THE EFFECTS OF BRAIN DOMINANCE ON CULINARY AND PASTRY STUDENTS' LEARNING STYLE

A Dissertation

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by

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Biography

Chef Jennifer Denlinger has been a culinary educator for over fourteen years. She has a BS from University of Central Florida in Hospitality Management, a M.Ed. from American Intercontinental University in Curriculum Design and CCC and CHE. Her culinary education was gained through an intensive apprenticeship program here at The Walt Disney World Resort Restaurants. Her lifelong goal includes combining her educational and culinary experiences together to create a positive learning environment for students and faculty members in an accredited Culinary School. She recently took the position of the Culinary Management Department Coordinator at one of Valencia College's new campuses which hosts a Culinary Arts and Hospitality center. Being a Chef Instructor, she has always enjoyed learning about the Anthropology of Food.

Her current research outside the culinary classroom is centered on the History and Cultural Anthropology of Food in Florida, from the first settlers to present. It covers both the cultural and economic significance of Florida Food, as well as the significance Florida Agriculture has on the economy. She focuses on the seasonality and freshness of food and what it takes to get to your table. Some of her work includes helping farmers and growers throughout the state promote their products and all Fresh from Florida. Her website is www.FloridaChef.net

Jennifer is also an active member of the American Culinary Federation, Central Florida Chapter, and Chaîne des Rôtisseurs, the oldest Food and Beverage Society in the world, where she holds the position of Southeast Regional Chargée de Presse Honoraire.

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This study was inspired by many years of teaching post-secondary Culinary Arts education at various institutions. Being a multi-disciplinary instructor for a good portion of my career as a culinary educator, the apparentness of how students in each discipline behave, socialize, prepare, learn and succeed emerged. To be successful as an instructor and to ensure I was presenting the best quality education in a manner that would work best for the students. I made sure the method in which the materials and lessons were delivered, as well as the educational setup were tailored to meet the population I was working with. It has been and will be my mission to deliver the highest quality culinary education in whatever means available to ensure the students have the best quality education. I have enjoyed teaching all my graduates and look forward to all my new enrollees in hopes of creating a very well-practiced Culinary Arts education philosophy that helps all students succeed and have prosperous careers., no matter what their passions in the food service industry are.

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ABSTRACT

The purpose of this study was to apply what is known about the correlation of brain dominance and learning styles to students enrolled in Post-Secondary Culinary Arts Programs. The field of Culinary Arts includes the subjects of Culinary, and Pastry & Baking. Since Culinary School students are required to take classes of their field, academic classes to gain credits for their degree, plus classes of the opposite discipline, they may not always learn in their preferred style. The significance of this study showed that there is significant effect with gender, age, and Brain Dominance had a significant effect on the odds of observing at least one response category of Learning Style. After delving into numerous brain dominance theories, Neethling's Whole Brain Creativity best suited this study to understand why students are drawn to their field and not the opposite. Students enrolled in Post-Secondary Culinary Arts Programs were asked a series of questions in a survey powered by SurveyMonkey™ based off the Neethling's Brain Instrument™ to help determine if their Brain Dominance (IV) affected their chosen career path [Culinary Arts or Pastry & Baking] (DV) or their Learning Style (DV). The results of the Brain Dominance survey were compared to the results of the VAK Learning survey by conducting logistic regressions. The findings of the relationship between the career path of a student enrolled in a Culinary School and their Brain Dominance, in relation to their age and gender was insignificant. The findings between the relationship of the students' brain dominance and their learning style was insignificant. The findings between a Culinary School's students' career path, their brain dominance, and their learning style was insignificant. A larger sample size is desired for further research.

CHAPTER I

INTRODUCTION

The way students learn does not solely depend on the type of instructional content they receive, but also how that material is delivered. The andragogy method of delivering material is the most beneficial manner, but also depends on the learning habits of the students. If material is presented duly, the best outcomes for both teachers and students can be achieved.

To be effective in the classroom, seasoned teachers must adjust their delivery to meet the learning needs of their students. Sometimes in multiple manners in the same delivery is required when there are different learning styles present in the same classroom. Sometimes the way a student learns can be learned through practice and association of other learners. Understanding individual differences in learning has been a major research interest since World War I. It has been too broad of a study, with lack of technology to get good readings of results. Narrowing down the study to a particular discipline and its sub-disciplines can help prove in a singular basis how to alter learning capacities (Bentley, 2000).

The purpose of this study was to apply what is known about the correlation of brain dominance and learning styles to students enrolled in a Post-Secondary Culinary Arts Program. There was no specific literature in this field, so creating a research project to help clarify how Culinary Students learn differently than Pastry & Baking Students will greatly help the instructors who teach at a Culinary Arts School. Similar studies include a look at socialized learning in culinary training by Thibodeaux (2012), how brain dominance affects students in an online health wellness education program (Oddi, 2011), and numerous studies on educators and brain dominance [(Wilber, 1995), (Tardif, E., Doudin, P.-A. and Meylan, N.,2015), (Ozgen, K., Tatariouglu, B., Akan, H., 2011) and (Denkler,1994)]. Gokalp (2013) aimed to evaluate the

learning styles of education faculty students and to determine the effect of their success and relationship between their learning styles and academic success. Research on brain dominance and learning style include the research on Kirton's Adaptation-Innovation Theory of cognitive style. It examined problem-solving preferences of students with the Felder Silverman Learning style model (Samms, & Friedel, 2012). Bentley (2000) made a correlation to Brain Dominance and Learning style using a Learning Orientation Questionnaire. With this knowledge, instructors can tailor assignments, so they are in the learning style of the learner. The learning styles are visual, auditory and kinesthetic. The visual-auditory-reading/writing/ kinesthetic (VARK model) [referred in some literature including this one, as just VAK] is used to "assess the learning style of the individual based on the sensory modality preferred by themselves to perceive information" (Anbarasi, et.al., 2015). Since the field of Culinary Arts is primarily a hands-on field, students enrolled may not be as academically inclined. Making learning more compatible for the learners, will help increase the success rate of the students.

Dr. Kobus Neethling is an acclaimed creative thinker whose post-doctoral research on whole brain creativity in 1983 determined that brain processes and creativity fell into two distinct categories (Korf, 2004). Dr. Neethling, first developed the Neethling Brain Instrument™ (NBI™) post doctorate with his University of Georgia professor Dr. Paul Torrance. The NBI™ is a brain dominance tool that was developed after extensive research of other brain dominance instruments (Arendse, 2008). The NBI™ has since been developed into numerous other whole brain instruments that are fine-tuned for other populations and professions (Neethling & Solutionfinding.com, 2005). There is no record of this type of data being collected in the culinary field, hence the need for data collection in this area.

Background of the Study

When most people think of food, cuisine, or eating out, they think of the entire meal, from start to finish. Both Culinary and Pastry & Baking (P&B) must work together and be in harmony to produce a seamless dining experience. The truth is, that both disciplines are very different from each other, and therefore the people who produce the products in each discipline are also very different. It is very common that those who excel in one discipline are not as successful in the other discipline.

Culinary Arts can be referred to as preparations of savory food. It includes things such as stocks, soups, sauces, meat fabrication and cookery, fruit and vegetable preparations, salads, and charcuterie and garde manager items. Examples of positions that can be obtained through Culinary Arts training could include things such as Line Cook, Pantry Cook, Prep Cook, Roundsman, Garde Manger, Grill Cook, Broiler Cook, Production Chef, Saluiere, Saucier, Sous Chef, Banquet Cook or Chef. The Term "Chef" generally applies to more advanced positions or roles within the professional kitchen (Le Cordon Bleu, 2014 p. 13).

Pastry can be referred to as preparations of sweet foods, and Baking can be referred to as preparations of foods that are primarily flour based and may or may not have a leavener. Pastry items include things that are high in sugar such as cakes, pies, tarts, custards and mousses, cookies, sweet sauces and then the conglomeration of these items into a dessert. Baking items usually refer to breads in any form, size, shape, make up, and may or may not have a leavener. Examples of positions that may be obtained by a Pastry & Baking position could include Baker, Pastry Cook, Bakery Assistant, Cake Decorator, Head Baker, Assistant Pastry Chef, Pastry Line Cook, Morning Production Baker, Pastry Chef, Pastry Cook, and Dessert Plater. The term "Chef" refers to generally applies to more advanced positions or roles within the professional

kitchen, bakery, or bakeshop (Le Cordon Bleu, 2014 p. 14).

Problem Statement

The National Restaurant Association predicts the number of new positions needed in the culinary industry to reach 1.3 million (2011). Outside the federal government, the restaurant industry is the largest employer in the United States and employed approximately 10% of the US workforce in 2014 [(National Restaurant Association, 2014), (Hertzman & Ackerman, 2010)]. This growth of the culinary industry makes the demands for trained culinary and P&B workers essential. Because of this trend, the shift to making Culinary Arts a professional field has increased the needs for Culinary Arts programs, schools, and colleges (Müller, VanLeeuwen, Mandabach, & Harrington, 2009).

Culinary Arts college often require students to take academic classes as well as hands on lab classes, to meet the requirements of the accrediting bodies issuing the degree(s). Teaching academics to students enrolled in a school based on a field that is a primarily hands-on field is challenging. Learning styles are generally considered as characteristic, cognitive, affective, and psychological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to a learning environment (Gokalp, 2013). Looking at one researcher's study where the determination of lecture versus lab learning abilities can be different, paves the way for this research of evaluating both Culinary Arts, and Pastry & Baking (P&B) students, and determining the left brain vs. right brain polarities.

The evaluation of both Culinary Arts, and P&B students, and then determining the left brain versus right brain polarities, as well studying their habits, behaviors and learning styles could be ground changing for instructors who teach the next generations of chefs, cooks, bakers, and culinarians.

Statement of Purpose

The purpose of this study was to first determine how culinary schools' students' brain dominance aligns with which program they are aligned in. Then, see what each student in each career paths' learning style is. This could be a groundbreaking approach for instructors who teach the next generations of chefs, cooks, bakers, and culinarians. The understanding of why interested students are drawn to certain food preparation careers based on their brain dominance can greatly increase the market reach of potential Culinary and P&B students. Not only that, but instructors would be able to present the information in a manner that best helps the students grasp the concept according to their brain dominance. Learners have unique ways of learning, which may greatly affect the learning process and consequently their academic achievement and its outcomes. Learners learn in many ways by seeing and hearing; reflecting and acting; reasoning logically and intuitively; memorizing and visualizing (Gokalp, 2013).

Since many times academic classes are constituted by students in both disciplines, and may be at different levels of their program, their learning levels may also be different. If an instructor needs to present a lesson, written in one format, it could exclude certain students who learn by a different format. By identifying key learning habits of students with left-brain habits and with right-brain habits and delineations of these, assignments could contain components of both, or identical assignments or activities that contain the same learning objectives but in different formats, the greatest number of students can be successful. Ned Herrmann, who studied the effect of brain dominance on his employees, stated in an interview, "The brain dominance characteristics of a person greatly affect that person's learning style because these characteristics determine a person's preferred mode of thinking. If a learning point is delivers in a mode that does not fit the person's preferred learning style, then it is likely that the learning

point will not be received" (Gorovitz, 1982).

The learning styles of students seem to be associated with their role models, or teachers. Teachers identified by students as models in an educational context may play a particularly important role in students' learning processes (Shein, & Chious, 2011). Teachers who are multidisciplinary or teach classes of both disciplines, it may be of a disadvantage to the student if the material present doesn't fit their learning style. Therefore, instructors would need to be made aware of ways to present material in various ways to meet the largest amount of learning styles.

Looking at how students learn is something every educator needs to be concerned with. If lessons can be broken down into components, and then each component taught in a way that is most beneficial to the audience, then the delivered materials can be absorbed by learners, so the education will be more beneficial. A simple awareness of differences in student learning styles is vital for educators to aid the learning process. Effective instruction reaches out to all students, not just those with one particular learning style.

"Students taught entirely with methods antithetical to their learning style may be made too uncomfortable to learn effectively, but they should have at least some exposure to those methods to develop a full range of learning skills and strategies" (Gokalp, 2013). Seeing that "individuals are born with roughly 20-30% of their [brain] preferences, while the remaining 70-80% develop through social and environmental interaction" presenting information in a whole brain manner can help students fully understand the concept (Neethling & Solutionfinding.com, 2005). By comparing the relationship of the theoretical framework to the desired outcome, researchers will be able see if their results are aligned with their proposed theories and if their methodologies help bring about valid results. Instead of displaying coping techniques to learn the information, students would have the chance to be in their "learning zone". Coping behavior

may be conduct that was not in accordance with one's preferred cognitive style, which meant that the behavior that once exhibited, was done to facilitate that different style (Samms, & Friedel, 2012). Ned Herrmann (1989) used his hypothesis of brain dominance to present the same training materials in different manners simultaneously, and he notices that the employees of GE "began to get smarter" (p. 212). He would deliver "each point not in just one way, but in three or four and sometimes even five or six [ways]……thus the multi-dominant teaching ensured that students mastered the materials as it was designed to be understood" (Herrmann, 1989 p. 213).

Gokalp explained that "different ways used by individuals to process and organize information or to respond to environmental stimuli refer to their learning styles", defines learning style as a sort of way of thinking, comprehending and processing information (2013). The evaluation both Culinary Arts, and P&B students, and determining the left brain versus right brain polarities, as well studying their habits, behaviors and learning styles is how Culinary education can be taken to the next level and produce very competent next generation chefs.

In Ned Herrmann's masterpiece of explanation, The Creative Brain, he states: A left-brain approach to solving a problem would be fact-based, analytical and step-by-step, favoring words, number and facts presented in logical sequence, and a right-brain strategy, would seek out insights, images, concepts, patterns, sounds, and movements (Herrmann, N., 1989, p.17). He continues on with: A left-brainer may learn may prefer to learn about engineering or law, whereas a right-brainer might prefer studying psychology, art or music (Herrmann, N., 1989, p.17). Herrmann States: "you can see how failing to match a person's cognitive style the delivery system of information to be learned can get…. The individual is likely to find the learning a great effort, frustrating, demanding, boring, non-productive, and un-fulfilling Herrmann, N., 1989, p.17).

Significance of the Study

Why study brain dominance? The business of Culinary education needs further work into the theory of learning capabilities. Although the Culinary Arts is a fairly new discipline to the post-secondary educational field as a formalized degree track, it has grown rapidly since the 1970s. It has become generally accepted that post-secondary formalized education in this field assisted graduates in their entry and placement in the industry (Stybe, 2015). Earning a degree in the field of Culinary Arts requires academic rigor, just as any other degree track might. However, sometimes the type of students that are drawn to a field that is extremely hands on and tactile are not necessarily the types who are able to go through the academic rigor needed to pass the academic classes needed to earn a degree. Although the process of learning is generally complex, it is not entirely unpredictable (Weibell, 2011). The proposed research of how Culinary Students learn differently than Pastry & Baking Students will classify the tendencies of students enrolled in a Culinary Arts School and ranks them as more left-brained or more right-brained. With the results classified, lessons and curriculum can be presented in a friendlier manner that will benefit their learning style most effectively. When students need to learn the opposite discipline as part of a well-rounded education, and for school accreditation purposes, helping them get through their least strong subject in a manner that is the friendliest to them will be helpful.

In a study that looked at Ethiopian Experience as they accommodate EFL [English as a Foreign Language] students' learning, Boersma (2008) used numerous resources to validate her theory, which also helps align the current research's hypotheses. "According to Reid (1995), instructors with an understanding of their students' learning styles are better able to adapt their teaching methods appropriately. With a large variety of teaching methods available, students are

more likely to be motivated and engaged in the learning (Willing, 1993). In research with secondary students, it was demonstrated, for instance, that “approximately 90% of traditional classroom instruction is geared to the auditory learner. Teachers talk to their students, ask questions, and discuss facts. However, only 20% to 30% of any large group could remember 75% of what was presented through discussion” [(Willing, 1993), (Boersma, 2008)].

“The word culinary is defined by theFreeDictionary.com as “of or relating to a kitchen or to cookery” while art is described as "human effort to imitate, supplement, alter, or counteract the work of nature." Put these two words together and you start to see that the Culinary Arts really involves creating something unique and beautiful – and something that is completely edible! It is called Culinary Arts for a reason, not just anyone can create delicious and inventive masterpieces” (www.internationalstudent.com, 2017).

Culinary School. Most Culinary Schools consist of different programs, degrees, or tracks that includes both Culinary Arts and Pastry & Baking. Culinary Arts is considered more of an art form. The ability to combine flavors and cooking methods can create an endless amount of possibilities. Pastry & Baking is considered more of a science. To concoct these dishes, require a steady hand with the measurements, because many of the items are formula based and the measurements need to be exact. Many of your Pastry & Baking items are a result of a chemical and/or biological reaction between ingredients. Even though it is all “food”, there are very different techniques and skills that are needed. Since there are many different skills and techniques needed, the personalities that prepare food in each discipline tend to be very different as well.

Since Culinary Arts is not considered a “traditional” education path, there are many students who are not “traditional” students and may not have the same advantages academically.

"In Culinary Arts, the competence-based curriculum has come to be regarded as mechanistic and reductionist, and unlikely to foster the fullest possible potential of human development" (Hegarty, 2004, quoted by Roche, 2012). Using a learning theory approach to pair with brain dominance can help assure that students are receiving information in a way that best suits them academically. "Knowledge of learning style preference can help lecturers to assist students to develop effective curricular approaches (Eagleton & Muller, 2001).

Enrollment conditions. To enroll in Culinary Schools, a student usually must complete requirements as set forth by their accrediting bodies, usually a minimum of completion of high school or the equivalent [(Le Cordon Bleu College of Culinary Arts, 2015), (Escoffier Online International Academy, 2017), (Delgado Community College, nd), (International Culinary Center, 2016), (Culinary Institute of America, 2016)].

Some schools also have a minimum age requirement of 17 or 18 for entering. If the student is not quite 18, parental consent is needed. "Schools that require their student to have an internship or externship, must delay the start of a student if needed to make sure they are at least 18 or older to work in a professional kitchen" (Shawn Wenner, personal communication, Former Director of Admissions, Le Cordon Bleu College of Culinary Arts, Orlando, March 9th, 2017), [(Le Cordon Bleu College of Culinary Arts, 2015), (Escoffier Online International Academy, 2017), (Delgado Community College, nd), (International Culinary Center, 2016)].

Minimum age requirements for Culinary School stem from the Occupational Safety & Health Administration (OSHA) guidelines. OSHA guidelines state that a child 14-15 may not: Cook , except with gas or electric grills that do not involve cooking over an open flame and with deep fat fryers that are equipped with and utilize devices that automatically lower and raise the baskets in and out of the hot grease or oil; bake or use bakery equipment such as mixers, dough

dividers, bread slicers, work in freezers or meat coolers work, except minors may occasionally enter a freezer for a short period of time to retrieve items; meat processing and work in areas where meat is processed. OSHA guidelines also state that a child under the age of 18 may not operate bakery equipment, meat processing equipment or slices, rotisseries, broilers (United States Department of Labor, nd).

Impact to Culinary School Education

The purpose of this study was to determine how Culinary Students learn differently than Pastry & Baking Students. After accomplishing this, looking at the social habits of students enrolled in Culinary School, in both the Culinary program and the P&B program, then the most prominent habits, tendencies and learning style preferences can be used to create effective lesson plans. By understanding the left-brained and right-brained tendencies of students enrolled in Culinary School, lesson plans and curriculum of the required classes not in their field of study can be tailored to ensure the success of the student. "When styles are mismatched, distractions cause the student to experience unnecessary difficulties with the presented material" (Denkler, 1994). Mismatching of learning and teaching styles, the students may become bored and inattentive, do poorly on tests, get discouraged about the courses, the curriculum, and themselves, and could possible change to other curricula/ career paths, or drop out of school (Gilakjan, 2012). When the Neethling Brain Instrument™ was used with a large pool of high schools in Australia, the approach to whole brain learning helped the student develop a more rounded approach, proving outstanding results (Whole Brain Thinking, 2005).

Implications of research

With the understanding that Culinary students and Pastry & Baking students are very different in their approaches to creativity and functions, curriculum could be altered to gain the

most educational benefits for them. Even though, some scholars are debating if left-brained versus right-brained differentiations exist, (University of Utah Health Sciences, 2013), there were still some ways to classify the habits of Culinary and Pastry & Baking students, so they are successful.

Concluding this research would allow instructors of Culinary Arts, and Pastry & Baking to prepare and present curriculum in non-dominant classes in a format that benefits their learning style, therefore being able to tailor assignments towards their learning styles. From this the instructor(s) can deliver materials that will be the most beneficial to the group of students they are teaching. Multidisciplinary instructors can understand how the different groups think and present their lessons in a manner that would best make sense to the group they are addressing, including the way they set their [work] stations up. Ned Herrmann has concluded that by presenting information in a "whole-brained method", then a greater chance of reaching all your audience effectively (Herrmann, 1981).

Recent research suggests that the style by which one learns and applies knowledge is an important characteristic to consider in andragogy [(Queen, 2014), (Golkap, 2013), (Abdulsalam, 2015), (Boersma, 2008)]. By spending a considerable amount of time examining the different versions of the term and concept of "learning styles", one can see that are quite a few variances. There are consistently high correlations between students' ratings of the "amount learned" in relation to the students' overall ratings of the teacher and the rating of the course (Gokalp, 2013). Those who were more successful at learning course material tended to give their teachers higher ratings. Since some instructors' lecture, others demonstrate or discuss; some focus on principles and others on applications; some emphasize memory and others on understanding, the students may learn differently. In literature, there exists numerous learning styles and learning style

models (Gokalp, 2013). The differences between learning definitions and teaching models result from the fact that learning is achieved at different dimensions in each person, and that theorists define learning styles by focusing on different aspects (Gokalp 2013).

The sufficient lack of research between student's enrolled in a Culinary School program, either Culinary or Pastry & Baking, and their brain dominance tied to how they learn prompted a research inquiry to the matter. No brain dominance studies found have been conducted in the field of Culinary Arts, P&B, or even hospitality. Thibodeaux (2012), points out how Culinary Arts education is a relatively new field. His research began paving the way for Culinary Arts education practitioners to make a relationship between meeting the needs of the employers, by providing skilled hands on training, and meeting the needs of the education community (Thibodeaux, 2012). Since Culinary Arts is such a hands-on field, the blaring need for academic confidence is usually gone unknown. The emergence of celebrity chefs has brought the world of Culinary Education into full limelight [(Konkol, 2013), (Frei, 2008)]. Students attend Culinary School for various reasons: The love for the craft, the desire to please people, the supposed "non-academic" side of it, varying to the hope of financial success, or fame, or acceptance. The paradigm shift of the emerging career of Culinary Arts has increased the demand of knowledge possessed by the chefs. The trends in the foodservice industry has now put pressure on the students in Culinary Schools to have an academic background as well (Frei, 2008). Since the increase of "non-traditional" students in the classroom, learning styles have tended to shift to the visual (V), and/or kinesthetic (K) learning styles (Hedges, 2008).

Definitions of Industry Terms

American Culinary Federation-(ACF) A professional organization for chefs and cooks. The main goal of the ACF is to promote the professional image of American Chefs worldwide

through education of culinarians at all levels. The American Culinary Federation provides accredited educational programs, certifications, competitions and networking designed to enhance professional growth for all current and future [culinary] Chefs [and Pastry Chefs]. In this research members of the ACF who are not instructors or culinary or Pastry and Baking students are referred to as professionals. (American Culinary Federation, 2016).

Back of the House- Commonly referred to as BOH or Heart of the House. These are the areas in a restaurant, or hotel/ resort that guests or customers do not see. They could include the kitchen, housekeeping, stewarding, receiving, room service, and other non-guest areas. Roles that are found in the back of the house could include: chef, cook, steward, housekeeper, receiver, maintenance, expeditor.

Baking- can be referred to as preparations of foods that are primarily flour based, and may or may not have a leavener. Baking items usually refer to breads in any form, size, shape, make up, and may or may not have a leavener (Le Cordon Bleu, 2014 p. 14).

Chef- 1. French for chief or head. 2. A title of respect given to a person skilled in food preparation and usually in charge of a professional kitchen. He or she is generally responsible for planning menus or ordering foodstuffs, training and supervising cooks and other personnel, and preparing food (Labensky, Ingram & Labensky, 2001).

Chef Instructor- A Chef employed by a post-secondary institution to provide education in the field of Culinary Arts, Pastry & Baking, Hospitality, and academic classes related to the Culinary field need to obtain a degree or certification. These instructors have had numerous years of experience in the field, plus minimum education and certification requirements.

Cook- 1. One who prepares food for consumption by others (Labensky, Ingram & Labensky, 2001). 2. A non-management member of a kitchen staff involved in food

preparation.

Culinarian- A member of a kitchen staff involved in food preparation who is not involved in the management or supervision of staff.

Culinary- Of or relating to a kitchen or the activity of cooking (Labensky, Ingram & Labensky, 2001).

Culinary Arts- Can be referred to as preparations of savory food. It includes things such as stocks, soups, sauces, meat fabrication and cookery, fruit and vegetable preparations, salads, and charcuterie and garde manager items (Le Cordon Bleu, 2014 p. 13).

Culinary School- An academic institution that off programs in Culinary Arts, Baking, Pastry, and/or Hospitality management, usually as a post-secondary education.

Externship- The ability to apply the skills acquired during Culinary School in a real-world situation for applicable course credit. The purpose of an externship is to help students transition to a successful career. These experiences may be paid or unpaid. Externships are done at the end of a program prior to graduation at an approved location.

Food Service Industry- Establishments primarily engaged in preparing meals, snacks and beverages, to customer order, for immediate consumption on and off the premises (Briscoe & Tripp, 2015).

Front of the House- Commonly referred to as FOH. These are the public guest areas in a restaurant or hotel/resort. They could include areas such as the dining room, bar, casino, recreation areas. The employees who work in the front of the house deal directly with customers/ guests and have roles such as: host(ess), manager, bartender, server, sommelier.

Hospitality/ Hospitality Management- broadly defined, hospitality is basically the generous and amicable entertainment and reception of visitors, strangers, and/or guests.

Hospitality also involves demonstrating respect for one's guests, treating them as equals, and providing for all their needs. Involves, but not limited to restaurant management, hotel administration, and customer service (Best Hospitality Degrees, nd). Most of the time hospitality roles are in the Front of the House.

Industry Professional- A Chef, Baker, Cake Decorator, Kitchen Manager, or other similar position in a restaurant, or other food service establishment. They could be management or non-management and work in any department or station with in a kitchen or service facility, and usually work with a food or food product.

Internship- The ability to apply the skills acquired during Culinary School in a real-world situation for applicable course credit. These experiences may be paid or unpaid. Internships are done during their education at an approved site.

Lecture Class- A class which is delivered in a non-lab setting, usually an academic classroom, but not exclusive it. Lecture classes might include academic topics needed for graduating (e.g. math, science, English, etc.), or for certification (e.g. nutrition, food and beverage cost control, food safety and sanitation, etc.) These classes may be taught by professors of their said discipline, or by Chef Instructors who are qualified.

