EXAMINATION OF EXPERIENTIAL PHENOMENA INFLUENCING CULINARY EDUCATORS’ PEDAGOGICAL CONTENT KNOWLEDGE

Danny Babin

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A Dissertation
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Education
in
Educational Leadership

by
Danny Babin
May 2022
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Andrew Hughes, Ed. D., Committee Chair
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This study aimed to explore the theory of expert teaching by comparing culinary educators at the secondary and postsecondary levels based on their varying levels of experience. Experience for culinary educators included pre-service teacher training, in-service teacher training, professional industry experience, and teaching experience. The primary goal of this descriptive phenomenological study was to examine the impact professional experience has on culinary educators' pedagogical content knowledge (PCK). Distinctions in PCK include collective PCK, personal PCK, and enacted PCK. PCK theory has been an integral part of educational research for over three decades; it has been studied, refined, and implemented into educational programs worldwide. Tacit knowledge (TK) theory has existed in the literature longer than PCK. Still, the two theories have not been intimately linked to examine teaching a contextual subject, like culinary arts, as it is in this study. TK is contextual knowledge that can be made explicit by regulating one’s cognition (Nonaka & Takeuchi, 1995). Therefore, as a contextually taught art form, culinary education requires those that teach it to possess PCK and TK. This study is the first to connect the constructs of PCK and TK and apply them to an examination of culinary arts education.

Participants who were current culinary educators at either secondary or postsecondary schools with various professional experiences participated in one-on-one interviews. Analysis of the interview results determined that educators of culinary education are generally lacking in PCK. Culinary educators with
increased amounts of professional experience exhibit culinary-specific PCK more readily than those with lesser amounts of professional experience. Pre-service teaching programs for culinary teachers for secondary and postsecondary teachers focused on emphasizing the tenets of culinary-specific PCK should become standard practice for the profession. Secondary schools should better emphasize the importance of experience in the food and hospitality industry when hiring culinary arts educators. Postsecondary schools should better emphasize the importance of pre-service teacher training that is specific to culinary content and pedagogy when hiring culinary arts educators. Both secondary and postsecondary schools should emphasize in-service professional development that is discipline-specific and teaches the tenets of culinary-specific PCK. In addition, administrators should ensure programs are in place that create collaboration between experienced teachers and novice teachers.

The outcome of this study could be used to determine the need for designing a professional development program for culinary educators based on improving levels of PCK and TK. Improved in-service teacher training facilitates the expert-to-student tacit knowledge exchange and enables institutions to promote a supportive learning culture that encourages high productivity and personal excellence.
ACKNOWLEDGEMENTS

My doctoral journey would not be complete without acknowledging those that helped make it possible. First, I must thank my committee for all the invaluable support I received during my research. Thank you, Dr. Tsushima and Dr. Acevedo, for all your wisdom and guidance; your critical advice was vital, and your confidence in me encouraged me to never give up. Thank you, Dr. Hughes, for being everything I needed in a dissertation chair. Your mentorship has been more than I could have ever imagined. You consistently went above and beyond by challenging me, encouraging me, and believing in me. The time you invested in me is something I will never forget, and I am grateful to consider you a friend.

I also want to thank my loving and supportive family for being the best people on the planet. To Brandi, Liz, and Amy, I feel like I lucked out to have three of the most intelligent, beautiful, and extraordinary women I know as sisters. You have always been there for me; it is an honor to share our love and call myself your brother. To Mom and Dad, I live to make you proud. Thank you for always supporting me in everything I do; it means the world to me. To Curtis and Daniel, thank you for being two of the best sons a father could ever ask for. I am proud of the men you have become; you are my greatest gift. Part of me chose to pursue my doctorate as an example of all the things you can and will accomplish. Finally, to my wife, Rachel, I am the man I am today because of you. There is no other person I’d rather share this life with. Your unwavering support,
trust, and faith in me are more powerful than you'll ever know, and it assures me
I am the luckiest man alive.
DEDICATION

This dissertation is dedicated to all culinary educators who pursue to provide the most meaningful educational experiences for their students. As a student, I revered my instructors for instilling and reinforcing my passion for all things professional cooking. I only hope to one day inspire the next generation of culinary professionals: its practitioners, educators, and researchers.

“To teach is first to understand” (Shulman, 1987, p. 14).
TABLE OF CONTENTS

ABSTRACT.................................................................................................................................iii

ACKNOWLEDGEMENTS...........................................................................................................v

LIST OF TABLES......................................................................................................................xi

LIST OF FIGURES.....................................................................................................................xii

CHAPTER ONE: INTRODUCTION

Overview......................................................................................................................................1

Purpose Statement.......................................................................................................................3

Research Question.....................................................................................................................3

Significance of Study..................................................................................................................4

Theoretical Underpinnings.........................................................................................................5

Definitions..................................................................................................................................11

CHAPTER TWO: LITERATURE REVIEW

Introduction.................................................................................................................................16

Conceptual Framework..............................................................................................................17

Theoretical Framework.............................................................................................................17

Career Technical Education.......................................................................................................20

History of Career Technical Education in the US.................................................................20

Culinary Arts Education in the US..........................................................................................25

Culinary Arts Educators............................................................................................................31

Pedagogical Content Knowledge as Expert Teaching.........................................................33
Tacit Knowledge.................................................................36
Pedagogical Content Knowledge...........................................41
  Content Knowledge..........................................................44
  Pedagogical Knowledge......................................................46
Knowledge of Students........................................................47
Knowledge of Assessment.....................................................48
Curricular Knowledge............................................................50
Contextual Knowledge...........................................................51
Pedagogical Content Knowledge Research..............................53
Pedagogical Content Knowledge Consensus............................60
Refined Consensus Model.......................................................63
  Collective and Personal Pedagogical Content Knowledge........65
Pedagogical Content Knowledge in Culinary Arts Education........68
Implications for Professional Development..............................70
Effective Professional Development.........................................74
  Pedagogical Content Knowledge Professional Development......74
Enacted Pedagogical Content Knowledge................................77
  Metacognitive Awareness....................................................77
  Teacher Self-regulation......................................................79
  Teacher Efficacy...............................................................81
  Pedagogical Reasoning.......................................................82
  Planning............................................................................84
LIST OF TABLES

Table 1: Development of Culinary School in America Timeline.................26
Table 2: Shulman’s Seven Categories of the Knowledge Base......................43
Table 3: Synthesized Models of Reasoning..................................................85
Table 4: Demographics..............................................................................116
Table 5: Components and Subcomponents of Pedagogical Content Knowledge.................................................................................117
Table 6: Subcomponents and Elicitation of Pedagogical Reasoning..............118
Table 7: Subcomponents and Elicitation of Collective Pedagogical Content Knowledge.................................................................................121
Table 8: Subcomponents and Elicitation of the Learning Context of Pedagogical Content Knowledge..................................................................................125
Table 9: Subcomponents and Elicitation of Personal Pedagogical Content Knowledge.................................................................................128
Table 10: Subcomponents and Elicitation of Enacted Pedagogical Content Knowledge.................................................................................133
LIST OF FIGURES

Figure 1: The SECI Model……………………………………………………………………35
Figure 2: Model of Teacher Knowledge………………………………………………55
Figure 3: Components of Pedagogical Content Knowledge…………………………56
Figure 4: Hexagon Model of Pedagogical Content Knowledge for Science Teaching……………………………………………………………………59
Figure 5: PCK Consensus Model…………………………………………………………63
Figure 6: PCK Refined Consensus Model………………………………………………65
Figure 7: A Model of the Process of Teacher Change………………………………71
Figure 8: The Interconnected Model of Teacher Growth……………………………..72
Figure 9: Shulman’s Model of Pedagogical Reasoning and Action…………………..84
CHAPTER ONE
INTRODUCTION

Overview

Culinary education is taught in a unique contextual environment that requires the explication of tacit knowledge (TK) (Anastasiou, 2019) and the possession and enactment of pedagogical content knowledge (PCK) (Murakami & Lehrer, 2021) by its teachers. TK is the knowledge used to account for the multitude of processes of human cognition that are not explicit, such as intuition, performance, and skills (Polanyi, 1958). PCK is the tacit cognition of teaching content influenced by teacher understandings on learning, teaching, and explicit versus tacit elements of knowledge (Loughran et al., 2001). Additionally, content knowledge, teacher experience, context of environment, knowledge of students, knowledge of assessment, knowledge of curriculum, and critical reflection influence PCK. TK is contextual knowledge that can be made explicit by regulating one’s cognition (Nonaka & Takeuchi, 1995). Therefore, as a contextually taught art form, culinary education requires those that teach it to possess pedagogical content knowledge and tacit knowledge. In addition to possessing PCK, an expert culinary teacher contextually enacts their PCK within various environments by regulating their pedagogical reasoning. The enactment of PCK makes a unique construct that culinary educators should display to be
effective. Therefore, knowing a culinary teacher’s level of PCK can help inform the future training of professional culinary educators.

Culinary arts educators are professionals with expertise in their vocation’s skills and subject matter knowledge. Yet, most industry professionals turned instructors have little or no formal training in the pedagogy of their field and, therefore, must learn how to teach (Bechtol, 2020; Hussain, 2016). Culinary educators lack training in pedagogical knowledge, lack experience with school culture, and are ill-prepared to assume teaching tasks and duties (Hegarty, 2015; Hussain, 2016). Hegarty (2015) claimed that culinary and hospitality educators rely heavily on their industry experience, adapting professional teaching practices from personal preference instead of practitioner-relevant research. The lack of proper pedagogical training for culinary and hospitality educators may inhibit providing curriculum content that is useful and appropriate (Hegarty, 2004). Additionally, Gersh (2016) found that educators of culinary arts education must meet and integrate industry standards through programs focused on delivering cutting-edge technical and interpersonal skills. Therefore, educators of culinary arts education must possess both subject matter and pedagogical expertise.

This phenomenological qualitative study aimed to determine if there is a need for culinary educators to receive professional development focused on developing their PCK. The study also aimed to contribute to the professionalization of culinary education and thus create recognized professionals in a recognized profession. As Hegarty (2014) states, the
professionalization of culinary education requires its educators to design, plan, and deliver programs that foster and support student learning. In turn, this will lead to a community of professional practitioners enabled to reflect on their practice, engage with the research, and build toward professionalism.

Purpose Statement

The purpose of this descriptive phenomenological qualitative study was to explore the theory of expert teaching by comparing culinary educators at the secondary and postsecondary levels based on their varying levels of experience. Experience for culinary educators included:

- Pre-service teacher training.
- In-service teacher training.
- Professional industry experience.
- Teaching experience.

The primary goal of this phenomenological study was to examine the impact professional experience has on culinary educators’ pedagogical content knowledge (PCK). Distinctions in PCK include collective PCK, personal PCK, and enacted PCK. The outcome of this study could be used to determine the need for designing a professional development program for culinary educators based on improving levels of PCK and TK.

