the study. The first phase of the apprentice model is modeling others as a cognitive part of experiential learning. Several of the participants told stories of seeing others use an EC. They had watched YouTube videos, spoke to someone in person at a vape shop, or even asked complete
stranger about their use of an EC. Once they ‘observed the performance of another person using an EC,’ they spoke of how they moved to the second phase: approximating. Here the smoker used the EC. They educated themselves or learned more about the EC by asked questions about different types of EC and the components (devices, e-liquid composition, nicotine, and flavors). They sought out additional “coaching and support” when needed and would use “self-monitoring and self-correction” (Merriam et al., 2007, p. 182) to use the EC more and reduce cigarettes. Fading occurred when the smoker felt more confident in using the EC use and knew how, where, and when he/she would use it. They required less learning support from others who use EC. In turn, the fourth phase of self-directed learning was validated when smokers used the EC to quit smoking and the final phase of generalizing occurred when smokers would tell others that they can quit smoking with the EC too. They became models themselves and would advocate for the use of an EC.

During the interviews several participants came to realize the ease of using an EC once they experienced it. Meriam and Bierema (2014) reference this type of learning embedded in body experiences as “embodied learning”. Several participants mentioned how the EC satisfied their senses and embodied habits which surround using a cigarette and can be replicated in EC use. Two participants in particular stated that they were not intending to quit with the EC, but similar to the findings of Simmons et al (2016), these participants stated that by using the EC and realizing its comparison to combustible cigarettes contributed to their reduced interest in continuing to use the combustible cigarette. Participants talked about using the EC just to give them a way to “smoke” in places that smoking is not allowed. By experiencing the EC these smokers have learned that they can use it to reduce or quit smoking.
The embodiment of smoking and how that can be partially replicated in EC use will be discussed in more detail later in this chapter, but it cannot be ignored as a theoretical reason why those dual users who intended to quit smoking with the EC were able to successfully do so.

**EC as a step towards quitting**

This research study provides insight into how the EC is used to quit or reduce tobacco use. As discussed in the previous section, the majority of EC users intended to quit smoking by using the EC and even some of those that didn’t initially intend to quit actually did. This section highlights how the EC is actually used and manipulated so that the smoker can use it to reduce or quit smoking.

**Devices.** The majority of dual users changed devices between the first and second survey. Similar to Yingst et al (2015), this study found that many smokers started with a cigalike device, but found that it didn’t “satisfy their craving” or “taste” for a cigarette. These users searched for a different device, such as one with a button to push when inhaled and a bigger battery, which “worked” for them. This device switching to find something that “works” is reported as a way to satisfy the “urge” to smoke. There is some evidence that seeing an EC can increase the urge to use one or to smoke (King et al., 2016) and that ECs that look like a cigarette in first time users was more effective in reducing the craving and nicotine withdrawal symptoms experienced when quitting than one that didn’t look like a cigarette (Dawkins, Munafò, Christoforou, Olumegbon, & Soar, 2016). Four of the 16 participants interviewed currently use a cigalike device, one exclusively, one is exclusive EC user of cigalike and mod devices, and two are dual users. It can be postulated from this research that the cigalike device, in some, may initially reduce the urge to smoke a cigarette because it replicates the look and feel of a combustible cigarette but in some users that is not enough to keep them from returning to smoking. Like Yingst et al. (2015) and
Lechner et al (2015), my research found several users switching from cigalike devices to an advanced or mod device with which they could then quit.

The amount of nicotine received from the EC is important for what participants explained as a “throat hit” or “satisfaction.” A large cross sectional survey from 2012 to 2014 found a relationship between attenuation of craving for tobacco cigarettes and higher e-liquid nicotine levels, modular devices, and higher battery voltage (Etter, 2015, 2016a). My study found a similar reaction from the participants with a few exceptions. Several participants referred to reducing nicotine liquid as they experienced the EC, and four in particular talked of reducing nicotine to reach zero nicotine levels. Self-dosing is an important component of EC use and contributes to its effectiveness (Watson, 2013). In addition to nicotine levels, convenience and safety of the design are important factors to EC users (Pokhrel et al., 2015) and were identified by three of my participants. Cathy, Joe, and Kate, all use closed systems (are not able to modify liquid or battery) because they wanted something “simple” without needing to “fiddle”. Although some of these devices are considered cigalikes, recent improvement in the EC design and characteristics has improved nicotine delivery and is able to “satisfy” and give a “throat hit”(Hajek et al., 2014) therefore, making the nicotine hit from a cigalike device more similar to a traditional cigarette.

**Flavors.** Taste and flavors prove important aspects of EC use (Cheney et al., 2016; Piñeiro et al., 2016) with men and young adults giving them the most preference. All of the study participants valued flavor as important but without consistency. For instance, several preferred tobacco flavor where others enjoyed fruit or candy. Providing multiple flavor options for EC users is in contradiction to public health recommendations to limit flavors due to concerns over initiation of EC use among nonsmokers with fruit flavor being the most preferred among smokers and nonsmokers (Berg, 2016). Although most participants in my study were not opposed to
government involvement in EC regulation, there was concern voiced regarding banning of candy and fruit flavors. This sentiment is similar to other studies which found that vapers are unopposed to regulation of EC devices as long as there is still flexibility in types of devices and refillable solutions (Caponnetto et al., 2015; Fraser et al., 2015).

Newer devices and non-tobacco liquid flavor seems to be associated with longer vaping history (Tackett et al., 2015), and my research did support this, although not completely. It seems that personal choice to modify the EC device or to be able to use a simple “buy and go” device makes a difference for smokers and contributes to their ability to use an EC to quit or reduce tobacco use. Using online sources to learn of others experiences helped smokers to gain an understanding of the different EC devices and how to use them. Experience using different types of EC, tasting flavors, and altering nicotine levels is an important part of learning to use an EC. In adult education this is referred to as experiential, informal, and online learning (Merriam & Bierema, 2014), and they all contribute to learning about and using an EC.

**Interpretation of Mixed Methods Findings**

For the current study, the qualitative findings provide some clarification or explanation of inconsistent or contradictory quantitative findings in two particular areas. First, the survey findings show that most dual users are switching devices and those that use a mod device are most likely to be quit. The personal interviews helped to clarify the reasons for device switching but also help to explain why some are able to quit with a cigalike device and others cannot. Secondly, a better explanation of why those who had no intention of quitting did quit with an EC is explored in the interviews.

In this section, I will discuss how the findings of this study inform the current research base of embodied learning, especially related to smoking and how body connections to smoking impact
a smoker’s use of an EC in light of quitting or reducing cigarette use. Following that discussion, I will highlight the interview results on how a cigarette smoker’s EC learning is synergistic and includes social and material connections. Finally, I present a model for learning about ECs and its contribution to adult learning, tobacco treatment, and tobacco regulation.

**Embodiment of Smoking and EC use**

Smoking is an embodied action with repetitive acts driving much of the body’s learning such as smoking a cigarette after dinner or while talking on the phone (Dawkins, 2013). Although nicotine is addictive and a primary reason to continue to smoke (Benowitz, 2010), many participants stated that using an EC to reduce or quit smoking is more than just a way to alleviate a chemical addiction. Although some studies suggest that expecting the EC to delivery nicotine to the body (Benowitz, 2014; Copp et al., 2015) contributes to the smoker’s positive response to the EC; this study, in addition to others (Dawkins et al., 2012; Hajek et al., 2014), found that the way (physical actions, sensory stimulations, etc.) that the EC gives the nicotine to the smoker is credited for the reason that it can be used to reduce or quit smoking.