Lab Class- A class that is taught in a kitchen or bakeshop with the instruction of a demo by the instructor, followed by hands on application of skills, techniques, recipes, or practice. It could be cooking or Baking, or any food preparation techniques.

Molecular Gastronomy- Also known as molecular cuisine or modernist cuisine. Refers to experimental restaurant cooking driven by the desire of modern cooks to explore the world's wide variety of ingredients, tools and techniques. It incorporates science into the kitchen. Commonly used to describe a new style of cuisine in which chefs explore new culinary

possibilities in the kitchen by embracing sensory and food science, borrowing tools from the science lab and ingredients from the food industry and concocting surprise after surprise for their diners (Shawki, 2015).

Mystery Basket- A mystery basket generally involves an unknown (to you) assortment of food products that have been pre-assembled for you, either by an individual Chef or a panel of Chefs. You are then presented with this assortment and expected, in a short amount of time, to come up an entire menu (generally 3 to 5 courses) and prepare it. Everything from how the items look and taste to your knowledge of classic cuisine and portion size (even professionalism!) is judged. (Le Cordon Bleu College of Culinary Arts, Orlando, course materials)

Pastry- can be referred to as preparations of sweet foods. Pastry items include things that are high in sugar such as cakes, pies, tarts, custards and mousses, cookies, sweet sauces and then the conglomeration of these items into a dessert (Le Cordon Bleu, 2014 p. 14).

Research Questions

The concluded research attempted to prove that Culinary Students were more left brained as compared to Pastry & Baking students. And furthermore, what degree within the laterization of the brain. From this knowledge, a link can be made as to how Culinary Students learn differently than Pastry & Baking Students.

Determining the brain polarity can only be determined after a series of other questions are answered and observations are made. These can be answered by the following research questions:

1. Is the career path of a student enrolled in a Culinary School influenced by their brain dominance?
2. Is there a statistically significant relationship between the students' brain dominance and their learning style?
3. Is there a statistically significant relationship between a Culinary School's students' career path, their brain dominance, and their learning style?

To determine Brain Polarization, the researcher presented the students with a questionnaire administered though SurveyMonkey™. Students enrolled in post-secondary Culinary Schools (DV) were asked a series of questions to help determine their Brain Dominance (IV). The answers were then correlated with what they determine is their preferred learning style (DV). Each section of the survey is different. The questions presented are the same to everyone, however they may be delivered in a different order (randomization). The types of questions are explained in the next few pages. Demographic questions are explained on page 53 Questions related to the Neethling Brain Dominance Instrument ™ are explained on pages 55-56.

The first set of questions cover participant demographics. Within this category, the participant identified the program they are enrolled in. By looking at these characteristics of the students, a picture of who is enrolled in each program can benefit the marketing of the program, the instruction in the classroom, and the learning outcomes of the students. These questions helped to align the learning style with the brain dominance. Questions included topics such as preferred hand usage, and questions about how they present themselves professionally. There was a null answer that encompasses "not applicable" or "choose not to answer" for questions about their personal lifestyle and/or habits. These questions were made available in Appendix B.

The second set of questions were questions used to determine brain dominance that are based off the NBI™. There were four options, to answer each question, each option representing a quadrant of the brain. The answers were representative of the characteristics of each quadrant of the brain (Appendix A). These questions were made available in Appendix B. To determine preference, answers were put into rank from best response, to least applicable response. Coding of these answers are found on page 56, and interpretation of these results on page 94.

Finally, the last set of questions were questions on learning style base off the VAK Learning Style Survey (DV). Students selected one assignment that they would wish to do. There were four (4) answers, each one representing a brain quadrant. Association of brain dominance and VAK Learning style is in figure 7 on page 47.

CHAPTER II

LITERATURE REVIEW

To help bring us to the conclusion of how Culinary School students' brain dominance plays into their learning style, first we must understand how Culinary School education works, the aspects of brain dominance, what are learning styles, and how to determine if something is creative.

In order to prove these hypotheses, an in depth look of each type and the characteristics of brain dominance, plus the known characteristics of how people with certain brain dominances. By looking at patterns in habits of people within the same brain dominance, then assumptions were made. The different learning styles was correlated with the brain dominance to help show how learning in a particular style can be beneficial to students of a particular brain dominance. The proceeding literature review drew hypotheses within each characteristic to align the hypotheses. This is followed with a look at terms related to the Culinary Arts field.

An internet resource shows that students with high visual and spatial skills would excel at careers such as being a chef, or being an artist (Rain, nd), however there is not enough evidence to back that up. Even though there is a bit of research on how brain dominance works, there is no current research on how it relates to Culinary and P&B students. Culinary Arts is a young discipline which remains under‐theorized in relation to other established fields such as the social sciences, business, and medicine as exemplars (Thibodeaux, 2012). By using one research question to pursue the second one, will allow for a streamlined education to be delivered.

Culinary Arts and Brain Polarity

The study of Culinary Arts will require research and published findings to determine the brain polarity. Essential skills that are needed in Culinary School were examined. One of topics

which had to be discussed is how creativity in the kitchen is evaluated. Since creativity highly subjective, creating standards to base creativity from is a challenge. Also, since Culinary and P&B vary from within their discipline, the viewpoints of what is creative varies as well.

The research began with numerous brain learning styles that will narrow on a focus of Neethling's Whole Brain Creativity, which will be used to support Research Question 1. Then, the concepts of teaching in a Culinary Arts School is was delved into, as well what is considered creative in the fields of Culinary Arts, and the different viewpoints that exist. This is important because what you determine as creative is determined by your brain dominance. Next looking at learning styles will help lead us to the final topic of the VAK learning style, and how it correlates to the Whole Brain Creativity. This will be used to support Research Question 2.

Overview of Theoretical Framework

This paper will look at how Brain Dominance influences learning styles. This research took place with students enrolled in Culinary Schools.

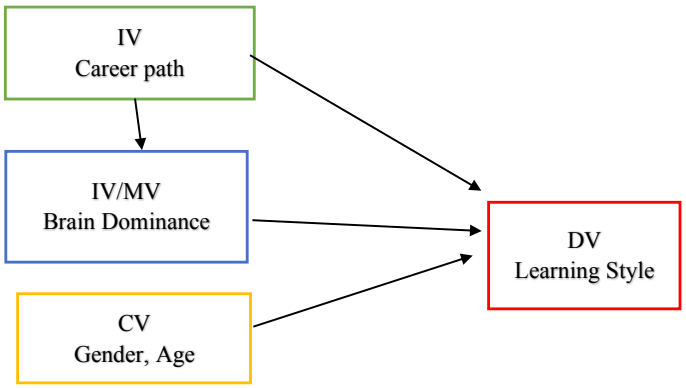

Figure 1 The Determination of Variables based on Hypothesis 1, Hypothesis 2, Hypothesis 3

The Coffield report (2004) documents an investigation into the wide range of existing learning style of learning. The Coffield report is an independent report commissioned through the University of London by the Learning Skills Councils in England. This report evaluates the main theories about learning styles and selects the most important models from the literature [(Oddi, 2011), (de Boer, A., Bothma, T., & du Toit, P., 2011)]. The first notion of duality in learning comes from Hippocrates in 450 BC (Neethling & Soloutionsfinds.com, 2005, Herrmann, 1989, p. 27). Roger Bacon determined that the dual brain consists of verbal and non-verbal modes (Herrmann, 1989, p. 27). Brain learning theories include a theory by Sperry, a theory by Gardner, a theory by Herrmann, plus research by Kobus Neethling.

Roger Sperry conducted brain research to determine that the brain's two hemispheres perform different functions. He stated that "each of the divided hemispheres now has its own independent mental sphere or cognitive system—that is, its own perceptual, learning, memory and other mental processes" (Corballis, 1995, Neethling & Solutionfinding.com, 2005). This theory is known as the theory of dual psychology or split-brain theory (Doty, 1998). Sperry found that a structure called the "*corpus callosum*" connects the two hemispheres of the brain and allows the sides to exchange information (Center for Excellence in Education, 2016). Sperry and his colleagues (Joseph Bogen, and Philpe Vogel) discovered that each hemisphere had its own "propensities and skills" (Doty, 1998). Each hemisphere of the brain then can communicate with the other hemisphere via neurons. They determined that the left hemisphere controlled the right side of the body is dominant for language, and speech as well as analytical and logical thought; and that the right hemisphere controls the left side of the body and excels at visualize, holistic, and unstructured tasks (Neethling & Solutionfinding.com, 2005).

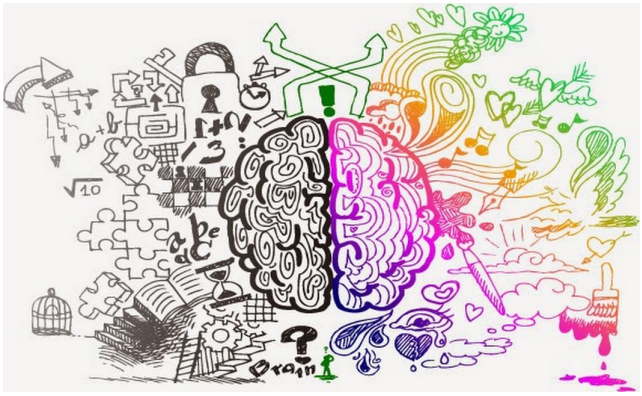

Figure 2 Graphical Interpretation of The Domination of Brain Functions

Following in Sperry's footsteps, Ned Herrmann determined that the brain can be divided into four different quadrants. He determined that there are "left and right areas of reason, and left areas of reason. These four quadrants are the learning centers of the brain" (de Boer, A., Bothma, T., & du Toit, P., 2011). The learning dominances help explain why some people learn better when instruction is in an abstract form, while others learn better if instruction is visually or verbally delivered (Center for Excellence in Education, 2016). According to Ned Herrmann, "the majority of people have a left brain that performs logical, analytical, and mathematical tasks, especially those that involve linear and sequential processes. In distinction, the right brain is better at coming up with forming ideas or notions, intuition, holistic and synthesizing activities, especially those involving spatial, visual and simultaneous processing" (Herrmann, 1981).

Howard Gardner introduced a theory of learning in which intelligence can be broken into seven separate categories. Like Sperry and Herrmann, Gardner's theory states that people demonstrate strengths in specific areas. These are the intelligences that are first described by Gardner in 1987:

- Linguistic intelligence: Good at reading, writing, and telling stories.;

- Logical-mathematical intelligence: Skilled at working with numbers;
- Visual-spatial intelligence: Competent in drawing, building, and design;
- Musical intelligence: Sensitive to rhythm and sound;
- Body-kinesthetic intelligence: Like to move, create, talk, and make crafts;
- Interpersonal: Prefer many friends and join groups;
- Intrapersonal: Prefer to work alone and pursue their own interests

(Center for Excellence in Education, 2016).

Neethling's Whole Brain Creativity as a conceptual model

After extensive research on all previous brain and learning models, including Herrmann's, Neethling developed the Neethling Brain Instrument™ with the guidance of Professor Paul Torrance of the University of Georgia [(Neethling & Solutionfinding.com, 2005), (Arendse, 2013)]. Neethling sought to bring connection between creativity, thinking styles and brain dominance (Arendse, 2013). According to Neethling, the left-brain hindquarter is for structured processing, the left-brain front quarter is for holistic processing, the right brain front quarter is for holistic processing, and the right brain hindquarter is for emotional processing (Eagleton & Muller, 2001).

Neethling was able to take Herrmann's four quadrants of learning, and delineate two separate dimensions in each quadrant, making eight dimensions. As with all brain theories, it is very possible for a person to have characteristics in more than one quadrant, and more than one dimension. A person can show very strong affinities in one section or area to make up their characteristics (Neethling & Solutionfinding.com, 2005).

Additionally, Neethling took the knowledge learned from his work with the whole brain, and the quadrants of learning, and create "Neethling Brain Instruments™" (NBI™) in numerous

different fields, including: teaching, education, health and fitness, sports, relationships, parenting, and career related topics. Each subject showed the preferences of that subject per brain quadrant, and/or brain dimension. The goal of this is to help individuals become more "whole brain" oriented and understand how others are similar or dissimilar to their own preferences (Neethling & Solutionfinding.com, 2005). "The ipsative nature of the NBI™, the scores on the different quadrants are dependent on one another. One cannot have a 'high' score on all 4 quadrants" (Korf, 2005).

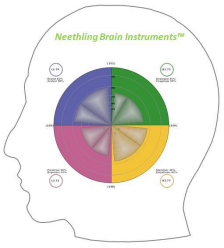

Figure 3 Neethling Brain showing the 4 Quadrants and 8 Dimensions

To fully engage all learning styles, consider using a variety of techniques and tools in the classroom.

Hand Dominance. Hand Dominance can be defined as a tendency to use one hand rather than another to perform most psychomotor activities (Milenkovic, Paunovic, & Kocijancic, 2016). A study by Hu and Newell (2011) looked how asymmetrical [brain] interference on task demands interacts with hand dominance. They concluded that the hand dominance is consistent with the accounts of hemispheric laterization. It is shown that motor laterization has each hemisphere is specialized on certain features when controlling the limb. It is well-known that the left hemisphere of the brain is typically dominant for speech and motor activity, while the right

hemisphere is responsible for the artistic aptitude, spatial orientation, attention, and many aspects of emotional life (Milenkovic, Paunovic, & Kocijancic, 2016). It is hypothesized that, since the brain works with a cross-over pattern, the dominant eye, ear and hand should be on the opposite side of the dominant brain [(Marloth, 2013), (Morris, 2006)]. Corabllis states that about 90% of people are right handed, and the remaining 10% are either left handed or have a degree of ambidexterity (Price, 2009)

The Harris Tests of Lateral Dominance was developed to help determine the dominant side of the brain in children. In children, it is designed to assess preference of one side of the body compare to the other. This test proved a reliable coefficient of contingency; the author placed reliability for the four hand dominance tasks at .894. Spearman-Brown reliability ranging from .85-.88. Test-retest reliability was between .75-.83. Other examiners used split half equivalency reliability coefficients were used with the Harris tests, with contingency coefficients ranging from .74 to .88. Concurrent validity has been established by significant correlation with other measures of dominance [(Harris, 1947), (Connolly, 1983)]. It is known that, although about 95% of right-handers do have left-hemisphere dominance, only around 19% of left-handers have right-hemisphere dominance, with another 20% or so processing language functions in both hemispheres (which could indicate ambidexterity) [(Mastin, L., 2012), (Martensson, F., 2007)].

Whole Brain Creativity

For this study, each quadrant was assigned a code to help distinguish without confusion which area is in question in discussions, or graphical representations.

The assigned codes will be as follows:

L1 (upper left)

R1 (upper right)

L2 (lower left)

R2 (lower right)

The researcher Kobus Neethling also assigned a color to each quadrant to help people understand which area was being referred to. He assigned the colors as such:

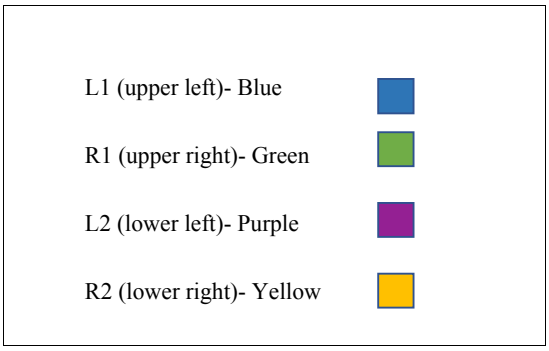

Figure 4 Neethling's Brain Quadrant representation color (Neethling, 2005)

In all his literature, Dr. Kobus Neethling & Solutionsfinding.com, [(Whole Brain Thinking (2005), (Neethling & Solutionfinding.com, 2005)] displays their results and findings in groups of boxes outlined in the quadrant color, as indicated above. Since that is not possible in a dissertation format, small colored boxes, as shown in Figure 4, or colored boxes will be used to display the results as needed, and to indicate the brain quadrant being referred to.

Each quadrant houses a different learning dominance. These quadrants can be described as follows:

L1 (upper left)- analytical and factual

R1 (upper right)- strategic and unorthodox

L2 (lower left)- organized and detailed

R2 (lower right)- interpersonal and sensitive

[(Arendse, 2008), (Eagleton & Muller, 2001).] Key words that describe the personalities and habits of each quadrant are presented in Appendix A.

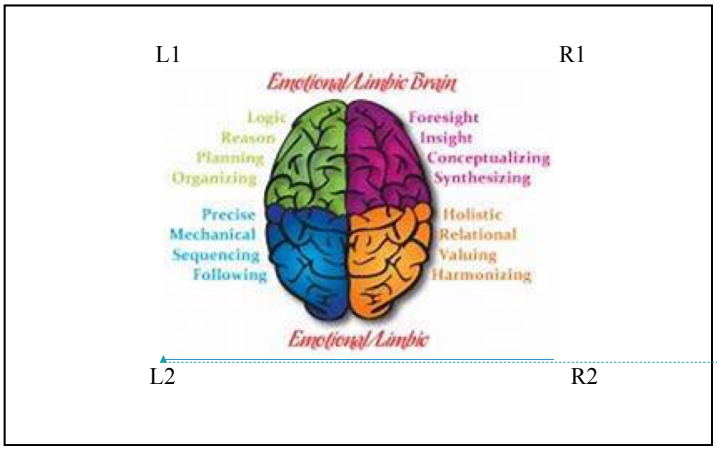

Figure 5 Brain Quadrants and their major characteristics

Culinary Creativity. Culinary Arts and Pastry & Baking professions have the never-ending challenge of remaining in the competitive edge with their customers and consumers. As trends change, so do tastes, as well as what the consumer is willing to purchase. Staying creative in the Culinary Arts and Pastry & Baking profession is vital. Since creativity can be a subjective term, rating it and judging could be a challenge. Now, since these two subjects are very different, so is the sense of creativity.

One of the skills that schools try to help students understand in the creative aspect needed to be successful in the in industry. "National restaurant firms report that Culinary Arts graduates are often not interested in working for restaurants that do not allow for a chef's creativity" (Antun, 2000). Creativity is hard to define, since it is based on person opinion, but by gaining opinions and triangulating the opinions, a fair assessment can be made of creativity. The aspect of creativity tends to be different between the Culinary field and the P&B field.

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Creativity is defined and debated amongst peers to the aspects that involve it. "[Culinary] creativity is divided into two types: scientific creativity and artistic creativity" (Peng, Lin & Baum, 2013). There are four steps to the creative process. Peng, Lin & Baum, (2013) refers to as "4P". It includes: the product of creating, the process of creating, the person who is creative, and the creative environment. The model of Culinary creativity is the meeting of training of the industry, and the education of education of academia (Peng, Lin & Baum, 2013).

The results of Peng, Lin & Baum's, (2013) research determined that there is "5 P's"- with the addition of principal. The limitations of this research include the use of only American and Chinese participants were involved, and they focused on experts in Chinese or Western Cuisine. In this case, Western Cuisine is not defined. The authors, however, did do well in figuring out a good way to define creativity in each of the cuisines. However, since in Culinary Arts, it is based on a person's impression, everyone's impressions are different, therefore the idea of creativity can be different as well. The authors did also indicate that since the same food is present in different ways around the world, and enjoyed differently, the "creativity" aspect needs to be relevant to what culture you are in (Peng, Lin & Baum, 2013).

Creativity may be needed to be further classified: artistic creativity and scientific creativity (Herrmann, 1998, p. 195). According to Herrmann (1998), "Artistic creativity is perceived aesthetic and amorphous, whereas scientific creativity is perceived a more defined, focused, and deliberate (p. 195)." Culinary Arts relies on scientific creativity, and creativity for Pastry & Baking is more artistic. Since in Pastry & Baking the recipes are formula based, the creativity may come from the presentation, colors, or added flavors. For Culinary Arts, the creativity can come from anything ranging from presentation, to flavors, or cooking style, or molecular gastronomy.

The creative process has four phases: preparation, incubation, inspiration [illumination], and evaluation [verification]. The creative process is the greatest in people who engaged in a wide repertoire of cognitive styles. Creativity in management realm refers to new ideas about products, practices, services, or procedures (Horng, & Hu, 2009).

In a study by Horng, & Hu (2009), to measure the creative process, the same classes were taught two separate universities. The curriculum offered include: Introduction to the Nature of Creativity, Relevant Creativity Skills, Review of Basic Culinary Skills, Food Cultures, Chromatics, and Principles of Food Science. In the classes, creativity and Culinary knowledge and skills integrated. They were evaluated on process and performance. Classes were for 16 weeks, with meetings once per week for 4 hours. To make it fair, the class was taught at the exact same time at each university. During classes, lecture was given less than ¼ of the time; the rest of the time was devoted to hands on exercises. There were 31 students, with a ratio of 63% female, and 37% male. The breakup of students' majors included 81% in Chinese Cuisine and the rest were a combination of Western Cuisine, Japanese Cuisine, and Baking majors (Horng, & Hu, 2009).

For the evaluation, students used chicken to create a new dish. They were evaluated using a "Consensual Assessment Technique" using 34 criteria. The Consensual Assessment Technique in when two or more expert judges rate the overall creativity of each solution or product generated by a research participant (Horng, & Hu, 2009). The qualitative research occurred through the process of class observations, and in-depth interviews with teachers, students, studying the notes students took, and the teachers' reflection notes (Horng, & Hu, 2009).

Teaching in the Culinary Arts Field

Since there has been a shift in society dining out, rather than eating in, the need for chefs' increases. The demands for healthful eating as increased as well. According to International Food Information Council (IFIC)' Food & Health Survey, factors that motivate consumers in their decisions include motivating the consumer's food selection (89%), price (71%), healthfulness (64%), convenience (56%), and sustainability (36%), (Abdulsalam, 2015). For professional Culinary Arts, educational programs to be successful, it is essential to include elements that are important to consumers (Abdulsalam, 2015).

"Students entering the field of Culinary training have perceptions and expectations of what they should be taught to be successful and how well their Culinary School is meeting their needs. Employed graduates may have different perceptions on the value of the education a school's educational processes have delivered. At the same time, the industry is constantly evaluating the graduate performance in the workplace" (Müller et al, 2009). "Researchers have identified a positive correlation between graduates' mastery of industry required skill sets, job satisfaction, and position longevity" (Resnick & Wirt, 1996 as quoted by Antun, 2000). Craft-skill education needs to have a connection between what is needed in the industry and what is received in vocational programs. In this case, skill standards should strengthen the education system. Skills required by the culinary industry will require workers who are more actively involved in their job and education (Antun, 2000).

There are essential skills needed for Culinary and P&B students to gain during their education to be considered successful by employers. Popular Culinary programs continue to focus on technical cooking skills with some focus on the teamwork and leadership skills essential to the delivery of a great meal. The field of Culinary Arts is relatively new as a higher education

discipline, and the primary literature, as a collective, displays a progression in ways of thinking and valorizing experiential learning (Thibodeaux, W. R., 2012).

These competencies that are needed are compared in importance in view of the students, to the view of the employers. The essential skills that are needed to survive in the field of Culinary Arts change with the perceptions of the value the provide to their employer. Soft skills that are listed for future skills in the Culinary industry include health and nutrition, and the trends in the fields, and allergies; food sanitation and safety and compliance with the laws; communication skills, ethics, integrity, enthusiasm, willingness to learn, a professional appearance, committed, hardworking, and conscientious, listening skills, focus on quality, takes initiative, communication that's clear and effective, flexibility, enhanced human resource skills, multitasking, and technology savvy (Stybe, K. J., 2015).

A successful Baking curriculum that emphasizes: more diverse Baking knowledge, more integrated Baking process skill, learn "soft skills" such as communication/coordination/ stress and crisis management, etc., and develop "forward looking creativity". These soft skills included traits needed to not just survive but thrive in a kitchen environment: a high resistance to stress, communication, coordination, attention to detail, service dedication, crisis management, plus a positive attitude, and ability to follow regulations (Chin, Wu, & Ko, 2010).

By using the "Chinkless-Teaching Concept" there was an understanding of what Baking employers require, and then the ability to write Baking curriculum that is industry approved. The study also helped make a connection between classes: how curriculum is intertwined and related. Understanding what is important to employers, curriculum writers can now intertwine the most important objectives seamlessly throughout the curriculum (Bao, Lee, & Chen, 2013). There are different ways to accumulate Culinary, or Pastry & Baking skills. Some believe that

having a formal education to gain the knowledge needed is the best. Some believe that working your way up is the sure-fire way to be successful. Since there is no way to determine how much someone can learn, through either method, a group of researchers determined a way to correlate the knowledge gained from two different methods that are common in Culinary Arts and rank them. A variety of advanced-position culinarians were broken into two groups of: Culinary School educated and no Culinary School [working your way up]. They were required to research and cook a specific dish. Unilaterally, a panel sorted 30 dishes by their opinion of skill level needed, then ranked against job positions, and then ranked into how many years in the industry it takes to master the skill. These results were compared to the results to both education groups of culinarians (Sellah, & Riley, 1994)

The four, high overarching values of the American Culinary Federation (ACF) are integrity, high performance, community, and excellence. Values are defined as "core beliefs that influences attitudes and actions of individuals" (Mack, G. R., 2012). After surveying Chef Educators, and members of the ACF, the determination was the most important professional courses were sanitation, basic cooking/hot foods- lab, food and beverage cost control, menu development, and saucier (Hertzman, 2006).

Since the surveys, chefs' attitudes and knowledge of healthy eating indicated that they had good nutrition knowledge even when their nutrition knowledge was no better than that of the average person. This could be explained by the limited amount of nutrition education and training among chefs. Nutrition subjects in most Culinary Arts programs are often being taught in a traditional lecture method rather than in conjunction with culinary techniques. It appears that instructors often give lectures about nutrition using the assigned book with an emphasis on

human nutrition science and little information regarding Culinary applications (Abdulsalam, 2015).

Culinary Arts students should also receive appropriate training on how to provide on-the-job nutrition awareness and importance to their coworkers (Abdulsalam, 2015). Since chefs are concerned with flavor (first), technique (second), and cost (third), nutrition may not be in the forefront. While graduates understand, and know how to cook, they may need time and help in learning the keys to saving steps and becoming more productive by managing their time and staying ahead (Müller et. al., 2009).

Kyle Stybe's (2015) dissertation looked at the Hard and Soft Skills needed in the Culinary Field. Results of the various questions that were asked demonstrated that educators were less inclined to designate competencies as critical to student success during their experiential education term. Competencies that were ranked low by educators and chef/supervisors in the study were: Takes Notes, Written Communication and Basic Baking Skills. Educators were closely aligned with the chef/site supervisors' responses regarding the skills students needed to develop prior to their experiential education term (Stybe, K. J., 2015).

The education delivered to students can be influenced by many forces. All too often a place on a Culinary Arts program's advisory board is merely an honorary position. The members of the advisory board are asked to participate because are well known in the community, or, are considered to be successful foodservice operators. This could result in a limited representation of the industry on the board if only "tablecloth" or fancy restaurants are asked to participate. "Culinary Schools often use their advisory boards as fund raising tools and emphasize donations and intuitional support over curriculum review or reform. Even when the advisory board does make suggestions for curricular changes, sometimes the suggestions are slow to even consider

instituting the change, citing members' inexperience in curriculum design as a reason not to use the recommendations. The members of advisory boards are most often busy professionals who volunteer their time and will respond with the level of effort expected by the sponsoring institution" (Antun, 2000).