Research Question
RQ: What is the essence of culinary educators’ pedagogical content knowledge based on experience?

The literature indicates that expert teachers possess PCK, an amalgamation of collective PCK, personal PCK, and enacted PCK. The literature also shows that culinary arts education is contextually taught, requiring pedagogical TK to be effective. If culinary educators’ PCK is insufficient, professional development is warranted to enhance those knowledge areas. The central question in this study was designed to determine whether a culinary teacher’s PCK is impacted by the type and longevity of professional training they have received.

Significance of Study

The lack of information on the epistemological benefits of pre-service and in-service training for culinary educators and whether it improves their PCK is regrettable because it could be knowledge that leads to improved pedagogy, student outcomes, and professionalization of culinary arts education. Research into how vocational instructors develop PCK required to teach their specific trade is lacking. However, it is justified according to Shulman’s proposal that studies on teaching particular subject matter are a “missing paradigm” (Hashweh, 2013). According to Hoekstra (2018), studies on how vocational instructors develop the PCK required for their specific trades and professions are warranted.
Hoekstra et al. (2018) determined that vocational instructor education focused on PCK is critical for mastering the skills and knowledge needed to teach specific industry practices. Supporting instructors in this area of their professional learning requires some formal training and integrated support within ongoing daily practices. Evidence shows that learning about teaching correlates to improved teaching; faculty who participate in pedagogical professional development activities have been shown to alter their classroom pedagogy (Condon et al., 2016).

Comprehensive development includes meeting the student’s intellectual, physical, social, and personal needs (Bice, 2019). The development requires instructional planning and strategic design based on the cadre of students’ skill level, maturity level, and environment in relation to the program goals and directives. In addition, Shim and Roth (2007) determined that novice Career and Technical Education (CTE) teachers require development and support beyond other new professors given their ancillary responsibilities such as maintaining laboratories and understanding credentialing systems. They recommended CTE teachers seek out mentorship from expert teachers to understand better and absorb their TK.

Theoretical Underpinnings

The most recent PCK Consensus Model, the Refined Consensus Model, was the guiding instrument from which the research was based. Several
relationships within the model have been studied and verified (Liepertz & Borowski, 2019). From the research (Park & Oliver, 2008), we know that PCK is a construct of teacher understanding and enactment. Enacted PCK requires pedagogical reasoning and is a modality that interacts with personal PCK and collective PCK. Research shows that personal PCK (Gess-Newsome, 2015) is fluid, tacit, and contextual knowledge that informs and is informed by collective PCK. The learning context filters the interaction between personal PCK and collective PCK, requiring a teacher’s TK to adjust teaching strategies (Chan & Yung, 2015; Gess-Newsome et al., 2019). In addition, Carlson and Daehler (2020) explain that the Refined Consensus Model can be used to learn how to support teacher development from pre-service to an expert by considering the role of experience and training at the individual level. Therefore, the research of this study was designed to determine the differences in which culinary educators of various training and experience exhibit enacted PCK, personal PCK, and collective PCK in culinary learning contexts for subject matter that an expert culinary teacher should be proficient.

The Refined Consensus Model is the product of decades of research from experts that have interpreted and studied Lee Shulman’s (1987) concept, PCK. PCK was intended to determine the professional identity for a taught profession (Shulman, 2012). By 2012, Shulman reflected on PCK and stated that each taught profession requires specific modes of teaching called signature pedagogies. Given this context, the PCK teacher knowledge bases are unique to
each taught discipline. Therefore, the five teacher knowledge bases (content, pedagogy, curriculum, assessment, students) of the Refined Consensus Model for a culinary teacher must be constituted to address knowledge specific to culinary educators. Since PCK is topic-specific, the main topics to consider examining for culinary educators were determined. From the American Culinary Federation’s Certified Culinary Educator practice exam, six themes emerged as overarching topics. The six topics are identified here, along with an example of a sub-topic for each:

- Food safety and sanitation
  - Cross-contamination
- Basic skills
  - Precision knife cuts
- Advanced skills
  - Preparing forcemeats
- Food costing
  - Food cost percentage
- Product knowledge
  - Muscle composition
- Cooking methods
  - Moist heat cooking

The guiding instrument to identify the three modalities of PCK for culinary educators was Loughran et al.’s (2001) work on Content Representations.
(CoRes) and Pedagogical and Professional-experience Repertoires (PaP-eRs). Cooper and Marangio (2020) are currently using CoRes and PaP-eRs in connection with the Refined Consensus Model to measure the growth and development of PCK in pre-service science teacher education at Monash University in Australia. The researchers have found that CoRes and PaP-eRs help improve the learning of science pre-service teachers, particularly in their explication of their PCK and the subsequent collective PCK that encourages conversations on shared knowledge. The CoRes and PaP-eRs instrument was designed to enable teachers to articulate their teaching knowledge for specific topics of learning. As content representations, CoRes are designed to explicate what a teacher understands about particular content and how it shapes their pedagogy. PaP-eRs are the narrative accounts of a teacher’s pedagogical repertoire that address the questions CoRes propose (Appendix B). The framework of CoRes and PaP-eRs can be attributed to the realms and modalities of the Refined Consensus Model, which became the framework for the interview for culinary educators’ PCK (Appendix C). The following are the framework questions of CoRes and how they connect and examine the related modalities of the Refined Consensus Model.

(1) What are the main concepts students must learn about this topic? (Collective PCK)

The outer realm of the Refined Consensus Model, the collective PCK modality, exchanges knowledge with the five teacher knowledge bases, of which
content is given the most weight. The intersection of content knowledge and the other knowledge bases has been the defining characteristic of PCK since its inception (Carlson & Daehler, 2020). In addition to demonstrating content knowledge, a culinary teacher applying their entire repertoire of PCK will also demonstrate knowledge of assessment, knowledge of curriculum, knowledge of students, and pedagogical knowledge (Stamm-Griffin, 2001). A student must learn about a topic based on the field’s collective knowledge and codified by its experts. By articulating what a student must learn, a teacher’s collective PCK is revealed because it draws upon a discipline’s communal contributions as interpreted by their intuitions, experience, and knowledge within a particular learning context.

(2) What factors influence the teaching of this topic/idea?

(3) What knowledge about students influences the teaching of this topic/idea? (Learning context)

One of the significant contributions of the Refined Consensus Model in advancing the research on PCK is its emphasis on the learning context in capturing PCK (Park, 2020). The broad factors that influence teaching a topic or idea include the educational climate, the learning environment, and the individual student attributes (Carlson & Daehler, 2020). Since the learning context is both the tacit separation and connection of a teacher’s personal PCK and collective PCK, it is critical to the identification of a teacher’s PCK that they can detect the influences on student learning. According to Carlson and Daehler (2020), student
attributes are the most critical aspect of the learning context. Teachers displaying higher levels of PCK should be able to understand how to shape instruction based on a student’s prior experiences, dispositions, and developmental readiness (Carlson & Daehler, 2020).

(4) Why is this important? (Personal PCK)

The original PCK summit of 2012 was critical in conceptualizing personal PCK as the knowledge that allows for reasoning and planning for teaching specific topics in particular learning environments (Gess-Newsome, 2015). The explicit planning for a lesson, which requires an understanding of its importance, makes possible the tacit implementation of the instructional planning and reasoning (Gess-Newsome, 2015). Personal PCK informs and is informed by both enacted PCK and collective PCK (Carlson & Daehler, 2020; Wilson, Borowski, and van Driel, 2020). A teacher’s ability to explicate why an idea is essential for a student to understand is, therefore, a construct of explicit collective knowledge, tacit personal knowledge, and the pedagogical reasoning behind it.

(5) What difficulties/limitations are connected with teaching this idea?

(6) What are the best ways to represent this content? Explain teaching strategies (and particular reasons for using these to engage with this idea). (Enacted PCK)

Research (Liepertz & Borowski, 2019) shows that pedagogical reasoning must be considered to perceive PCK fully and account for complex teaching contexts. Pedagogical reasoning is at the center of the Refined Consensus
Model because it regulates the procedures and principles of teaching. Wilson et al. (2020) determined that research is needed to examine the processes that support pedagogical reasoning. They believe research should be designed to reveal a teacher’s enacted PCK by examining the plan-teach-reflect cycle of pedagogy across teachers with different backgrounds and experiences. Understanding what difficulties or limitations are connected with teaching a particular idea exposes how a teacher plans and reflects on the action of teaching.

Definitions

*Collective pedagogical content knowledge.* Explicit knowledge that has been codified by experts and made available for use by teachers (Gess-Newsome, 2015).

*Content knowledge.* Depth and understanding with respect to a particular subject taught with a framework of broad liberal education that allows for old learning and as a facilitator for new understanding (Shulman, 1987).

*Content representations (CoRes).* A representation of what a teacher understands about particular content and how it shapes their pedagogy.

*Contextual knowledge.* An internal construct, one that allows a teacher to understand how environmental variations (i.e., students, school, curriculum) impact instructional decisions (Gess-Newsome et al., 2019).
Culinary educators. Professionals that are practiced in the culinary industry, in culinary subject matter, and fluent in pedagogy.

Enacted pedagogical content knowledge. A teacher's pedagogical reasoning requiring the internal processes of metacognitive awareness, teacher self-regulation, and teacher efficacy.

Expert teaching. The transformation of content knowledge into pedagogical forms that are contextually adaptive, and that promote high productivity and personal excellence (Shulman, 1987; Park & Oliver, 2008).

Knowledge of assessment. An understanding of the dimensions to be assessed and the methods used to complete an assessment (Tamir, 1988; Magnusson et al., 1999; Park & Oliver, 2008). The dimensions to be assessed include the teacher, the learner, the subject matter, and the context, or social environment (Park & Oliver, 2008).

Knowledge of curriculum. A teacher’s level of understanding the full range of coursework connected to a particular subject, the instructional materials that are required and best suited for their instruction, and which circumstances dictate the use of differentiated program materials (Shulman, 1986; Magnusson et al., 1999).

Knowledge of students. Knowing students well enough to anticipate their challenges with understanding certain concepts, knowing what they will find interesting and motivating, and how new knowledge will be applied by the students (Ball et al., 2008).
Learning context. The tacit separation and connection of a teacher’s personal PCK and collective PCK which include the educational climate, the learning environment, and individual student attributes (Carlson & Daehler, 2020).

Metacognitive awareness. The perception of one’s own knowledge of cognition and regulation of cognition (Hughes, 2017).

Pedagogical and professional experience repertoire (PaP-eRs). Narrative accounts of specific instances of PCK-on-action.

Pedagogical content knowledge (PCK). The tacit cognition of teaching content influenced by teacher understandings on learning, teaching, and explicit versus tacit elements of knowledge (Loughran et al., 2001). It is influenced by content knowledge, teacher experience, context of environment, knowledge of students, knowledge of pedagogy, knowledge of assessment, knowledge of curriculum, and critical reflection.