The ability to replicate the habit of ‘hand to mouth’ action and the ‘inhale and exhalation of vaper’ are frequent reasons given by smokers when they talk about how they use an EC to reduce or quit smoking. Current research found (King et al., 2016) that passive imagery of the EC replicating smoking by ‘hand-to-mouth movement’ and ‘inhale and exhale’ behaviors may generalize as a conditioned cue to smoke. This research proposes that the ability for the EC to replicate this ‘hand to mouth’ action and the ‘inhale and exhale’ of vapor is a reason that the smoker can use the EC to reduce or quit.

Bodily senses are activated with smoking and also with the EC. This “connected knowledge” (Swartz, 2012) allows for the familiar (traditional smoking) activity to be comfortably
replaced with new activity (EC use). Seeing the similarity of the EC to traditional cigarettes has been found to contribute to more interest in EC use (Pepper, Emery, Ribisl, Southwell, et al., 2014) however, learning that the EC will replicate the sensory involvement that cigarette smoking provides (Dawkins, Turner, & Crowe, 2013) is comfortable to the smoker and likely contributes to the use of the EC to reduce or quit smoking.

Two participants in this study quit unintentionally. One realized that after months of using the EC he preferred the EC and was just naturally reaching for the EC instead of his cigarette. He was not intending to quit but once his body learned that the EC could replace the sensory involvement that smoking gave him he preferred the EC. The second participant classified himself as a ‘die hard’ smoker because he has tried to quit multiple times before and couldn’t. Because of this he just resided to the fact that he will smoke until he dies. He started to use the EC at work because he could not smoke there. As his body experienced the EC he realized that he could use it more frequently and he eventually quit smoking. This sensory involvement is noted as a positive outlook on EC use and can predict continued use among cigarette smokers (Dawkins & Corcoran, 2014). Similar to Stuckey (2009) and her discussion on learning that comes from paying attention to the body’s senses and being aware of the body responses, I believe that as the smoker experiences the body response to the use of an EC, they learn how it can replace the sensory involvement that smoking gives. This is an important concept to consider and is evident in the experiences of these two participants.

Emotions and perceptions around EC use also provide embodied learning experience. Surprisingly many smokers interviewed expressed happiness and increased confidence when learning to use the EC to quit smoking. Their environment became healthier which contributed to more peace in their lives. This finding contributes to how Moya interprets the work of Merleau-
Ponty’s in which human experiences contribute to human learning (Moya, 2014). EC users learned that through the experience of using an EC they could improve their environment which then made them feel more confident and healthier. This way of complimenting the physical learning from using the EC, such as the EC can replace the sensory parts of smoking; the smoker also learned that their environment improved. Pulkki et al (2017) found that through a tangible lived body experience people can connect better and value nature more. Similar to this, smokers found that they connected to their inhabited environment with a happiness and mindfulness which gave them an enhanced appreciation of being smoke free. Seeing cleaner walls and car windshields created an embodied experience for the smoker which was expressed as experiencing a happier more peaceful feeling.

Tobin and Tisdell (2015) found that writing about the body in learning immediately after an embodied activity can increase body awareness overall. Learning embedded in the body can include the cognitive and physical aspects, and this research contributes to the current understanding that smoking impacts the smoker’s senses, actions, and emotions (Lucchiari et al., 2016). This research contributes to the current adult learning research because it found that quitting smoking, particularly with an EC, increases body awareness. In addition, by paying attention to the body senses smokers found with cigarettes and the transfer of these connections to EC use, they found other ways to reduce or quit smoking.

**EC Learning and Actor Network Theory**

The process of giving agency, or an ability to make change, to the EC is why I look to Actor Network Theory (ANT) to explain some of the learning which occurs when using an EC. ANT assumes a connection between human and nonhuman entities. These connections provide a network for learning and change (Fenwick & Edwards, 2010). During the interviews participants
talked of how they came to learn of an EC. Several mentioned seeing someone using it, hearing or reading about it through some type of media, or even being offered an opportunity to try it by a complete stranger. In addition, continuing to use the EC was similarly supported. People or media provided more information about the EC and more understanding of how to experience the EC. The cooperation of all the parts of the EC user’s networks creates a synergy for learning. Synergy is defined as the interaction of two or more agents to produce a combined effect greater than the sum of their separate effects (Dictionaries, 2018)

Learning about and using an EC has many levels of interaction. Some of these interactions are of a personal or human nature (friend, coworker, etc.) and others are of a material or virtual support (EC device, online chat group, etc.) (Cheney et al., 2016). These levels are synergistic and connect with each other by providing a flow of information and experiences. This study, like others, found that exposure to an EC generally occurs through an electronic source (internet, Facebook, Twitter, YouTube, etc.), that connects to networks, or another person (Dawkins, Turner, Roberts, et al., 2013; Emery et al., 2014). Several participants talked about seeing someone else using the EC which increased their interest in it; or others stated that they saw an ad on television or through the internet. Becoming aware of the EC seems in line with current research that is available. However, my research found that experiencing an EC and learning what works for the smoker is quite individual and personal, but it does connect to networks, as discussed in ANT. Although current research tells us that experiencing an EC is prompted and supported by networks of family, friends, coworkers, etc., (Li et al., 2014; Pokhrel et al., 2015) the continued use of an EC is a very individual and personal decision. For EC use to continue, it seems that the smoker must come to an internal acceptance of the benefit of reducing or replacing smoking with an EC, and relates to their social networks as well as their own individual needs, acceptance, and desires,
and what they perceive as a benefit and liability. The amount that a smoker uses an EC is dependent on their perceived benefit of using an EC.

This study, like others, found that continuing to use an EC depends on a positive expectancy of the benefit of EC use (Baweja et al., 2016; Cooper et al., 2016) with the length of time using an EC determined by the amount of positive or negative effects from using an EC (Maloney & Cappella, 2016; Thrul & Ramo, 2017). However, many users stated that being able to continue to use the EC also depended on the ability of the user to find an EC that satisfied their expectation of the EC, such as ‘throat hit’, easy to use device, or acceptable flavor. Similar to Etter (2016b) this study shows that being able to change or alter the EC device is important to maintain expected sensory effects of the EC.

Participants stated that being able to know how to change or alter the device is an important component to learning about ECs both in the open ended questions on the survey and in the interviews. How the learning occurred involved trial and error of different devices, nicotine levels, and flavors of liquids. How the smoker learned about the devices involved synergy of the networks. This interaction in learning generally took place when the smoker was first introduced to the EC and was likely using both a cigarette and an EC. This dual use is often said to support continued smoking and reduce chances of quitting (Manzoli et al., 2015; Pepper & Brewer, 2014). However, I found that some of those interviewed needed more time to adjust to the EC, and more network support to fully understand how the EC can help them quit smoking. They were dual users for sometimes years but eventually they became exclusive EC users. Some of those interviewed who considered themselves ‘hard core’ smokers even stated that if they were told that the EC was a device to allow them to quit smoking they would not have even tried it. This research demonstrates the importance of personal experience with the EC and the need for the smoker to have their own
experience when using the EC. One way is not the only way. Flexibility in frequency, length, and method of use of an EC all contributes to successful use of the EC to reduce or quit smoking.