Breaking down the roles in the professional kitchen, Konkol (2013) examines how professional kitchens set demands upon their workers, and opinions of famous and celebrity chefs. The article then goes into the classical Culinary training of yore by looking at apprenticeships and guilds. A traditional day of Culinary education is examined, as well as the educators of the classes (Konkol, S. M., 2013). Kitchen work attracts "fringe" personalities and yet they cater to the financial and cultural elites. The kitchen personnel must be professionals, and adhere to a code of conduct and ethics, while still allowing the creative and odd personalities to coexist and thrive (Mack, G. R., 2012). Since the field of Culinary Arts has the appearance of being non-academic, and essentially there are no laws requiring anything more than a sanitation certificate, (U.S. Department of Health and Human Services, 2013) many are drawn to a field that promises success without necessarily the need of academic rigor.

Since OSHA requirements set the standard for ages to work in professional kitchens, andragogy is the teaching theory that is used. Motivation for adults to learn is very various. The pros and cons of andragogy has been studied in numerous studies (Queen, 2014, Roche, 2012, Gonzolaz, 2016, Abdulsalam, 2015, Konkol, 2013, Denkler, 1994). Andragogy is how [Hospitality and Culinary] students incorporate experiences to the existing knowledge regarding the instructional perspectives of adult educators. The intent is to expand research in the field of practical hospitality education including Culinary Arts. The principal of andragogy is used since adults go for culinary education. The mere fact that many places the law is that you must be 17

or 18 to use the equipment in a professional kitchen keeps younger applicants out of Culinary Schools. There are many different aspects that are considered with andragogy (Queen, V. B., 2014). Andragogy is looked at as techniques in educational delivery. Some believe that "in the undergraduate curriculum in Culinary Arts, the emphasis needs to be placed on recognizing and fostering the intellectual development of the students rather than fragmenting learning into measurable chunks" (Roche, 2012). "When adults deem what they are learning valuable, they tend to invest a substantial amount of time and effort into their learning" (Forrest III & Peterson as quoted by Gonzolaz, 2016). Queen's 2015 research had participants answer questions in a Likert scale fashion on the MIPI or Modified Instructional Perspective Inventory, which is designed to measure the use of anagogical principles by adults' educator, was used to determine the results.

"There are four leading Culinary textbooks in the United States and they follow a similar blueprint in presenting Culinary Arts Information. Instructors often use these textbooks without focusing on specific internal or external learning outcomes. Testing students on material from the textbook and grading cooking assignments are no longer sufficient for accurately assessing student learning. It places too much emphasis on rote learning and not on the creative and critical thinking skills" (Mack, G. R., 2012).

Chefs are accustomed to the master- apprentice setting, dating back to the era of guilds, in which the student eagerly awaits instruction and demonstration from the master and then replicates the technique. "Instructors do not want probing questions that reveal the limits of their knowledge. Knowledge in the Culinary field is sometimes regarded as something to be conquered and mastered." There is a distinct hierarchy in the kitchen and the chef's authority is not to be challenged (Mack, G. R., 2012). Roche (2011) studied how professional chefs look

back on their own formal education and the extent to how it prepared them for their career. When the educational background of the Chef Instructor is solid, the education they deliver is sound. In order to successfully teach the creative process, it must be done in the whole-brained approach (Herrmann, 1981). Therefore, to present materials in a whole brain approach, here are some suggested implications that could be done in Table 1.

Table 1

Quadrant L1	Quadrant R1	Quadrant L2	Quadrant R2
Have a quiet environment	Experimenting or Exploration of ideas	Disciplined study activities/ Self-study	Group activities/ study sessions
Present students with a guideline	Avoid repetitive activities	Repetition until memorization	"talking through" problems
Present review information in short, clear summaries	Planning and Predictive Activities	Present detailed summaries	Group projects
Research projects	Allow for flexibility in timing (no time table)	Give clear and precise instructions	Emotion driven assignments
Facts/ figures and concrete data	Short attention span- Chunk information	Have a quiet, stable environment	Personal enrichment activities
Note taking	Include diagrams and visual aids	Prefers a schedule or timetable	Life experience enrichment activities
Critiquing of information	Have an informal learning environment	Neat and orderly environment	The atmosphere must match the study tone
Summarizing information	Allow for unstructured debates	Practical hands on learning	Verbalize instructions
Analyzing information	Mind mapping	Step-by-step learning	Create stories
Identity specific outcomes	Visualization of ideas	Categorization of materials	Discussions on topics
	Study games		Have music in the environment

Preferred Activities based on Brain Quadrant

(adapted from: Whole Brain Thinking, 2005)

It is very common for a learner to have preferences in more than one quadrant.

Learning Styles

A learning style is defined as "the characteristics, strengths and preferences in the way people receive and process information" (Gokalp, 2013). It is an individual's preferred method of gaining knowledge. It is the complex way learners most efficiently and most effectively perceive, process, store, and recall what they are trying to learn (Anbarasi, et. Al., 2015). A learning style "affects how the individual acts in a group, learns, participates in activities, relates to others, solves problems and works" (Hedges, 2008). To focus on learning styles will help the instructors of the classes to tailor their lessons so that way the students can best be engaged in the learning process. Many researchers agree that matching student learning styles to teaching strategies is an acceptable plan for educators to help them teach all the students in the classroom (Denkler, 1994). Three different looks on using learning style preference are considered. Denkler (1994), Garcia, Amandi, Schiaffino, & Campo (2005), and Gokalp (2013) have provided insight on learning style preferences.

Denkler (1994) wanted to show that matching student learning styles to teaching strategies could be a viable plan for educators to help them teach all the students in the classroom. He wanted to determine if learning style preferences would predict student performance in two types of vocational education instruction: 1) the traditional lecture method, and 2) manipulative instruction and focused on the education in the field of Culinary Arts. Pedagogical instructional strategies to drive learning objectives and outcome evaluation that are aligned with the student's background knowledge, experience, and environment don't seem to exist. The environment as urban setting, or work setting, equally receives no consideration as a learning situation, thus physical, social, and cultural settings where externships occur receives no acknowledgement either (Thibodeaux, W. R., 2012).

Garcia, Amandi, Schiaffino, & Campo evaluated the reasoning behind how students process information differently (2005). They determined that students are characterized by different learning styles, focusing on different types of information and processing this information in different ways. To achieve this goal, we must detect how students learn: reflecting or acting; steadily or in fits and starts; intuitively or sensitively. They chose to evaluate the Bayesian networks at detecting the learning style of a student in a Web-based education system. One of the desirable characteristics of an [Web-based] education system is that all the students can learn despite their different learning styles. The Bayesian network model's different aspects of a student behavior while they work with this system. Then, it infers their learning styles according to the modeled behaviors. Different levels of precision were found for the different dimensions or aspects of a learning style.

Gokalp (2013) aimed to evaluate the learning styles of education faculty students and to determine the effect of their success and relationship between their learning styles and academic success. Recent research suggests that the style by which one learns and applies knowledge is an important characteristic to consider. The purpose of this study was to improve students' knowledge and skills in studying.

The outlying idea of studying learning styles is: does the learning style directly correlate to academic success? "Students learn in many ways by seeing and hearing; reflecting and acting; reasoning logically and intuitively; memorizing and visualizing; drawing analogies and building mathematical models; steadily and in fits and starts. Teaching methods also vary. Some teachers lecture, others discuss or demonstrate; some emphasize memory, while others emphasize understanding. How much a given student learns depends on the student's ability and prior preparation, and on the compatibility of his/her learning style and the teacher's teaching style(s).

Studies have shown that greater learning may occur when the teaching style matches the students' learning styles than when they are mismatched" [(Garcia & et. al., 2005), (Gilakjan, 2012)].

The framework for learning style proposed by Felder & Silverman in Garcia & et. al., (2005) report is a model comprises 32 learning styles. Each learning style can be defined by the answers to the following five questions:

- what type of information does the student preferably perceive: sensory (external) sights, sounds, physical sensations, or intuitive (internal) possibilities, insights, hunches?
- through which sensory channel is external information most effectively perceived: visual pictures, diagrams, graphs, or verbal words, sounds?
- with which organization of information is the student most comfortable: inductive or deductive?
- how does the student prefer to process information: actively through engagement in physical activity or discussion, or reflectively through introspection?
- how does the student progress towards understanding: sequentially in continual steps, or globally in large jumps, holistically (Garcia & et. al., 2005)?

Postsecondary institutions are constantly trying to increase retention rates in their institutions, and student success. The relationship between students and faculty is crucial. Students want to feel like they belong, when there is a positive correlation between faculty and students, success rates go up. There are many things that can alter the success of the student, however it has been shown that some of the items that contribute to a poor learning environment in the students' opinion include: organization, accessibility, and ineffective presentations (Gonzalez, 2016).

Bao, Lee, & Chen, (2013) proposes the "Chinkless-Teaching Concept" (CTC) for increasing the skills and employability of students enrolled in a vocational Baking program. The two common methods used in vocational Baking programs that were studied are the sandwich teaching, and topping-teaching methods. Usually the sandwich teaching results in a mass-production of product type of training. The topping-teaching method results in more serious, career focused type of training. Both are needed in the career. [The sandwich teaching technique is when a student does on-the-job training in the middle of their educational program or "internship"; the topping-teaching method is when students apply what they have learned in their education and apply it in a work setting, usually for credit or "externship"]. The CTC model looks to combine the positive aspects of both methods. The methods of measurement began by asking for the employers to list the needs and expectations of Baking employees, then to rank them. The results were given a weighted amount, which were then used to write appropriate vocational curriculum (Bao, Lee, & Chen, 2013).

Teachers should use the most effective type of instruction for their students and not rely on traditional methods. "They should capitalize on the student's strong points; accommodate by initially decreasing the amount of work required in adverse style; remediate with increasing amount of work required in adverse style; evaluate the students' progress and adjust encourage success, and finally incorporate the learning style model in the classroom is for the instructor to allow students to take charge of their learning to ensure life-long achievement" (Denkler, 1994). Pedagogical instruction strategies to drive learning objectives and outcome evaluation aligned with the student's background knowledge, experience, and environment are not evident (Thibodeaux, W. R., 2012).

"Curriculum development and evaluation is a dynamic process…. and instructors must ensure that currency is met always to ensure credibility, and efficiency" (Müller, et al. 2009). Looking at the relationship between dissimilar cognitive styles and use of learning strategies in undergraduate students, Samms & Friedel states that The Kirton's Adaptation-Innovation Theory of cognitive style examines problem-solving preferences of students and was an integral part of the Felder Silverman Learning style model (2012). Kirton's Adaptation-Innovation Theory (KAT) of cognitive style examines problem-solving preferences of students. They want to see if dissimilar styles between teachers and students discourage learning. One speculation is that students apply learning strategies to cope and overcome cognitive styles (Samms, & Friedel, 2012). The objective in this study is to determine the cognitive style of the faculty and the cognitive style of the students using KAT, and to determine the learning strategies of the under-graduate students. Then, next to examine the relationship between the cognitive style and learning gap, in comparison to the undergraduate's use of learning strategies (Samms, & Friedel, 2012). Using KAT supports the methodology of the study. Since it breaks down into nine subscales, and down even further into topics, getting to the heart of the information being asked is possible. As the information desired gets broken down into more and more questions, the narrower the results will more, meaning the more accurate the data (Samms, & Friedel, 2012).

Denkler (1994) chose to search for ways to make learning more productive by pairing learning styles with teaching methods. One of the precise ways to evaluate learning styles is to use a Bayesian network. Bayesian networks was studied by Garcia et al, (2005). The term that Bayesian networks' (BN) refers to, a precise tool for "representing and detecting students' learning styles in a web-based education system" (Garcia et al, 2005). This technique was chosen because it enables the researchers to model both quantitative and qualitative information about

students' learning style. "A learning-style model classifies students according to where they fit in a number of scales belonging to the ways in which they receive and process information. There have been proposed several models and frameworks for learning styles. Induction is a reasoning progression that proceeds from particulars to generalities. Deduction proceeds in the opposite direction. Induction is the natural human learning style. Experiments have proved that most [engineering] students are inductive learners" (Garcia & et. al., 2005). Since creating memories with food and understanding what it takes to get the final product, sometimes it takes the same understanding as engineering.

In the study that Gokalp prepared in 2013, the amount a student learns is compared to their learning style and is showed that there are consistently high correlations between students' ratings of the "amount learned" in the course and their overall ratings of the teacher and the course. Those who felt they learned more gave their teachers higher ratings. Some instructors lecture, others demonstrate or discuss; some focus on principles and others on applications; some emphasize memory and others on understanding. This could be in direct relation to the instructors preferred learning style. "The differences among definitions and models result from the fact that learning is achieved at different dimensions and that theorists define learning styles by focusing on different aspects" (Gokalp 2013).

Gokalp used a t-test to determine whether there was a difference between test scores in preliminary and final applications of the items involved. A correlation analysis was used to determine the relationship between pre-and post-test scores in each item and between these scores and student success. These results showed a positive correlation between the scores of post-tests on the items of learning, planned study, effective reading and grades while there was weak negative correlation between the scores of pre-tests on the items of learning, planned study,

effective reading and grades at the significant level of 0.05. While the correlation between pre-tests scores in the items of listening, and note taking and grades wasn't significant, the correlation between the scores of post-test and grades was strongly positive (Gokalp 2013).

Samms and Friedel showed that cognitive style and intelligence are not related. They suggested these items need to be measured separately. Their research showed that the cognitive style of the student is concerned with preferences or approaches. This should be aligned with mental ability capacity and academic competence. These learning styles may be based on previous experiences (2012).

"Coping strategies for learning happen when students try to reconcile their current learning style with the different learning style that of their own. This leads to problem solving." Suggested methods of effective compromise include cater to various styles of learning styles according to the pre-reviews on learning styles, and to offer courses that employ a variety of teaching styles (Samms, & Friedel, 2012).

VAK Learning Styles. The VA[R]K model is used to "assess the learning style of the individual based on the sensory modality preferred by themselves to perceive information" (Anbarasi, et.al., 2015). The acronym VARK stands for Visual, Aural, Read/write, and Kinesthetic sensory modalities. Kinesthetic is sometimes referred to as Physical. "Learning style inventories or questionnaires are used to help a student determine their own learning style." By using a numerous learning style inventories, a full learning style for a student can be accomplished (Hedges, 2008). "The VARK™ Model shows some characteristics of a left-right distinction, such as the presence of visual and kinesthetic components associated with the right hemisphere" (Morris, 2006). This is shown in Figure 7.

Learning Orientation Questionnaire. A Learning Orientation Questionnaire (LOQ) is an assessment instrument used to reveal the dominant power of emotion and intentions in guiding and managing cognitive processes. In understanding the complex relationships between learning styles and interactions. "Ultimately, [instructors] should design [learning] to fit groups of students with particular aptitude patterns. There should be a relationship between with cognitive, affective, conative and social factors in learning situations" (Bentley, 2000).

Studies of Similar Research

This researcher found no studies that are assign brain polarity to students enrolled in any hospitality driven programs, specifically Culinary School or students enrolled in Culinary or P&B programs. The gap in research in this area could significantly improve the delivery of materials and to students enrolled in post-secondary Culinary Arts or P&B programs. There is a need for knowledge in this area, and the proceeding research will help pave the way to future Culinary education. Most brain dominance research with in the educational realm using the NBI™ look at the relationship between brain dominance and the ranking on the MBTI (Myer Briggs Type Indicator) scale, not with the VAK system (Arendse, 2008, Geyser, 2000, Bentley, 2000, & Bunderson, 1989).

Learning Style Based Teaching. There are several studies in other fields similar to this study whose concepts could be applied. Medical students, when taught in their preferred learning style, learned and performed better than those taught with just the traditional lecturing method. By teaching in a manner that best invokes interests in all students (Anbarasi, et. Al, 2015). "While it might not be practically tenable to undertake the teaching of the entire syllabus by dividing a class into learning style-based groups, it is suggested that multiple audio, video, and kinesthetic resources be made available to students. They may then be encouraged to use

learning style-specific resources for learning to enhance their academic performance and improve their understanding of subjects" (Anbarasi, et. Al, 2015).

A study by Mehrdad & Ahghar (2012) looked at the correlation of left-handed students to their preferred learning styles, based from a VAK Learning Styles Indicator. It was concluded that there are differences in learning styles for each hand dominance. One hundred students were in the participation, 50 were known left handed, 50 were known right handed. The indication that left-handed students have the highest correlation to the Visual Learning Style (Visual 78%, Auditory 0%, and Kinesthetic 22%). Right-handed students also showed a dominance for the Visual Learning Style, but the distribution was not distinct (Visual 40%, Auditory 32%, and Kinesthetic 28%) (Mehrdad & Ahghar, 2012).

Brain Dominance and Learning Style. In the *International Journal of Science and Medicine*, Zhang reported (December 2011) that "46.6% of all left-brained dominated people are plain visual learners, 7.1% are plain auditory learners 0.0% is plain kinesthetic learners, 35.7% are both visual and auditory learners, 7.1% are both auditory and kinesthetic learners, 0.0% is both visual and kinesthetic learners, and 3.6% are visual, auditory, and kinesthetic learners. 85.7% of left-brain dominated people are visual learners, 53.6% are auditory learners, and 10.7% are kinesthetic learners. 65.0% of right-brain dominated people are plain visual learners, 0.0% is plain auditory learners, 0.0% is plain kinesthetic learners, 25.0% are both visual and auditory learners, 0.0% is both auditory and kinesthetic learners, 5.0% are both visual and kinesthetic learners, and 5.0% are visual, auditory, and kinesthetic learners. 100.0% of right-brain dominated people are visual learners, 30.0% are auditory learners, and 10.0% are kinesthetic learners". This helps with a beginning start point of understanding how brain dominance and learning style

correlate. This is just between duality, and not whole brain, or quadrant. Further refinement of learning styles by the four quadrants of the brain will help reduce the gap in learning.

The Learning Styles are based on the VAK Learning Styles Model Represents visual-auditory-reading/writing/ kinesthetic learning preferences.

Table 2

Association of Brain Dominance to VAK Learning Style

Brain Quadrant	VAK Learning Style
L1 (upper left)- Blue	visual (1)
R1 (upper right)- Green	kinesthetic
L2 (lower left)- Purple	visual (2)
R2 (lower right)- Yellow	auditory

(http://thepeakperformancecenter.com/educational-learning./learning/preferences/), (Smith, 2016).

Since visual is the option for more than one quadrant, in interpreting results to ensure the differentiation, each will be indicated with a 1 (L1=V1) or a 2 (L2=V2).

Hypotheses

The hypotheses of this research that were examined were:

Research Question 1: Does the career path of a student enrolled in a Culinary School depend on their brain dominance?

Ha- There is a significant difference with students who are enrolled in a Culinary Arts program who has the same brain dominance and are in the same career path.

Ho- There is no significant difference with students who are enrolled in a Culinary Arts program who has the same brain dominance and are in the same career path.

Research Question 2: Is there a statistically significant relationship between the students' brain dominance and their learning style?

Ha- There is a statistically significant number of students who have the same brain dominance and choose the same learning activity.

Ho- There is not a statistically significant number of students who have the same brain dominance and choose the same learning activity.

Research Question 3: Is there a statistically significant relationship between a Culinary School's students' career path, their brain dominance, and their learning style?

Ha- There is a significant difference with the correlation between students enrolled in Culinary Schools' career path, their brain dominance and their learning style.

Ho-. There is no significant difference with the correlation between students enrolled in Culinary Schools' career path, their brain dominance and their learning style.

CHAPTER III
RESEARCH METHODOLOGY

This study examined the relationship between brain dominance, learning style, and demographics in students enrolled in Culinary School. A causal- comparative study was utilized to evaluate if students who wish to learn about the food service industry choose their career path based on their brain dominance. All participants were asked demographic questions. Participants were then asked to choose one of four (4) assignments they wish to complete each one representing a quadrant of the brain. Results were correlated with their brain dominance test results, the final section of the survey. Data was collected through an online survey via SurveyMonkey™ for the Left Brain versus Right Brain polarization based off Neethling Brain Instrument™ (NBI™).

To get a determinant ratio to start from, research on what is known for the distribution of left-brained and right-brained people in the general population.

Table 6

Known Distributions of Left Brained and Right Brained People

Source	Total tested	Left Brained (*Ha*)	Right Brained	Lateral	Unstated
Huffington Post	160,000	37%	29%		34%
Forbes.com	35,345,657	41%	27%	32%	0%
Indian Journal of Science and Technology	552	220 (39.9%)	332 (60.15%)		
Merve Oflaz	43	11 (25.59%)	26 (60.46%)	6 (13.95)	--
Mean:	-	.3587	.4415	.2296	
Pop. SD		.0612	.1617		
Pop. Variance		.0038	.0261		

[(Hidyegi, T., 2016), (Sommer, 2014), (Dhandabani, & Sukumaran, 2015). (Oflaz, M., 2011)]

There are no scientific sources that specify the amount in the population that are particularly left brained or right brained. A wide range of data was presented in many sources but as a starting out point to run G*Power, averages of known studies will provide the mean *Ho* and *Ha.*

Data Collection

Data collection in SurveyMonkey™ consisted of participants' responses being assigned a participant number by the computer, which goes across the entire survey. This survey was conducted in three parts. Part one asked demographic questions. Part two consisted questions to determine brain dominance. Part three consisted of questions to determine the student's learning style. All original data was recorded and reported. Each participant had a number assigned to them that number was carried through each part of the survey.

Similar Studies' Validity and Reliability

In a similar study by Ozgen, Tataroglu, & Alkan (2011), *An examination of brain dominance and learning styles of pre-service mathematics teachers,* the researchers also used an adapted brain dominance survey, with an adapted learning style survey. They used 6 brain dominance questions, and 12 learning style questions. Another similar study compared Brain Dominance and Learning Styles of Navajo and Hopi American Indians. In *Measurements of Navajo and Hopi brain dominance and learning styles* they used an undisclosed number of brain dominance questions and learning style questions. This study had reliability and validity factors of at least .70. The test-retest reliability was .904. (Rhodes, 1990). A Chi Square was used to measure strategies to look at the patterns of selection of the quadrant specific activities in each modified module. A Chi Square was also used with the treatment group only to investigate the consistent aligned activity selection. The use of Cronbach's Coefficient alpha measured the

positive succession of answers chosen by students. Parallel Form Reliability will be used to judge reliability of the answers. The chosen assignments will be compared to the student's NBI™ results to see if they choose the assignment that is relevant to their brain dominance.

Population

Research population included students enrolled in post-secondary Culinary Arts and Pastry and Baking. These schools were chosen because they have an ACF accreditation or accreditation through another academic accrediting body. There was a mix between for profit and not for profit institutions studied.

Using G Power, the following information to calculate sample size is below.

Sample Size Determination

To have a verifiable data base for collection, more samples will be taken to have enough completed, surveys. Power analysis for a logistic regression was conducted using G*Power 3.1.9.2 (to determine a sufficient sample size using an alpha of 0.05, a power of 0.80, a medium effect size (odd ratio = 1.72) and two-tailed test. Based on the aforementioned assumptions, the desired sample size is 177.

a. Z tests: Logistic regression
b. Analysis: A priori: Compute required sample size- given *a*, power, and effect size

Input:

a.	Tails	2
b.	Odds ratio	1.72
c.	Pr(Y+1/X=1) HO	0.2
d.	*a* err prob	0.05
e.	Power (1-ß err prob)	.8
f.	R^2 other X	0
g.	X distribution	normal
h.	X parm μ	0
i.	X oarm σ	1

Output:

a.	critical z	1.9599640
b.	Total sample size	177
c.	Actual power	.8018787

A minimum of 177 completed student samples were necessary to complete the desired research goals. As many useable samples that can be collected were.

- School 1 is a public college that offers AS degree programs in both Culinary Arts and Pastry & Baking.
- School 2 is a for-profit college that offers AS degree programs in both Culinary Arts and Pastry & Baking.
- School 3 is a private university that offers an AS degree programs in Culinary Arts
- School 4 is a public community college that offers AOS degree programs and certificates in both Culinary Arts and Pastry & Baking.
- Other students who participated are members of the Central Florida Chapter of the American Culinary Federation, the Sarasota Chapter of the American Culinary Federation, and the Tampa Bay Chapter Association whose designated school(s) chose not to participate.

Sampling Approach

Schools that were selected are regionally accredited schools that offer both Culinary Arts and Pastry & Baking programs preferably. These schools also offer academic classes for students to meet the requirements needed for the program. Emails explaining the survey, including the link for the survey powered by SurveyMonkey™ were distributed. Samples collected were non-probability. Approved emails and consents were sent by either the registrar or dean of the programs that have elected to participate and who's IRB terms have met. If schools didn't have an IRB, the dean has agreed to participate in the study. All students within

the Culinary and/or Baking and Pastry programs at the elected schools received the email and were encouraged to participate but were not pre-selected based on criteria.

Participant Pool

The sample was drawn from a pool of candidates, either electively or selectively. Elective schools opted to send this survey to all students in the Culinary/ P&B programs. Selective schools chose which classrooms to participate. depending on the policies of the school. To get accurate results, a minimum of 177 completed surveys from students were needed.

Students from four schools were asked to participate in a survey that was emailed to them. The survey was sent to 400 students, 52 Chef Instructors, and 100 professional members of the ACF. The response rate was 188 students, 40 Chef Instructors 49 professional members of the ACF. There are three sections: demographics questions, then a section based off the NBI™ test for brain dominance, and finally a section based off VAK.

All personal questions have exhaustive answers including an opt out selection. (See Appendix B**.)**

Data Collection Tools

The dissertation survey was imported into SurveyMonkey™. The survey can be seen in Appendix B. There are three sections as follows:

Part 1

The first part of the survey will consist of four (4) questions:

a. Program Enrollment

b. Gender

c. Age

These questions provide exhaustive answers with an option not to answer.

Part 2

The second part of the survey is based off the survey tools from the NBI™ for "Learning Style". These questions will help determine brain dominance. There are 15 (fifteen) questions tailored so they represent the Culinary Arts/ Pastry & Baking fields. This survey was purchased from Genesis Business Services and included an explanation of results (Genesis Business Solutions, nd). This survey is further explained below under Neethling Brain Instrument™.

Part 3

The final part of the survey provided 7 (seven) sets of questions each one with four answers of preferred activities. Each activity related to one of the four quadrants of the brain. Participants choose which activity they would like to do. This was used to measure learning style with the VAK system. This survey is further explained below under VARK™ Survey.

Neethling Brain Instrument™

Neethling Brain Instrument™ (NBI™) is a proven reliable and valid instrument that was developed in the 1980's by Dr. Kobus Neethling. This instrument has been used with over 20,000 adults and children to help determine their brain dominance. Since the initiation of this instrument, Neethling has continued to go on to develop 14 different versions that hone in on different populations and careers to provide very accurate results (Whole Brain Thinking, 2005). "The NBI™ includes profiles of preference that are comprehensive, unbiased analysis of the individual's thinking preferences, that has no profile appearing better or worse than another (Arendse, 2008).