Pedagogical knowledge. “…the ways of talking, showing, enacting, or otherwise representing ideas so that the unknowing can come to know, those without understanding can comprehend and discern, and the unskilled can become adept” (Shulman, 197, p. 7).

Pedagogical reasoning. The state of reasoning where teachers make decisions based on their knowledge base and contextually enact them (Ong’ondo, 2017); it includes the processes of planning, active teaching, and reflecting.
Personal pedagogical content knowledge “…the knowledge of, reasoning behind, and planning for teaching a particular topic in a particular way for a particular purpose to particular students for enhanced student outcomes” (Gess-Newsome, 2015, p. 35).

Professional development. The process of continued career training that supports and promotes professional growth (Clarke & Hollingsworth, 2002).

Refined Consensus Model. A 2016 conceptualized model of PCK designed by expert researchers of PCK that has assisted the design of PCK professional development programs.

Reflection-in-action. The tacit monitoring of behaviors within the contexts in which they occur.

Reflection-on-action. A function of the knowledge of assessment knowledge base and is the evaluation of all the pedagogical reasoning processes that preceded a teaching outcome (Shulman, 1987; Park & Oliver, 2008).

Self-regulation. “self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals” (Zimmerman, 2000, p. 14).

Subject matter knowledge. Content knowledge for a given profession that is absent of the pedagogical knowledge to best know how to explicate it.

Tacit knowledge (TK). The knowledge used to account for the multitude of processes of human cognition that are not explicit, such as intuition, performance, and skills (Polanyi, 1958).
Teacher efficacy. The foundation of human agency, where one’s belief to produce desired results ultimately affects adaptation and change (Bandura, 2001).
CHAPTER TWO
LITERATURE REVIEW

Introduction

The design of this phenomenological qualitative study is based on research primarily conducted on the literature of pedagogical content knowledge, tacit knowledge, and culinary arts education. This chapter explores how these subjects interconnect to create the framework on which this study is designed. First, the framework was conceptualized to address how professional training and experiences shape a culinary teacher’s pedagogy. The pragmatism and constructivism learning theories offered guidance in how to approach the research. Constructivism learning theory states that building knowledge is an active process situated in context and culture. Pragmatism learning theory is also an action-oriented theory, which accepts the possibility of error and uses discussion and investigation to identify and rectify errors.

Building on the theoretical framework, subsequent sections of this chapter detail how this study will contribute to the continued exploration of improving the profession of culinary education. First, the histories of Career Technical Education and Culinary Arts Education are examined, offering insight into their shared history and current influences on one another. Then tacit knowledge is explored, what it is and how it intersects with expert teaching. Finally,
pedagogical content knowledge is defined and dissected among its components and subcomponents.

Conceptual Framework

The literature indicates that expert teachers possess pedagogical content knowledge (PCK), culminating collective PCK, personal PCK, and enacted PCK. The literature (Anastasiou, 2019) also indicates that culinary arts education is contextually taught, which requires pedagogical tacit knowledge (TK) to be effective. If culinary educators’ PCK is insufficient, professional development is warranted to enhance those knowledge areas. The guiding question was whether a culinary teacher’s PCK is impacted by the type of professional training and professional experiences they have received.

Theoretical Framework

The pragmatism and constructivism learning theories guided the theoretical perspective for studying expert teaching in culinary arts. The founders of pragmatism, Charles Sanders Peirce and William James defined and defended the philosophical viewpoint that the concept of truth requires clarification, which can be realized through scientific experimentation. Defined truth can be personal and collective knowledge formulated by a continuous construction of beliefs (Murray, 1912). Constructivism theory begins with the concept that knowledge instructs our thinking and behavior and that building knowledge is an active process situated in context and culture (Maclellan &
Theorists and scholars such as Dewey, Piaget, and Vygotsky have played integral parts in the development of constructivism, which offers a framework for understanding the complex processes of learning. As applied to my study, pragmatism and constructivism theories predict that teacher training impacts teacher PCK because PCK is a unique construction of teacher knowledge that is both personal and collective.

Through pragmatistic epistemological inquiry, one accepts the possibility of error and uses discussion and investigation to identify and rectify errors (Dewey, 1930; James, 1897). Accepting the unknown and scientifically inquiring is the fundamental belief of pragmatism; that all inquiry can be made practical. Pragmatism is an action-oriented theory. The ideal instruments for pragmatic problem-solving are our principled logical forms of cognition (Dewey, 1914). Situations can then be traversed and evaluated through the experiences and perceptions of the individual.

In *Democracy and Education: An Introduction to the Philosophy of Education* (1916), Dewey states that experience requires reflection so that we may adopt a method as a rule. Learning from experience requires connecting previous circumstances through experimentation, a give and take with nature. “Thinking, in other words, is the intentional endeavor to discover specific connections between something which we do and the consequences which result, so that the two become continuous” (Dewey, 1916, p. 145). The pragmatistic search for a result dictates thoughtful inquiry; after all, the objective
of thinking is to reach a conclusion. The inquiry is native to the individual; it is the search for one’s truth. The validity of one’s truth is self-confirmed through experiential trial and error (Dewey, 1916). Successful methods of formal pedagogy are constructed in the experiential framework of connecting situations to personal or shared familiarities. Critical thinking in this regard, the discovery versus the learning, is naturally and tacitly invoked (Dewey, 1916).

Constructivism is the active process of obtaining knowledge through a learner’s self-regulation (Piaget, 1977). Knowledge is created within the constructivist perspective when individuals and groups attempt to make sense of their experiential world (Maclellan & Soden 2003). How knowledge is interpreted lies within an individual’s socially constructed mediators; the mediators are the tools that interpret experiences and process reasoning (Maclellan & Soden 2003). As Maclellan and Soden (2003) state, “restructuring of thought is related to the acquisition and use of powerful new tools and signs for mediating thought” (p. 112). Expert teacher training and development hinges on this notion; mediation of pedagogical tools will vertically build upon a teacher’s knowledge. Hashweh (2005) defined the pedagogical tools as teacher pedagogical constructions, a collection of knowledge entities that inform other teachers how to teach specific topics. Constructing collective pedagogy is the theory behind Loughran et al.’s (2001) Content Representations (CoRes) and Pedagogical and Professional-experience Repertoires (PaP-eRs), which coincides with Vygotsky’s
theory of constructivism, that knowledge develops from individuals' environmental and social interactions.

Career Technical Education

Career Technical Education (CTE) is distinct in that it does not fall within traditional models of educational pathways. CTE often gets an unwarranted knock for its lack of academic rigor; it is typically more workforce-driven than its scholastic counterparts. Although there have been strides to improve perceptions of CTE, there are still those that view it as lesser than (Tucker, 2019). Skills learned in CTE can be conceptualized in both general and discipline-centric terms. Generally, the CTE learner must, above all else, carry the desire to be a genuine learner. In CTE, each student brings their own set of foundational skills such as reading, writing, and mathematics; these are addressed in CTE as building blocks for scaffolding the necessary discipline-specific workforce competencies. CTE embeds general, realized aptitudes in systems learning, technology, resource and information learning, interpersonal skills, and “soft,” or 21st century, skills, which are then stratified to meet individual learning styles.

History of Career Technical Education in the US

It is in trade schooling that the history of culinary education began. One of the first known American trade schools was the Farm and Trade School of Boston, founded in 1814 (Bennett, 1926), which provided academic and vocational education for orphans; an example of CTE continuously targeting
special populations for access since its inception (Gordon & Shultz, 2020). Eighteenth-century European pioneers of the manual arts, such as Jean-Jacques Rousseau and Johann Heinrich Pestalozzi, believed that education should consist primarily of manual labor; that it was a more natural way of learning, offering children apprentices the opportunity to learn through thinking and doing (Gordon & Shultz, 2020). As a result, Americans adopted the paradigms of the European manual arts. Apprenticeships were offered well into the industrial period in skilled trades that ranged from agricultural to mechanical vocations (Imperatore & Hyslop, 2017).

America’s antebellum period of the early and mid-nineteenth century witnessed the lyceum movement, which was crucial in developing adult education in America. The movement consisted of transient public lectures, debates, and dramatic performances. This edifying indoctrination of thousands of individuals that otherwise were absent of educational instruction served its purpose as a socially unifying and intellectual forum. The lyceums eventually gave way to formal vocational training, founding the Polytechnic Institute at Worcester, Massachusetts, in 1868 (Bennett, 1926). Gone, too, were the apprenticeships of inculcated servitude; the groundbreaking curriculum of theoretical coursework combined with vocational laboratory work offered a contemporary worker for the newly forming industrial period. Critically influential in this period were the educational viewpoints of Booker T. Washington, who stressed that the process of skill acquisition involves first integration, then
refinement. In addition, Washington believed that education should be less about rote memorization but should include self-discipline, moral standards, a sense of service, and cognitive and problem-solving skills (Gordon & Shultz, 2020).

After the turn of the twentieth century, and as the imminence of international war approached, America realized the German vocational preparation was superior. The country understood that it had to quickly train the inexperienced civilians required during the effort and, eventually, during rebuilding. The Smith-Hughes Vocational Education Act, passed in 1917, paved the way for creating the Federal Board for Vocational Education, which effectively federally centralized the emerging vocational sector of American higher education. Federal funds were appropriated to each state that established a state board for vocational education, essentially separating vocational education from academic education in perpetuity (Gordon & Shultz, 2020).

Integrating vocational education into the mainstream American college system became a topic of debate by the 1920s. John Dewey and Edwin Cooley, both Chicago University professors, believed in the merits of vocational education but were opposed to how it should be incorporated into the academy. Cooley fought for a version of the European model, a separate vocational education track with a separate administration and facilities. At the same time, Dewey preferred complete integration as part of progressive education. In addition, Dewey argued that the incurred costs and associated isolation of the students counter the ideology of democratic higher education (Gordon & Shultz,
2020). Finally, in 1925, a modified version of Cooley’s concept of vocational education was introduced to American schools as industrial arts education at the University of Chicago.

Professional studies, consisting of broad undergraduate curriculums, soon emerged and grew beyond institutions solely focused on graduate education and research (Ryan, 2003). Two-year colleges, born out of the need to allow universities to filter first- and second-year students, proved to be successful alternatives. In the decades to come, the two-year junior colleges were adapting to the needs of a largely overlooked segment of potential students, those seeking vocational training. Occupational courses designed to prepare students for immediate entry into the workforce gained traction. Metropolitan locales found a need to offer classes that fit the part-time student, including evening and summer sessions. The community college, evolving from the junior college, further met the needs of another untapped market of students, which needed a localized school. Offering vocational and professional programs, community colleges became the destination for a substantial number of students that found themselves with an opportunity not only to gain a postsecondary education but could do it locally, frugally, and expeditiously.