The experience of the EC is multifaceted with networks of people, EC devices, components, and e-liquids in addition to the internet, newspaper, advertisements, vape shops, etc. all contributing to learning about the EC. As ANT reveals, these social and material connections experienced by the smoker should be recognized as significant networks which help smokers learn to use the EC and these networks have an important role in the personal or self-directed learning which is required when participating in EC use. Just like Prout (1996) discusses the self-learning involved when using a metered dose inhaler to treat asthma, using an EC to reduce or quit smoking requires similar networks and support. Although teaching about how to use an EC may be a component of a vape shop employee, a YouTube video, or hopefully, one day, a health care provider, the experience of it is directed by the smoker and is a personal process, reflective of the synergy of the networks.

The continued exposure to parts of the network provided knowledge the smoker needed to change their use of cigarettes and to use the EC to reduce or quit smoking. Whether using ECs exclusively or continuing to dual use, there is a process of material and social applications that evolve when learning about the EC and its use. This process flows from making the EC available to be seen by smokers and talked about to people using the EC and advocating for its ability to provide a way for smokers to reduce or quit smoking. This synergism is prevalent and powerful in the EC community. The combined effect of the social support and material experiences are greater than either alone.
A Model of Adult Learning for EC Use

Given these findings and theoretical implications, I have developed what I call a synergistic use of EC model. In this sense, synergy means that the social interaction of a smoker learning about EC use combined with the exposure of material (vape shops, computers, etc.) and technical (EC and its components) aspects of the EC, create a greater learning experience than either social or material aspects alone. Before presenting the actual model, first I provide the rationale and background to the proposed model.

The model is based on Latour’s ANT paradigm (2005) which gives meaning to educational practices by tracing the network builders (material and social connections) around learning, and Freiler’s (2008) conceptualization of embodied learning which considers the body’s experience of being and doing when knowing something.

Rationale and Background

This research indicates that there is a role for adult education in EC use, not only in the act of educating about the benefits of quitting smoking with an EC but also in the benefit of knowing the body connections to smoking and the networks which support learning about and using an EC. Certainly it will be beneficial to bring the sensory involvement of smoking into the patient’s treatment as discussed by Dawkins (2013). In addition, acknowledging the experience the smoker undergoes when learning about and using an EC can, as Thrul and Ramo (2017) suggest, increases the smoker’s confidence in improving their health and in staying quit. This could be misconstrued as mimicking a bad behavior or supporting continued smoking (Voigt, 2015), but when successfully replacing smoking with a less harmful product, the diseases impacted by smoking can be tremendously reduced.
In the beginning of this dissertation I told a story about my own embodied experience of dancing. I thought about how I learned from dance. Dance started off with little conscious impact on my learning, but soon dance had a power over me in a positive way. I came to know feelings and a way of being from the movement and sensory involvement of dance. I wanted to know more. My dance instructor provided more ways for me to experience the art which in turn enhanced my interest in continuing.

Adult educators can have a similar role in working with learners and patients, in a general way in regard to providing ways of learning through the body while also taking into account their material and social networks. As such, adult educators may provide healthier and more holistic methods for education or treatment to intervene and provide a connection for a person who wants to change a way of being. By being the facilitator and providing such methods, adult educators become part of the process in the learning network. Much like Prout’s (1996) discussion on the impact of the metered dose inhaler on the actions of health care providers in treating asthma, being able to explain and provide multiple ways to alter a way of being allows adult educators to enter the network as the human actor who is translating nonhuman or material ways to learn to the student.

Although explaining adult education in the actor network of learning can be complicated, Fenwick and Edwards discuss it as “a learning activity that embodies imminent actors (this teacher and this learner with these tools and text) simultaneously with collective dreams and all of its problems imprinted in all of its things” (2010, p. 167). This is true with facilitating and/or learning to use an EC to reduce or quit smoking. The actors are smokers or nonsmokers and EC devices, components, vape shops, online forums etc. Popova et al. (2017) state that providing for the sensory and physical actions of smoking when offering ways to quit increases the chances that a
smoker will quit and I say that providing the network of actors is how this learning occurs. This
learning activity involves multiple actors, human and nonhuman. Rahman et al. (2015) found
once a smoker experiences the sensory replication an EC can give to them, the more their interest
in using it to reduce or quit smoking may become. As Swartz (2012) discusses there is a
neurobiological process in learning which is enhanced by physical actions, and patient education
and educators should adapt to this way of embodied learning.

Learning is a simultaneous activity of past, present, and future understandings and tools
which provide the connections to relearn or learn new ways of being (Fenwick 2010). As cigarette
smokers experiment with and explore different types and styles of ECs, they are using past and
present learning activities to create a future of reduced or quit smoking.

In my embodiment of dance, I progressed from experiencing dance to exploring different
types and intensities of dance. From there, I decided that a great deal of my time would be spent on
dance, and I progressed to teaching dance and advocating for the benefits of dance because of what
it did for me. I became part of the actor-network, which is “simultaneously an actor whose activity
is networking heterogeneous elements and a network that is able to redefine and transform what
it is made of” (Callon 1987, p.93); for me, that was made of dancing. I then realized that I did the
same type of learning with tobacco treatment. Initially, I experimented with providing tobacco
treatment to smokers and realized that the treatment is needed and important but not
comprehensive. This moved me to explore more options to treating tobacco use which involved
other elements and people. My idea of tobacco treatment became redefined and transformed
through working with hundreds of smokers, understanding medications to treat tobacco
dependence, and by advocating for tobacco users and treatment.
Incorporating the theories of embodied learning and ANT in relationship to learning is the framework for this model. It does not answer all questions about adult learning, but it leads to a pedagogy that can be used when unlearning and relearning a new way of being. Just like embodiment of dancing and tobacco treatment which grew with each level I encountered, the use of EC provides for learning in the smoker. I explain the learning in four stages which requires different intensities of interest in the EC. The learner may not go through all stages, but the smoker starts at level one and goes through at least one of the four stages when learning about and using an EC.

The following is my model with accompanied explanations for learning about and using ECs at different stages in the model. The model is interpreted in light of the intersecting theoretical frameworks of the study, and implications for adult education. Implications for tobacco treatment and tobacco regulation are considered in the next section.

The Model Itself

A visual depiction of the model (figure 6.1) appears on the page 208. I call the model, A Journey toward Quitting Smoking: A Model of Adult Learning through Material and Social Networks. The model depicts a four stage process, and there are certain assumptions about the model, namely that:

1) No non-smokers enter the model. This is the most important assumption to keep in mind for regulation as this might not be true in real world scenarios.

2) The model is multi-directional meaning that it is entered from the bottom and smoker’s progress clockwise around the circle, but, the smoker can go back and forth between stages, particularly between the experimenter and explorer stage.

3) Not all users go through all four stages of Experiment, Explorer, Advanced User, and
Expert. Some smokers will continue to dual use. These smokers have not internalized the use of an EC in the same way as exclusive EC users. They may bounce around between different stages of the model; perhaps because the network did not provide the variety or freedom to experience an EC in a way that allows for the level of confidence the smoker needs to reduce or quit smoking.