The NBI™ can provide information on "how a person:

- Communicates
- Acts towards other people

- Conducts business
- Learns
- Teaches
- Finds satisfaction in a career
- Solves problems
- Makes decisions"

(Neethling & Solutionfinding.com, 2005).

The NBI™ will show thinking preferences. These are not right or wrong and may or may not be representative of skills. A high score in one quadrant may indicate strong preferences for some of the characteristics, but not necessarily all (Neethling & Solutionfinding.com, 2005).

The Questionnaire

To determine the valuation of brain dominance, there were a series of 15 (fifteen) questions asked and each has four (4) responses. The respondent placed (drug) the statement most accurate to them statement in the first position, then continued with all the statements. This ranked the answers from most to least. The test is valued at 300 points [(Venter, 2011), (NBI™ Learning Profile, 2017)].

There are 15 questions, so each question is worth 20 points. To score the test, whichever statement is chosen for "most like describes me" is valued the highest, and each statement after is scored a little less, and there on.

Value of responses:

1st position: 8 pts.
2nd position: 6 pts.
3rd position: 4 pts.
4th position: 2 pts.

Since each response represents one quadrant of the brain, this test also allows for secondary strengths to be shown as well. The test will not allow a person cannot score "high" in all four quadrants. Page 82 of this study explains what high scores in each quadrant could indicate.

Interpreting Results. The scores on the NBI™ serve as guidelines and should thought of categories instead of a specific numerical value. The higher the score in any specific quadrant, the stronger and more visible the preferences are. Scores on the NBI™ can be allocated to the following five categories:

a. Category 1 (95+) This score indicates that an individual has a very strong preference for the use of that quadrant. If the Individual's personal circumstances are in harmony with that preference those circumstances can be regarded as being highly desirable.

b. Category 2 (80-94) This score indicates that an individual has a strong preference for the use of that quadrant. If the Individual's personal circumstances are in harmony with that preference those circumstances can be regarded as being desirable.

c. Category 3 (65-79) This score indicates that an individual has an average preference for the use of that quadrant. This score indicates that the individual is comfortable with the processes of that particular quadrant.

d. Category 4 (50-64) This score indicates that an individual has a low preference for the use of that quadrant. A low preference indicates that the individual views the attributes and characteristics of that process as merely functional and clearly secondary. The individual will prefer other the processes of other quadrants but will not necessarily avoid the processes of this quadrant.

e. Category 5 (30-49) This score indicates that an individual has a very low preference for the use of that quadrant. A very low preference may indicate that the individual is lacking the processes and procedures of that quadrant or even that the features of the quadrant are being avoided or rejected.

(Geyser, 2000)

VARK™ Questionnaire

The VARK™ Questionnaire is a well know reliable instrument developed by Neil Fleming, from New Zealand, in 1987. This survey is for people to figure out how they learn

best. The survey is a communication questionnaire about how students like to receive information that is presented to them by their instructors.

The VARK™ Questionnaire has been adapted into at least 4 different versions. It also has been translated into 20 different languages (Fleming, N.D. & Bonwell, C., 2013).

The Questionnaire

Students were presented with seven (7) scenarios with four (4) assignment options. Each assignment option represents one quadrant of the brain. The materials on the assignments would be the same. Activity one is an activity dealing with organization, sequential thinking, planning and detail. Activity two is an activity dealing with logical, analytical, fact based, and quantitative information described in Figure 9. Activity three involves, kinesthetic, emotional, feelings based and interpersonal skills. The final activity (activity four) deals with intuitive thinking, integration, synthesizing, and a holistic approach. If the student chooses the correct assignment unaided to match their brain dominance, then the theory of the study can be said to be reliable. This will be repeated 7 times (seven sets of questions.). Each time, the answers for the questions will be rearranged (randomized), so there is no pattern for occurrence of answers. This is unimodal version of the VARK™ survey. "The options to each question are designed so that those with a particularly strong preference will choose the response that matches that preference even when the situation in the question stem is biased towards another mode. That is how VARK™ discriminates and for that reason the proportion of respondents choosing each option in a question is unlikely to be close to 25% for each question. It is more likely that one or sometimes two options in each question will be very attractive to most and that only those with a strong preference will choose a different answer, aligned with their modal preference" (Fleming, N. D. & Bonwell, C. C., 2017).

Questions were slightly adapted to be in context of the field of a Culinary School. There are several versions of the VAK Survey available [(Fleming, N. D. & Bonwell, C. C., 2017), (Luna, 2017), (educationplanner.org, 2011), (Vaknlp, nd)]. They are all based on the same fundamental concepts. The differences are in the number of questions asked. A seven (7) question model was adapted to prevent a tied answer (and this is what makes this a unimodal version, instead of a bimodal.) The instructions are:

Read the description of the topic given, which is a topic that is covered in Safety and Food Safety and Sanitation Class. Choose the assignment in each scenario that you would want to complete. (You are not doing the assignment, just select which one sounds the most interesting to you). Note: all assignments would be worth equal points and would have the same amount of time to complete.

Examples of activities that are successful to use or avoid for each of the VARK™ designation are as follows in Table 3.

Table 3

Learning Preferences based on VARK™ characteristics

	Likes	Uses	Avoid
V	Maps Charts Graphs Symbols Diagrams Overviews Flow Charts Handwritten notes instead of printed/ typed Cartoons	Underlining Highlighters Different Colors Color is Important	PowerPoints, webpages, video Lists and Bullet Points
A	To explain Discussions	Self-talk Recording devices	Note taking/ notebook requirements

	Texting Summaries Using a Tape Recorder Training and Teaching Sessions Leaving lots of spaces in their notes Sharing ideas with others describing the overheads Pictures and other Visuals remember the interesting examples Quiet atmospheres Meetings	Recalling information Email, Texting, Blogs Twitter Phones Verbal Explanations Stories	
R	Lists Notes Essays Reports Contracts Textbooks Glossaries/Definitions Quotations Dictionaries PowerPoints Printed Handouts Wordy Mind Maps Laboratory Manuals Websites and Webpages Taking Notes (verbatim) Journaling Multiple Choice Tests	Dictionaries and Thesauri Mnemonics Lists Textbooks Repeating Notes Pen/ paper	Meetings/ conferences Discount the value of books Having concrete definitions Discussions/ arguments

K	Videos Field Trips Case Studies Trial and Error Applied Opportunities Examples of Principles doing things to understand them Exhibits, Samples, Photographs Laboratories/ Practical Sessions Real-life Examples hands-on approaches Recipes solutions to problems using all your senses pictures collections of similar subjects to compare Documentaries Responds physically to music or drama	Condensed notes Search for the reality and the applications of any ideas. Find pictures and photographs that illustrate an abstract idea, theory or principle. Role-playing Put plenty of examples into your notes and your answers. Builds notes backwards-filling in information once the outcome has been achieved Practice makes perfect Hands on approaches	Too many instructions Lengthy instructions

Note. V= Visual; A= Auditory; R=Read/Write; K= Kinesthetic

(Fleming, 2012)

Students will be asked to pick from one of four assignments based on a required academic class (Food Safety and Sanitation). The assignments will cover the same material and that would be given after the instructor lecture. Each activity would align with a different brain quadrant, as shown in Table 3.

Interpreting results. The determination of the preference of the learning style of the student is calculated by simply totaling how many of each response in each category were given (visual, auditory, read/write, and kinesthetic). The category with the most amount of responses shows the preference of the learner. Using a unimodal style of the quiz gives a dominant learning preference. (Fleming, N.D. & Bonwell, C., 2013)

Table 4

Learning Habits and Environments of Whole Brain Thinking

	QUADRANT L1	QUADRANT R1	QUADRANT L2	QUADRANT R2
Learning	at desk	sits/lies down - seldom at desk	at desk	amongst people
	supplies handy	diagrams	does detailed summaries,	emotional about contents
	makes summaries	learning games	practices subject-matter	likes music in the background
	enjoys research	tries new methods	practical applications	talks loud to memorize
		rarely does a timetable	time table for studying	non-verbal communication
		mind wanders		role play
Environment	Neat	challenging info	programs handy	room for movement
	info always available	colorful	detailed [black]board work	music
	displays work on a [black]board	humorous		person-oriented
	accurate	exhibitions		exhibitions
	quiet	artistic		friendly
		changing		colorful
				comfortable

When the survey results are printed per number, first the tabulation will go as follows:

Program enrolled

Demographic data results

Lifestyle data results

Learning style preferred most

Primary brain quadrant

Table 5

Data Recording Sheet Sample

Participant Number	Status	Field	Gender	Age Range	Learning Style Preference	Brain Dominance Preference

Validity and Reliability

The two instruments used in the survey to collect data include the Neethling Brain Dominance Instrument™ and the VARK™ Questionnaire. These instruments have reliability and validity measures as follows.

Validity and Reliability of the NBI™

Validity and Reliability of the NBI™ have been confirmed by several different entities. Dr. Korf and Dr. Venter both worked to prove the validity and reliability of the NBI™.

Dr. Liezel Korf, an independent Research Psychologist, worked to prove the validity and reliability of the Neethling Brain Instrument™. Her test of construct validity included:

- "Test-retest reliability of the subscales
- Criterion related validity
- Internal consistency of the four subscales

  This cannot be done for the whole scale, since there is no variance in the total score, it is done to explore the nature of the intercorrelations between items.
- Discriminant validity: If the scale discriminates between groups it is theoretically and intuitively expected to discriminate between, this serves as support for the construct validity of the scale", [(Korf, 2004), (Neethling & Solutionfinding.com, 2005), (Ardense, 2008).]

Construct validity was also shown in two different examples. First the results of the NBI™ was correlated to a Myer-Briggs Type Indicator test in two samples. Then validity was also shown by comparing subgroups of include males and females, different occupational groups, managers vs. non- managers, and the general population vs. specialized law enforcement officers. Seven occupational groups were compared, and differences were found in the expected directions, e.g. stronger preference for left brain quadrants amongst individuals in administrative and analytical positions, a stronger R2 preference amongst the helping professions, and strong R1 preference for individuals in management and strategic positions (Neethling & Solutionfinding.com, 2005).

The test- retest reliability showed per brain quadrant: L1 0.851, L2 0.840, R1 0.867, R2 0.918. This is an acceptable result for this type of study. Because of her tests, some aspects of the NBI™ were changed/ updated, which increased the internal consistencies of the subscale (Neethling & Solutionfinding.com, 2005).

Dr. Venter is a widely-recognized psychologist expert in education regarding whole brain thinking. He was then able to verify the findings and advantages of the NBI™ (Arendse, 2008).

"Nieuwehnuizen & Groenwald in 2006 contrasted the NBI™ with Ned Herrmann's Herrmann Whole Brain Instrument®, which is a proven instrument which uses psychometric assessment to first determine the brain strength of the individual." "As documented by the authors "the Neethling Brain Instrument™ (NBI™) is comparable to the HBDI®, furthermore, as with the HBDI®, splits the brain in four quadrants…. The NBI™ could very well be deemed the South African version of the HBDI®" [(Korf, 2005), (Arendse, 2008)].

Validity and Reliability of the VARK™

Validity and Reliability of the VARK™ was tested by Dr. Walter Leite. The reliability estimates for the scores of the VARK™ subscales are: Visual .85, Aural .82, Aural .84, Kinesthetic .77. These results are considered adequate given that the VARK™ is not used for high-stakes decisions (Leite, W., Svinicki, M., & Shi, Y., 2009). The VARK™ survey results identify students as unimodal (classify as only one strength) or multimodal (bimodal, trimodal or quadmodal) in their learning preferences (James, S., D'Amore, & Thomas, T., 2011). This research uses only one modal.

Variables

Does the career path of a student enrolled in a Culinary School depend on their brain dominance? The variables for Research Question 1 are:

IV- Career Path (Culinary Arts, Pastry & Baking)

DV- Brain Dominance of Students

Is there a statistically significant relationship between the students' brain dominance and their learning style? The variables for Research Question 2 are:

IV- Brain Dominance of Students

DV- Learning Style

Is there a statistically significant relationship between a Culinary School's students' career path, their brain dominance, and their learning style? The variables for Research Question 3 are:

IV- Career Path (Culinary Arts, Pastry & Baking)

MV- Brain Dominance of Students

DV- Learning Style

The independent variable. The independent variable of the study are students enrolled

in post-secondary Culinary Arts or Baking programs to earn a degree or diploma in there given field. These students are subject to one subject in their opposite discipline (the Pastry students need to take a class on basic Culinary Arts, and the Culinary students need to take a class in Pastry & Baking). These students also must take academic classes, including Food Safety and Sanitation, but also may be enrolled in classes to meet the needs of their academic degree (e.g. math, cost control, English, culinary French, science, culinary nutrition, hospitality supervision). This is a dichotomous variable for students, a nominal variable for instructors.

The mediated variable. The mediated variable of this study is the brain dominance. Brain dominance will be measured using the Neethling's Brain Instrument™. The Neethling's Brain Dominance Institute Provides quantitative surveys to help determine brain dominance which will be modified to include terminology and situations relevant to the Culinary and P&B industries (Herrmann International, 2016). There are four different brain strengths that were discussed in Chapter II. This is a nominal variable.

The dependent variable. The dependent variable in this study is the learning style(s) of the student. The learning style of the student will be determined by the VAK learning style. The VAK Learning Style refers to *Visual Auditory Kinesthetic* learning styles and to the ways in which students learn best. The VAK learning style questionnaire will ask students to choose assignments that they would like to do. Each question will have four options, each option will be covering the same material, but presented in the same manner. The VAK learning style was discussed in Chapter II. This is a nominal variable.

The covariates. The covariates in this study are gender and age. Both questions will help with determining how the results lie in the data. Each question will have a choice to opt out of the question. Gender is nominal variable, age is an interval variable.

Statistical Analysis

A summary of the statistical analyses to be run is as follows: Each of the following three questions asked will have separated statistical analyses run. The variables for these tests, as well as the tests to be run are found in Table 6.

Table 6

Statistical Analysis/ Variable Relationships

Research Questions	IV/CV	DV/MV	Variable Designation	Statistical Analysis
1. *Does the career path of a student enrolled in a Culinary School depend on their brain dominance?*	IV: Career Path CV: age, gender	DV: Brain Dominance	Nominal	Logistic regression
2. Is there a statistically significant relationship between the students' brain dominance and their learning style?	IV: Brain Dominance CV: age, gender	DV: Learning Style	Nominal	Logistic regression
3. Is there a statistically significant relationship between a Culinary School's students' career path, their brain dominance, and their learning style?	DV: Learning Style, CV: age, gender	MV: Brain Dominance IV: Career Path	Nominal	Logistic regression

Note: IV= independent variable; DV= dependent variable; CV= covariate; MV= mediating

Logistic regression is a method for fitting a regression curve, $y = f(x)$, when y is a categorical variable. The typical use of this model is predicting y given a set of predictors x. The predictors can be continuous, categorical or a mix of both (Alice, 2018).

Logistic Regression was used to measure if the IV (career path) with two options (Culinary Arts or P&B) has any relationship to the DV (students' brain dominance) and if it is

due to chance. A Logistic Regression test of independence was also used because the DV (Brain Dominance) is nominal data and IV (Learning style) is nominal data. The test is to see if there is a significant relationship between brain dominance and learning style. Logistic Regression is used to determine RQ3 because we are trying to predict a learning style (DV) from brain dominance (IV) and students' chosen program in a Culinary School.

CHAPTER IV

DATA ANALYSIS AND RESULTS

Background of Study

This study was aimed at determining how brain dominance affects the student enrolled in culinary arts and pastry and baking programs at Culinary Schools, with hopes of using the data collected to create a teaching methodology centered towards culinary and pastry students. The researcher reported data on demographics, brain dominance, and learning style.

Data Collection

This study used two different instruments to collect data. Participants habits were questioned through a series of predetermined questions from the Neethling Brain Dominance Instrument™ to determine brain dominance. They were also asked to pick their preferred assignments based on the VARK™ learning style questionnaire. Both instruments and their measuring techniques are valid and reliable. The participants were students and instructors at one of 4 Culinary Schools, or members of the American Culinary Federation. Both surveys and demographic questions were compiled together in a SurveyMonkey™ survey and distributed by email. The data collected was analyzed as instructed by each of the survey instruments.

Study Participants

The survey was sent to 400 students, 52 Chef Instructors, and 100 professional members of the ACF. The response rate was 188 students, 40 Chef Instructors 49 professional members of the ACF. The study aimed to classify members of the food service industry as Left-brained or Right-brained based on their chosen profession. From there, to help the success rate of students in these programs, provide students with lessons tailored to their VAK learning style whenever

possible. There was a 94% response rate for students, 82% for instructors, and 49% for industry professionals.

Summary statistics were calculated for each interval and ratio variable, and frequencies and percentages were calculated for each nominal variable. For Research questions 1, 2, and 3, data reported was for completed survey results for students only. Incomplete surveys were removed from displayed results. Any results with ties were removed from displayed results. Then descriptive, bivariate and multivariate analyses were then run.

Frequencies and Percentages. For industry, the most frequently observed category of program was Culinary (n = 17, 59%). For instructor, the most frequently observed category of program was Culinary (n = 25, 96%). For student, the most frequently observed category of program was Culinary (n = 90, 64%). Frequencies and percentages are presented in Table 7.

Table 7

Frequency Table for Nominal Variables

Variable	Industry	Instructor	Student
Program			
P&B	3 (10%)	1 (4%)	40 (29%)
Culinary	17 (59%)	25 (96%)	90 (64%)

Note. Due to rounding errors, column wise percentages may not equal 100%.

Results

First, the researcher reviewed the demographics of the population. This is the beginning of the alignment of chosen career field to the brain dominance. A total of 277 subjects completed the survey through email: 188 students enrolled in post-secondary Culinary Arts programs (Culinary Arts, and Baking and Pastry), and a total of 89 instructors and/or industry professionals chose to participate. Students were split between the culinary arts program, baking and pastry program, and those enrolled in a generalized hospitality program. It became apparent

that Hospitality students needed to be included in the study because most Hospitality majors require their students to take BOH classes to meet the degree requirements. Instructors and Industry Professionals were classified at spending most of their time doing or teaching Culinary, spending most of their time doing or teaching Baking and Pastry, spending an equal amount of time doing both Culinary and Pastry duties, or working in the Front of the House.

Quantitative Data Report

Each set of data was collected and analyzed separately. When displayed, as shown in Table 18, a comparison was made between each individual category of program (career path), brain dominance, and learning style through logistic regression.

The researcher provided basic data analysis on the research variables used in the study. Initial research began with the dependent variable. Since the results of both the Neethling's Brain Dominance Test and the VAK survey produce nominal categorical data, the results had to be coded to be entered to IntellectusStatistics™ Software. The statistical functions that could be run were limited to count, and percent.

Descriptive Analysis of the Covariates

The researcher explored the demographics of the participants regarding how they may have influenced the results of the study. The researcher reviewed data of the spread of gender and age between participants. There was a total of 277 records collected, and the results of the descriptive statics are displayed in Table 6. The values entered for gender identity included "male", "female", "other", and "choose not to answer". Since IntellectusStatistics™ Software needed a nominal variable, the range of ages were given a code to allow input into the program. The answers to the demographic questions were used as covariates in the study for all three research questions. Incomplete samples were removed from the database sample size for

this calculation is (N)186. The researcher put these variables into IntellectusStatistics™ Software as ordinal variables that were coded as such:

Gender

Male	0
Female	1

Age

18-25	1
26-35	2
36-45	3
46-55	4
over 55	5

Table 8

Descriptive Analysis for the Career Path

	Students	**Instructors and Professionals**
	What Program are you enrolled in? N(%)	What is your Primary Field or Occupation? N(%)
Culinary	90(64.3)	42(76.4)
P&B	40(28.6)	4(7.3)
unreportable data	10(7.1)	9(16.3)
Total	140(100)	55(100)

Summary of Statistics. Table 8 shows that most of the students responded as culinary students (64.3 %), P&B (28.6%), and Hospitality (unreportable) (7.1%). In the Instructors and Professional category, the majority were Culinary (76.4%), then Baking and Pastry (7.3%) with 16.3% unreportable (FOH, undeclared, more than one position). Unreportable data includes

those under the age of 18, which all data collected from those participants were deleted; or those who chose the gender of "other", or did not answer the question.

Table 9

Frequency Table for Nominal Variables

Variable	Instructors and Professionals N (%)	Student N (%)
Gender		
Male	43(78)	65 (46)
Female	12 (22)	75 (54)
Learning Style		
Visual 1	12 (22)	32 (23)
Visual 2	15(27)	28 (20)
Auditory	8 (14)	24 (17)
Kinesthetic	4 (7)	23 (16)
Brain Dominance		
Left 1 (L1)	2 (3)	18 (13)
Left 2 (L2)	11 (20)	14 (10)
Right 1 (R1)	9 (16)	38 (27)
Right 2 (R2)	30 (55)	63 (45)

Note. Due to rounding errors, column wise percentages may not equal 100%.

Table 10

Descriptive Analysis for Age by gender

		18-25 N(%)	26-35 N(%)	36-45 N(%)	46-55 N(%)	Over 55 N(%)	Unreportable N(%)	Total N(%)
Gender	Male	20(18.5)	16(14.8)	22(20.4)	25(23.1)	21(19.4)	1(.69)	108(55.4)
	Female	38(43.7)	18(20.7)	17(19.5)	7(8.0)	77(7.03)	0(0.0)	87(44.6)
Total		58 (29.7)	34 (17.4)	39 (20.0)	32 (16.4)	28 (14.4)	1(.69)	195 (100)

Table 11

Descriptive Analysis of Career Path by Status

	Culinary N(%)	P&B N(%)	Unreportable N(%)	Total N(%)
Student	90 (46.1)	40 (20.5)	10 (5.1)	140 (71.8)

Summary of Statistics. Table 11 displays the breakdown of Career Path (or program enrolled in) by students. Unreportable data includes those who did not answer the question, students who were in hospitality classes, and professionals who classified themselves as Front of House. That data was removed from the charts and not displayed.

Table 12

Frequency Table for Nominal Variables

Variable	P&B N (%)	Culinary N (%)
Status		
Industry	3 (7)	17 (13)
Instructor	1 (2)	25 (19)
Student	40 (91)	90 (68)
Gender		
Male	14 (32)	84 (64)
Female	30 (6)	48 (36)

Note. Due to rounding errors, column wise percentages may not equal 100%.

Descriptive Analysis of the Dependent Variable

The dependent variable for all three research questions was the data collected on Brain Dominance.

Table 13

Results of the Survey Part 4: Descriptive Analysis for Brain Dominance with Raw Data (nominal categorical variables)- Entire population

Brain Dominance	N (%)
L1 (upper left)	20 (7.22)
R1 (upper right)	47 (16.97)
L2 (lower left)	25 (9.02)
R2 (lower right)	94 (33.94)
Total	186 (67.15)

**Note to do rounding, and removal of unreportable data, numbers will not equal 100%*

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Table 14

Frequency Table for Nominal Variables- Students

Brain Dominance	N (%)
L1 (upper	18 (13.53)
R1 (upper	14 (10.52)
L2 (lower	38 (28.57)
R2 (lower	63 (47.37)
Total	133 (100)

Summary of Statistics. Table 13 shows the raw data for Brain Dominance shows that most respondents are right brained (50.91%). With a 32.85% non-response or incomplete rate, the new sample size for this calculation is (N)186, which shifted the percentages to 10.75% for L1, 25.27% for R1, 13.44% for L2, and 50.54% for R2. This is still in proportion to the original raw data.

Table 14 shows the data for students. Results that showed "tied" were removed from the results, which brings the sample size for Brain Dominance to 133.

Descriptives

Frequencies and percentages were calculated for Learning Style and Brain Dominance split by gender. For male, the most frequently observed category of Learning Style was Visual 2 (n = 32, 30%). For female, the most frequently observed category of Learning Style was Kinesthetic (n = 21, 24%). For male, the most frequently observed category of Brain Dominance was R2 (n = 50, 46%). For female, the most frequently observed category of Brain Dominance was R2 (n = 43, 49%). For Brain Dominance L1, observed categories of gender were 0 (male) and 1 (female), each with an observed frequency of 10 (50%). For Brain Dominance L2, the most frequently observed category of gender was male (n = 15, 60%). For Brain Dominance R1, the most frequently observed category of gender was male (n = 28, 60%). For Brain Dominance R2, the most frequently observed category of gender was male (n = 50, 54%). Frequencies and percentages are presented in Table 15.

Table 15

Frequency Table for Nominal Variables- entire sample

Variable	Male	Female
Learning Style		
Visual 1	31 (29%)	13 (15%)
Visual 2	32 (30%)	11 (13%)
Auditory	13 (12%)	19 (22%)
Kinesthetic	6 (6%)	21 (24%)
Brain Dominance		
L1	10 (9%)	10 (11%)
L2	15 (14%)	10 (11%)
R1	28 (26%)	19 (22%)
R2	50 (46%)	43 (49%)

Note. Due to rounding errors, column wise percentages may not equal 100%.

Descriptive Analysis for the Dependent Variable

The dependent variable was the data collected on Learning Style.

Table 16

Results of the Survey Part 4: Meditating Variables with Raw Data

Learning Style	N (%)
Visua1 1	52 (27.66)
Kinesthetic	37 (19.68)
Visual 2	59 (31.38)
Auditory	40 (21.28)
Total	188 (100)

Note. Due to rounding errors, column wise percentages may not equal 100%.

Table 17

Frequency Table for Nominal Variables- Student results

Learning Style	N (%)	
Visual 1	32	(29.90)
Visual 2	28	(26.17)
Auditory	24	(22.43)
Kinesthetic	23	(21.49)
Total	107	(99.99)

Note. Due to rounding errors, percentages may not equal 100%.

Summary of Statistics. The data for Learning Style as displayed in table 10 shows that most respondents are visual learners (visual 2 and visual 1) (27.66% and 19.68% respectively). Table 16 shows the distribution for students only. Participants who did not complete this portion or who had scores that were tied were removed from the results. The data now shows that most student respondents are also visual learners (29.90% and 26.17% respectively).

Table 15

Frequency Table for Nominal Variables by gender

Learning Style	Male	Female
Visual 1 (V1)	31 (29%)	13 (15%)
Visual 2 (V2)	32 (30%)	11 (13%)
Auditory	13 (12%)	19 (22%)
Kinesthetic	6 (6%)	21 (24%)

Note. Due to rounding errors, column wise percentages may not equal 100%.

Summary of Statistics. For male, the most frequently observed category of Learning Style was Visual 2 (n = 32, 30%). For female, the most frequently observed category of Learning Style was Kinesthetic (n = 21, 24%).

Analyzing the Neethling Brain Dominance Test

The Neethling Brain Dominance instrument is a valid and reliable instrument that determines the primary brain quadrant of the user. This is done by respondents ranking the responses to the given statements in order of their preferences. Each response represents a quadrant of the brain, though they aren't labeled as such in the quiz. They are scored according to the statements order.