Mid-century America had a burgeoning, modern economy that needed more service workers than ever before. New legislation aimed to expand and improve the then decades-old vocational education programs. The Vocational Education Act of 1963, otherwise known as the Perkins-Morse Bill, was written
and supported by Carl D. Perkins, a vocational education advocate still affecting CTE. A new era of vocational education addressed the needs of the domestic industries and the needs of the citizens. Part-time employment was made available for full-time students, offering those that needed to earn the ability to do so. Continuing the student-centric approach, the reformed Carl D. Perkins Act of 1984 witnessed CTE come full circle in serving the underserved and underprivileged with ‘hand-up’ opportunities. The reformation of the Perkins Act was, in most part, a reaction to the 1983 National Commission on Excellence in Education report stating that the underperforming US education system was contributing to an economic decline regarding the international competition.

The global technological advancements of the late twentieth century spurred another congressional reinvestment into vocational education with the passing of the Carl D. Perkins Vocational and Applied Technology Education Act of 1990 (Perkins II) (Tucker, 2019). Within the Act, states were tasked with articulating improved academic and vocational instruction between secondary and postsecondary institutions. By 1998, the Act was again updated, emphasizing improving student literacy and mathematic acuities. Perkins III’s version continued to focus on articulation between secondary and postsecondary education, with improved support for career guidance. The fourth iteration of the Perkins Act, Carl D. Perkins Career and Technical Education Improvement Act of 2006 (Perkins IV), reinforced the government’s aim to strengthen America’s corps of industry workers with an appropriation of 1.3 billion dollars annually for
CTE state and community programs. In addition, Perkins IV aimed to implement teacher preparation reforms, which included programs focused on improving CTE teachers’ subject matter knowledge and pedagogical knowledge (Tucker, 2019). The most recent update to the Perkins Act (Perkins V), The Strengthening Career and Technical Education for the 21st Century Act of 2018, recommitted the annual 1.3 billion and challenged the States and local recipients to “rethink CTE” and to “arrive at bold goals” (cte.ed.gov, n.d.).

Culinary Arts Education in the US

The birth of the American culinary school was a natural progression born of both necessity and the desire to elevate the vocation from a trade to a profession. At the forefront of the American culinary revolution was the acclaimed chef and author of the *Epicurean*, Charles Ranhofer (Brown, 2005). As the head chef for the most acclaimed restaurant in America at the time, Delmonico’s, Ranhofer required quality staff and, through his magazine, *Chef*, pointed to the National Institute of Cookery in London, founded in 1882, as an exemplary to be modeled after (Brown, 2005).

The first known culinary school in the United States, the Boston Cooking School, was established in 1879 by Sarah Hooper. Innovative for its time, the school featured a curriculum that included food marketing, food chemistry, and anatomy and digestion. Its most famous graduate and eventual president, Fannie Farmer, wrote and published the groundbreaking *Boston School Cookbook*. The
book stressed the importance of measurements and documenting the procedures of recipes and is still in publication today. Table 1 chronicles the progression of culinary education in the United States.

Table 1

*Development of Culinary School in America Timeline*

<table>
<thead>
<tr>
<th>Year</th>
<th>Historical Event in the Formulation of Culinary Education</th>
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<tbody>
<tr>
<td>1879</td>
<td>Boston Cooking School became first culinary school in America</td>
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<tr>
<td>1893</td>
<td>Charles Ranhofer published <em>The Epicurean</em> (Ranhofer, 1893)</td>
</tr>
<tr>
<td>1896</td>
<td>Fannie Merritt Farmer published the Boston School Cookbook, which emphasized accuracy of measurements in quantifiable terms</td>
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<tr>
<td>1903</td>
<td>Founding of International Stewards hospitality association (Brown, 2005)</td>
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<tr>
<td>1907</td>
<td>Efforts began by the Stewards to establish a national culinary school</td>
</tr>
<tr>
<td>1910</td>
<td>The Stewards established a fund to build a National Training School for Cooks in America in Indianapolis, Indiana</td>
</tr>
<tr>
<td>1911</td>
<td>Legislation passed in Wisconsin promoting a uniform apprenticeship program</td>
</tr>
<tr>
<td>1917</td>
<td>Passing of Smith-Hughes Vocational Education Act</td>
</tr>
<tr>
<td>1922</td>
<td>Cornell University established the first 4-year college-level hospitality management program (Gersh, 2016)</td>
</tr>
<tr>
<td>1925</td>
<td>Vocational education was introduced to American schools in the form of industrial arts education at the University of Chicago</td>
</tr>
<tr>
<td>1929</td>
<td>American Culinary Federation (ACF) was established</td>
</tr>
<tr>
<td>1937</td>
<td>The National Apprenticeship Law passed</td>
</tr>
</tbody>
</table>
1946 | Culinary Institute of America (CIA) was founded (originally the Restaurant Institute of Connecticut)
---|---
1946 | James Beard began teaching cooking through television
1963 | Vocational Education Act of 1963 (Perkins-Morse Bill), was signed into law by President Lyndon B. Johnson
1973 | Johnson & Wales University School of Culinary Arts Education was founded
1976 | Federal government designated chef as a profession (Brown, 2005)
1981 | Classification of Master Chef was established in the U.S.
1986 | American Culinary Federation (ACF) began accreditation
1990 | Carl D. Perkins Vocational and Applied Technology Education act was signed into law

By the late nineteenth century, the societal needs for professional culinarians presented themselves. Mainly geared towards the home cook, early American culinary arts education shifted its focus to meet a booming economy’s vastly changing societal needs. Foodservice had to evolve from an unregulated trade of journeyman cooks to a formalized system that produced reliably reproducible, trained chefs for the expanding hospitality sector. The International Stewards, founded in 1903, was banded by hotel industry professionals to establish a national culinary school (Brown, 2005). Although it never materialized due to fiscal mismanagement, the need for classroom training for journeymen chefs, stewards, and cooks had caused a groundswell of enthusiasm for such an endeavor.
The early-twentieth-century archetype for culinary education mainly consisted of professional chefs and cook associations incorporating their intimate experience with the apprentice-to-journeyman model into culinary laboratories (Miller, 2019; Mandabach, 1998). Integral in the development of public culinary education was the federal support of the Smith-Hughes Vocational Education Act of 1917 (Mandabach, 1998). In laboratories and apprenticeship programs, continuing culinary education fortuitously gained traction as vocational trade training schools were concurrently becoming established systematically. To further legitimize culinary arts education, a leading spokesman for culinary education at the time, Chef Adolf Meyer, believed that state and federal apprenticeship boards should be tasked to monitor the burgeoning culinary institutions. Soon after that (1929), the American Culinary Federation (ACF) was established.

An amalgamation of the Philanthropic Culinary Society, the Chefs de Cuisine, and the Vatel Club, the ACF was integral in professionalizing the practitioners of the culinary industry (acfchefs.org, n.d.). In 1976, the ACF heavily lobbied the US Department of Labor, changing the designation of executive chef from service status to the professional category (Brown, 2005). The most prominent professional chefs’ organization in North America, the ACF has over 14,000 members in more than 170 chapters across the United States (acfchefs.org, n.d.). The ACF is well-established as the premier organization for culinary certification training, apprenticeship programs, domestic and
international competitions, and an accrediting body for American culinary arts education. The ACF apprenticeship program, endorsed by the United States Department of Labor, is a certificate-based training focused on applying culinary skills, along with a collegial emphasis on academics and theory (Milster, 2019; Hegarty, 2014).

The Servicemen’s Readjustment Act of 1944, better known as the G.I. Bill, changed the landscape of postsecondary education, particularly public junior colleges. The Act was designed to address the millions of men and women veterans and defense workers returning from the war who would need assistance with tuition, fees, and books. Degree credit enrollments increased 63% in the first four years, subsequently affecting housing needs, vocational programming, and accelerated programs (Gordon & Shultz, 2020). The postwar economy of the 1940s not only saw a peak in private two-year colleges, but culinary schools followed suit. The most renowned culinary school in America is the Culinary Institute of America (CIA). Founded in 1946 as the New Haven Restaurant Institute, the CIA was specifically created to train the returning vets utilizing the G.I. Bill, having graduated 600 veterans in their first four years (Milster, 2019). The CIA was granted the right to confer an Associate of Occupational Studies degree by the New York Board of Regents in 1971 and two Bachelor of Professional Studies degrees in 1993. The CIA has recently developed graduate degree programs with a Master of Professional Studies in Food Business and a Master of Professional Studies in Wine Management (ciachef.edu, n.d.).
Another prestigious private American culinary school, Johnson and Wales University School of Culinary Arts Education, was founded in Providence, Rhode Island, in 1973 and newly renamed, as of June 1, 2020, as Johnson and Wales University College of Food Innovation & Technology. The renamed college has added, “a contemporary focus on how food impacts people, communities, and economies” (jwu.edu, n.d.). Founded in 1914 as a business school, the school became a junior college in 1963, a senior college in 1970, and a university offering postgraduate degrees in 1980 (culinaryschools.org, n.d.). With its business school roots, the culinary programs are grounded in the teaching of culinary proficiencies and the business of foodservice and hospitality management.

Currently, culinary arts education in the United States is offered through varying private and public programs. There are approximately 423 culinary arts schools in the US (ibisworld.com, n.d.). Private programs are offered through for-profit and nonprofit institutions, and they typically offer associate or bachelor’s degrees. However, some, such as CIA and Johnson and Wales University, offer postgraduate degrees in tangential studies, such as hospitality management and food business. Public programs can be either four-year or two years or less, where one can earn a bachelor’s degree, an associate degree, or gain industry-recognized certification. Forty-four percent of culinary arts degrees awarded in 2019 were associate, 28 percent were a one- to two-year postsecondary certificate, 24 percent were a less-than-one-year certificate, and only two and a
half percent were bachelor’s degrees (ibisworld.com, n.d.). Public two-year institutions are the prevailing sector for culinary arts education, currently offering 267 culinary arts programs in the US (datausa.com, n.d.). Annual tuition for a culinary arts program at a two-year public institution averages $3600, whereas private institutions average $19500 (datausa.com, n.d.).

Culinary Arts Educators

Culinary educators meet some of the same challenges as chefs in the professional sector, such as tight budgets and stressful working environments (Swift, 2017). Research (Shulman, 1987; Gess-Newsome et al., 2019; Hashweh, 2013) states that expert educators must understand subject matter, students, curriculum, assessment, and learning contexts. Therefore, culinary educators are professionals that must be practiced in industry, experts in subject matter, and fluent in pedagogy. At the postsecondary level, most culinary educators must meet industry experience qualifications to teach, but many institutions do not require teaching credentials or certifications. The American Culinary Federation offers certification for culinary educators, the Certified Culinary Educator, with minimum education requirements and workforce requirements for industry and teaching experience. The Certified Culinary Educator is nationally recognized but not required for most teaching positions. Teaching credentials are typically not required at the secondary level (and not at the postsecondary level), but with less
emphasis on industry experience, a critical factor for quality culinary educators (Hertzman & Ackerman, 2010).