View the model on the next page (208).
A Journey toward Quitting Smoking:
A Model of Adult Learning through Material and Social Networks

**Explorer** - may have a preferred EC device, visit online learning sources, and talk to other EC users. In this stage users may start to realize the benefits of smoking less.

**Advanced User** - is likely to be very vocal about EC use benefits. Some may even be considering quitting EC use.

**Expert** - EC advocate, may work in or own a vape store, often involved in online and political conversations.

**Experimenter** - is just starting to try EC devices. If smokers do not have enough social and material support or the e-cigarette does not mimic enough of the actions and habits of cigarette smoking, they might not progress to the next stage.

**Explorer** - Dual User 'Starting to believe'

**Advanced User** - No cigarettes only EC 'Knows the EC works'

**Expert** - No cigarettes only EC 'Advocate'

**Experimenter** - Dual User 'Curious'

Smoker enters model

coworkers, family members, friends, other EC users, online resources, EC devices and components, vape shops, etc.
The model shown here represents the use of ECs by smokers. Smokers enter from the bottom as experimenters and generally flow through the learning model in a clockwise direction. They may go back and forth between stages (represented by the thin black arrows), with the first two stages, Experimenter and Explorer, of the model with the most back and forth activity. What is assumed in this model is the sensory and embodied learning (EL) that occurs within the 4 stages: Experimenter, Explorer, Advanced, and Expert. EL is an internal learning process but the learning is supported by external networks of people and materials which are portrayed in the center of the model. Each stage is rich with network support which provides for the internal learning, with stages Experimenter and Explorer signifying dual (cigarettes and EC) use, and Advanced and Expert stages signifying EC only use. The Experimenter and Explorer stages need the most network support to learn about and use an EC and those in the Advanced and Expert stages contribute the most to the network growth by providing smokers with continued learning opportunities.

In what follows I describe the four stages, Experimenter, Explorer, Advanced User, and Expert, of the learning model.

**Experimenters**, or Beginners, are smokers who are *curious* about the EC. They ask about, read about, and experiment with the EC. They are often trying different types of EC and may or may not like them. They may frequent vape shops and search online for more information about the EC and how to use it. They may be switching devices and not quite convinced of the real value in using an EC: being able to reduce or quit conventional smoking. These users have lots of questions about safety, value of use of an EC, how to start to use an EC regularly. They may have learned about the EC from a friend, coworker, or family member and are curious about it.
This stage involves experiential learning and material support of EC devices, e-liquid flavors and nicotine levels in addition to ways to find out about EC use either through people etc. Here human and nonhuman actors are evident in the ‘source of action’ (Callon & Law, 1997) which is the learning about and using the EC. The smoker must experiment with EC use and may find out about the EC through someone they know, but the device must be used in this stage. Embodiment of smoking is still prevalent in this stage. EC use is not embodied and the continued use of an EC is dependent on the confidence in the smoker that the EC will work for them to replace sensory effects of smoking. It is in this stage that adult educators should be aware of the importance in the smoker’s belief that the EC will work as a way to reduce or quit smoking. The smoker may need more experiences of EC use to increase their understanding and belief that ECs can replace cigarette use.

**Explorers**, or Intermediates, are dual users who are exploring the idea of or are using an EC regularly to reduce cigarette use. They have generally found a device that suits them and are starting to believe that they can reduce or quit smoking with the EC. They may still be switching devices, but less frequently. They may have started to use the EC as a way to get nicotine in places where they cannot smoke and may have started noticing health improvements. They are likely to have convincing reasons to continue with or increase their EC use, but are not ready to quit using traditional cigarettes entirely, feeling some need or reason to continue smoking.

This stage involves embodied learning and how embodiment of smoking is felt when switching to an EC. Users of EC in this stage are starting to feel in their body that the EC can be a replacement for cigarettes and they are starting to feel confident in this new way to replace smoking. Adult educators should know that this is the critical stage for identity change. If the smoker believes in this stage that they can quit smoking, then the switch is inevitable. Smokers
using EC in this stage may start to search for others who feel the same way that they do. They want to know how others progressed to using the EC more and smoke less. Again, people and material support of EC use are important in this stage and can be obtained via electronic methods or in person. ANT assumes that these conversations, techniques, and body responses all have an active role in social dynamics (Callon & Law, 1997). All these social dynamics have a role in using an EC to quit smoking.

**Advanced Users** are exclusive EC users. These learners are confident in the value of using an EC and they know that the EC works to reduce and quit smoking. They often have notable health improvements. They may be considering reducing nicotine levels in their liquid to reduce their use or dependence on the EC to potentially stop EC use. They are familiar with different devices, and e-liquid flavors and nicotine levels. They are confident and happy about their choice to switch from smoking to EC use. These EC users are usually happy to explain their story to those willing to ask, but may not purposely go out of their way to advocate for EC usage. They have embodied a new way of being, that of a former smoker!

This stage has moved the smoker to a former smoker status and may have created some ambiguity in the former smoker as to why others, particularly nonsmokers such as government agencies and healthcare providers, have not embraced their great achievement ‘quitting smoking’. In this stage, the embodiment of smoking has been reduced or replaced with the use of an EC. Former smokers are starting to participate as an actor in the ANT by talking about how they use their EC and the health improvements they feel from quitting. Adult educators would benefit from acknowledging the success of the smoker in this stage and even use their expertise to help others, such as those in the experimenter or explorer stage.
Experts, or Professionals, are EC advocates or store owners/operators. They articulate clearly what the EC does for them and are able to converse with others about the value of the EC. They are often well-read on the effects of e-cigarettes, nicotine, propylene glycol, vegetable glycerin, and vapor flavorings. These users are often very active contributing to online resources, open public and government forums, and lobbying for continued availability of ECs by enrolling others in their cause. These associations contribute to the growth of the EC network by making it larger, more durable and influential (Callon & Law, 1997).

This stage of learning is where the EC user starts to understand the power of the network and how is it responded to by society and government agencies. Because EC users often feel that the government does not understand and/or care enough about their position, they take it on themselves. They are serious about supporting EC use by telling their story to government officials, healthcare providers, media, or anyone who will listen. In addition, these users are most likely to approach other smokers to try and help them to quit, similar to a mentor, helping to guide smokers through the beginner stage to the explorer stage. In this stage, former smokers have embodied a new identity; one that takes on an almost evangelical support of EC use. They are advocates and staunch supporters of EC use. They want government agencies and health care professionals to acknowledge the EC as a smoking cessation device and will go to great lengths to support and protect the use of the EC.

These supporters participate as actors in the ANT by providing material ways to learn about and use the EC by making YouTube videos, opening vape shops, posting on online forums and chat rooms, and particularly speaking at government forums, focus groups, sending e-mails to their representatives, and digitally responding to government call for public comments. EC users in this stage have embodied a new identity. In addition to being quit, they have taken on a
proactive expert role to keep the use of EC going. They are integral participants in the actor
network that supports learning about and using ECs. In fact, this group seems to be the foundation
of the networks which support and grow learning about and using ECs.

These four stages became apparent during the interview process and analysis of that data. I
would not have recognized this type of learning by analyzing the quantitative survey data. In the
next section, I consider further implications of this research; in particular, I discuss the significance
of the network based on the model above.