For research question 1, the IV was career path, and the CV were age and gender, looking to prove the DV of brain dominance. Since all people participating have the same career interests, using gender and age to see if there were any factors that could have influenced the results of the students' brain dominance.

The determination of Brain Dominance, the results were calculated following the guidelines from Heather Frances, (Personal Communication, February18, 2017) & Genesis Business Solutions (nd). The respondent placed (drug) the statement most accurate to them

statement in the first position, then continued with all the statements. This ranked the answers from most to least. The test is valued at 300 points [(Venter, 2011), (NBI™ Learning Profile, 2017)].

There were 15 questions, so each question can be valued at 20 points. To score the test, whichever statement was chosen for "most like describes me" was valued the highest, and each statement after was scored a little less, and there on.

Value of responses:

1st position: 8 pts.
2nd position: 6 pts.
3rd position: 4 pts.
4th position: 2 pts.

For Brain Dominance, the results were coded as R1, R2, L1, L2. These were then changed into numerical data so IntellectusStatistics™ Software could read them. A logistic regression was used to test the independence between the variables since "Brain Dominance" is nominal data, and "Learning Style" is nominal data to see is there was any significance in the relationship between brain dominance. The results of the surveys showed a mix of significantly and insignificantly statistical differences. Each result will be looked at independently.

For VAK learning style, the results were coded as V1, V2, A, K. These were then changed into numerical data so IntellectusStatistics™ Software could read them. The determination of the preference of the learning style of the student is calculated by simply totaling how many of each response in each category were given (visual, auditory, read/write, and kinesthetic). The category with the most amount of responses shows the preference of the learner. Using a unimodal style of the quiz gives a dominant learning preference. (Fleming, N.D. & Bonwell, C., 2013).

Table 19

Association of Brain Dominance to VAK Learning Style

Brain Quadrant	VAK Learning Style
L1 (upper left)- Blue	visual (1)
R1 (upper right)- Green	kinesthetic
L2 (lower left)- Purple	visual (2)
R2 (lower right)- Yellow	auditory

(http://thepeakperformancecenter.com/educational-learning./learning/preferences/), (Smith, 2016).

Since visual is the option for more than one quadrant, in interpreting results to ensure the differentiation, each will be indicated with a 1 (for L1) or a 2 (for L2).

To gain accurate results, first all incomplete data was cleared from the database, bringing the sample size down to 195. The following results came from the new database.

Findings for Research Question 1

Research Question 1 stated: *Is the career path of a student enrolled in a Culinary School influenced by their brain dominance?* In looking at the correlation to brain dominance to career path, there is no significant difference when it comes to industry professionals and instructors, but there is a significance with students. The hypothesis for Research Question 1 (Ha) states: *there is a significant difference with students who are enrolled in a Culinary Arts program who has the same brain dominance and are in the same career path.*

Descriptive Statistics

Frequencies and percentages were calculated for Brain Dominance and Career Path. The most frequently observed category of Brain Dominance was Right 2 (*n* = 93, 48%). The most frequently observed category of Career Path was Culinary (*n* = 132, 68%). Frequencies and percentages are presented in Table 20.

Table 20

Frequency Table for Nominal Variables- Research Question 1

Variable	*n*	*%*
Brain Dominance		
L1	20	10.26
L2	25	12.82
R1	47	24.10
R2	93	47.69
Career Path		
Culinary Arts	132	67.69
P&B	44	22.56

Note. Due to rounding errors and removable of incomplete data, percentages may not equal 100%.

Descriptives

Frequencies and percentages were calculated for Brain Dominance split by gender. For male, the most frequently observed category of Brain Dominance was R2 (*n* = 27, 42%). For Culinary, the most frequently observed category of Brain Dominance was R2 (*n* = 36, 48%). Frequencies and percentages are presented in Table 21.

Table 21

Frequency Table for Nominal Variables for students- Brain Dominance

Variable	Male	Female
Brain Dominance		
L1	8 (12%)	10 (13%)
L2	5 (8%)	9 (12%)
R1	21 (32%)	17 (23%)
R2	27 (42%)	36 (48%)

Note. Due to rounding errors, column wise percentages may not equal 100%.

Descriptive Statistics

Frequencies and percentages were calculated for Brain Dominance split by age. For ages 18-25, the most frequently observed category of Brain Dominance was R1 (n = 26, 45%). For ages 26-35, the most frequently observed category of Brain Dominance was R2 (n = 12, 44%). For ages 36-45, the most frequently observed category of Brain Dominance was R2 (n = 13, 48%). For ages 46-55, the most frequently observed category of Brain Dominance was R2 (n = 10, 53%). For ages 56 and older, the most frequently observed categories of Brain Dominance were R1 and R2, each with an observed frequency of 3 (50%). Frequencies and percentages are presented in Table 22.

Table 22

Frequency Table for Nominal Variables by age for students

Ages Range	18-25	26-35	36-45	46-55	56 and older
Brain Dominance					
L1	2 (3%)	3 (11%)	5 (19%)	5 (26%)	0 (0%)
L2	3 (5%)	5 (19%)	6 (22%)	0 (0%)	0 (0%)
R1	26 (45%)	4 (15%)	3 (11%)	2 (11%)	3 (50%)
R2	25 (43%)	12 (44%)	13 (48%)	10 (53%)	3 (50%)

Note. Due to rounding errors, column wise percentages may not equal 100%.

Bivariate Analysis

A Chi-square Test of Independence was conducted to examine whether Brain Dominance and Career Path were independent of each other. There were four levels in Brain Dominance: L1, L2, R1, and R2. There were three levels in Career Path: culinary, P&B, and those who responded they were taking hospitality courses. The results we are concerned with are the four main categories of brain dominance (L1, L2, R1, and R2) and the two observed career paths of Culinary Arts and B&P.

Assumptions. The assumption of adequate cell size was assessed, which requires all cells to have expected values greater than zero and 80% of cells to have expected values of at least five (McHugh, 2013). A total of 1 cell had expected frequencies of zero, indicating the first condition was violated. A total of 46.67% of the cells had expected frequencies of at least 5, indicating the second condition was violated. When the assumptions of the chi-square test are violated, Fisher's exact test can be used to produce more reliable results with small sample sizes. Logit models such as binary logistic regression can be used for larger sample sizes.

Results. The results of the Chi-square test were not significant, $\chi^2(8) = 14.10$, $p = .079$, suggesting that Brain Dominance and Career Path could be independent of one another. This implies that the observed frequencies were not significantly different than the expected frequencies. Table 23 presents the results of the Chi-square test.

Table 23

Observed and Expected Frequencies

	Career Path					
Brain Dominance	Culinary	P&B	Hospitality	χ^2	*df*	*p*
1	12[11.57]	6[5.14]	0[1.29]	14.10	8	.079
2	10[9.00]	2[4.00]	2[1.00]			
3	24[24.43]	14[10.86]	0[2.71]			
4	37[40.50]	18[18.00]	8[4.50]			

Note. Values formatted as Observed[Expected].

Multivariate Analysis

A multinomial logistic regression analysis was conducted to assess whether gender, age, and Career Path had a significant effect on the odds of observing each response category of Brain Dominance relative to a 100% probability.

Assumptions. The assumption of absence of multicollinearity was examined. Variance Inflation Factors (VIFs) were calculated to detect the presence of multicollinearity between predictors. High VIFs indicate increased effects of multicollinearity in the model. VIFs greater than 5 are cause for concern, whereas VIFs of 10 should be considered the maximum upper limit (Menard, 2009). All predictors in the regression model have VIFs less than 10. Table 24 presents the VIF for each predictor in the model.

Table 24

Variance Inflation Factors for Gender, Age, and Career Path

Variable	VIF
Gender	1.15
Age	1.04
Career Path	1.10

Results. The results of the multinomial logistic regression model were significant, χ^2 (16) = 29.41, p = .021, suggesting that gender, age, and Career Path had a significant effect on the odds of observing at least one response category of Brain Dominance relative to a 100% probability. McFadden's R-squared was calculated to examine the model fit, where values greater than .2 are indicative of models with excellent fit (Louviere, Hensher, & Swait, 2000). The McFadden R-squared value calculated for this model was 0.08. Since the overall model was significant, each predictor was examined further.

Examining Predictors. The regression coefficient for female Brain Dominance L2 was not significant, B = 0.42, χ^2 = 0.28, p = .597, indicating that females did not have a significant effect on the odds of observing Brain Dominance L2 relative to a 100% probability. The regression coefficient for females with Brain Dominance R1 was not significant, B = -0.76, χ^2 = 1.47, p= .226, indicating that females did not have a significant effect on the odds of observing of Brain Dominance R1 relative to a 100% probability. The regression coefficient for females who are R2 brain dominance was not significant, B = -0.09, χ^2 = 0.03, p = .873, indicating that females did not have a significant effect on the odds of observing Brain Dominance R2 relative to a 100% probability.

The regression coefficient for age for Brain Dominance L2 was not significant, B = -0.04, χ^2 = 0.02, p = .879, indicating that age did not have a significant effect on the odds of observing females with Brain Dominance L2 relative to a 100% probability. The regression coefficient for Brain Dominance R1 was significant, B = -0.49, χ^2 = 4.10, p = .043, suggesting that a one unit increase in age would decrease the odds of observing Brain Dominance R1 relative to a 100% probability by 38.73%. The regression coefficient for age in response to Brain Dominance R2 was not significant, B = -0.06, χ^2 = 0.07, p = .786, indicating that age did not

have a significant effect on the odds of observing Brain Dominance R2 relative to a 100% probability. The regression coefficient for P&B students who have L2 Brain Dominance was not significant, B= -1.04, χ^2 = 1.21, p = .272, indicating that female P&B students did not have a significant effect on the odds of observing Brain Dominance L2 relative to a 100% probability. The regression coefficient for P&B students who have Brain Dominance of R1 was not significant, B = 0.38, χ^2 = 0.34, p = .558, indicating that P&B who are females relative to a 100% probability. The regression coefficient for P&B females in response Brain Dominance R2 was not significant, B = -0.00, χ^2 = 0.00, p = .995, indicating that P&B females did not have a significant effect on the odds of observing Brain Dominance R2 relative to a 100% probability.

Table 25

Multinomial Logistic Regression Table with Brain Dominance predicted by gender, age, and program

Variable	Response	*B*	*SE*	χ^2	*p*	*OR*
(intercept)	L2	-0.29	0.97	0.09	.765	
Gender	L2	0.42	0.79	0.28	.597	1.52
Age	L2	-0.04	0.29	0.02	.879	0.96
Career Path	L2	-1.04	0.95	1.21	.272	0.35
(Intercept)	R1	2.00	0.73	7.55	.006	
Gender	R1	-0.76	0.63	1.47	.226	0.47
Age	R1	-0.49	0.24	4.10	.043	0.61
Career Path	R1	0.38	0.65	0.34	.558	1.46
(Intercept)	R2	1.31	0.71	3.41	.065	
Gender	R2	-0.09	0.59	0.03	.873	0.91
Age	R2	-0.06	0.21	0.07	.786	0.94
Career Path	R2	-0.00	0.60	0.00	.995	1.00

Note. $\chi^2(16) = 29.41$, p = .021, McFadden R^2 = 0.08.

Conclusions for Research Question 1

Research Question 1 wanted to know if there was a correlation of Brain Dominance to Career Path. Gender and age were also taken into consideration. A Chi-square Test of Independence was conducted to examine whether Brain Dominance and Career Path were independent of each other. There were four levels in Brain Dominance and three levels in Career Path. The results we are concerned with are the four main categories of brain dominance. The results of a multinomial logistic regression model were significant, χ^2 (16) = 29.41, p = .021, suggesting that gender, age, and Career Path had a significant effect on the odds of observing at least one response category of Brain Dominance relative to a 100% probability. Looking at each reference category for gender: Brain Dominance L2 was not significant with a p = .597, Brain Dominance R1 was not significant with a p= .226, Brain Dominance R2 was not significant, with a p = .873. Looking at each reference category for age: Brain Dominance L2 was not significant with a, p = .879, Brain Dominance R1 was significant, with a p = .043, Brain Dominance R2 was not significant, with a p = .786. Looking at each reference category for career path: Brain Dominance L2 was not significant, with a p = .272, Brain Dominance R1 was not significant, with a, p = .558, Brain Dominance R2 was not significant with a p = .995.

Examining the effects of gender on Brain Dominance, gender did not have a significant effect on observing one particular category of Brain Dominance. The results of the Chi-square test were not significant, $\chi^2(8) = 14.10$, p = .079, suggesting that Brain Dominance and Career Path could be independent of one another. Only one category of Brain Dominance, R1, shows there was a less likely a chance of observing R1 when age increased.

The result of Research Question 1 is that there is not enough significant data to declare a steady conclusion on to what the relationship between the career path of a student enrolled in a

Culinary School and their brain dominance, in relation to their age and gender. Further research is required. The null hypothesis is accepted.

Findings for Research Question 2

Research Question 2 looked at data from students, instructors, and industry professionals. Research Question 2 states: *Does the students' brain dominance affect their learning style?* This question looks to find correlation between students that have a similar brain dominance and how they learn best. It is hypothesized that students of similar brain dominance should prefer the same learning activities. So, therefore, the hypothesis for research question 2 states: (Ha) *There is a statistically significant number of students who have the same brain dominance and choose the same learning activity.* The results of the survey show that there is a statistical significance for the correlation between brain dominance and learning style for students. The following presentation of data shows the significance of the results.

Table 26

Learning Style of Students, field comparison

	P&B Students	Culinary Students
Blue Activity (L1)	11	21
Green Activity (R1)	10	11
Purple Activity (L2)	3	19
Yellow Activity (R2)	5	16
Total	29	67

Descriptives

Frequencies and percentages were calculated for Learning Style split by gender. For males, the most frequently observed category of Learning Style was Visual 2 (n = 32, 30%). For females, the most frequently observed category of Learning Style was Kinesthetic (n = 21, 24%). Frequencies and percentages are presented in Table 27.

Table 27

Frequency Table for Nominal Variables- Learning Style by gender

Variable Learning Style	Male	Female
Visual 1	31 (29%)	13 (15%)
Visual 2	32 (30%)	11 (13%)
Auditory	13 (12%)	19 (22%)
Kinesthetic	6 (6%)	21 (24%)

Note. Due to rounding errors, and removal of unreportable data column wise percentages may not equal 100%.

Bivariate Analysis

A Chi-square Test of Independence was conducted to examine whether Learning Style and Brain Dominance were independent. There were four levels in Learning Style: 1, 2, 3, and 4. There were four levels in Brain Dominance: 1, 2, 3, and 4.

Assumptions. The assumption of adequate cell size was assessed, which requires all cells to have expected values greater than zero and 80% of cells to have expected values of at least 5 (McHugh, 2013). All cells had expected values greater than zero, indicating the first condition was met. A total of 40.00% of the cells had expected frequencies of at least five, indicating the second condition was violated. When the assumptions of the chi-square test are violated, Fisher's exact test can be used to produce more reliable results with small sample sizes. Logit models such as binary logistic regression can be used for larger sample sizes.

Results. The results of the Chi-square test were significant, $\chi^2(16) = 55.98$, $p < .001$, suggesting that Learning Style and Brain Dominance are related to one another. The following level combinations had observed values that were greater than their expected values: Visual 2: L1, Auditory: L2, Visual 1: R1, Visual 2: R2, and Kinesthetic: R2. The following level combinations had observed values that were less than their expected values: Visual 1: L1,

Auditory: L1, Kinesthetic: L1, Visual 1: L2, Visual 2: L2, Kinesthetic: L2, Visual 2: R1, Auditory: R1, Kinesthetic: R1, Visual1:R2, and Auditory: R2. Table 28 presents the results of the Chi-square test.

Table 28

Observed and Expected Frequencies- Learning Style

Learning Style	L1	L2	R1	R2	χ^2	*df*	*p*
Visual 1	3[4.11]	0[3.20]	13[8.69]	13[14.40]	55.98	16	< .001
Visual 2	4[3.60]	2[2.80]	7[7.60]	15[12.60]			
Auditory	1[3.09]	9[2.40]	5[6.51]	5[10.80]			
Kinesthetic	2[2.96]	1[2.30]	2[6.24]	18[10.35]			

Note. Values formatted as Observed[Expected].

The correlation of brain dominance to learning style activity, as shown in figure 7, is tabulated in Table 29.

Table 29

Correlation of Brain Dominance and Learning Style

Status		Value	Df	Asymptotic Significance (2-sided)
Student	Pearson Chi-Square	103.573	30	.000
	Likelihood Ratio	95.074	30	.000
	N of Valid Cases	188		

Multinomial Logistic Regression

A multinomial logistic regression analysis was conducted to assess whether gender, age, and Brain Dominance had a significant effect on the odds of observing each response category of Learning Style relative to a 100% probability.

Assumptions. The assumption of absence of multicollinearity was examined.

Variance inflation factors. Variance Inflation Factors (VIFs) were calculated to detect the presence of multicollinearity between predictors. High VIFs indicate increased effects of multicollinearity in the model. VIFs greater than 5 are cause for concern, whereas VIFs of 10 should be considered the maximum upper limit (Menard, 2009). All predictors in the regression model have VIFs less than 10. Table 30 presents the VIF for each predictor in the model.

Table 30

Variance Inflation Factors for gender, age, and Brain Dominance

Variable	VIF
Gender	1.08
Age	1.10
Brain Dominance	1.07

Results. The results of the multinomial logistic regression model were significant, χ^2 (24) = 78.32, $p < .001$, suggesting that gender, age, and Brain Dominance had a significant effect on the odds of observing at least one response category of Learning Style relative to a 100% probability. McFadden's R-squared was calculated to examine the model fit, where values greater than .2 are indicative of models with excellent fit (Louviere, Hensher, & Swait, 2000). The McFadden R-squared value calculated for this model was 0.17. Since the overall model was significant, each predictor was examined further.

Examining Predictors. The regression coefficient for females with a Visual 2 Learning Style was not significant, $B = 0.38$, $\chi^2 = 0.44$, $p = .507$, indicating that females did not have a significant effect on the odds of having Visual 2 Learning Style relative to a 100% probability. The regression coefficient for females with Auditory Learning Style was not significant, $B =$

1.00, $\chi^2 = 2.32$, $p = .128$, indicating that females did not have a significant effect on the odds of observing Auditory learning style relative to a 100% probability. The regression coefficient for females with Kinesthetic Learning Style was significant, $B = 2.21$, $\chi^2 = 9.93$, $p = .002$, suggesting that a one unit increase in females would increase the odds of observing Kinesthetic Learning Style relative to a 100% probability by 809.25%. The regression coefficient for age with Visual 2 Learning Style was not significant, $B = 0.17$, $\chi^2 = 0.66$, $p = .417$, indicating that age did not have a significant effect on the odds of observing Visual 2 Learning Style relative to a 100% probability. The regression coefficient for age in with Auditory Learning Style was not significant, $B = 0.35$, $\chi^2 = 2.03$, $p = .154$, indicating that age did not have a significant effect on the odds of observing Auditory Learning Style relative to a 100% probability. The regression coefficient for age with Kinesthetic Learning Style was not significant, $B = -0.30$, $\chi^2 = 1.22$, $p = .270$, indicating that age did not have a significant effect on the odds of observing a Kinesthetic Learning Style relative to a 100% probability. The regression coefficient for L2 Brain Dominance in with Visual 2 Learning Style was not significant, $B = 16.32$, $\chi^2 = 0.00$, $p = .995$, indicating that L2 Brain Dominance did not have a significant effect on the odds of observing the Visual 2 Learning Style relative to a 100% probability. The regression coefficient for L2 Brain Dominance with Auditory Learning Style was not significant, $B = 19.28$, $\chi^2 = 0.00$, $p = .995$, indicating that L2 Brain Dominance did not have a significant effect on the odds of observing Auditory Learning Style relative to a 100% probability. The regression coefficient for L2 Brain Dominance with Kinesthetic Learning Style was not significant, $B = 16.02$, $\chi^2 = 0.00$, $p = .995$, indicating that a L2 Brain Dominance did not have a significant effect on the odds of observing a Kinesthetic Learning Style relative to a 100% probability. The regression coefficient for R1 Brain Dominance with a Visual 2 of Learning Style was not significant, $B = -0.78$, $\chi^2 = 0.74$, $p =$

.391, indicating that a R1 Brain Dominance did not have a significant effect on the odds of observing a Visual 2 Learning Style relative to a 100% probability. The regression coefficient for R1 Brain Dominance in response to an Auditory Learning Style was not significant, B = 0.49, χ^2 = 0.14, p = .706, indicating that a R1 Brain Dominance did not have a significant effect on the odds of observing Auditory Learning Style relative to a 100% probability. The regression coefficient for R1 Brain Dominance with Kinesthetic Learning Style was not significant, B = -1.72, χ^2 = 1.90, p = .168, indicating that R1 Brain Dominance did not have a significant effect on the odds of observing a Kinesthetic Learning Style relative to a 100% probability. The regression coefficient for R2 Brain Dominance in response to a Visual 2 Learning Style was not significant, B = -0.13, χ^2 = 0.02, p = .876, indicating that R2 Brain Dominance did not have a significant effect on the odds of observing a Visual 2 Learning Style relative to a 100% probability. The regression coefficient for R2 Brain Dominance in with an Auditory Learning Style was not significant, B = 0.19, χ^2 = 0.02, p = .885, indicating that R2 Brain Dominance did not have a significant effect on the odds of observing Auditory of Learning Style relative to a 100% probability. The regression coefficient for R2 Brain Dominance with kinesthetic learning style was not significant, B = 0.65, χ^2 = 0.41, p = .524, indicating that R2 Brain Dominance did not have a significant effect on the odds of observing an Auditory Learning Style relative to a 100% probability. Table 30 presents the results of the multinomial logistic regression model.

Table 30

Multinomial Logistic Regression Table with Learning Style predicted by gender, age, and Brain Dominance

Variable	Response	*B*	*SE*	χ^2	*p*	*OR*
(Intercept)	V2	-0.28	0.98	0.08	.774	
Gender	V2	0.38	0.57	0.44	.507	1.46
Age	V2	0.17	0.21	0.66	.417	1.18

Variable	Response	*B*	*SE*	χ^2	*p*	*OR*
L2	V2	16.32	2815.34	0.00	.995	1.22×10^7
R1	V2	-0.78	0.91	0.74	.391	0.46
R2	V2	-0.13	0.86	0.02	.876	0.87
(Intercept)	Auditory	-2.50	1.45	3.00	.083	
Gender	Auditory	1.00	0.66	2.32	.128	2.71
Age	Auditory	0.35	0.25	2.03	.154	1.42
L2	Auditory	19.28	2815.34	0.00	.995	2.36×10^8
R1	Auditory	0.49	1.30	0.14	.706	1.63
R2	Auditory	0.19	1.28	0.02	.885	1.20
(Intercept)	Kinesthetic	-1.02	1.21	0.72	.398	
Gender	Kinesthetic	2.21	0.70	9.93	.002	9.09
Age	Kinesthetic	-0.30	0.27	1.22	.270	0.74
L2	Kinesthetic	16.02	2815.34	0.00	.995	9.02×10^6
R1	Kinesthetic	-1.72	1.25	1.90	.168	0.18
R2	Kinesthetic	0.65	1.02	0.41	.524	1.92

Note. $\chi^2(24) = 78.32$, $p < .001$, McFadden $R^2 = 0.17$.

Conclusions for Research Question 2

Research Question 2 looked to find correlation between students that have a similar brain dominance and how they learn best. The results of a Chi-square test were significant, $\chi^2(16) = 55.98$, $p < .001$, suggesting that Learning Style and Brain Dominance are related to one another. The results of a multinomial logistic regression model were significant, χ^2 (24) = 78.32, $p < .001$, suggesting that gender, age, and brain dominance had a significant effect on the odds of observing at least one response category of Learning Style relative to a 100% probability.

A multinomial logistic regression analysis was conducted to assess whether gender, age, and Brain Dominance had a significant effect on the odds of observing each response category of Learning Style. The results of the multinomial logistic regression model were significant, χ^2 (24)

= 78.32, $p < .001$, suggesting that gender, age, and Brain Dominance had a significant effect on the odds of observing at least one response category of Learning Style. Looking at each reference category for gender: Visual 2 Learning Style was not significant, with a $p = .507$, Auditory Learning Style was not significant, with a $p = .128$, and Kinesthetic Learning Style was significant with a $p = .002$. Looking at each reference category for age: Visual 2 Learning Style was not significant, with a $p = .417$, Auditory Learning Style was not significant, with a, $p = .154$, and Kinesthetic Learning Style was not significant, with a $p = .270$. Looking at each reference category for L2 Brain Dominance: Visual 2 Learning Style was not significant, with a $p = .995$, Auditory Learning Style was not significant, with a $p = .995$, and Kinesthetic Learning Style was not significant, with a $p = .995$. Looking at each reference category for R1 Brain Dominance: Visual 2 of Learning Style was not significant, with a $p = .391$, Auditory Learning Style was not significant, with a $p = .706$ and Kinesthetic Learning Style was not significant with a $p = .168$. Looking at each reference category for R2 Brain Dominance: Visual 2 Learning Style was not significant, with a $p = .876$, Auditory Learning Style was not significant, with a $p = .885$, and Kinesthetic learning style was not significant, with a $p = .524$.

Understanding how to apply lessons of each Learning Style to each different group of gender, age and Brain Dominance can best benefit is what Research Question 2 is trying to determine. Since there is a significance in some categories of gender, age, and Brain Dominance in result to Learning Style, then further research and a larger sample size can help solidify results and classify students by age and gender into categories of learning style by brain dominance. The null hypothesis is accepted.

Findings for Research Question 3

Research Question 3 looks for a correlation between program enrollment, Brain Dominance, and Learning Style of students. Research Question 3 states *Is there a statistically significant relationship between a Culinary School's students' career path, their brain dominance, and their learning style?* It is hypothesized that: (Ha) *there is a statistically significant number of students who have the same brain dominance and choose the same learning activity*.

Descriptive Statistics

Frequencies and percentages were calculated for gender, age, Learning Style, and Brain Dominance. The most frequently observed category of gender was female (n = 75, 54%). The most frequently observed category of age range was [18-25] (n = 58, 41%). The most frequently observed category of Learning Style was Visual 1 (n = 32, 22%). The most frequently observed category of Brain Dominance was R2 (n = 63, 45%). Frequencies and percentages are presented in Table 31.

Table 31

Frequency Table for Nominal Variables

Variable	*n*	*%*
Gender		
Male	65	46.43
Female	75	53.57
Missing	0	0.00
Age		
18-25	58	41.43
26-35	27	19.29
36-45	27	19.29
46-55	19	13.57
Over 55	6	4.29

Variable	*n*	*%*
Missing	0	0.00
Learning Style		
Visual 1	32	22.86
Visual 2	28	20.00
Auditory	24	17.14
Kinesthetic	23	16.43
Missing	0	0.00
Brain Dominance		
L1	18	12.86
L2	14	10.00
R1	38	27.14
R2	63	45.00
Missing	0	0.00

Note. Due to rounding errors, and removal of unusable data, percentages may not equal 100%.