The food service industry is projected to see unprecedented growth over the next decade, requiring culinary schools to produce highly trained culinary professionals (Gersh, 2016). Research into improving the profession of culinary educators is lacking and warranted (Hertzman & Ackerman, 2010; Zopiatis et al., 2014). Existing recent research on what constitutes quality culinary education (Hertzman & Ackerman, 2010; Zopiatis et al., 2014) has determined that faculty are directly correlated. Zopiatis et al. (2014) defined quality culinary education as being “able to meet or exceed the implied or stated needs and expectations of students, their families, the industry, and society” (p. 89). They determined that time, effort, and financial resources must be invested in faculty development if culinary education evolves from the developmental stage to the strategically developed stage. Hertzman and Ackerman (2010) found that industry experience, teaching techniques, and subject matter experience are the most important quality indicators for educators of culinary arts education. They determined that future research is needed to gain specific guidance on appropriate faculty credentials and training needs. Miles (2007) stated that developing skills for new and less competent teachers can be accomplished through professional development among peers. A peer mentorship can create a learning community that shares similar issues, encourages professional debate,
and assists in the transition of traditions, techniques, and methods specific to the teaching of the vocation and its curriculum (Miles, 2007).

Pedagogical Content Knowledge as Expert Teaching

Expert teaching requires epistemological development that addresses and transcends intuitive pedagogy (Kind, 2009; Sternberg & Horvath, 1999). Culinary educators at the postsecondary level are professionals who have mastered kitchen skills, have successfully trained and coached personnel, and carry the wisdom of the industry with them. Yet, many have not been formally trained or credentialed as educators (Gersh, 2016). Sternberg and Horvath (1999) assert that those “untrained in education” possess “powerful tacit conceptions about teaching and learning (p. 125)” and go on to say that it dramatically influences a teacher’s pedagogical approach. They call these intuitive pedagogical conceptions ‘folk pedagogy’ and point out that the resultant commonsense epistemology has limitations within its framework. Folk pedagogy employs an objectivist view towards knowledge as a unidirectional transmission of content from the teacher to the learner (Sternberg & Horvath, 1995; Sternberg & Horvath, 1999; Hoy, 1996). Conversely, expert teaching challenges the intuitive basis that knowledge is only created externally through imitation and didactic exposure. Instead, van Driel and Berry (2012) declare that it is non-linear and contextually nuanced.
Expert teaching, according to Bruner (1996), is grounded in fostering one's internal constructivism (their personal level of knowledge) and intersubjectivism (their social collaboration within their learning community). Expert teaching requires an abstract methodology that ties into the principles and strategies of PCK (Van Driel & Berry, 2012). The capacity to transform content knowledge into pedagogical forms that are contextually adaptive is the enactment of an expert teacher's PCK (Shulman, 1987; Park & Oliver, 2008). Therefore, expert teaching is the possession and application of one's PCK (Park & Oliver, 2008; Magnusson et al., 1999). Metacognitive awareness allows one to cognitively regulate and enact PCK (Shulman, 1986). Metacognitive awareness, therefore, plays a significant role in the transformation from intuitive to expert teaching. Additionally, expert teachers utilize pedagogical reasoning (Shulman, 1987), allowing for the formulation of academic ideas and discussion and evaluation of those ideas.

In expert teaching, a balanced instructional mode means perpetually engaging with the learner's internalist perspective while delivering curriculum-based content. The interchange of knowledge between teacher and student is a consortium of explicating existing knowledge with ingrained perspectives. For example, demonstration and imitation are proper instructional modes given a particular context, such as physical tasks (i.e., knifework). In this case, knowledge is passed socially, tacit-to-tacit, but limitedly with the knowledge never becoming explicit enough to gain systematic insight (Nonaka & Takeuchi, 1995).
Nonaka and Takeuchi’s 1995 book on the creation of knowledge stated that knowledge becomes transcendent when the exchange happens *between* tacit and explicit means (tacit-to-explicit or explicit-to-tacit). Culinary arts education lends itself to a didactic instructional model that teaches the baseline objective properties of cooking, creating an explicit-to-explicit interchange between teacher and learner. Additionally, culinary arts education requires reflection about techniques and methods that engage critical thinking about decisions, results, and how conclusions were made (Hegarty, 2011; Muller et al., 2009); this requires reflection-on-action, which is a tacit-to-explicit interchange. Higher metacognitive awareness allows for the articulation of tacit knowledge (TK) to become explicit (Shim & Roth, 2007). When intersubjectivities are exchanged through an explicit collaboration of shared best practices and negotiated truths, the learner is more likely to accumulate and transfer that new knowledge (an explicit-to-tacit interchange) into personal TK (Nonaka & Takeuchi, 1995). These steps are illustrated in Figure 1.
Figure 1 *The SECI model (Nonaka & Takeuchi, 1995)*

Anastasiou (2019) conducted a study that examined how culinary educators use the personal TK they gained from working in the industry in a vocational education setting. The study found that educators display personal TK when they connect and align their content knowledge with the course curriculum and their knowledge of students. Anastasiou determined that the lack of a supportive learning culture that promotes high productivity and personal excellence hinders the expert-to-student TK exchange.

**Tacit Knowledge**

Michael Polanyi, the originator of the theory of TK, was a prominent physical chemist. Polanyi fled from Budapest around 1920 and then again from the Kaiser Wilhelm Institute in Berlin to the University of Manchester in England in 1933 (Nye, 2011). The communist and fascist oppression Polanyi endured shaped his eventual philosophy and sociology. Polanyi believed science was misunderstood and could be better explained to promote a healthy society (Gulick, 2016). As a scientist, Polanyi rejected objectivist thinking that sought to infringe upon public liberty and mute scientific discernment (Gulick, 2016). Instead, he believed that judgments are guided by tacit evaluative factors central to developing all knowledge systems (Gulick, 2016). Polanyi’s eventual foray into an alternative ideal of knowledge manifested in his book *Personal Knowledge: Towards a Post-Critical Philosophy* (1958). His term personal knowledge was
conceptualized as a modification of what is understood as *knowing*. Polanyi (1958) defined knowing as a skillful and active comprehension of practically and theoretically known things. A subsidiary awareness accesses the known entities within us that Polanyi claimed lies in our ‘focal awareness’, which today may be described as our metacognitive awareness. Polanyi contended that every act of knowing requires a personal contribution of comprehension. This layering of personal knowledge is a function of our perceptual framework, where we seek to recognize new concepts and skills to satisfy our anticipatory intellectual desire (Polanyi, 1958). The anticipation of novel and unprecedented concepts is the unceasing need to accommodate the perpetual changes that we incur personally and professionally (Polanyi, 1958).

TK is not easily defined; Polanyi used it to account for the multitude of processes of human cognition that are not explicit, such as intuition, performance, and skills. Polanyi notably used the metaphor of riding a bike to explain how one learns and enacts their TK. One cannot be told how to ride a bike, or one cannot read how to ride a bike without the assistance of the modes of teaching or transferring TK: learning through observation from those that can, and through close personal instruction from those who can (Collins, 2010). Eventually, the physiological understanding of how to balance, pedal, and steer a bike becomes personal knowledge or TK. Polanyi (1966) coined the phrase “we can know more than we can tell” (p. 4), which correlates with his assertion that all knowledge is either tacit or rooted in TK (Gulick, 2016). Polanyi’s theory of TK is
functional; it shapes and integrates information during intentional thinking and skillful acting, such as teaching and learning (Gulick, 2016). Polanyi (1958) described the aim of skillful acting as “the observance of a set of rules which are not known as such to the person following them” (p. 49); and the tacit integration of knowledge as “a secret art residing in the depths of the human soul.” Other researchers have since defined TK in alternate ways. Sternberg and Grigorenko (2001) defined TK as “knowledge which individuals use to perform effectively but which they may find hard to articulate” (p. 1). Nonaka and Takeuchi (1995) defined TK as “an important cognitive dimension” consisting of “mental models, beliefs, and perspectives so ingrained that we take them for granted, and therefore cannot easily articulate them” (p. 98). Collins (2010) defined TK as “knowledge that is not explicated” (p. 1).

While Polanyi’s work was primarily focused on an individual’s processes of knowing, Harry Collins’ contribution complements it by addressing the social realm of knowledge. Collins (2010) also differed in that he described explicit knowledge as the more abstract concept. He argued that knowledge can be made explicit through language, text, or scientific explanation, whereas knowledge that cannot be scientifically established is tacit. Polanyi differed in his belief by contending that all knowledge is tacit and can be made explicit through various means, including intermediaries. Collins explained that conveying TK requires direct contact and cannot be passed via an intermediary because the knowledge must first be made explicit to the intermediary. Instead, TK is acquired
through socialization as an apprenticeship or classroom setting. Collins spoke of TK as the knowledge that drives education, that it is the crucial part of what teachers teach. “Education is more a matter of socialization into tacit ways of thinking and doing than transmitting explicit information or instructions” (Collins, 2010, p. 87)

Collins saw the explication of TK as existing on a spectrum of resistance ranging from weak to strong. Collins developed a three-phase model of TK consisting of relational TK (weak), somatic TK (medium), and collective TK (strong).

Relational TK is the weakest form of TK because it is not based on human physiology but rather on how people relate to each other within their social organization (Collins, 2010). Relational TK can be made explicit, but generally is not because of the contingencies of human relationships; it could be knowledge that is purposefully kept private as concealed or secret knowledge. Relational TK can also fail to be shared because the sender simply does not know to offer the information or does not offer enough information; this type of failure to transfer knowledge is what Collins calls mismatched saliencies. An example would be a teacher who does not know what the students do not know and, therefore, does not pass along enough information to fill in the gaps of their missing knowledge on a certain topic. This lack of communication is an example of why a teacher’s knowledge of students is the most important of the teacher knowledge bases,
besides subject matter knowledge, for a teacher to possess (Shulman, 1987; Hashweh, 2013).

Somatic TK includes the embodied, or somatic, skills that an individual possesses; it is a form of an individual’s innate personal knowledge that can often be explicated through various forms (Collins, 2010). In this realm, Collins overlaps with Polanyi’s conceptualization of TK, even referring to Polanyi’s learning to ride a bicycle example. Collins attributed the learning of riding a bike to a process of what he called socialization, where one assimilates or accommodates knowledge of skill through social immersion of that activity. However, Collins also conceded that knowledge within the body can become forever changed and that personal knowledge is tacit unless explicated. Collins argued that all somatic TK can be made explicit through technology. Gulick (2016) countered this notion by stating that a human experiencing somatic TK is tacit because the brain is not fast enough to capture the body’s somatic messaging the way a computer could. Therefore, an individual is accessing their somatic TK while performing an innate skill in-action (as it is happening).