**The Significance of the Network: Insights and Questions**

The foundation of the network above is the electronic cigarette user. Newberg and
Waldman (2016) discuss movement rituals as a way to alter perceptions in the world and a ritual is
a biological desire to form a united community. Electronic cigarette (EC) users came together as a
community of adult cigarette smokers who wanted another way to give their bodies nicotine. Some
users wanted to quit smoking while others just wanted an alternative to smoking in places where
smoking was not allowed (Barbeau et al., 2013).

The network developed strength through EC users but also through the EC itself. The
changing designs and online support for the products allowed users to experience with different
liquids in nicotine levels and flavors. These not human attributes of the EC flowed over to the
desire of humans to provide experiential opportunities for others despite the unwillingness of
healthcare providers or government agencies to acknowledge the potential benefit smokers could
gain by quitting or reducing smoking with an EC (Fraser et al., 2015). Although ANT does not
really get at embodied learning, the network in the learning model starts to provide a method to
the way a learner embodies a new way of being. The smoker’s body reactions to the EC provided
additional support for the use of an EC to replace cigarettes. The synergy of the experiences of
the smoker and the continued improvement in the EC product gave energy and power to the learning network. This allowed for regular and continued growth in the use of ECs among adult cigarette smokers.

A potential reason for the strength of the network can be related to the fact that cigarette smokers are marginalized and have felt the government has threatened to reduce or take away their ability to use EC (Fraser et al., 2015). This has created suspicion and resentment towards government messages regarding EC. Smokers are not going to the government to learn about the use of ECs particularly because of conflicting information they hear, such as ECs are bad for you, but those that are using the EC feel healthier in their bodies and now experience a new way of being because they have quit smoking (Popova et al., 2017). Even though the EC is not an FDA approved tobacco treatment product (Pokhrel, Little, Fagan, Kawamoto, & Herzog, 2014), many EC users state that it helped them to quit and they will support others by telling them how to use the EC or where to find out more information about it. This activity supports growth of the network by helping others learn about the use of ECs.

The strength of the network comes from the people participating in the network in addition to their interaction with the technology or objects used to bring about learning and change. The experience of using an EC brings together the sensorimotor aspects of embodiment to smoking and the use of a different nicotine delivery device. If using an EC creates a positive expectation in the smoker, they will likely continue to use it (Nelson et al., 2015). The model discussed in this chapter identifies the importance of both human and object learning and how that learning changes the internal identity or beliefs of the individual. This way of learning, through a network that supports humans and objects in producing a behavior change or a desired outcome can be used in multiple settings. Just think how it can be incorporated into learning
about the use of technology to provide online teaching or something less formal such as using
digital technology to manage food intake and activity levels. It can be used in classrooms with
computers or advanced technology. These learning activities can be approached within the
context of the learning model presented here with the stages of experimenters growing to
explorers, then advanced to expert users. The network is the place that provides the growth and
contribution of each stage. It is exciting to me to be able to provide a method in which users of a
material product or technology can manage their learning and then see the impact their learning
can make when they contribute to the network.

Questioning how people learn and continuing to investigate it is evident from the results
of this study. The point is that mixed methods design allows for multiple types of data collection
but it still is not the absolute answer to understanding how adult smokers learn about and use
ECs. Clearly thought out research and additional theorizing about how smokers come to learn
about and use an EC, particularly the design of the EC and moving between different types of
devices and why, is needed to more completely understand this complex issue. Developing
research trials which use multiphase strategies which allow for more choice and direction from
the participant may be a way to provide a greater understanding of adult smokers and their use of
EC and to provide for more effective and scalable tobacco treatment interventions.

**Implications for Theory and Practice**

The model discussed above relates the larger synergistic interconnection of embodied
learning and actor network theory (taken together) for adult learning, and then theorizes it in
relationship to the EC in particular; but, there are implications for adult learning theory and
practice overall, and then theorizing for the EC.
Adult Learning Theory

In adult learning, social constructivism is one of the traditional learning theories that supports the perspective that “learning is the construction of meaning from experience” (Merriam & Bierema, 2014, p. 36). This theory assumes that learners have knowledge which is constructed by making sense of experiences.

Vygotsky discusses the experience of social interaction when he acknowledges the important role community contributes to the learner’s process of making meaning. He refers to attention, sensation, perception, and memory as the mental functions through which an individual interacts with their sociocultural environment (Vygotsky, 1978). These processes contribute to the interaction between the learner and the mentor or more knowledgeable other. Piaget (1972) believes that humans develop a more sophisticated cognitive structure as they mature which allows the construction of meaning at a higher level. Dewey (1938) discusses experiences as a transaction between an individual and their environment and how this action contributes to learning.

All of these theorists contributed to the grand theory of social constructivism which focuses on the social context more generally but what Actor Network Theory (ANT) does is focus specifically on the network—both human and object. In this study, both are extremely important. The model I described earlier is different from social theory because it considers the contribution of the embodiment of smoking and the use of EC and how the learning to use an EC is supported by a network of humans and objects. This is so profound that participants in the network can express their embodied connections to an EC by saying “the use of an EC saved my life” and “this is the only way I can quit smoking because I can still have the smoking
experience”. The experience of the smoker and the contribution of the human and non-human actors support the continuing growth and strength of the network.

Controversy surrounds the use of an EC which is evident by researchers and government groups not supporting it or trying to limit or stop its use. By participating in the network the smoker can learn about and how to use an EC in their own multistage way by progressing through the levels of the model. Those who use an EC successfully and have quit smoking participate in the network to promote others interest in the EC. Their contributions to the network come in ways that provide human or material support regarding the use of an EC. Those EC users in the advanced or expert stages of the model have taken on a personal roll to keep the EC in use. Some of them may do this out of fear of losing the ability to freely use the EC or are averse to the government’s potential regulation of access to ECs. This group is working through the network to keep the EC in place and growing in acceptability among its users.

EC users in the stages of advanced and expert embody the use of an EC in place of a cigarette. Their identity has changed to that of a former smoker and they believe in their success. Most want to share this way of being with other current smokers. It is in the network that smokers can learn about how to become nonsmokers through the technology of the EC. In addition to the human contribution of learning, the acknowledgement of human interaction with objects or technology and its impact on learning is really what makes this model of a network for learning different from social theory.

Based on my approach to synergy of learning between human and nonhuman networks, I believe that adult learning theory building will be enhanced by a conceptualization of the influence of social and material networks made more apparent in theory (and practice). In the world of advancing technologies, it is to our benefit to consider the how human interaction or
reaction to objects and technology support learning. ANT focuses on the very small or mundane behaviors or interactions to illuminate what negotiations or actions create knowledge (Fenwick & Edwards, 2010). Within these behaviors, ANT can also enlighten researchers on how these interactions with technology contribute to embodied learning. Just as social constructivists consider environment and culture as part of learning, Brockman (2001) considers these influences in embodied learning. The way learning is presented in the model is similar to his discussion of knowledge transmission though beliefs and social norms that provide knowledge through the body’s physical sensations to them. Therefore, theory development will be enhanced by discussion of the body’s participation in learning and defining that in the areas of interest to be studied.

In addition, theory development can be enriched by questioning the sources to be studied and their assumptions about the intent of the study. For example, when the focus is on learning about quitting smoking with an EC, the participant may give much different answers in an interview if they assume that the researcher is part of a tobacco company, it is helpful to question the participants point of view regarding participating in the study and not just the researchers reason for undertaking the research.