The overall results for Research Question 3 will help paint a picture of the student enrolled in a post-secondary Culinary Arts or P&B program. Table 32 shows the correlation via chi-square.

Bivariate Analysis

A Chi-square Test of Independence was conducted to examine whether Learning Style and Career Path were independent. There were four levels in Learning Style: Visual 1, Visual 2, Auditory, and Kinesthetic. There were three levels in Career Path: Culinary, P&B, and Hospitality.

Assumptions. The assumption of adequate cell size was assessed, which requires all cells to have expected values greater than zero and 80% of cells to have expected values of at least five (McHugh, 2013). All cells had expected values greater than zero, indicating the first

condition was met. A total of 66.67% of the cells had expected frequencies of at least 5, indicating the second condition was violated. When the assumptions of the chi-square test are violated, Fisher's exact test can be used to produce more reliable results with small sample sizes. Logit models such as binary logistic regression can be used for larger sample sizes.

Results. The results of the Chi-square test were significant, $\chi^2(8) = 19.41$, $p = .013$, suggesting that Learning Style and Career Path are related to one another. The following level combinations had observed values that were greater than their expected values: Visual 1: Culinary, Visual 2: Culinary, Auditory: Culinary, Visual 1: P&B, Kinesthetic: P&B, Visual 2: Hospitality, Auditory: Hospitality, and Auditory: Hospitality. The following level combinations had observed values that were less than their expected values: Kinesthetic: Culinary, Visual 2: P&B, Auditory: P&B, and Visual 1: Hospitality. Table 32 presents the results of the Chi-square test.

Table 32

Observed and Expected Frequencies for Culinary School Students

	Career Path					
Learning Style	Culinary	P&B	Hospitality	χ^2	*df*	*p*
Visual 1	21[20.57]	11[9.14]	0[2.29]	19.41	8	.013
Visual 2	19[18.00]	3[8.00]	6[2.00]			
Auditory	16[15.43]	6[6.86]	2[1.71]			
Kinesthetic	11[14.79]	10[6.57]	2[1.64]			

Note. Values formatted as Observed[Expected].

Table 33

Relationship of Program to Brain Dominance to Learning Style by status

Status	Program		Value	Df	Asymptotic Significance (2-sided)
Professionals	P&B	Pearson Chi-Square	-		
		N of Valid Cases	3		
	Culinary	Pearson Chi-Square	24.840	20	.208
		Likelihood Ratio	28.183	20	.105
		N of Valid Cases	28		
	both	Pearson Chi-Square	12.800	12	.384
		Likelihood Ratio	10.585	12	.565
		N of Valid Cases	8		
	FOH	Pearson Chi-Square	2.917	2	.233
		Likelihood Ratio	4.016	2	.134
		N of Valid Cases	7		
	Total	Pearson Chi-Square	19.937	25	.750
		Likelihood Ratio	22.864	25	.586
		N of Valid Cases	46		
Instructors	Culinary	Pearson Chi-Square	31.343	30	.399
		Likelihood Ratio	30.911	30	.420
		N of Valid Cases	39		
	P&B	Pearson Chi-Square	-		
		N of Valid Cases	1		
	Total	Pearson Chi-Square	29.732	30	.479
		Likelihood Ratio	29.853	30	.473
		N of Valid Cases	40		
Students	P&B	Pearson Chi-Square	71.153	24	.000
		Likelihood Ratio	65.497	24	.000
		N of Valid Cases	48		
	Culinary	Pearson Chi-Square	81.438	25	.000
		Likelihood Ratio	78.844	25	.000
		N of Valid Cases	118		
	Hospitality	Pearson Chi-Square	14.500	8	.070
		Likelihood Ratio	17.369	8	.026
		N of Valid Cases	22		
	Total	Pearson Chi-Square	103.573	30	
		Likelihood Ratio	95.074	30	
		N of Valid Cases	188		

Note: FOH= Front of House

Summary of Statistics

Brain Dominance in relation to Learning Style was also classified by gender. This is

shown in Table 34. Incomplete entries were deleted.

Table 34

Descriptive Analysis for two Dependent Variables by Gender

Gender		BD	Total
V1			
	Male	31	36
	Female	10	16
V2			
	Male	31	43
	Female	11	13
A			
	Male	9	18
	Female	17	23
K			
	Male	6	7
	Female	21	30

Multinomial Logistic Regression

A multinomial logistic regression analysis was conducted to assess whether gender, age, and Brain Dominance had a significant effect on the odds of observing each response category of Learning Style relative to a 100% probability.

Assumptions. The assumption of absence of multicollinearity was examined.

Variance inflation factors. Variance Inflation Factors (VIFs) were calculated to detect the presence of multicollinearity between predictors. High VIFs indicate increased effects of multicollinearity in the model. VIFs greater than 5 are cause for concern, whereas VIFs of 10

should be considered the maximum upper limit (Menard, 2009). All predictors in the regression model have VIFs less than 10. Table 35 presents the VIF for each predictor in the model.

Table 35

Variance Inflation Factors for gender, age, and Brain Dominance

Variable	VIF
Gender	1.08
Age	1.10
Brain Dominance	1.07

Results. The results of the multinomial logistic regression model were significant, χ^2 (24) = 78.32, $p < .001$, suggesting that gender, age, and Brain Dominance had a significant effect on the odds of observing at least one response category of Learning Style relative to a 100% probability. McFadden's R-squared was calculated to examine the model fit, where values greater than .2 are indicative of models with excellent fit (Louviere, Hensher, & Swait, 2000). The McFadden R-squared value calculated for this model was 0.17. Since the overall model was significant, each predictor was examined further.

Examining Predictors. The regression coefficient for females who have a Visual 2 Learning Style was not significant, $B = 0.38$, $\chi^2 = 0.44$, $p = .507$, indicating that females did not have a significant effect on the odds of observing the Visual 2 Learning Style relative to a 100% probability. The regression coefficient for females who have an Auditory Learning Style was not significant, $B = 1.00$, $\chi^2 = 2.32$, $p = .128$, indicating that females did not have a significant effect on the odds of observing the Auditory Learning Style relative to a 100% probability. The regression coefficient for females with Kinesthetic Learning Style was significant, $B = 2.21$, $\chi^2 = 9.93$, $p = .002$, suggesting that a one unit increase in females would increase the odds of observing the Kinesthetic Learning Style relative to a 100% probability by 809.25%. The

regression coefficient for age in response to Visual 2 Learning Style was not significant, B = 0.17, χ^2 = 0.66, p = .417, indicating that age did not have a significant effect on the odds of observing Visual 2 Learning Style relative to a 100% probability. The regression coefficient for age in response to Auditory Learning Style was not significant, B = 0.35, χ^2 = 2.03, p = .154, indicating that age did not have a significant effect on the odds of observing Auditory Learning Style relative to a 100% probability. The regression coefficient for age with Kinesthetic Learning Style was not significant, B = -0.30, χ^2 = 1.22, p = .270, indicating that age did not have a significant effect on the odds of observing Kinesthetic Learning Style relative to a 100% probability. The regression coefficient for L2 Brain Dominance in response to Visual 2 Learning Style was not significant, B = 16.32, χ^2= 0.00, p = .995, indicating that L2 Brain Dominance did not have a significant effect on the odds of observing the Visual 2 Learning Style relative to a 100% probability. The regression coefficient for L2 Brain Dominance for Auditory Learning Style was not significant, B = 19.28, χ^2 = 0.00, p = .995, indicating that L2 Brain Dominance did not have a significant effect on the odds of observing the Auditory Learning Style relative to a 100% probability. The regression coefficient for L2 Brain Dominance with Kinesthetic Learning Style was not significant, B = 16.02, χ^2 = 0.00, p = .995, indicating that L2 Brain Dominance did not have a significant effect on the odds of observing Kinesthetic Learning Style relative to a 100% probability. The regression coefficient for R1 Brain Dominance in response to Visual 2 Learning Style was not significant, B = -0.78, χ^2 = 0.74, p = .391, indicating that R1 Brain Dominance did not have a significant effect on the odds of observing L2 Learning Style relative to a 100% probability. The regression coefficient for R1 Brain Dominance in response to Auditory Learning Style was not significant, B = 0.49, χ^2 = 0.14, p = .706, indicating that R1 Brain Dominance did not have a significant effect on the odds of observing Auditory Learning

Style relative to a 100% probability. The regression coefficient for R1 Brain Dominance with Kinesthetic Learning Style was not significant, $B = -1.72$, $\chi^2 = 1.90$, $p = .168$, indicating that R1 Brain Dominance did not have a significant effect on the odds of observing Kinesthetic Learning Style relative to a 100% probability. The regression coefficient for R2 Brain Dominance in response to L2 Learning Style was not significant, $B = -0.13$, $\chi^2 = 0.02$, $p = .876$, indicating that R2 Brain Dominance did not have a significant effect on the odds of observing Auditory Learning Style relative to a 100% probability. The regression coefficient for R2 Brain Dominance in response to Auditory Learning Style was not significant, $B = 0.19$, $\chi^2 = 0.02$, $p = .885$, indicating that R2 Brain Dominance did not have a significant effect on the odds of observing Auditory Learning Style relative to a 100% probability. The regression coefficient for R2 Brain Dominance with Kinesthetic Learning Style was not significant, $B = 0.65$, $\chi^2 = 0.41$, $p = .524$, indicating that R2 Brain Dominance did not have a significant effect on the odds of observing Kinesthetic Learning Style relative to a 100% probability.

Table 36

Multinomial Logistic Regression Table with Learning Style predicted by gender, age, and Brain Dominance

Variable	Response	*B*	*SE*	χ^2	*p*	*OR*
(Intercept)	Visual 2	-0.28	0.98	0.08	.774	
Gender	Visual 2	0.38	0.57	0.44	.507	1.46
Age	Visual 2	0.17	0.21	0.66	.417	1.18
Brain Dominance L2	Visual 2	16.32	2815.34	0.00	.995	1.22×10^7
Brain Dominance R1	Visual 2	-0.78	0.91	0.74	.391	0.46
Brain Dominance R2	Visual 2	-0.13	0.86	0.02	.876	0.87
(Intercept)	Auditory	-2.50	1.45	3.00	.083	
Gender	Auditory	1.00	0.66	2.32	.128	2.71

Variable	Response	*B*	*SE*	χ^2	*p*	*OR*
Age	Auditory	0.35	0.25	2.03	.154	1.42
Brain Dominance L2	Auditory	19.28	2815.34	0.00	.995	2.36×10^8
Brain Dominance R1	Auditory	0.49	1.30	0.14	.706	1.63
Brain Dominance R2	Auditory	0.19	1.28	0.02	.885	1.20
(Intercept)	Kinesthetic	-1.02	1.21	0.72	.398	
Gender	Kinesthetic	2.21	0.70	9.93	.002	9.09
Age	Kinesthetic	-0.30	0.27	1.22	.270	0.74
Brain Dominance L2	Kinesthetic	16.02	2815.34	0.00	.995	9.02×10^6
Brain Dominance R1	Kinesthetic	-1.72	1.25	1.90	.168	0.18
Brain Dominance R2	Kinesthetic	0.65	1.02	0.41	.524	1.92

Note. $\chi^2(24) = 78.32$, $p < .001$, McFadden $R^2 = 0.17$.

Multinomial Logistic Regression

A multinomial logistic regression analysis was conducted to assess whether Brain Dominance and Career Path had a significant effect on the odds of observing each response category of Learning Style relative to a 100% probability.

Assumptions. The assumption of absence of multicollinearity was examined.

Variance inflation factors. Variance Inflation Factors (VIFs) were calculated to detect the presence of multicollinearity between predictors. High VIFs indicate increased effects of multicollinearity in the model. VIFs greater than 5 are cause for concern, whereas VIFs of 10 should be considered the maximum upper limit (Menard, 2009). All predictors in the regression model have VIFs less than 10. Table 37 presents the VIF for each predictor in the model.

Table 37

Variance Inflation Factors for Brain Dominance and Career Path

Variable	VIF
Brain Dominance	1.11
Career Path	1.11

Results. The results of the multinomial logistic regression model were significant, χ^2 (24) = 74.35, $p < .001$, suggesting that Brain Dominance and Career Path had a significant effect on the odds of observing at least one response category of Learning Style relative to a 100% probability. McFadden's R-squared was calculated to examine the model fit, where values greater than .2 are indicative of models with excellent fit (Louviere, Hensher, & Swait, 2000). The McFadden R-squared value calculated for this model was 0.17. Since the overall model was significant, each predictor was examined further.

Examining Predictors. The regression coefficient for L2 Brain Dominance in response to V2 Learning Style was not significant, $B = 16.71$, $\chi^2 = 0.00$, $p = .997$, indicating that L2 Brain Dominance did not have a significant effect on the odds of observing V2 Learning Style relative to a 100% probability. The regression coefficient for L2 Brain Dominance in response to Auditory Learning Style was not significant, $B = 20.10$, $\chi^2 = 0.00$, $p = .997$, indicating that L2 Brain Dominance did not have a significant effect on the odds of observing Auditory Learning Style relative to a 100% probability. The regression coefficient for L2 Brain Dominance in response to Kinesthetic Learning Style was not significant, $B = 17.34$, $\chi^2 = 0.00$, $p = .997$, indicating that L2 Brain Dominance did not have a significant effect on the odds of observing Kinesthetic Learning Style relative to a 100% probability. The regression coefficient for R1 Brain Dominance in response to Visual 2 was not significant, $B = -0.89$, $\chi^2 = 0.95$, $p = .331$, indicating that R1 Brain Dominance did not have a significant effect on the odds of observing V2 Learning Style relative to a 100% probability. The regression coefficient for R1 Brain

Dominance in response to Auditory Learning Style was not significant, $B = 0.14$, $\chi^2 = 0.01$, $p = .913$, indicating that R1 Brain Dominance did not have a significant effect on the odds of observing Auditory Learning Style relative to a 100% probability. The regression coefficient for R1 Brain Dominance in for Kinesthetic Learning Style was not significant, $B = -1.48$, $\chi^2 = 1.54$, $p = .214$, indicating that R1 Brain Dominance did not have a significant effect on the odds of observing Kinesthetic Learning Style relative to a 100% probability. The regression coefficient for R2 Brain Dominance to Visual 2 Learning Style was not significant, $B = -0.65$, $\chi^2 = 0.55$, $p = .460$, indicating that R2 Brain Dominance did not have a significant effect on the odds of observing V2 Learning Style relative to a 100% probability. The regression coefficient for R2 Brain Dominance in response to Auditory Learning Style was not significant, $B = 0.00$, $\chi^2 = 0.00$, $p = .998$, indicating that R2 Brain Dominance did not have a significant effect on the odds of observing Auditory Learning Style relative to a 100% probability. The regression coefficient for R2 Brain Dominance in for Kinesthetic Learning Style was not significant, $B = 0.66$, $\chi^2 = 0.44$, $p = .506$, indicating that R2 Brain Dominance did not have a significant effect on the odds of observing Kinesthetic Learning Style relative to a 100% probability. The regression coefficient for P&B Students who are V2 Learning Style was not significant, $B = -1.30$, $\chi^2 = 3.11$, $p = .078$, indicating that P&B Students did not have a significant effect on the odds of observing V2 Learning Style relative to a 100% probability. The regression coefficient for P&B students in response to Auditory Learning Style was not significant, $B = 0.24$, $\chi^2 = 0.12$, $p = .730$, indicating that P&B students did not have a significant effect on the odds of observing Auditory Learning Style relative to a 100% probability. The regression coefficient for P&B students for Kinesthetic Learning Style was not significant, $B = 0.57$, $\chi^2 = 0.88$, $p = .349$, indicating that P&B students did not have a significant effect on the odds of

observing Kinesthetic Learning Style relative to a 100% probability. Table 38 presents the results of the multinomial logistic regression model.

Table 38

Multinomial Logistic Regression Table with Learning Style predicted by Brain Dominance and Career Path

Variable	Response	*B*	*SE*	χ^2	*p*	*OR*
(Intercept)	Visual 2	0.63	0.80	0.63	.429	
L2 Brain Dominance	Visual 2	16.71	4662.49	0.00	.997	1.81×10^7
R1 Brain Dominance	Visual 2	-0.89	0.91	0.95	.331	0.41
R2 Brain Dominance	Visual 2	-0.65	0.89	0.55	.460	0.52
P&B	Visual 2	-1.30	0.74	3.11	.078	0.27
(Intercept)	Auditory	-1.20	1.20	1.01	.315	
L2 Brain Dominance	Auditory	20.10	4662.49	0.00	.997	5.36×10^8
R1 Brain Dominance	Auditory	0.14	1.27	0.01	.913	1.15
R2 Brain Dominance	Auditory	0.00	1.28	0.00	.998	1.00
P&B	Auditory	0.24	0.71	0.12	.730	1.28
(Intercept)	kinesthetic	-0.67	0.96	0.49	.484	
L2 Brain Dominance	kinesthetic	17.34	4662.49	0.00	.997	3.39×10^7
R1 Brain Dominance	kinesthetic	-1.48	1.19	1.54	.214	0.23
R2 Brain Dominance	kinesthetic	0.66	0.99	0.44	.506	1.93
P&B	kinesthetic	0.57	0.61	0.88	.349	1.77

Note. $\chi^2(24) = 74.35$, $p < .001$, McFadden $R^2 = 0.17$.

Conclusions for Research Question 3

Research Question 3 looks for a correlation between Career Path Brain Dominance, and Learning Style of students. Research Question 3 states: *What is the relationship between a Culinary Schools' students' career path, their brain dominance, and their learning style*? The overall results for Research Question 3 will help paint a picture of the student enrolled in a post-

secondary Culinary Arts or P&B program. The results of the multinomial logistic regression model were significant, χ^2 (24) = 78.32, $p < .00$. The results of the Chi-square test were significant, $\chi^2(8) = 19.41$, $p = .013$, suggesting that Learning Style and Career Path are related to one another. There is a positive significance of .015 between Brain Dominance and gender, stating there is a significance difference with brain dominance and gender. The negative correlations between gender and age (-.299), age and learning style (-.128), and Learning Style and Brain Dominance (-.141) indicates when one variable increases, the other variable decreases.

The Logistic Regression model for Research Question 3 had the following results final findings for RQ3 based on logistic regression. There is no significance L2 Brain Dominance in response to V2 Learning Style with a $p = .997$. There is no significance between L2 Brain Dominance in response to Auditory Learning Style with a $p = .997$. There is no significance between L2 Brain Dominance in response to Kinesthetic Learning Style with a $p = .997$. There is no significance between R1 Brain Dominance in response to Visual 2 Learning Style with a $p = .331$. There is no significance between R1 Brain Dominance in response to Visual 2 with a $p = .331$. There is no significance between R1 Brain Dominance in response to Auditory Learning Style with a $p = .913$. There is no significance between R1 Brain Dominance in response to Kinesthetic Learning Style with a $p = .214$. There is no significance between R2 Brain Dominance in response to Visual 2 Learning Style with a $p = .460$. There is no significance to R2 Brain Dominance in response to Auditory Learning Style with a, $p = .998$. There is no significance between R2 Brain Dominance in response to Kinesthetic Learning Style with a $p = .506$. There is no significance between P&B students in response to V2 Learning Style with a $p = .078$, There is no significance between P&B students in response to Auditory Learning Style with a $p = .730$. There is no significance between P&B students in response too

Kinesthetic Learning Style with a $p = .349$. Further research is required. The null hypothesis is accepted.

Comparing the Chi-square tests between students and instructors we can see the significance levels and how they compare between professionals, instructors and students. This is shown in Table 39.

Table 39
Comparison of significance of Brain Dominance scores by status, extracted from Table 33

	Professionals	Instructors	Students
Culinary	.208	.399	.000
Both	.384	-	-
P&B			.000

The significance for students in all career paths have a .000. This is a significant contribution. For this the conclusion will be there is a relationship between a Culinary Schools' students' career path, their brain dominance, and their learning style. With this initial research, the door can now open to further and more in-depth research to the correlation of why students who enter into the world of culinary arts choose the path that they do, and help educators better instruct them in a manner that is the most beneficial for them.

Understanding the Results

The importance of looking at what a person's strongest brain category is crucial to understanding how they process information. To start with, the results of a brain dominance test are displayed with the ranges of responses in each location. Figure 7 on page 110 is a sample results print out, with the explanation of what each diagram or indication means. Within each location, there are characteristics that define the personalities and learning capabilities of that individual that places high in that quadrant. Even though an individual will be mainly characterized with traits from their high quadrant, they may also have tendencies from

neighboring quadrants, or the areas that had slightly lower scores.

Meanings of each categorical score

What does the results of each variable mean?

Brain Dominance. The Neethling Brain Dominance Test categorizes the results into four (4) categories. After results are calculated as shown on page 78, they are classified as follows:

• The L1 Quadrant (Upper Left)

Individuals with a strong L1 preference are characterized by a logical approach to problem solving. They don't express much emotion but seem concerned with factual accuracy and the evaluation of facts. There is a focus on exactness and preciseness among these persons (Geyser, 2000).

• The R1 Quadrant (Upper Right)

Individuals with a strong R2 preference are characterized by a preference for the "big picture", rather than focusing on the detail. They are able to see hidden possibilities and do not always act according to the set rules. They rely on their "gut-feeling" to solve problems and prefer to do their own (Geyser, 2000)

• The L2 Quadrant (Lower Left)

Individuals with a strong L2 preference are characterized by their need to organize and keep track of essential information. They ensure the timely implementation of projects, keep a firm hand on financial matters and place security as a priority (Geyser, 2000).

• The R2 Quadrant (Lower Right)

Individuals with a strong R2 preference are characterized by having a gut feel for people and situations. They are adept at reading body language and enjoy social interaction with others, in-groups or as individuals (Geyser, 2000).

The results can be displayed as followed as a visual representation according to the brain quadrants. This is displayed in Figure 7.

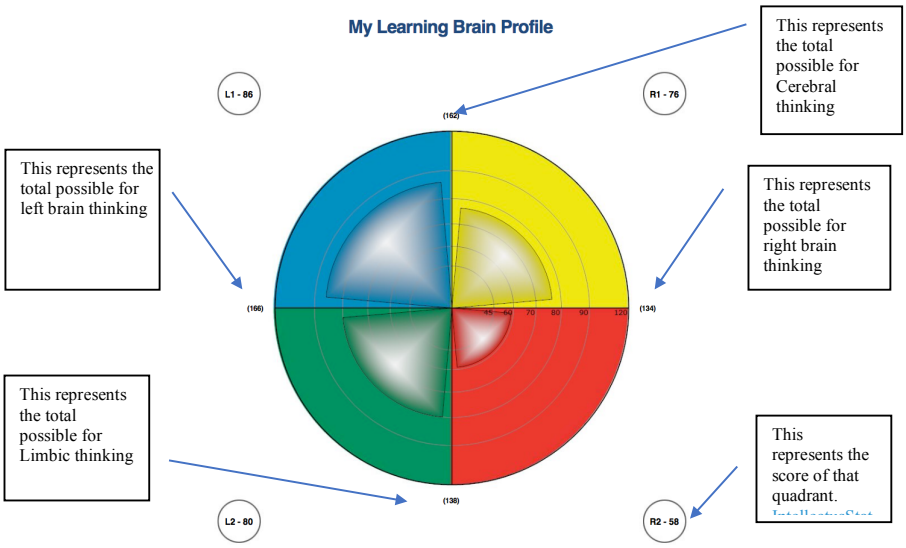

Figure 7 NBI™ test results with explanations
[(Venter, 2011), (NBI™ Learning Profile, 2017), (Heather Frances, Personal Communication, Genesis Business Solutions, February18, 2017)].

Learning Style. The VARK™ Test categorizes the results into three (VAK) or four VARK) categories. This test only recognized 3 categories (VAK). After results are calculated as shown on page 78. The meanings of the results can be found in Figure 9.

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CHAPTER V
DISCUSSION AND CONCLUSIONS

The purpose of this study was to apply what is known about the correlation of Brain Dominance and Learning Styles to students enrolled in post-secondary culinary arts programs. The field of Culinary Arts includes the subjects of Culinary, and Pastry & Baking. Since Culinary School students are required to take classes of their field, academic classes to gain credits for their degree, plus classes of the opposite discipline, they may not always learn in their preferred style. The significance of this study is when the results are coordinated, lessons and curriculum can be presented in a friendlier manner that will benefit their learning style of each discipline most effectively. Students enrolled in post-secondary culinary arts programs were asked a series of questions in a survey powered by SurveyMonkey ™ based off the Neethling's Brain Instrument™ to help determine if their Brain Dominance (IV) had an affect over their chosen career path [Culinary Arts or Pastry & Baking] (DV) or their Learning Style (DV).

Looking at results of the study shows areas for improvement and places for further research in the future. These thoughts can help to improve the overall results when trying to teach Culinary and Pastry students according to their brain dominance. The lack of research in culinary education based on Brain Dominance leads the way too many opportunities of increasing anagogical success when teaching and addressing adult students who are enrolled in a post-secondary culinary arts program.

Summary of Procedure

After surveys were sent out, and data collected, the results were computated, as explained on pages 55 and 61. All results were coded as described on page 70. Incomplete entries were removed from the data base before running calculations to ensure accurate statistics. Descriptive statistics, bivariate analysis and multivariate analysis was run, as well as logistic regression were

run on the results of the Learning Style of the students and the Brain Dominance of students. These results were compared to which program the subjects were associated with. This was all done in hope of looking for a relationship between learning style and brain dominance academic program enrolled.

Summary of Results

There were three questions asked and studied. Question 1 was: *Does the career path of a student enrolled in a Culinary School depend on their brain dominance?* The hypotheses were: *Ha*- There is a significant difference with students who are enrolled in a culinary arts program who has the same brain dominance and are in the same career path.
Ho- There is no significant difference with students who are enrolled in a culinary arts program who has the same brain dominance and are in the same career path. The result of Research Question 1 is that there is not enough significant data to declare a steady conclusion on to what the relationship between the career path of a student enrolled in a Culinary School and their brain dominance, in relation to their age and gender. Further research is required. The null hypothesis is accepted. Even though the results of the multinomial logistic regression model were significant, χ^2 (16) = 45.18, $p < .001$, suggesting that Career Path had a significant effect on the odds of observing at least one response category of Brain Dominance, only one of the nine reference categories showed any significance; therefore, the claim was rejected and the null hypothesis was accepted. The likelihood ratio of Brain Dominance to program enrollment is .036. This is low, showing that there is less likely a coincidence of enrollment in programs based on Brain Dominance. Students who are interested in a food-related career choose their path (culinary arts or P&B) based on their [unknown] Brain Dominance. Instructors and Industry Professionals results were not studied for this question.

Question 2 was: *Is there a statistically significant relationship between the students' brain dominance and their learning style?* The hypotheses were: *Ha*- There is a statistically significant number of students who have the same brain dominance and choose the same learning activity.