For Collins, collective TK is the strongest and most authentic form of TK; it is TK that cannot be explicitated because it can only be acquired through social embedding (Collins, 2010). Collins again used the bicycle scenario, but to explain collective TK, he used riding the bike in traffic. Collins stated that understanding social and cultural cues is necessary when navigating a bicycle in traffic, depending upon your country. Cultural insight, observation, and personal
experience play essential roles in effectively accomplishing tasks within a culture (Gulick, 2016). Language and its interpretation can also be attributed to collective TK because it exists within a society that requires a tacit understanding to communicate effectively. Collins argued that this is the only true form of TK because it cannot be made explicit; technology cannot replicate it. Collins also said that humans are connected via the neurons of their brains through shared sensory perceptions; that true TK exists only within society. Gulick (2016) refutes this notion by agreeing with Polanyi’s theory of individual TK, stating that it is a collective of individuals with their own personal experiences and distinct memories that makes up collective TK.

Pedagogical Content Knowledge

In 1985, Lee Shulman gave the Presidential Address at the annual meeting of the American Educational Research Association in Chicago. Shulman specialized in teacher education and cognitive psychology of instruction at Stanford University and had been working on a research program called Knowledge Growth in Teaching. The address focused on teachers’ content knowledge and how critical it was to teacher knowledge. He was concerned that the importance of teachers as subject matter experts had given way to an overemphasis on the procedures of teaching. Shulman’s research program was squarely aimed at examining teachers and the cognitive psychology of their learning, particularly in teacher education and development. He and his
colleagues wanted to know the sources of teacher knowledge, how it is acquired, and how it is retrieved (Shulman, 1986).

Soon after, in the article Knowledge and Teaching: Foundations of the New Reform (Shulman, 1987), Shulman attempted to articulate answers to the questions "what are the sources of the knowledge base for teaching" and "in what terms can these sources be conceptualized" (p.4)? His search to specify the characteristics of a teacher's knowledge base and its sources aimed to legitimate the professionalization of teaching. Through his research, Shulman began with the concept that teaching starts with a teacher's understanding of how to teach what is to be learned. He then defined the categories of knowledge that facilitate teacher understanding to promote student comprehension best; these became his seven domains of teacher knowledge. Shulman's original seven domains of teacher knowledge included content knowledge, general pedagogical knowledge, curriculum knowledge, pedagogical content knowledge, knowledge of learners and their characteristics, knowledge of educational contexts, and knowledge of educational ends, purposes, and values (Table 2). Of these seven, the domain of pedagogical content knowledge (PCK) distinctively emerged as the one that identifies the idiosyncratic bodies of knowledge for teaching. “It represents the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction” (Shulman, 1987, p. 8).
Table 2

*Shulman’s Seven Categories of the Knowledge Base*

<table>
<thead>
<tr>
<th>Content knowledge</th>
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<tbody>
<tr>
<td>General pedagogical knowledge</td>
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<tr>
<td>Curriculum knowledge</td>
</tr>
<tr>
<td>Pedagogical content knowledge</td>
</tr>
<tr>
<td>Knowledge of learners and their characteristics</td>
</tr>
<tr>
<td>Knowledge of educational contexts</td>
</tr>
<tr>
<td>Knowledge of educational ends, purposes, and values</td>
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</table>

PCK is the knowledge concerned with finding optimal ways to teach specific content with expected effects (Minstrell, 1999); it is a complex concept in that it is tied to TK and therefore not easily articulated (Loughran et al., 2001; Kind, 2009). PCK is fluidly influenced by how one understands and teaches content to the point that novel concepts become indistinguishable from existing ones (Loughran et al., 2001). PCK is the tacit cognition of teaching content influenced by teacher understandings on learning, teaching, and explicit versus tacit elements of knowledge (Loughran et al., 2001). PCK is influenced by content knowledge, teacher experience, context of environment, knowledge of students, knowledge of pedagogy, knowledge of assessment, knowledge of
curriculum, and critical reflection. Research has demonstrated that PCK is complex to the point that it is highly sensitive to the specificity of the person, the subject, the situation, and the topic (Van Driel & Berry, 2012; Kind, 2009; Hashweh, 2013). Therefore, Van Driel and Berry (2012) identify that an expert teacher, one that possesses and applies PCK (Park & Oliver, 2008), fluidly adapts their PCK based upon subject, situation, and topic. Marks (1990) went as far to say the phrase content-specific pedagogical knowledge more aptly characterizes the application of pedagogical principles to contexts of particular subject matter; he called it specification “the appropriate instantiation of a broadly applicable idea in a particular context” (p. 8)

Content Knowledge

PCK represents a unique domain of teacher knowledge, resulting from a transformation of knowledge from other domains (Magnusson, Borko, & Krajcik., 1999). The domain of content knowledge refers to a teacher’s breadth and organization of knowledge about the profession of teaching. Although the technical knowledge a teacher requires is unique to the profession of teaching, it must extend beyond a subject’s facts and concepts (Ball et al., 2008; Shulman, 1986). Content knowledge comes from “the accumulated literature and studies in the content areas, and the historical scholarship on the nature of knowledge in those fields of study” (Shulman, 1987, p. 9). In 1986, Shulman (1986) identified three categories of content knowledge for teachers: subject matter knowledge, pedagogical knowledge, and curricular knowledge. By 1987, Shulman (1987)
expanded on his sources of the knowledge base for teaching by identifying seven domains of teacher knowledge (Table 2). Pedagogical content knowledge was of specific concern for Shulman because “it identifies the distinctive bodies of knowledge for teaching” and “is the category most likely to distinguish the understanding of the content specialist from that of the pedagogue” (Shulman, 1987, p. 8).

Several researchers (Shulman, 1987; Kind, 2009; Van Driel et al., 2002; Halim & Meerah, 2002) agree that subject matter knowledge is an essential prerequisite in developing PCK. Content knowledge for teachers has been synonymously referred to as subject matter knowledge by many researchers (Marks, 1990; Koballa et al., 1999; Tamir, 1988). Shulman (1986) referred to content knowledge as an understanding of subject matter structures and the variety of ways to organize a discipline, calling it “the amount and organization of knowledge per se in the mind of the teacher” (p. 9). Shulman (1986) agreed with Schwab’s (1964) writings on the structure of disciplines during the curriculum reform movement of the 1960s. Schwab conceptualized that subject matter content knowledge exists in academic disciplines in substantive and syntactic structures. Substantive structures are the concepts, rules, and principles of a discipline that guide inquiry (Deng, 2015). The teacher is ill-equipped to deliver quality substantive lessons, absent of the requisite content knowledge. Syntactic structures are the methodological aspects of establishing validity based on pertinent yet pliable phenomenological rules within a discipline’s domain. The
syntactic structure offers modes of inquiry and verification methods (Deng, 2015). Structured subject matter content knowledge addresses the question, “why is this content being taught, and how does it connect to other content”? This blending of substantive and syntactic structures, or content knowledge, is contextually navigated. Marks (1990) calls this process interpretation; “the content is examined for its structure and significance, then transformed as necessary to make it comprehensible and compelling to a particular group of learners” (p. 7).

**Pedagogical Knowledge**

Pedagogical knowledge has been defined and specified in various ways (Kirschner et al., 2016). According to Magnusson et al. (2016), pedagogical knowledge includes instructional principles, classroom management, understanding learner processing, and awareness of educational aims. Gess-Newsome et al. (2017) describe pedagogical knowledge as general teaching skills that offer the ability for a teacher to supercede content. Voss et al. (2011) conducted a study on teacher general pedagogical knowledge and determined it consists of classroom management, teaching methods, and classroom assessment. For their physics PCK model, Kirschner et al. (2016) synthesized the research communities’ definition of pedagogical knowledge into the following facets: (a) classroom management, (b) teaching methods, (c) individualization, and (d) assessment/feedback.

Shulman (1986) saw pedagogical knowledge as going beyond subject matter knowledge into those practices that are most concerned with the subject’s
teachability. He stated it must be understood what student preconceptions or misconceptions lead to specific topics being more difficult to learn than others. Therefore, the teacher must know content from both research and personal practice to the extent that it can be offered in various forms of representation (Shulman, 1986). Pedagogical knowledge utilizes this relationship between student influence and learning and contextually adapts and melds the two concepts into comprehensible lessons (Shulman, 1986). Shulman (1987) identified this contextual pedagogical process as transforming understanding, in the same manner, Polanyi identified explicating TK: “these are the ways of talking, showing, enacting, or otherwise representing ideas so that the unknowing can come to know, those without understanding can comprehend and discern, and the unskilled can become adept” (Shulman, 197, p. 7).

Knowledge of Students

A teacher’s knowledge of students and their characteristics is essential in developing PCK (Shulman, 1987; Park & Oliver, 2008). Shulman and Sykes (1986) viewed teaching just as dependent on the knowledge of students as a teacher’s subject matter knowledge and pedagogical knowledge are. Ball et al. (2008) conducted a study in which they subdivided PCK into domains of knowledge of content and students and knowledge of content and teaching. Their domain of knowledge of content and students addressed the intersectionality of the two components. They found that teachers must know their students well enough to anticipate their challenges with understanding
certain concepts, know what they will find interesting and motivating, and how the students will apply new knowledge (Ball et al., 2008). Park and Oliver (2008) found that students influence how teachers develop, organize, and validate their PCK. They also found that understanding a student’s existing knowledge significantly impacts a teacher’s PCK in planning and conducting instruction and assessment. Understanding student beliefs, understandings, and misconceptions regarding specific topics allow teachers to adjust pedagogical procedures (Hashweh, 2013; Park & Oliver, 2008). Adjusting pedagogical procedures also requires a teacher to have robust subject matter knowledge (Park & Oliver, 2008), which, as previously mentioned, is a prerequisite for the enactment of the components of PCK.

**Knowledge of Assessment**

Shulman’s knowledge of educational ends, purposes, and values is currently referred to by most PCK researchers as knowledge of assessment (Park & Oliver, 2008; Helms & Stokes, 2013). Knowledge of assessment requires understanding the dimensions to be assessed and the methods used to complete an assessment (Tamir, 1988; Magnusson et al., 1999; Park & Oliver, 2008). The dimensions to be assessed include the teacher, the learner, the subject matter, and the context or social environment (Park & Oliver, 2008). According to Park and Oliver’s study (2008), PCK development results in reflection related to knowledge-in-action and knowledge-on-action.
Reactive assessment of teaching is referred to as PCK knowledge-in-action. Initially identified by Schon (1983) as reflection-in-action, PCK as knowledge-in-action is a form of knowledge of assessment. Knowledge-in-action refers to a teacher’s understanding of how to react to unexpected situations in real-time. Park and Oliver (2008) found that all components of PCK are required to transform unexpected, challenging moments into teachable moments. For example, in culinary arts education, laboratory practicum can often lead to unexpected results for students, possibly creating misconceptions. A teacher exhibiting their PCK will effectively integrate all their knowledge bases through instructional strategies that allow students to arrive at new understandings in light of their misconceptions (Park & Oliver, 2008).