The longitudinal design used to analyze the surveys and the mixed method approach of this study did provide for development of a more directed interview in a specific population of EC users. However, this design only accounted for a very small population of EC users. Obviously, I cannot just investigate the population of this study, dual users, and expect to learn all I need to about how smokers learn about and use ECs. I must consider the shortcoming of my approach when making conclusions about my findings.
For example, when I found that most exclusive EC users were switching to a mod device, it would be easy to make the assumption that smokers are more likely to quit smoking with an EC if they use a mod device. However, what I found in my interviews is that many mod device users had switched a while ago and had not recently used a cigalike device because they found that it did not satisfy their ‘throat hit’. But, cigalike users in my study found that they liked the similar smoking connection experienced with the use of a cigalike device and would not have quit with a mod device. This personal preference in this cohort is what really accounts for the ability of a smoker to be able to use an EC to reduce or quit smoking. It is not a specific device or a preplanned experience that provides what is needed for an adult smoker to learn about and use an EC. Rather, it is the internal experience of the EC with the external support of the EC that allows a smoker to learn about and use an EC. This multiple choice of, and varied exposure to ECs is paramount for a smoker to accept using an EC. It seems the more support for the varied ways to use and learn about an EC contributes to the internal sensory involvement needed to continue with EC use. Once a smoker believes that the EC will help in reducing smoking, the greater their confidence in their ability to quit or reduce smoking becomes. Embodiment of a new identity starts to develop. As providers of care, the tobacco treatment community in addition to tobacco regulation should consider all avenues that lead to reducing or quitting smoking.

The model above, offers some implications for practice not yet discussed, related to the areas of adult learning, tobacco treatment, and tobacco regulation.
Adult Learning Practice

How are adult cigarette smokers learning about EC and how to use them from an adult learning perspective? As discussed in the model above, smokers learn when using an EC. This experiential learning is important to consider when providing education about addiction.

While there’s been much recent discussion on learning through the body (Lawrence, 2012; Merriam & Bierema, 2014), research studies on how it unfolds are limited in adult education and health care (Swartz, 2012; Tobin & Tisdell, 2015). Freiler (2008) discusses embodied learning or learning via a connection between the mind and body and spirit. Niedenthal (2007) adds to this definition by describing embodied learning as a learned way of being related to the perceptions and experiences of the body’s senses, motor actions, and emotions. This can have consequences both for positive learning and learning through the body that involves an addiction, such as addiction to cigarettes. This study has shown that the sensory involvement of smoking has created an embodiment of smoking which can be replicated when using an EC. When smokers want to reduce or quit smoking, for some, replicating this sensory expectation is the only way for them to do it.

As discussed in the model, actors have agency in adult learning and considering their power to create knowledge will improve education techniques and methods. By acknowledging their part in the network, adult educators can start to assimilate their human contribution with the influence of nonhuman entities. Once understood, this synergy in learning can become more conscious and may be able to be persuaded or modified by educators. Using learning through networks can give adult educators another way to support learning in areas that require change in habits or identity. Difficult lifestyle changes required for other addiction treatments may be enhanced by the incorporation of a learning method supported by the model presented. By
understanding several facets of learning, adult educators can provide more effective guidance in unlearning or relearning new ways of being.

**Tobacco Treatment**

This study offers implications for tobacco treatment. A percentage of the adult population has learned that smoking cigarettes delivers a good feeling to their body. Over time, they have learned that going too long between smoking a cigarette can be uncomfortable and they experience moodiness, stress, and agitation (Benowitz, 2010). Many of these same smokers also learn that quitting the use of cigarettes is challenging because of all the ways in which smoking a cigarette supports their social and physical experiences (Fiore et al., 2008). Discourse around these perceptions can provide for an understanding of how such adults make meaning in their lives. Further putting an embodied learning lens to their experience may help uncover ways such individuals may learn to eventually quit smoking. Use of electronic cigarettes may be a step along the way to facilitate such learning and unlearning as it allows smokers to now associate the feeling with a less harmful device while not interrupting their sensory and physical routine.

Tobacco treatment can support trying to reduce cigarettes by substituting with a device when you can. Smokers are telling us that they want control over the intensity of use of a tobacco cessation device; therefore, tobacco treatment programs should consider leaving the exact prescription of use, particularly of an EC, open and in the control of the smoker.

Is the EC to be used as a cessation aid? If no, should the status quo now be maintained? Or should providers not suggest ECs, but be happy if their patients do fully switch to ECs and quit smoking? If yes, then tobacco treatment guidelines should include multiple ways to use an EC. It can be slowly exposed to the cigarette smoker with an explanation of what the device is and what it provides. The different devices, e-liquid composition, nicotine liquid levels, and
flavors should be written down for the smoker and reviewed. It should also be explained to the
smoker that it is okay to use both the EC and smoke and to try to replace at least a few cigarettes
with the EC. The different styles of devices should be explained and offered to the smoker. It is
the smoker’s decision to make when it comes to cigalike, advanced, or mod devices. The
healthcare provider should also understand that the smoker may change devices, nicotine levels,
and flavors of e-liquid.

**Tobacco Regulation**

The study also offers implications for tobacco regulation. Recently, through friends, vape
shops, and word of mouth, (Pepper, Emery, Ribisl, Southwell, et al., 2014; Thirlway, 2016) the
electronic cigarette (EC) has entered the tobacco use market and it has grown in popularity
exponentially over the last several years, particularly among current cigarette smokers. By 2014
over 55% of former smokers, and 47.6% of current smokers tried an EC while 22% of recently
quit smokers regularly use an EC (Schoenborn & Gindi, 2015). While these statistics are
interesting, currently, there is a lack of data-based research that focuses on the social and
material factors (including the body) that impact learning about and using an EC.

Government agencies can be active in providing evidence based information about how
smokers learn about and use an EC. This study found that smokers want a nicotine replacement
that mimics the sensory and physical involvement of smoking. Tobacco regulation should
consider the positive and negative effects of nicotine in general and be fair with the comparison
of chemicals received from a cigarette compared to those received from an EC. Most of the
participants had tried and failed with current FDA approved products stating that they just didn’t
work to replace the physical, sensory, or emotional aspects of smoking that they had learned
from many years of smoking. Although some smokers can quit with the use of these products,
we should consider all those who have this addiction and may benefit from using an EC to
reduce or quit smoking.

In addition, many participants want to know what is in the EC. Where is it coming from
and who is making it? Many EC users I surveyed mentioned batteries and usage. They voiced
concern over the unintended incidences that occur with unsafe battery practices. Regulations can
be used to help make sure the batteries are all properly labelled, and battery safety is conveyed to
the consumer properly to make these incidents happen less. In this way, the government can
show that they listen to the concerns of EC users. It is also important to create a standard
message to manage information given to cigarette smokers and healthcare providers so there is
confidence in the healthcare provider knowledge of ECs and in the smoker when they receive
this information.