Ho- There is not a statistically significant number of students who have the same brain dominance and choose the same learning activity.

The results of the multinomial logistic regression model were significant, χ^2 (16) = 45.18, $p < .001$, suggesting that Brain Dominance had a significant effect on the odds of observing at least one response category of Learning Style relative to Brain Dominance. Since there was only one out of 16 response categories that had significant findings, the claim was rejected and the null hypothesis was accepted. In this case, students who are of similar brain dominance chose activities of the same learning style.

Question 3 was: *Is there a statistically significant relationship between a Culinary School's students' career path, their brain dominance, and their learning style?* The hypotheses were: *Ha*- There is a significant difference with the correlation between students enrolled in Culinary Schools' career path, their brain dominance and their learning style. *Ho*-. There is no significant difference with the correlation between students enrolled in Culinary Schools' career path, their Brain Dominance and their Learning Style.

As shown in Table 33 on pages 98 there is only significant results for students, not for instructors or industry professionals. After removing incomplete data, a chi-square was run. Students had an Asymptotic Significance of .000. There were only one of 14 response categories that had significant findings. Therefore, the null hypothesis was accepted. For students, there are similar learning styles and brain dominance with students enrolled in the same Culinary School

program. The results of the multinomial logistic regression model were significant, χ^2 (18) = 40.37, p = .002, suggesting that Learning Style, Brain Dominance, and Career Path had a significant effect on the odds of observing at least one response category of status.

Unexpected Findings

The results of this study had some surprises, some expected results. Students who are enrolled in other majors elected to take a hands-on cooking class as an elective were also in the mix, and their results had to be removed since they did not meet the requirements of being enrolled in a culinary arts program. Hospitality students are also required to take at least hands-on cooking class for degree program requirements were also distributed the survey. Their results had to be removed since they did not meet the requirements of being enrolled in a culinary arts program.

Some unexpected findings in the data include the spread of ages that had participated. There is a flux of first-time-in-college versus second career college goers. Another unexpected finding was the slight differences between students and industry professionals in the results. The undeclared hypothesis was there would be similar results between those practiced in their profession, and those first starting out.

Strengths of the Study

This study showed great participation from both the education community and hospitality industry. The willingness to participate allowed for a broad range of responses and accuracy of data collected. With this data that was collected that was complete, the answers provided great insight on how the [Culinary Arts/ P&B] industry learns and processes data.

Limitations

A limitation of this research was the use of NBI™. The survey is written by the Kobus Neethling with tutelage of a professor Dr. Paul Torrance (Neethling & Solutionfinding.com, 2005) and is consider valid and reliable, [(Korf, 2004), (Neethling & Solutionfinding.com, 2005), (Ardense, 2008)], but the questions are not culinary industry specific. Another finding of the study is that while Neethling and Herrmann both use colors to designate brain quadrants they are both similar, but presented differently, which caused the need for very exact referencing in research.

Herrmann	Neethling
Quadrant A (upper left)- Blue	L1 (upper left)- Blue
Quadrant D (upper right)- Yellow	R1 (upper right)- Green
Quadrant B (lower left)- Green	L2 (lower left)- Purple
Quadrant C (lower right)- Red	R2 (lower right)- Yellow

[(Herrmann, 1998), (Arendse, 2008, Eagleton & Muller, 2001)]

Figure 8 Comparison of representative colors between HBI® and the NBI™

Throughout all literature, different authors designate their own colors. While in part, this may be due to copyright requirements, the explanation of results and phenomena due in this field may become confusing when different researches use different colors (or use the same colors, just representing different locations of the brain.) Also, the NBI report of brain dominance (page 109) shows the results in colors representative of Herrmann's instrument, not his own. Even though the latter is based off the former, it would have been beneficial to code the results with their own system. Throughout literature (academic and non), different people use different

colors to represent the quadrants of the brain. Also, when looking at the brain diagram, not all literature designates which side is limbic as opposed to cerebral so therefore the diagrams can get easily get misinterpreted (refer to figures 2, 3, 4, 5, 7).

Delimitations

A few delimitations of the research include the scope of schools engaged in the study. Not all schools can be represented, and not all students participated, since it was a voluntary study. Even though Culinary Schools are academic, there are no pre-requisites for entering besides a high school diploma or the equivalent. As the research progressed, students who were enrolled in neither a Culinary Arts or P&B program but were required to take classes as part of their degree requirements we also present in the studies. Students enrolled in hospitality programs are required to take basic culinary and pastry classes to fulfill their degree requirements.

Suggested Implications

At the end of this initial stage of research has opened the door to insight of how students enrolled in Culinary Arts or P&B program think and prefer to learn. Concluding this research would allow instructors of Culinary Arts, and Pastry & Baking to prepare and present curriculum in non-dominant classes in a format that benefits their learning style, therefore being able to tailor assignments towards their learning styles. From this the instructor(s) can deliver materials that will be the most beneficial to the group of students they are teaching. Multidisciplinary instructors can understand how the different groups think and present their lessons in a manner that would best make sense to the group they are addressing, including the way they set their [work] stations up. Ned Herrmann has concluded that by presenting information in a “whole-

brained method", then a greater chance of reaching all your audience effectively (Herrmann, 1981).

Students come in all different learning styles and capabilities. It is best to try to reach the largest number of students with the largest amount of techniques possible. By capturing the most learning styles based on your population at one time, the learning environment can be diversified, and tailored to meet the needs of the students in the audience. Also, presenting the materials in more than one way will help solidify the points being made, even if it is not in the manner most prevalent for that individual.

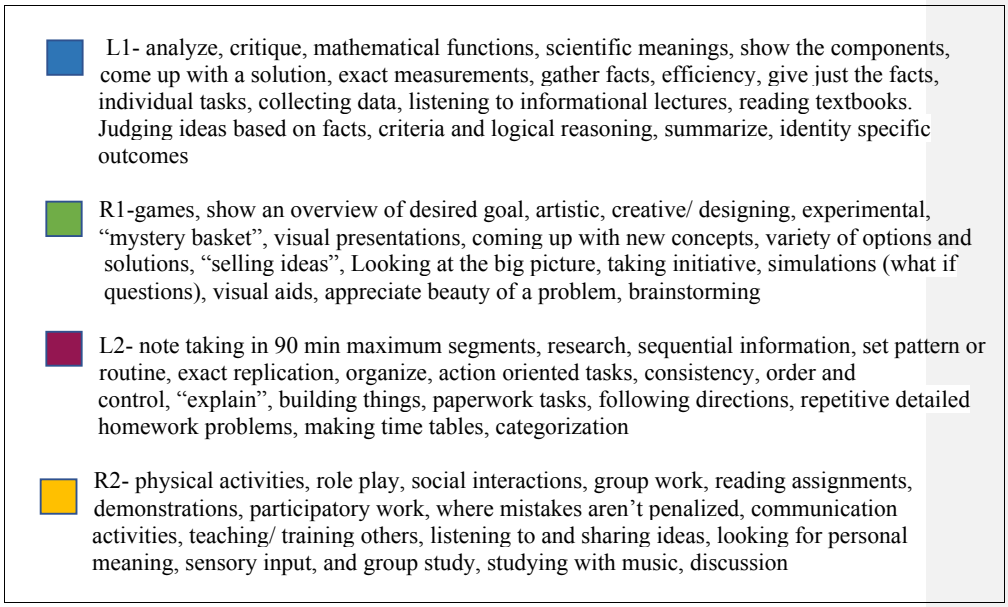
When addressing a mixed crowd of students, present information with pictures and illustrations on the left side of the document/ book/ PowerPoint presentation and the text portion on the right side. Since the left visual field is associated with the right visual cortex, and the right visual field is associated with the left visual cortex this will help present information in a manner that will allow student to grasp it successfully (Herrmann, 1989, p. 15).

When there is heavy lecture or reading, or note taking place, play soft classical music in the background to improve mental stability [(Herrmann, 1989, p. 57), (Whole Brain Thinking, 2005)].

Present materials to L1  and R1  quadrants all at once in a lecture/ PowerPoint.

Present materials to L2  and R2  quadrants interspersed with visuals (films, cartoons, jokes movement exercises, peeks into the future, and breaks) [(Herrmann, 1989, p. 230), (Whole Brain Thinking, 2005)].

When designing activities and lessons try to benefit the activities per person, here's what each quadrant prefers:



[(Morris, 2006), (Leonard, nd), (Whole Brain Thinking, 2005)]

Figure 9 Learning Activities based on Brain Quadrant

Using the VAK Learning Styles System, Madeleine Turgeon in *Right Brain/Left Brain Reflexology* (1993) assigns Visual Learners to the Left Hemisphere. Auditory Learners to the Right Hemisphere of the brain. This information was presented to show how to live a more harmonious life, however the principals will still apply.

Potential Biases

A notable bias that could have occurred during research is that most of the respondents probably came from one area of the country. Three of the four post-secondary schools that chose to participate reside in the state of Florida. The fourth from another school in the south (Arkansas). This could be corrected by expanding the pool of respondents to other regions of the country.

Another potential bias is the status of the researcher, and the participants participating in the study for acknowledgment from the researcher instead of for the desire willingly. Even though the results were submitted anonymously, the willingness to please the researcher and proclaim they had participated may have led to bias in data collection.

Further Research

To continue this research post-dissertation, more demographic qualities should be added to the study to better paint a picture of the student's enrolled, their personalities, and their learning styles. The goal is to create a holistic learning experience for students that will be help them succeed in their chosen career path.

These are the questions that should be added to the study:

1. How do you relate to yourself?
    a. Straight
    b. Lesbian/Gay/Bisexual/Transgender/Queer
    c. I'm not sure
    d. Prefer not to answer

2. How would a doctor or other medical professional classify you? (If you aren't sure, check here.)
    a. Underweight
    b. Average or right where I'm supposed to be
    c. Overweight
    d. Obese
    e. Morbidly obese
    f. Prefer not to answer

3. What type of shirt do you wear under your uniform?
    a. Full short sleeved shirt (V-neck or Crew Cut)
    b. Long Sleeve
    c. Female: Camisole, "wifebeater", Tank Top, Sleeveless
       Male: "A-shirt", "wifebeater", vest
    d. I don't like to wear an undershirt
    e. Prefer not to answer

4. Please indicate how many tattoos do you have?
    a. None
    b. #_____

c. _____ % of my body
d. Prefer not to answer

5. How many Piercings do you have? Individual Holes. Please include all body parts including ears, tongue, face, bellybutton, genitals/ nipples etc.
   a. None
   b. #_____

As odd as the questions might sound, there is solid research that drives at the hypotheses. This research is as follows.

Tattoos and Piercings as Body Art. Tattooing and doodling is an indication that an individual is trying to express themselves to society at large. Dr. Betty Edwards, an Art professor at California State University, Long Beach, suggests that doodlers allow material to flow from their brain uncensored as a form of expression of a left brained function (Qutub, 2012). Since there is not much literature on the correlation of brain dominance to tattoos, it can only be assumed that since tattooing is a creative form of expression, in the visual form that it is in alignment with the left side which houses creativity. However, Neethling shows that "color" and "artistic" belong on the right side of brain, as well as doodling. The hypothesis for this research will be:

(H1- P&B students have more tattoos).

Cebula & Kasten (2015) ran a study between intelligence and creativity between tattooed and non-tattooed students. Their results showed: "The average value of non-tattooed in the creativity test is 17.57 and the standard deviation (SD) is 10.91. The average value of tattooed is 16.06 and the standard deviation (SD) is 10.01. The values of the tattooed and non-tattooed people are very close to each other and there is little difference in the field of creativity between tattooed and non-tattooed." The stated limitation of the study was the small number of participants (Cebula & Kasten, 2015). Another study by Tiggemann and Hopkings (2011)

looked at the motivations of tattooing and piercing. One of the categories that they explored was the need for uniqueness. This rated as "reported test–retest reliabilities of .91 over two months and .68 over four months. In the current study, internal consistency was adequate (α = .79)" (Tiggemann and Hopkings, 2011).

Piercings are another form of expression. Therefore, the hypothesis for this research will be:

(H2- P&B students have more piercings)

Tiggemann and Hopkings (2011) also looked at the motivations of body modifications of piercing. They looked at reasons for "uniqueness, appearance investment, and distinctive appearance investment for participants" with no piercings, ear piercings only, and other facial and body piercings. There was a significant overall difference between groups on uniqueness $F(1,76) = 4.70$, $p = .012$, η^2_p.

The means also indicate that individuals with only ear piercings tended to score higher on appearance investment, but lower on distinctive appearance investment, than the other two groups. However, these differences were not statistically significant for either appearance investment, $F(1,76) = 1.20$, $p > .05$, $\eta^2_p = .03$, or distinctive appearance investment, $F(1,76) = 1.81$, $p > .05$. $\eta^2_p = .05$ (Tiggernann & Hopkings, 2011).

Sexual orientation. James Olson stumbled upon a direct correlation between hemispheric dominance in the brain and the person's sexual orientation. His theory portends that heterosexual men and lesbians are generally dominated by the left hemisphere of the brain, which is responsible for sequential, thought-oriented processes. He also claims that heterosexual women and gay men are much more likely to be regulated by the right hemisphere of the brain, which is responsible for feelings and cultural awareness (Brydym, 2012). This helps to tie

together that there are more women enrolled in the P&B program, and the men who are enrolled in a P&B program tend to identify themselves as GLBTQ.

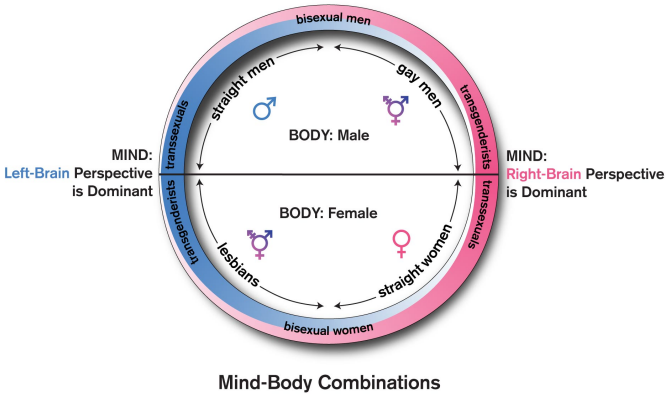


Figure 10 Mind-Body Combinations

The hypothesis for this research will be:

(H2- P&B field attract more men who are not straight, culinary field attracts more women who are not straight.)

Weight Classifications. There are no reliable sources that show or classify the weights of the chef [or culinary student] but an article in the search did bring about thought-provoking reasoning. On *Quora.com* it was hypothesized that Pastry Chefs are more likely to be overweight because the field is 'more mellow'. On the culinary side of the kitchen, there is a lot of movement, in a smaller, more confined area, which is easier if you are slimmer. There is a lot of running around, lots of lifting, lots of standing and lots and lots of repetitive work (Quora.com, 2013). Contrary, the pastry [and baking] side of the kitchen which usually revolves around fine detail work, patience, and tenacity to finish complicated project.

The hypothesis for this research will be:

(H2- P&B students tend to be more overweight)

Other noted patterns through observation. The style of undershirt worn under the chef coat has noticeable patterns. The style of undershirt for a P&B female tended to be a sleeveless style, whereas for a culinary female student tended to wear a full shirt style. The work environment of the respected field might be the reasoning. Whereas, the environment for someone who works in culinary tends to be hot and humid (the hot line), the undershirt provides a layer of protection from the heat, and from perspiration; the environment for the someone in the baking and pastry realm, it may not be (the bake shop).

Within the same sense of research questions, those who identify themselves as female and are in P&B tend to wear colored undergarments, and make sure they can be seen, whereas those females in Culinary Arts tend to wear white or skin toned undergarments, or ensure they are not seen through the chef jacket. This goes along with the research done on wearing colored socks under a uniform, and Herrmann's research on color patterns in dress (Herrmann, 1989).

Enrollment patterns of students of students in P&B programs also seem to have more female students of American decent that have first names that end in "y" or in "i". There is no current research to as why this pattern may exist, only that it is common pattern.

Handwriting patterns of students also showed great significances. Since there are note taking requirements in Culinary School, as well as the required homework of writing and turning in recipe homework, differences in handwriting was observed. Ned Herrmann did extensive research on the handwriting on his employees. He noted the pattern of writing based on the brain dominance (Herrmann, 1989). The pattern that was noticed is that P&B students tend to have

more bubbly type of handwriting, whereas Culinary students tended to write in more scribbles. This may have to do with the dominant brain side, in combination with their gender.

Conclusion

This research was conducted by first identifying the need in the realm of the career field of culinary arts. Differences in students' personalities, habits, and behaviors were noticed in the classroom. After studying the behaviors and patterns of students enrolled in culinary arts and P&B programs, the researcher decided to formally collect data. The data collected included some demographic questions, including enrollment, plus collecting data on the student's brain dominance and their preferred learning style.

The researcher has determined that with further research, understanding how the Brain Dominance of Culinary Arts and Pastry and Baking Students affects their learning style can be a very viable avenue of research. The positive results of this study opened the door for future possibilities. With further refinement of questions, and the addition of other topics, more accurate results can be obtained. By understanding the left-brained and right-brained tendencies of students enrolled in Culinary School, lesson plans and curriculum of the required classes not in their field of study can be tailored to ensure the success of the student. This knowledge will allow assignments to be written and delivered in a manner that will engage the students and allow them to learn most effectively.

The first step in delivering a whole brain approach in Culinary Arts is to first acknowledge the fact that everyone learns differently. There are a lot of different skills, techniques, facts, and customs that go with being a chef. Many times, these aspects of the career are not taken in to account when educating those interested in a new career. As the field of Culinary Arts grows in the field of education, so does the manner of delivery of the education.

Since the initial research shows a positive correlation between brain dominance and learning style and program enrolled, (χ^2 (18) = 40.37, p = .002) this can now lead the way to deeper research within the field of culinary education. To increase the knowledge in the area is now a new goal and passion.

The expansion of research will include more demographic questions and more questions about their traits. A larger pool of participants is also desired that can include students from different regions and more schools and help with the accuracy of results. Since this is such new research, there are many avenues to explore with data collection. Since the fields of culinary arts and P&B are so different, even though they use similar ingredients, and occur in the same place, trying to delineate the learning differences of those who desire to enter the field there is a possibility of more cohesive education. The goal from this research is to create a teaching method specifically geared towards students enrolled in a culinary arts or P&B program.

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Websites for graphics
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APPENDIXES

Appendix A

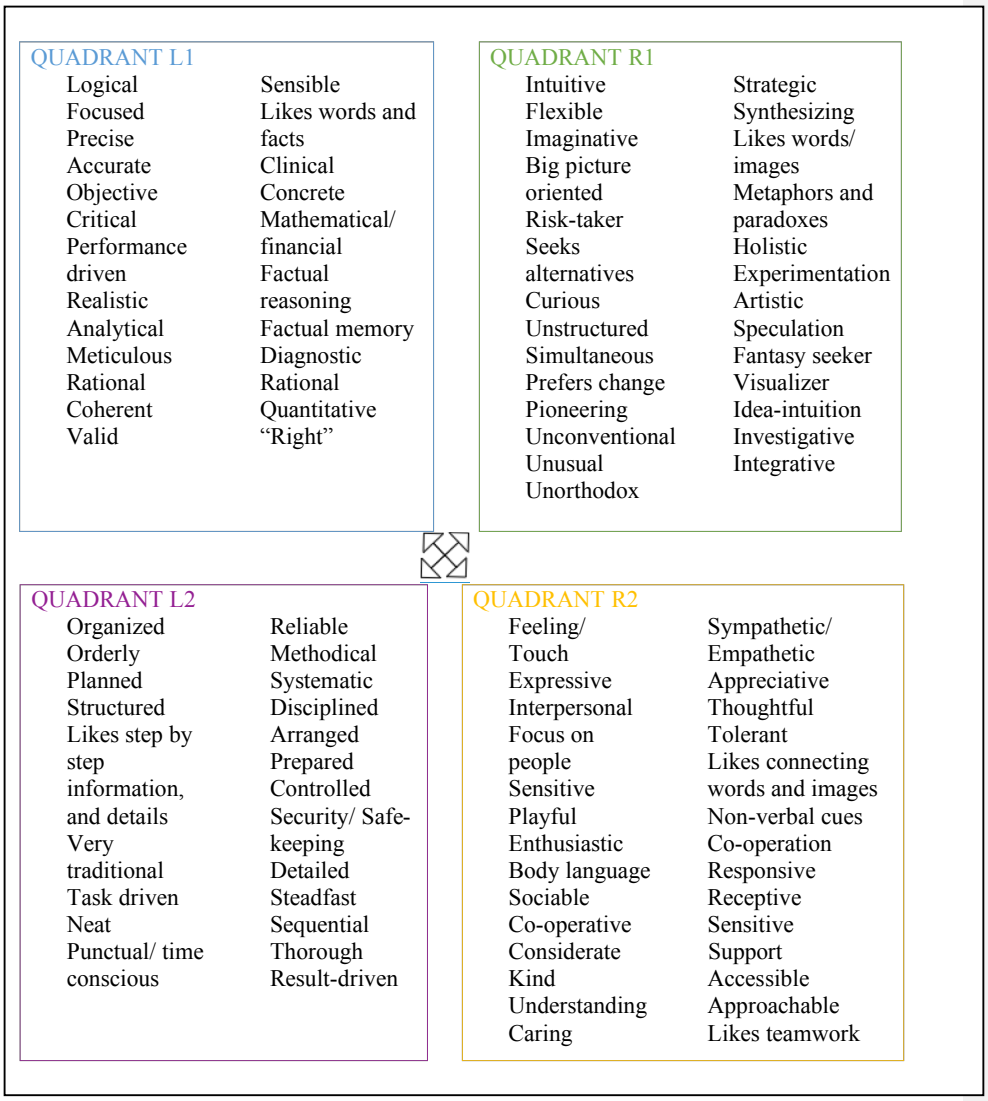

Figure 11 Characteristics and Communication Patterns of Whole Brain Thinking [(Whole Brain Thinking, 2005), (Neethling & Solutionfindings.com, 2005)]

Appendix B- *Survey administered through SurveyMonkey™ –Original Survey- some data collected not used, and discarded per IRB regulations.*

Learning Styles of Culinary and Pastry Students

Welcome to My Survey

Thank you for participating in our survey. Your feedback is important.

THE EFFECTS OF BRAIN DOMINANCE ON CULINARY AND PASTRY STUDENTS' LEARNING STYLE

CONSENT TO PARTICIPATE IN RESEARCH

You are invited to take part in a research study that examines How Pastry and Baking Students learn differently than Culinary Arts students. The researcher invited students currently enrolled in a post-secondary culinary arts program, or chapters of the American Culinary Federation that chose to participate, and are over the age of 18 years of age, to be in the study. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part. This study is being conducted by the following researcher Chef Jennifer M. Denlinger who is a doctoral student in the College of Education at Trident University.

PURPOSE OF THE STUDY The purposes of this study are to:

- determine how Culinary Schools students' brain dominance aligns with which program they are aligned in.
- see what each student in each career paths' learning style is.

PROCEDURES If you agree to be in this study, you will be asked to complete a short survey.

- The survey includes 34 questions total.
- The estimated time commitment to complete the survey is 15-20 minutes.

POTENTIAL RISKS AND DISCOMFORTS

There is no risk anticipated for this study to any party. All information for the survey will be submitted anonymously. An incentive will be offered for participating, which is done on a third-party site and will require a name or nickname and email address so that no one will be able to identify you or your answers when the results are recorded/reported. Your participation in this study is totally voluntary and you may withdraw at any time without negative consequences. To withdraw at any time during the study, simply close the survey and exit out of your browser.

POTENTIAL BENEFITS

• Benefits: If you decide to participate in this study there may be no direct benefit to you. It is hoped that the information gained in this study will benefit culinary and baking and pastry education. Concluding this research would allow instructors of Culinary Arts, and Pastry & Baking to prepare and present curriculum in non-dominant classes in a format that benefits their learning style, therefore being able to tailor assignments towards their learning styles. From this the instructor(s) can deliver materials that will be the most beneficial to the group of students they are teaching. Multidisciplinary instructors can understand how the different groups think and present their lessons in a manner that would best make sense to the group they are addressing, including the way they set their stations up.

CONFIDENTIALITY

- No personal identifying information (such as name) will be collected in this study, and all participants will remain anonymous and confidential. The researcher will not use any information for any purposes outside of this research project. Answers are submitted anonymously to prevent participant identity; therefore, no identifiers will be accessed. The researcher will store all participants' records so as to prevent access by anyone other than the researcher. Any information obtained during the duration of the research will remain Only the Primary Researcher will have access to the data, and the data will be stored electronically on the Primary Researcher's laptop which is password protected. The file itself will also be password protected. Data will be kept for a period of at least 3 years, as required by the university.

Learning Styles of Culinary and Pastry Students

Welcome to My Survey

PARTICIPATION AND WITHDRAWAL This study is voluntary. Everyone will respect your decision of whether you choose to be in the study. If you decide to join the study now, you can still change your mind later. You may stop at any time, simply close the survey and exit out of your browser.

CONTACTS AND QUESTIONS You may ask any questions you have now. Or if you have questions later, you may contact:

Chef Jennifer M Denlinger, Ph. D. Candidate jdenlinger@valenciacollege.edu

Dr. Pamela A. Wilson, Ph. D. Mentor Trident University [redacted] or [redacted]

If you have questions regarding your rights as a research subject, contact the Institutional Review Board for the Protection of Human Subjects at Trident University International, 5757 Plaza Drive, Suite 100, Cypress, California 90630; Telephone: (714) 816-0366 x2189; Email: irb@trident.edu

STATEMENT OF CONSENT I have read and understand the above information

* 1. I have read this information and consent to the information above.

- ○ yes
- ○ no

Learning Styles of Culinary and Pastry Students

* 2. I am a

- ◯ culinary, pastry and baking, or hospitality student
- ◯ chef educator
- ◯ industry professional

Learning Styles of Culinary and Pastry Students

Culinary School Students

Please truthfully answer all questions (4 questions)

3. Which program are you enrolled in?

- ◯ Culinary Arts
- ◯ Pastry and Baking
- ◯ Hospitality (general)
- ◯ Other

4. How do you prefer to identify yourself?

- ◯ male
- ◯ female
- ◯ other
- ◯ prefer not to answer

5. How old are you?

- ◯ Under 18
- ◯ 18-25
- ◯ 26-35
- ◯ 36-45
- ◯ 46-55
- ◯ older than 55
- ◯ prefer not to answer

Learning Styles of Culinary and Pastry Students

Culinary Instructors and Industry Professionals

Please answer all questions truthfully (4 questions)

7. Which is your primary field of expertise?

- ◯ Culinary Arts
- ◯ Baking and Pastry
- ◯ I spend an equal amount of time doing each
- ◯ I do something else bedsides back of the house work
- ◯ Other (please specify)

8. How do you prefer to identify yourself?

- ◯ male
- ◯ female
- ◯ other

◯ prefer not to answer

9. How old are you?

◯ Under 18

◯ 18-25

◯ 26-35

◯ 36-45

◯ 46-55

◯ older than 55

◯ prefer not to answer

10. Which hand to you primarily use to write, use a knife, or hold your spatula?

◯ right

◯ left

◯ ambidextrous

Learning Styles of Culinary and Pastry Students

Lifestyle Questions

Please answer all questions truthfully. The data collected is for classification purposes only, and will not be used outside this study. (5 questions)

11. The uniform policy clearly states that you must wear socks. It also states they must be black or white. What socks do you ACTUALLY wear?