Reflective assessment of teaching is referred to as PCK knowledge-on-action. Initially identified by Schon (1983) as reflection-on-action, PCK as knowledge-on-action is also a form of knowledge of assessment. Knowledge-on-action refers to a teacher’s assessment of the knowledge enacted after the teaching situation. Reflecting on what went right or wrong can expand or modify the planning and teaching of specific topics (Park & Oliver, 2008). Whether during instruction or after, reflection-in-action and reflection-on-action synergistically influence each other and PCK development (Park & Oliver, 2008).

Examples of classroom situations can further enrich a teacher’s knowledge base in the form of case study knowledge. Shulman referred to case knowledge as a dynamic that can add to teacher knowledge, the “knowledge of
specific, well-documented, and richly described events” (Shulman, 1986, p. 11). Case examples of instructional events that include all contextual particulars offer the assessment of educational practice in both practical and theoretical terms. Cases can serve as both prototypes and precedents that can guide a teacher’s work by generating ideas and stimulating new thinking (Shulman, 1986). Creating theories and explanations that inform instructional decisions and action is an aspect of PCK that contributes to teacher professionalism (Park & Oliver, 2008).

**Curricular Knowledge**

Schwab (1969) defined curriculum as *what* is to be taught and when and how it is taught. He described curriculum as requiring action; that it is the act of discriminating the knowledge to be learned, the order in which it is taught, and the clear, organized presentation of the knowledge within the context of time, association, and form of application. He believed the navigation of the facets of curriculum require a particularly eclectic and artful knowledge. Schwab stated that one must identify disparities during its application yet be practical in addressing real, not theoretical, discrepancies.

Shulman (1986) believed an entire domain of teacher knowledge is owed to curricular knowledge. As Schwab had identified, Shulman confirmed and defined curricular knowledge as a teacher’s level of understanding the full range of coursework connected to a particular subject, the instructional materials that are required and best suited for their instruction, and which circumstances dictate the use of differentiated program materials (Shulman, 1986; Magnusson et al.,
1999). As does PCK, curricular knowledge represents the knowledge that distinguishes the subject matter expert from the pedagogue (Magnusson et al., 1999). Just as PCK is knowledge and skill (Gess-Newsome, 2015), so too is curricular knowledge. The interconnected courses of a subject require the knowledge and skill to properly blend them, whether they are a priori, concurrent (lateral curriculum knowledge), or subsequent (vertical curriculum knowledge) to the subject at hand (Grossman, 1990). Proper curricular knowledge allows a teacher to connect learning within a program’s pathway laterally and vertically by intersecting related content through common means and materials (Shulman, 1986; Magnusson et al., 1999).

**Contextual Knowledge**

Teaching and learning occur within contexts specific to the teacher, the learner, and the educational environment (Love, 2015). PCK is not simply the possession of the five domains of teacher knowledge; it is the blending and enactment of these domains within unique contexts of instruction (Love, 2015; Park & Oliver, 2008). The coherence among each domain is essential to developing one’s PCK (Park & Oliver, 2008). All components of teacher knowledge influence one another in an integrative fashion that strengthens the enactment of PCK to contextually reflect in-action and on-action (Park & Oliver, 2008).

Shulman saw contextual knowledge as a separate and distinct knowledge base for the development and enactment of PCK (Park & Oliver, 2008). Since
then, several researchers have considered contextual knowledge as an abstract construct of PCK rather than a knowledge base. (Hashweh, 2005; Loughran et al., 2006; Gess-Newsome et al., 2019). Gess-Newsome et al. (2019) define contextual knowledge as an internal construct that allows a teacher to understand how student variations impact instructional decisions. Their study ran a factor analysis on the three constructs of content knowledge, pedagogical knowledge, and contextual knowledge. They revealed pedagogical knowledge and contextual knowledge were not entirely distinct. Pedagogical knowledge “was noted as being intertwined with the context of teaching specific students,” while “content knowledge acted as the subject matter context to be considered” (Gess-Newsome et al., 2019, p. 952). Chan and Yung (2015) conducted a study and found high levels of content knowledge and pedagogical knowledge allow teachers to accommodate the context of the learning environment. For example, a high level of content knowledge will enable a teacher to notice a student’s misconceptions. In contrast, a high level of pedagogical knowledge will allow the teacher to find opportunities to insert instructional strategies as needed (Chan & Yung, 2015). These recent findings suggest that contextual knowledge is embedded within content knowledge and pedagogical knowledge and is essential to one’s PCK.

PCK contextually bridges discipline-specific content knowledge and the practice of teaching and is, therefore, the transformation of the knowledge that combines content knowledge, pedagogical knowledge, and contextual
knowledge (Ball et al., 2008; Grossman, 1990). It, therefore, stands to reason that we need culinary education to include instructors well-versed in culinary subject matter, culinary pedagogy, and contextual knowledge to the extent that they are cognitively aware of and able to enact their culinary PCK. Love (2015) defines the skill of enacting PCK and states, “This intuitive skill is one that cannot be fully taught and is the result of a special blend between content as well as the pedagogical knowledge” (p. 49). Relating to Polanyi’s (1958) assertion that TK fills in the gaps of explicit knowledge, Love is describing the intuitive skill of TK that contextually blends content knowledge and pedagogical knowledge into personal PCK.

Pedagogical Content Knowledge Research

Shulman’s 1987 theory of PCK has since been interpreted and conceptualized in different ways by many researchers, resulting in countless attempts to measure or capture it. His 1986 and 1987 articles on PCK have each been cited over 25,000 times. Most PCK research has been conducted within math and science disciplines (Hashweh, 2013). Still, there have also been many different subject areas such as design and technology (Doyle et al., 2019), business English (Peng, 2013), instrumental music (Haston & Leon-Guerrero, 2008), physical education (Ward & Ayvazo, 2016), CTE (Carpenter, 2012), and countless more. In addition, PCK research has led to educators designing PCK-based teacher education programs and professional development (Hashweh,
2013). The following are some of the influential research and developments that have occurred in the 35-year duration since PCK’s inception; from this, I will demonstrate the progression and evolution of the PCK concept to its current consensus as it stands among the top PCK researchers in the world.

Pamela Grossman is one of the early contributors to PCK research and was a graduate student at Stanford during Shulman’s early work on PCK. Grossman (1990) explored the pedagogical content knowledge of secondary school English teachers with no formal teacher training. She found that all the untrained teachers made the mistake of assuming their content knowledge could replace or offset the planning required for a lesson. In addition, she found their knowledge of students lacking; they often blamed the students for their difficulties instead of altering their approach. Her more significant impact on PCK research was published a year later when she included graduates of a professional educational program for teachers for comparison. When comparing teachers who received teacher education, Grossman (1990) found that teacher education offers teachers better professional preparation by linking pedagogical understanding to subject matter. From this study, she produced a Model of Teacher Knowledge (Fig 2). The model identifies four knowledge bases of teacher knowledge as subject matter knowledge, general pedagogical knowledge, contextual knowledge, and PCK. PCK interacts with each of the other knowledge bases and comprises conceptions of purposes for teaching subject matter, those identified from the teachers that had no formal teacher
training: knowledge of students, curricular knowledge, and knowledge of instructional strategies.

Figure 2 *Model of Teacher Knowledge* (Grossman, 1990, p. 5)

Magnusson et al. (1999) conducted a study on the literature aimed at defining effective science teaching. Informed by Shulman’s (1986;1987) and Grossman’s (1990) works, they were interested in discerning the knowledge that distinguishes a teacher from a subject matter expert. The resultant conceptualization of PCK by Magnusson et al. (1999) built on Grossman’s (1990) model by adding the knowledge base *knowledge of assessment* and reconfiguring how the knowledge bases interrelate. The component *orientations toward teaching* replaced Grossman’s (1990) *conceptions of purposes for teaching*. They defined it as “a teacher’s knowledge and beliefs about the purposes and goals for teaching” (p. 5); it is the filter through which PCK and the
knowledge bases shape each other. Magnusson et al. illustrated their concepts in their Model of Components of Pedagogical Content Knowledge (Fig 3).

Figure 3 Components of Pedagogical Content Knowledge (Magnusson et al., 1999, p. 4)

Maher Hashweh has been exploring teacher knowledge for almost four decades, beginning with his dissertation (1985) on the effects of science teachers' knowledge of subject matter. Lee Shulman was a member of his dissertation committee. From his initial study, Hashweh determined a framework for describing teacher knowledge, including pedagogical knowledge, knowledge of students, subject matter knowledge, teacher values and beliefs (efficacy), and metacognitive knowledge. He also identified a sub-category of teacher
knowledge which he called subject-matter pedagogical knowledge (later, PCK); the knowledge related to teaching topic-specific content.

In 2005, Hashweh reviewed the history of research on PCK to reconceptualize and define it. He conceptualized teacher pedagogical constructions to address problems he associated with PCK. He then proposed a new definition of PCK:

*Pedagogical content knowledge is the set or repertoire of private and personal content-specific general event-based as well as story-based pedagogical constructions that the experienced teacher has developed as a result of repeated planning and teaching of, and reflection on the teaching of, the most regularly taught topics* (Hashweh, 2005, p. 277).

A teacher’s pedagogical construction is a collection of knowledge entities, specific to each teacher, that they accumulate, which shape what, why, and how they teach specific topics (Hashweh, 2005). Pedagogical constructions coincide with Vygotsky’s theory of constructivism: knowledge develops from individuals’ environmental and social interactions. The 2005 study revealed seven assertions of teacher pedagogical constructions, the first one asserting that PCK represents a teacher’s personal and private knowledge. The assertion corresponds with Collins’ (2010) claim that somatic TK is personal and private. As such, Hashweh was asserting that TK is a critical component of PCK.

Loughran et al. (2001) conducted research documenting science teachers’ PCK. They found that the difficulty in portraying teachers’ knowledge is
explicating the TK of experienced teachers. Their contribution was an attempt to codify PCK for science teachers through articulation and documentation. From their effort to foster collaborative discussion and professional development amongst teachers, they constructed a format called Content Representations (CoRes) and Pedagogical and Professional-experience Repertoires (PaP-eRs). A CoRe is a topic-specific central content representation that addresses PCK concepts for each topic, such as *why is this important?* *Difficulties in teaching this concept, knowledge about student influence,* and *teaching procedures.* CoRes are representations of what a teacher understands about particular content and how it shapes their pedagogy. PaP-eRs, which are narrative accounts of specific instances of PCK-on-action, accompany CoRes. The two guiding features of PaP-eRs are (1) they are of particular content and are attached to that content, and (2) a diversity of PaP-eRs is required to address the many aspects of PCK. When linked with PaP-eRs, CoRes become the collective PCK of expert teachers for a specific topic (Hume & Berry, 2011). CoRes and PaP-eRs are currently being used in development programs for pre-service teachers, teacher educators, and in-service teachers in countries around the world, such as Australia, New Zealand, Sweden, and South Africa (Berry, 2018).