**Limitations and Suggestions for Further Research**

Future research on this design will help adult educators, tobacco treatment, and tobacco
regulation in their understanding of how adults learn another way of living, particularly with an
addition such as nicotine. Like any study, this study has some limitations. This study is limited
by the small sample size and purposeful population. This is generally expected from qualitative
research. Using a mixed methods approach did provide a greater understanding of the research
problem but the sample size remained small and may not be generalizable. I also used survey
answers and interviews from dual EC and cigarettes users only. This method certainly biased my
sample and could skew my results. Although the information presented is valid, it may not be
transferable to all EC users.

Consideration should be given to the possibility that the network may be fueled by
controversy around EC use and this controversy may be the driving force of the network and
learning about ECs. If so, once or if the controversy subsides, the network within the learning model may stop growing or change completely. However, I have gained enough of an understanding through this research to start to formulate a model of EC use and the users’ progression. I think that may provide for a starting point in understanding how smokers embrace the use of ECs and either use them exclusively or continue to dual use. So while the study has limitations it has strengths as well, and also offers suggestions for further research.

Future research should consider the contributions of smokers and how they learn about ways to reduce or quit. This addiction hits many levels of society but its worst effects are on those who continue to smoke cigarettes. Investigating the reasons why smokers continue to smoke and why they are not seeking treatment is imperative. Developing other ways to treat nicotine addiction is apparent in the popularity and increasing use of ECs. This technology is being learned about and used by smokers despite the lack of support from the tobacco treatment community. I believe that as researchers we should always listen to the voice of the smoker. How else are we going to even try to understand this seductive and profound addiction? We need to understand before we can even attempt to treat.

This research is a start to understanding the diversity in use of ECs and how smokers are learning about and using ECs. Research should consider that one size EC and one way to use it does not work. In addition, social and material systems provide for a network of exposure to learn about and experience ECs. Clinical trials that allow for alternative paths in the intervention phase would provide for a more realistic interpretation of what is happening with adult smokers when they switch to ECs. Having multiple devices to choose from and multiple ways, perhaps even allowing the participant to decide which device to use, for the participant to experience the EC will give the investigator tremendous information.
Some smokers want to use the cigalike device. They are comfortable with it and like how it mimics their cigarettes use. Others do not want to a cigalike. They like to tinker and alter batteries and devices throughout the day. Others like certain flavors, some tobacco, but many fruit or candy. Research could tell us if there are differences among these users and what the differences are. Perhaps using or expanding on the model described above as a framework may provide for a direction of the progression of EC use in research participants.

Sensory and embodied connections to smoking and the impact that has on quitting is another research topic to study. It is interesting that many of those interviewed stated that they could not quit with FDA approved medications and treatment but could quit with the EC. Further understanding of this aspect of tobacco addition is important if we are to combat this health concern. We can no longer sit and tell smokers what to do. We need to offer flexible, personal, and accepted treatments to smokers so that they can do what the majority of smokers want to do, **QUIT!**

**Conclusion and Final Reflections**

In drawing this work to a conclusion, this study offers a big picture view to how people make use of an electronic cigarette to either intentionally or unintentionally quit smoking, or to taking a big step forward in limiting their smoking or tobacco use. There are people who quit without intention by using an EC. There are smokers who reduced very slowly to quit. They needed time to learn about the device and how they would react to quitting smoking. Emotions, perceptions, physical activities, and body movements are all part of smoking. These combined parts all support the act of smoking. What we as a community need to better understand is that our current treatments of this addiction often concentrate on *only* one or maybe two of these components. This works for some as we know from those who have quit smoking in the past, but
for those who continue to smoke, tobacco treatments likely need to be multifaceted and able to support the physical embodiment of smoking, in addition to the social, and emotional connections with it. ECs are a start to this form of multifaceted treatment. We need to allow the smoker to direct their treatment. We can provide multiple ways to quit but allow the smoker more direction in the way and method used to reduce or quit smoking.

Incorporating tobacco treatment which gives power to the smoker with the ability for the provider to allow for flexibility in the use of the device, may begin to increase confidence in the smoker because this method represents that we, educators, researchers, healthcare providers, and government agencies, are listening to smokers and are providing what they tell us they need to quit or reduce cigarettes use. Just because we tell smokers to quit smoking does not mean that they will quit. We must also provide what they need to quit. This research is a start to understanding what the smoker needs and why it is important to allow the smoker to tell us what they need to quit.

In offering some final reflection on the study from a personal perspective, this research has built a tremendous understanding in my treatment of tobacco addiction with those who use ECs. The basic survey data provided some concrete, what I thought was concrete, information about EC users, such as that they are likely to quit with the mod device, but real life interviews told me differently. I have learned that the use of an EC is personal and, while I lend advice on the product, it is not up to me to decide what will work for the smoker, but I also recognize as a result of the study that smokers are connected to networks. It is my position to provide information on types of EC devices and ways they are used so that the smoker can make their own decisions on how to use the device safely, while taking into account both their networks and their individual needs.
I was interested in why some smokers could not quit with traditional FDA approved medications, and this research provided some of those reasons. I have come to realize the importance of embodied learning and the expectations in our ways of living and how we make meaning of our lives dependent on what our bodies are expecting to have happen. Senses, actions, and emotions are all part of tobacco treatment and should always be considered.

Adult learning occurs in many levels particularly when a technology or device is introduced. Learners require people and things to help them to understand the correct and most useful avenue to take in the learning process. As an educator, I need to provide those avenues so that learning is supported and can occur in the learner.

Most importantly, I have learned that progressing through a process, such as writing a dissertation or learning to use an EC is one step at a time. The fulfillment is in the journey to the goal. The excitement is in achieving the goal. I have grown and made many small achievements that gave me the incentive to move forward. It is moving forward that counts and is what gets me to the exciting goal. Although the excitement is short-lived, the fulfillment in the process is always present, at least for me, for my lifetime. So, as I dance this dance and presented these findings on February 12, 2018, I experienced an embodiment of fulfillment. The dissertation was the culmination of 4 years of work into one exciting goal. The moment I received a Doctorate in Adult Education degree will stay with me forever as the reminder of each of the steps taken which gave me the joy and fulfillment of this exciting achievement. I hope in my professional work that I can support the fulfillment of smokers as they take the steps required to get them to the goal of being quit. And now that this work is done, I believe and I know that what I did for love was absolutely worth it.
References


doi:10.1038/clpt.2008.3

doi:10.1146/annurev.pharmtox.48.113006.094742


doi:[http://dx.doi.org/10.1093/ntr/ntu200](http://dx.doi.org/10.1093/ntr/ntu200)

doi:[http://dx.doi.org/10.1093/ntr/ntu200](http://dx.doi.org/10.1093/ntr/ntu200)


doi:[http://dx.doi.org/10.1002/cncr.28811](http://dx.doi.org/10.1002/cncr.28811)


doi: [http://dx.doi.org/10.1136/tobaccocontrol-2014-051648](http://dx.doi.org/10.1136/tobaccocontrol-2014-051648)


doi: [http://dx.doi.org/10.1111/add.13240](http://dx.doi.org/10.1111/add.13240)


doi: [http://dx.doi.org/10.1037/adb0000137](http://dx.doi.org/10.1037/adb0000137)


doi: [http://dx.doi.org/10.1016/j.drugalcdep.2014.12.007](http://dx.doi.org/10.1016/j.drugalcdep.2014.12.007)


therapies among e-cigarette users (aka vapers). *Nicotine & Tobacco Research, 17*(2), 193-200. doi:[http://dx.doi.org/10.1093/ntr/ntu149](http://dx.doi.org/10.1093/ntr/ntu149)


doi: [http://dx.doi.org/10.1016/j.brainresbull.2015.10.003](http://dx.doi.org/10.1016/j.brainresbull.2015.10.003)


doi:http://dx.doi.org/10.1111/add.12878


APPENDICES

APPENDIX A: Electronic cigarette pictures

Cigalike:

Advanced Generation with a button:
Mod Versions, First two with large battery:
APPENDIX B: Survey Questions used for this study

First survey

What is the single most important reason you use an e-cig?