- ◯ always white
- ◯ always black grey
- ◯ something colorful and/or patterned
- ◯ whatever I have clean
- ◯ I don't wear socks
- ◯ prefer not to answer

Learning Styles of Culinary and Pastry Students

VAK Learning Styles

Please read the description of the topic. Choose the assignment in each scenario that you would want to complete. (You are not doing the assignment, just select which one sounds the most interesting to you).

Note: all assignments would be worth equal points, and would have the same amount of time to complete. (7 questions)

12. Dishwashing Procedure

- ◯ Write out a training procedure for washing pots and pans in both a three (3) compartment sink and a four (4) compartment sink. (activity)

◯ Match the detergent to use to the water temperature.

◯ Research and explain what happens if you don't follow the procedure of "wash, rinse and sanitize"

◯ Create a training to show how to use a three (3) compartment sink and then show your instructor.

13. Cooler Storage

◯ Solve this scenario: The cooler you use to store meat and proteins has broken. Now you must share the same cooler you use to store produce and prepared food. Explain how you will do this.

◯ Prepare a presentation (PowerPoint/ oral) to show and explain the proper cooler storage procedures.

◯ Create a SOP (Standard Operating Procedure) for receiving and storing these items in your restaurant: beef, fish, pork, tomatoes, milk, refrigerated salad dressings.

◯ Assuming you have one shelf in your refrigerator, place all items to be stored in the proper order. (using the mock cooler shelf in the front of the room and the mock food).

14. Handwashing

◯ Prepare a short presentation (5 minutes maximum) to explain how to wash hands properly during the

◯ Read a scenario of the Chef's day at work. Indicate by circling or underlining every place the Chef should wash his/her hands.

◯ List all the steps for handwashing, and the places where hand sinks are required.

◯ Demonstrate the proper technique for washing hands and then check your accuracy using the black light.

Learning Styles of Culinary and Pastry Students

Neethling Brain Dominance Instrument

You will be presented with fifteen (15) questions. Each question has four (4) options. Please rank the answers from most like you (1) to least like you (4)
PLEASE REMEMBER - There are not correct or incorrect answers, only answers which reflect your preferences.

19. When I learn something new, I prefer to ...

concentrate and focus on the work until I understand it

repeat the content and steps until I understand it

think how I can use what I learn in life

talk to somebody about it

20. I prefer homework that ...

includes projects that allow some freedom and choice

allows us to work in groups

has an understandable step by step way of doing it

allows me to find out if the facts and basics are correct

21. I prefer certain subjects because ...

we work in groups

we work with real and actual problems

there is a clear beginning, middle and end

we are asked to draw our own conclusions

22. I enjoy non-fictional books that ...

tell me how to make or build certain things

gives information in a balanced and sensible way

give me new ideas about a wide range of subjects

help me to become a better person

23. When studying, I prefer to...

use charts, diagrams and drawings

talk out loud to help me memorize

summarize what I learn

be very critical about the information I am studying

24. When I study, I prefer....

to use a time-table

to not have fixed times of studying

to concentrate and not to be disturbed

to study where other people are around

25. My teachers / lecturers most likely describe me as a learner who...

likes to participate in group discussions

is very conscientious and hard working

does not like to make mistakes

challenges and does not always accept what they say

26. I prefer teachers who...

connect what we learn with the bigger world out there

give me a lot of practical work to do

know their subject very well

are friendly and pleasant

27. When I have to solve a problem, I prefer to...

jump right in and try out a couple of things

make sure I understand the problem first

talk it through

break down the facts into smaller parts

28. A fun lesson for me would include...

interesting stories

a lot of humor and laughs

receiving new and interesting facts about a favorite topic

doing things and not just listening

29. I would see it as an enjoyable challenge to be in charge of ...

re-organizing the layout of the classroom

a project to determine the average amount every learner spends per week

designing a new motto for the class/institution

deciding the role of teams in learning and teaching

30. I believe my friends would describe me as someone...

who knows what he/she wants

who likes to try out new options

others can depend on

who likes to be with other people

31. I remember new material better, when teachers / lecturers ...

use visual aids, pictures etc. to explain

repeat the information regularly

stick to the point and stay focused on the new facts

give learners the opportunity to take part in the lesson

32. I like to be described as someone...

who is always doing what needs to be done

who always wants to figure out the problem

who likes to socialize and to talk

who likes to discover new ways of finding solutions

33. I prefer to understand more about ...

why I have to learn

what I learn

people I can learn from

what there is to learn how to learn

Learning Styles of Culinary and Pastry Students

End of Survey

Thank you very much for your honest answers!!!!! Your feedback is very much appreciated.

34. Would you like to be entered into a drawing for one of 10 gift cards for Coffee for participating in this survey? This is optional and this information wi not be used to identify answers and will be displayed separately than the answers given.

Click here: [CONTESTANT LINK]

Appendix C- *Survey Questions with Answer Meaning*
[surveys are not shown with colored answers. They are just provided here.]

L1 (upper left)- Blue

R1 (upper right)- Green

L2 (lower left)- Purple

R2 (lower right)- Yellow

Question 1:
When I learn something new, I prefer to …
- concentrate and focus on the work until I understand it
- repeat the content and steps until I understand it
- think how I can use what I learn in life
- talk to somebody about it

Question 2:
I prefer homework that …
- includes projects that allow some freedom and choice
- allows us to work in groups
- has an understandable step by step way of doing it
- allows me to find out if the facts and basics are correct

Question 3:
I prefer certain subjects because …
- we work in groups
- we work with real and actual problems
- there is a clear beginning, middle and end
- we are asked to draw our own conclusions

Question 4:
I enjoy non-fictional books that …
- tell me how to make or build certain things
- show information in a balanced and sensible way
- give me new ideas about a wide range of subjects
- help me to become a better person

Question 5:
When studying, I prefer to…
- use charts, diagrams and drawings
- talk out loud to help me memorize

- summarize what I learn
- be very critical about the information I am studying

Question 6:
When I study, I prefer….
- to use a time-table
- to not have fixed times of studying
- to concentrate and not to be disturbed
- to study where other people are around

Question 7:
My teachers / lecturers would most likely describe me as a learner who…
- likes to participate in group discussions
- is very conscientious and hard working
- does not like to make mistakes
- challenges and does not always accept what they say

Question 8:
I prefer teachers who…
- connect what we learn with the bigger world out there
- give me a lot of practical work to do
- know their subject very well
- are friendly and pleasant

Question 9:
When I have to solve a problem, I prefer to…
- jump right in and try out a couple of things
- make sure I understand the problem first
- talk it through
- break down the facts into smaller parts

Question 10:
A fun lesson for me would include…
- interesting stories
- a lot of humor and laughs
- receiving new and interesting facts about a favorite topic
- doing things and not just listening

Question 11:
I would see it as an enjoyable challenge to be in charge of …
- re-organizing the layout of the classroom
- a project to determine the average amount every learner spends per week
- designing a new motto for the class/institution
- deciding the role of teams in learning and teaching

Question 12:
I believe my friends would describe me as someone…

- who knows what he/she wants
- who likes to try out new options
- whom can depend on
- who likes to be with other people

Question 13:
I remember new material better, when teachers / lecturers …

- use visual aids, pictures etc. to explain
- repeat the information regularly
- stick to the point and stay focused on the new facts
- give learners the opportunity to take part in the lesson

Question 14:
I like to be described as someone…

- who is always doing what needs to be done
- who always wants to figure out the problem
- who likes to socialize and to talk
- who likes to discover new ways of finding solutions

Question 15:
I prefer to understand more about …

- why I have to learn what I learn
- people I can learn from
- what there is to learn
- how to learn

Part 3: Learning Style Questions
[The learning style of each question is indicated by highlight. The online survey will not show which activity is related to each brain quadrant].

Please read the description of the topic. Choose the assignment in each scenario that you would want to complete. (You are not doing the assignment, just select which one sounds the most interesting to you).

Note: all assignments would be worth equal points, and would have the same amount of time to complete.

1. Dishwashing Procedure
    a. Write out a training procedure for washing pots and pans in both a three (3) compartment sink and a four (4) compartment sink.
    b. (activity) Match the detergent to use to the water temperature.
    c. Research and explain what happens if you don't follow the procedure of "wash, rinse and sanitize"

d. Create a training to show how to use a three (3) compartment sink and then show your instructor.

2. Cooler Storage
    a. Solve this scenario: The cooler you use to store meat and proteins has broken. Now you must share the same cooler you use to store produce and prepared food. Explain how you will do this.
    b. Prepare a presentation (PowerPoint/ oral) to show and explain the proper cooler storage procedures.
    c. Create a SOP (Standard Operating Procedure) for receiving and storing these items in your restaurant: beef, fish, pork, tomatoes, milk, refrigerated salad dressings.
    d. Assuming you have one shelf in your refrigerator, place all items to be stored in the proper order. (using the mock cooler shelf in the front of the room and the mock food).

3. Handwashing
    a. Prepare a short presentation (5 minutes maximum) to explain how to wash hands properly during the pre-shift meeting.
    b. Read a scenario of the Chef's day at work. Indicate by circling or underlining every place the Chef should wash his/her hands.
    c. List all the steps for handwashing, and the places where hand sinks are required.
    d. Demonstrate the proper technique for washing hands and then check your accuracy using the black light.

4. Microorganisms
    a. Using the game pieces, match the microorganism to the major causes on the large board in front of the room.
    b. Write a 2-page paper on an assigned microorganism.
    c. Complete the following worksheet of a crossword puzzle using microorganisms.
    d. Explain how the microorganism _____ can be prevented by providing exact examples.

5. Allergens
    a. Prepare a plan to prevent cross contact when you receive a special order indicating your customer has allergy concerns.
    b. Identify all allergens in all menu items. Indicate if they those ingredients can be left out or substituted, or if the item is unable to be changed.
    c. Set up the dry store room shelves to prevent cross contact of allergens.
    d. Create an alternate menu item for someone who has a food allergy(s), but still wants the same flavors and types of food.

6. Cooking Temperatures
    a. Complete the following worksheet of a matching foods to the final cooking temperatures.
    b. Using the game pieces, match the food product to the final cooking temperature on the large board in front of the room.
    c. Create a poster to hang in the kitchen/bakeshop to help the staff understand the required final cooking temperatures.
    d. If you have one oven to cook an entire meal (such as a Thanksgiving feast), plan how you can bake and hold all your items safely, and so they won't be ruined by going at the wrong temperature.

7. HACCP (Hazzard Analysis and Critical Control Points)
    a. Create the Standard Operating Procedure to monitoring HACCP
    b. Identify all the CCP in each recipe provided.
    c. Make a plan of communication for when HACCP procedure isn't done properly.
    d. Make a visual presentation of the 7 HACCP principals (10-15 minutes)

Appendix D-1 Email for College A

Hello Everyone!

I am a Chef finishing up my PhD in Educational Leadership and would like to learn more about how you learn!!!! I am interested in how Culinary Students learn differently from Pastry & Baking Students.

I have a survey for you to complete that will help me accomplish this task!
The survey consists of a total of 34 questions that are multiple choice, or have answers that you will rank by preference. There are not any right or wrong answers, only what your preferences are! This should only take you about 15-20 minutes of your time (or maybe less!!) For your generosity of time, you have the option of entering a drawing for one of 10 gift cards for coffee.

By completing this survey, you will help your instructors develop materials that will benefit your education.

All information will be submitted anonymously, so that no one will be able to identify you or your answers when the results are recorded/reported. Your participation in this study is totally voluntary and you may withdraw at any time without negative consequences. To withdraw at any time during the study, simply close the survey and exit out of your browser.

Please feel free to contact Chef Jennifer M. Denlinger at jdenlinger@ValenciaCollege.edu if you have any questions about the study.
Or, for other questions, contact [redacted] or Trident University's Institutional Research Board at Institutional Review Board for the Protection of Human Subjects at Trident University International, 5757 Plaza Drive, Suite 100, Cypress, California 90630; Telephone: (714) 816-0366 x2189;
Email: irb@trident.edu

By continuing with the survey, you agree to these terms.
If you do not agree with these terms, please close this email and delete it.

Chef Jennifer M. Denlinger M.Ed., CCC, CHEP
Culinary Management Program Department Chair, Poinciana Campus

Start the survey:
[Survey link]

Appendix D-2 Email for College B

Hello Everyone!

I am a Chef finishing up my PhD in Educational Leadership and would like to learn more about how you learn!!!! I am interested in how Culinary Students learn differently from Pastry & Baking Students.

I have a survey for you to complete that will help me accomplish this task!
The survey consists of a total of 34 questions that are multiple choice, or have answers that you will rank by preference. There are not any right or wrong answers, only what your preferences are! This should only take you about 15-20 minutes of your time (or maybe less!!)

For your generosity of time, you have the option of entering a drawing for one of 10 gift cards for coffee!!!!!!!!

By completing this survey, you will help your instructors develop materials that will benefit your education.

All information will be submitted anonymously, so that no one will be able to identify you or your answers when the results are recorded/reported. Your participation in this study is totally voluntary and you may withdraw at any time without negative consequences. To withdraw at any time during the study, simply close the survey and exit out of your browser.

Please feel free to contact Chef Jennifer M. Denlinger at jdenlinger@ValenciaCollege.edu if you have any questions about the study.
Or, for other questions, contact the [redacted] or Trident University's Institutional Research Board at Institutional Review Board for the Protection of Human Subjects at Trident University International, 5757 Plaza Drive, Suite 100, Cypress, California 90630; Telephone: (714) 816-0366 x2189; Email: irb@trident.edu

By continuing with the survey, you agree to these terms.
If you do not agree with these terms, please close this email and delete it.

Valencia Culinary Management Program Department Chair, Poinciana Campus

Start the survey:
[Survey link]

Appendix D-3 Email for College C

Hello Everyone!

I am a Chef finishing up my PhD in Educational Leadership and would like to learn more about how you learn!!!! I am interested in how Culinary Students learn differently from Pastry & Baking Students.

I have a survey for you to complete that will help me accomplish this task!
The survey consists of a total of 34 questions that are multiple choice, or have answers that you will rank by preference. There are not any right or wrong answers, only what your preferences are! This should only take you about 15-20 minutes of your time (or maybe less!!)

For your generosity of time, you have the option of entering a drawing for one of 10 gift cards for coffee!!!!!!!!

By completing this survey, you will help your instructors develop materials that will benefit your education.

All information will be submitted anonymously, so that no one will be able to identify you or your answers when the results are recorded/reported. Your participation in this study is totally voluntary and you may withdraw at any time without negative consequences. To withdraw at any time during the study, simply close the survey and exit out of your browser.

Please feel free to contact Chef Jennifer M. Denlinger at jdenlinger@ValenciaCollege.edu if you have any questions about the study.
Or, for other questions, contact the director of [redacted] or Trident University's Institutional Research Board at Institutional Review Board for the Protection of Human Subjects at Trident University International, 5757 Plaza Drive, Suite 100, Cypress, California 90630; Telephone: (714) 816-0366 x2189;
Email: irb@trident.edu

By continuing with the survey, you agree to these terms.
If you do not agree with these terms, please close this email and delete it.

Valencia Culinary Management Program Department Chair, Poinciana Campus

Start the survey:
[Survey link]

Appendix D-4 Email for all ACF members

Hello Chefs!

I am a chef finishing up my PhD in Educational Leadership and would like to ask for your help completing my research! I am interested in how Culinary Students learn differently from Pastry and Baking Students.

My study is: The Effects of Brain Dominance on Culinary and Pastry Student's Learning Style.

I have a survey for you to complete that will help me accomplish this task!
The survey consists of a total of 34 questions that are multiple choice, or have answers that you will rank by preference. There are not any right or wrong answers, only what your preferences are! This should only take you about 15-20 minutes of your time (or maybe less!!) Please try to answer all the questions. That would help me out greatly!

For your generosity of time, you have the option of entering a drawing for one of 10 gift cards for coffee!!!!!!!!

All information will be submitted anonymously, so that no one will be able to identify you or your answers when the results are recorded/reported. Your participation in this study is totally voluntary and you may withdraw at any time without negative consequences. To withdraw at any time during the study, simply close the survey and exit out of your browser.

Please feel free to contact Chef Jennifer M. Denlinger at jdenlinger@ValenciaCollege.edu if you have any questions about the study or Trident University's Institutional Research Board at Institutional Review Board for the Protection of Human Subjects at Trident University International, 5757 Plaza Drive, Suite 100, Cypress, California 90630; Telephone: (714) 816-0366 x2189; Email: irb@trident.edu

By continuing on with the survey, you agree to these terms.
If you do not agree with these terms, please close this email and delete it.

Valencia Culinary Management Program Department Chair, Poinciana Campus

Start the survey:
[Survey link]

Appendix D-5 Email for College D

Hello Everyone!

I am a chef finishing up my PhD in Educational Leadership and would like to learn more about how you learn!!!! I am interested in how Culinary Students learn differently from Pastry and Baking Students.

I have a survey for you to complete that will help me accomplish this task!
The survey consists of a total of 34 questions that are multiple choice, or have answers that you will rank by preference. There are not any right or wrong answers, only what your preferences are! This should only take you about 15-20 minutes of your time (or maybe less!!) For your generosity of time, you have the option of entering a drawing for one of 10 gift cards for coffee.

By completing this survey, you will help your instructors develop materials that will benefit your education.

All information will be submitted anonymously, so that no one will be able to identify you or your answers when the results are recorded/reported. Your participation in this study is totally voluntary and you may withdraw at any time without negative consequences. To withdraw at any time during the study, simply close the survey and exit out of your browser.

Please feel free to contact Chef Jennifer M. Denlinger at jdenlinger@ValenciaCollege.edu if you have any questions about the study.
Or, for other questions, contact the IRB Administrative Liaison [redacted]

By continuing on with the survey, you agree to these terms.
If you do not agree with these terms, please close this email and delete it.

Chef Jennifer M. Denlinger
Valencia Culinary Management Program Department Chair, Poinciana Campus

Start the survey:
[Survey link]

Appendix E-1

IRB Approval Letter, College A

Version 07/15/11

[redacted]

Human Research Protection (HRP) Institutional Review Board (IRB)

IRB Determination Form

Title of Research Protocol: **The Effects of Brain Dominance on Culinary and Pastry Students' Learning Style**

Principal Investigator (PI): Jennifer M. Denlinger

Date Received by IRB Chair: 03/22/2017

IRB Number: 17-0012

Based on the IRB Protocol Initial Submission Form (or, as appropriate, the IRB Continuing Review/Termination Form or the IRB Addendum/Modification Form) submitted by the Principal Investigator and for the project identified above, the following determination has been made by the Valencia IRB:

☐ The research is exempt from IRB review.

☒ The research is eligible for expedited review and has been approved. Expedited review category: 7

☐ The research is eligible for expedited review but requires modifications and re-submission before approval can be given.

☐ The research is subject to full review and will be discussed at the next IRB meeting, currently scheduled for _____ (date).

☐ The research has been subjected to full review and has been approved.

☐ The research has been subjected to full review and has been disapproved.

Period of Approval: 3/28/2017 **to** 3/28/2018

Additional details specific to this determination are attached to this letter. It is the Principal Investigator's responsibility to read, understand, and comply with these attachments.

If you have any remaining questions about Valencia's IRB process, contact the IRB Chair at irb@valenciacollege.edu.

[redacted] 3/28/2017

Signature of IRB Chair or Designated Representative — Date

C: IRB File, IRB Members, PI Supervisor/Administrator

1

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Appendix E-2

IRB Approval Letter, College B

Document Approved On: 6/12/17
Project Expiration On: 6/11/18
Protocol Number: IRB000AP17JD11

[redacted]

Internal Studies
Institutional Review Board
Approval Form

Researcher Name(s): Jennifer M. Denlinger	
Campus where research will be conducted: through email- Sarasota, Tallahasse, Melbourne	
Name of individual who granted permission to collect or access data (letter stating approval must be attached): Chef Michael Moench	
Title of Study: THE EFFECTS OF BRAIN DOMINANCE ON CULINARY AND PASTRY STUDENTS' LEARNING STYLE	
☑	**Level of Study** (Describe reason for selected review)
☐ Exempt	
☒ Expedited	Already approved at Valencia College. Researcher redy to collect data.
☐ Full Review	

Abstract
(Insert abstract here)

The purpose of this study is to apply what is known about the correlation of brain dominance and learning styles to students enrolled in Post-Secondary Culinary Arts Programs. The field of Culinary Arts includes the subjects of Culinary, and Baking and Pastry. Since culinary school students are required to take classes of their field, academic classes to gain credits for their degree, plus

2017

classes of the opposite discipline, they may not always be learning in their preferred style. The significance of this study is when the results are coordinated, lessons and curriculum can be presented in a friendlier manner that will benefit their learning style of each discipline most effectively. After delving into numerous brain dominance theories, Neethling's Whole Brain Creativity best suits this study and will help understand why students are drawn to their field and not the opposite. Students enrolled in Post-Secondary Culinary Arts Programs (IV) will be asked a series of questions in survey powered by Survey Monkey ™ based off the Neethling's Brain Instrument™ to help determine their Brain Dominance (MV). These results will be correlated with their VAK Learning Survey (DV) This paired with questions about personality and habits will classify determine the brain dominance of the students in each field by multivariate analysis. The results of the first survey will be compared to the results of the VAK Learning survey by conducting multivariate analysis. This knowledge will allow assignments to be written and delivered in a manner that will engage the students and allowthem to learn most effectively.

Applicants do not write below this line. This area is for IRB use only.

KU IRB Recommendation

☑ Recommend for approval ☐ Recommend with modifications ☐ Denied Approval

Notes.

Shoshana Dayanim, PhD

IRB Representative Signature Date Signed

Vice Chancellor of Academic Affairs

☒ Approve ☐ Modifications Needed ☐ Deny

Notes.

06/09/17

Vice Chancellor of Academic Affairs Signature Date Signed

2017

Appendix E-3
IRB Approval Letter, College C

[redacted]

Date: July 10, 2017

TO: Chef Jennifer M. Denlinger
Culinary Department Chair, Valencia College, Poinciana Campus

FROM: Tracy Peyton, Ed.D.
District Department Head, English and Communications
IRB Chair

SUBJECT: Approval of Protocol #2017-0004

TITLE: The Effects of Brain Dominance on Culinary and Pastry Students' Learning Style

I am pleased to advise you that the [redacted] Institutional Review Board has recommended approval of this protocol. Based on its review, the [redacted] IRB determined that this research presents no more than minimal risk to participants. Given your protocol, it is essential that you obtain signed documentation of informed consent from each participant.

If you wish to make any changes to this protocol, you must disclose your plans before you implement them so that the [redacted] can assess their impact on your protocol. In addition, you must report to the H[redacted] IRB any unexpected complications that affect your participants.

If you have not completed this protocol by (July 10, 2018), please telephone our office (850) 484-1705.

[redacted]

Appendix E-4
Letter of Approval, College D

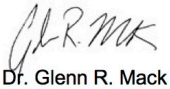
[redacted]

September 11, 2017

To whom it may concern,

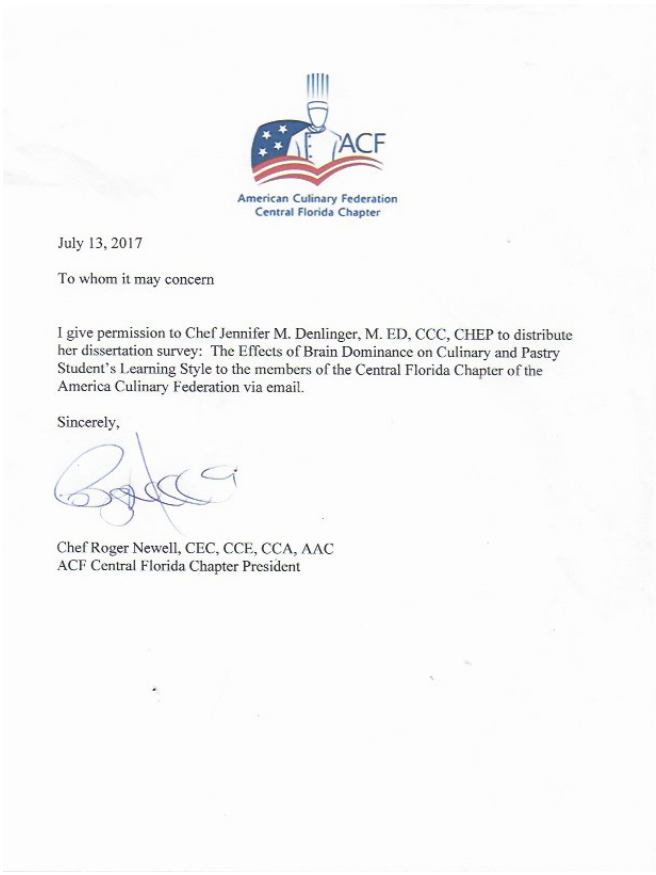
[redacted] will distribute to all our students and graduates a dissertation survey designed by Chef Jennifer M. Denlinger M.Ed., CCC, CHEP.

Thank you for the opportunity to participate,



Dr. Glenn R. Mack

Appendix E-5
Letter of Approval, Central Florida Chapter of the ACF



American Culinary Federation
Central Florida Chapter

July 13, 2017

To whom it may concern

I give permission to Chef Jennifer M. Denlinger, M. ED, CCC, CHEP to distribute her dissertation survey: The Effects of Brain Dominance on Culinary and Pastry Student's Learning Style to the members of the Central Florida Chapter of the America Culinary Federation via email.

Sincerely,

Chef Roger Newell, CEC, CCE, CCA, AAC
ACF Central Florida Chapter President

Appendix E-6
Letter of Approval, Sarasota Chapter of the ACF

July 13, 2017

To whom it may concern

I give permission to Chef Jennifer M. Denlinger, M. ED, CCC, CHEP to distribute her dissertation survey: The Effects of Brain Dominance on Culinary and Pastry Student's Learning Style to the members of the Sarasota Chapter of the America Culinary Federation via email.

Sincerely,

Chef Samantha Slechta CEC
ACF Sarasota Chapter President

Appendix E-7
Letter of Approval, Tampa Bay Chapter of the ACF

American Culinary Federation
Tampa Bay Culinary
Association, Inc.

July 13, 2017

To whom it may concern

I give permission to Chef Jennifer M. Denlinger, M. ED, CCC, CHEP to distribute her dissertation survey: The Effects of Brain Dominance on Culinary and Pastry Student's Learning Style to the members of the Tampa Bay Chapter of the America Culinary Federation via email.

Sincerely,

Chef Rene Marquis, CEC,CCE,CCA,AAC,ACE
ACF Tampa Bay Chapter President