When you started using your e-cig, was it your intention to quit soon?

Which of the following e-cig characteristics are important to you? Variety of liquid flavors, shaped like a cigarette, provides good vapor quality?

Second survey

Have you used electronic cigarette in the past 30 days? (Yes/No)

Have you smoked cigarettes in the past 30 days? (Yes/No)

Have you used any other tobacco or nicotine products in the past 7 days?

From the responses to these questions, the original dual users will be placed into one of two groups, continuing to smoke or quit smoking, and placed into one of the following five categories.

1) Those who quit cigarettes,
   a. And are exclusive EC users,
   b. Or use no product.

2) Those who continue to smoke cigarettes,
   a. Are dual users,
   b. Only smoke cigarettes,
   c. Other (EC, cigarettes, and other tobacco product).

These two groups will be analyzed for change in factors associated with EC use by comparing their answers to the following questions from the first to the second survey.

What is the single most important reason you use an e-cig?
Are you planning to continue using your e-cig for at least the next year, or quit within that timeframe?

Which of the following e-cig characteristics are important to you? Variety of liquid flavors, shaped like a cigarette, provides good vapor quality?

Have you ever tried to quit smoking? (Yes/No)

Are you currently using or have you ever used a nicotine replacement medication? (patch, gum, tablet, inhaler, or nasal spray) (Yes/No)

Are you currently using or have you ever used the smoking cessation drug called bupropion? (Zyban, Wellbutrin) (Yes/No)

Are you currently using or have you ever used the smoking cessation drug called varenicline? (Chantix) (Yes/No)

The second survey posed these additional questions;

To what extent do you believe that you can cope well with highly stressful situations?

Compared to cigarettes, do you feel that EC helped you to quit smoking? (Yes/No)

If you stopped using your EC, why did you stop using your e-cig?

There were two open ended questions that were asked on the second survey that are relevant to this study. These are:

Please add any additional information you think a public health researcher should know about electronic cigarettes. (Open ended response)

If you were advising a current smoker who is interested in switching to e-cigs but has never tried them, what would be your main recommendations, based on what you have personally learned? (Open ended response)
APPENDIX C: Interview Guide

Semi-Structured Interview Guide

You have participated in 2 online surveys about electronic cigarettes supported by Penn State College of Medicine. So first thing I want to do is to thank you for taking the time to do that. I also thank you for your willingness to tell me more about your experiences with this electronic device that I call an EC but I understand that there are many ways to reference it. How do you refer to your product and the use of your product? _______________________

I will tell you a little about me. I am a nurse and I have been working in tobacco treatment and regulation for the last 6 years. I have learned a lot about tobacco dependence from current and former smokers and I am fascinated by people like you who are using or have used ____________ (their preferred name for EC). I am really interested in hearing your stories about how you came to learn about and use a/an ________________ (their preferred name for EC). I think it is important for health care professionals to hear what you have to say about ________________ (their preferred name for EC).

To do this, I will interview you. The interview will take 30 to 60 minutes and I will be recording our voices. Are you able to give that time today?

Great! So I would like to start with you.

1. Can you tell me a story about the first time you used an (their preferred name for EC)? The questions below will be asked if the answers do not spontaneously come up during the story.
   a. How did you hear about EC?
   b. Who showed you how to use it? Where were you?
   c. What was your initial thought about an electronic cigarette?
   d. Tell me more about how you decided on which EC to use?
      • discuss brand, style, e-liquid flavor, battery size, nicotine dose
   e. How much would you say that you used your e-cig like a cigarette?
      • none, little, some, a lot.
   f. How would you say it was different or similar to smoking?
   g. What did your friends and family say about your (their preferred name for EC) use at that time?

2. Next I would like to talk about the time between the 2 surveys?

At the time of the first survey (2013/2014) you stated that you recently used EC and cigarettes.

At the time of the second survey (2017) you said that you used __________________.

a. What happened to your ________(preferred name for EC) and cigarette use in the middle? Follow up questions; may be prefaced with ‘Tell me more about’
   i. What made you decide to switch to_____/or continue with ______?
   ii. What happened that lead you to use the EC more/less? When did this happen?
   iii. What did your friends and family say about your (their preferred name for EC) use during this time?
3. Tell me about your ______(preferred name for EC) use now and what a typical day in your life looks like?
   a. What are the times of day use device?
   b. Events or activities experienced when using EC.
   c. EC brand, e-liquid flavor, battery size, uses per day, ml per day
   d. What do your friends and family say about your EC use now?

4. Have there been any changes in your health that led you to use an EC the way that you do? Tell me more about these health changes.

5. If you were writing a book about quitting smoking with an EC, what do you think would be the 3 main lessons to learn? What made you decide on these 3 lessons?
CURRICULUM VITAE
SHARILEE MYER HRABOVSKY

FORMAL EDUCATION:
Doctorate of Education May 2018
The Pennsylvania State University, Middletown, Pennsylvania
Dissertation: “Adult Cigarette Smokers: How They Learn About and Use Electronic Cigarettes”
(Chair: Elizabeth Tisdell, Ed.D.)

Nurse Practitioner Certification, 1996
Widener University, Chester, Pennsylvania

Master of Science in Nursing, 1994
Villanova University, Villanova, Pennsylvania

Bachelor’s Degree in Science of Nursing, 1986
Thomas Jefferson University, Philadelphia, Pennsylvania

Associates Degree in Science of Nursing, 1983
Harrisburg Area Community College, Harrisburg, Pennsylvania

LICENSURE AND CERTIFICATIONS:
Certified Registered Nurse Practitioner, VP-004065-B
Professional Nurse, RN 261176L
CRNP Prescriptive Authority, 003819
ANCC Certification, Family Nurse Practitioner, number 0264339
Certified Tobacco Treatment Specialist
Graduate Certificate in Adult Education in Health and Medical Professions

EXPERIENCE:
Clinical Faculty Graduate School:
   College of Nursing, Pennsylvania State University, Hershey, PA 1/2018-present
Research Advanced Care Nurse Practitioner: Problem Based Learning Facilitator
   Penn State College of Medicine, Hershey, PA 1/2012-present
Nurse Practitioner, Otolaryngology Head and Neck Surgery:
   Hershey Medical Center, Hershey, Pennsylvania 2/2005-12/2011
Family Nurse Practitioner, Linglestown Family Medical Center:
Registered Nurse, Home I.V. Infusion Therapy

CREDENTIALS:
Certified Registered Nurse Practitioner Family Practice, Family Health state of PA
American Nurses Credentialing Center (ANCC) certification as Family Nurse Practitioner
CRNP Prescriptive Authority, State of PA.
DEA Registration
RN License, Commonwealth of Pennsylvania