The process of deconstructing one’s teaching through CoRes and PaP-eRs is the articulation of a teacher’s TK. Loughran et al. (2001) explained that articulating TK is an essential element of a profession so that it may be analyzed and understood by others. In their words, “much of what PCK may be is tacit in a
science teachers’ practice and that the ability to recognize and document it is influenced by the researchers’ understanding of what they believe they are looking for” (p. 26).

Park and Oliver (2008) conducted a multi-case study aimed at conceptualizing PCK in a new way to understand teachers as professionals better. Their study was an effort to capture the evidence of PCK by analyzing segments of teaching to reveal explicit PCK. Explicit PCK was identified through observation and described by what the teacher did, why they did it, and what the teacher knew. From their findings, they developed a model of pedagogical knowledge for (science) teaching, comprised of six interactive components (Fig 4): (1) orientation to teaching, (2) knowledge of curriculum, (3) knowledge of students, (4) knowledge of assessment, (5) knowledge of instructional strategies, and (6) teacher efficacy.
Figure 4 *Hexagon model of pedagogical content knowledge for science teaching* 
(Park & Oliver, 2008, p. 279)

Park and Oliver (2008) based their new conceptualization of PCK as an internal and external construct; they believed researchers must examine PCK as a teacher’s understanding and enactment. The study resulted in several findings that have significantly impacted PCK research. First, they found teachers develop PCK through reflection within instructional contexts, both in-action (during) and on-action (after); they noted that a teacher’s reflective capacity impacts PCK development. Also, students significantly impact PCK development; understanding their misconceptions plays a significant role in shaping one’s PCK. As for enactment, PCK is idiosyncratic due to its internal construct, context, and interrelationship between domains. Finally, Park and Oliver found teacher efficacy to affect one’s PCK. Meaning, teacher beliefs about their ability to enact specific methods of teaching specific subject matter to affect the ability to teach effectively directly impacts their PCK.

**Pedagogical Content Knowledge Consensus**

In 2012, many of the top PCK researchers assembled a PCK summit to conceptualize and define PCK among each other. At the summit, Lee Shulman spoke about the genesis of PCK, its evolution, and his current views on it. He talked about how the concept of PCK came about, that it is domain or content-specific. Shulman described that disciplines have more than one structure, that
they are unique to the way the discipline is organized for both inquiry and teaching. Each structure frames how a discipline is explicated into something someone can learn. He spoke about teacher education and the fact that every taught profession requires specific modes of teaching he called signature pedagogies. Each discipline’s signature pedagogy differs from every other discipline’s signature pedagogy. Signature pedagogies suggest that there needs to be education designed to identify, assess, and improve the modes of teaching in every profession, including teaching culinary arts. Shulman concluded by postulating the question, “what is the professional identity?” of an expert teacher in any discipline. The inquiry is at the heart of what Shulman designed PCK to determine. Similarly, Loughran et al. (2001) described PCK research as probing the essence of teaching itself. They were searching for what makes a professional teacher an expert professional teacher. Likewise, in this study, I am searching for what makes a professional culinary teacher an expert professional culinary teacher.

During Shulman’s keynote speech, he identified four things that are missing from his original concept of PCK: (1) the affect, or the emotion of the teacher on the learning environment, (2) the process; he believed that he originally placed too much emphasis on reasoning in place of the act of teaching, (3) the context, and (4) outcomes such as the relationship between how teachers think and evidence of student learning. Shulman stated that his original concept of PCK was too cognitive and not enough about the teachers themselves.
Shulman’s introspect correlates with Hashweh’s (2005) assessment that PCK is personal and private, and everyone idiosyncratically constructs their own. Also, his acknowledgment that context is a larger construct of PCK than originally conceptualized echoes the findings of Gess-Newsome et al. (2019). They found that contextual knowledge is an internal construct intertwined with content knowledge and pedagogical knowledge and Park and Oliver’s (2008) assertion that context places limitations on the learning environment.

From the summit emerged the Consensus Model of PCK (Fig 5). The Consensus Model was an amalgam of many of the findings from PCK researchers over the years. The PCK experts reduced teacher professional knowledge bases to five, with contextual knowledge conceptualized as a construct that amplifies and filters knowledge used in the classroom. Classroom practice is amplified and filtered by student beliefs and misconceptions, resulting in student outcomes. As Shulman had identified, he initially overlooked student outcomes, but in this model, they result from a teacher’s PCK; they inform classroom practice, the professional knowledge bases, and topic-specific professional knowledge.
As they did in the first summit, the researchers of the second PCK Summit in December of 2016 designed a newly conceptualized model of PCK (Fig 6). The most recent Consensus Model, the Refined Consensus Model, further demonstrates the evolution PCK has undergone since its inception. Since we know PCK consists of personal TK, an inherent difficulty exists with its explication; explicating personal TK is not a cultural norm of the profession of teaching (Loughran et al., 2001). We know from Park and Oliver (2008) that a model of PCK must demonstrate its understanding and enactment. The summit researchers understood this and designed the Refined Consensus Model of Pedagogical Content Knowledge to begin and end with the teacher’s pedagogical reasoning.
The Refined Consensus Model includes the five of Shulman’s domains of teacher knowledge from the first consensus model: content knowledge, pedagogical knowledge, curricular knowledge, knowledge of students (Shulman’s knowledge of pupils), and assessment knowledge (Shulman’s knowledge of educational ends). A noticeable distinction in the Refined Consensus Model is that content knowledge is conceptually contributing fifty percent of the teacher knowledge base. In this illustration (Fig 6), the knowledge bases are informing and informed by three modalities of PCK: collective PCK, personal PCK, and enacted PCK. Collective PCK is a shared professional community’s knowledge of a discipline, topic, and concept specificity (Rodriguez & Towns, 2019). Personal PCK exchanges knowledge with collective PCK through the implicit and explicit mediation of a teacher’s TK. Collective PCK and personal PCK are also interrelated through the learning context in which students contribute knowledge, conceptions, and misconceptions. Enacted PCK informs and is informed by personal PCK and collective PCK. Idiosyncratically, the teacher’s pedagogical reasoning cyclically enacts their PCK through planning, teaching, and reflecting-in-action and on-action.
Collective and Personal Pedagogical Content Knowledge

The consensus among PCK researchers (Shulman, 1987; Grossman, 1990; Hashweh, 2005; Park & Oliver, 2008) is that PCK is topic- and content-specific. The first consensus model of 2012 depicted this understanding by dedicating a realm of PCK as a teacher's topic-specific professional knowledge; it includes instructional strategies, content representations, and discipline-specific practices. The knowledge in this realm is said to be collective because it is the explicit knowledge that has been codified by experts and made available for use by teachers (Gess-Newsome, 2015). Magnusson et al. (1999) and Park and Oliver (2008) identified collective PCK simply as knowledge of instructional strategies. By canonizing instructional strategies as collective knowledge, it
becomes normative in function. Collective knowledge allows for the construction of measurements, tests, and rubrics and, therefore, can be used as a framework for designing professional development (Gess-Newsome, 2015). An example of its practicality in this manner is the application of Content Representations (CoRes), where a community of pedagogical input offers insight to teachers on specific subject matter. As originally devised, CoRes represent a conceptualization of expert teachers’ collective PCK for a specific topic (originally for science) (Hume & Berry, 2010). The result is somatic TK becoming collective TK through social embedding (Collins, 2010). When examining the Refined Consensus Model from the outside inward, the knowledge bases shape or inform the collective PCK for a specific topic, which in turn is filtered or amplified by the learning context and student conceptions and misconceptions, and then interpreted by the individual’s personal PCK and enacted PCK.

The original summit of PCK researchers created a consensus for a new conceptualization of PCK. Of particular interest was the conceptualization of personal PCK due to its fluid, contextual, and private nature. As a result, Gess-Newsome (2015) defined personal PCK and a related construct called personal PCK and skill. They described personal PCK as explicit reflection-on-action and PCK and skill as both tacit and explicit reflection-in-action. Gess-Newsome (2015, p. 35) defines the two concepts as follows:
• **Personal PCK** is the knowledge of, reasoning behind, and planning for teaching a particular topic in a particular way for a particular purpose to particular students for enhanced student outcomes.

• **Personal PCK and skill** is the act of teaching a particular topic in a particular way for a particular purpose to particular students for enhanced student outcomes.

These definitions demonstrate the differentiation that must take place for effective classroom instruction. The explicit aspects of personal PCK are the agentic acts of planning for and reflecting on the instruction. The tacit aspects of personal PCK can be found in the implementation of instructional planning and reasoning (Gess-Newsome, 2015). These definitions address the fact that teaching from the PCK framework is contextually specific to the topic, the purpose, the student, and the environment. These definitions also address the fact that skill, a tacit form of knowing (Polanyi, 1958), plays a part in effective teaching.

The tenets of PCK have been the basis for designing pre-service teacher education programs, teacher assessment, and continuous professional development programs for over three decades (Hashweh, 2013). Yet, the current conceptualization of the Refined Consensus Model is better suited to guide future research and help target opportunities for professional development (Gess-Newsome, 2019). By defining different types of PCK and identifying the explicit and tacit nature of PCK, educators can design professional development
activities to target specific types of knowledge for specific topics and specific students (Gess-Newsome, 2015). In addition, the PCK experts identified the contextual variables as amplifying or filtering PCK, offering the opportunity to recognize and examine their mediation.

Pedagogical Content Knowledge in Culinary Arts Education

PCK experts designed the Refined Consensus Model to improve teachers’ knowledge in teaching science. Yet, from its design, it is generalizable to teaching any subject matter in a curriculum-based setting. Carlson and Daehler (2020) justified the model’s reformation as a valuable tool for those who conduct research in other domains. Its adaptability lies within the learning context of the discipline being taught. The learning context serves as a filter that mediates teacher actions based on the educational climate and individual student attributes (Carlson & Daehler, 2020). The uniqueness of culinary pedagogy dictates culinary educators have a deep knowledge of a learning context based on both science and art. The culinary learning context, as is the science learning context, is the tacit separation and connection of a teacher’s personal PCK and their collective PCK.

Pedagogy is the science and art of education, which uses methods to discover, evaluate, and coordinate theoretical reasoning (Best, 1988). Pragmatistic theorists Dewey and Vygotsky viewed teaching and learning as conditional and contingent (Daniels, 2002). But Vygotsky did not believe uniform
methods existed for either; instead, they are socially collaborative and contextual activities. Heusdens et al. (2016) argued that the domain of CTE is more than theory versus practice; it is complex, and it must contextualize both the teaching of skill and theoretical knowledge. Contextualizing is “bringing any judgment or action into a more conceptual context” (Heusdens et al., 2016, p. 158). The contextualization of vocational knowledge involves conceptualizing and concretizing (Heusdens et al., 2016). Heusdens et al. (2016) defined conceptualizing as the inference required to connect concepts within particular situations in relation to other concepts. Concretizing is building knowledge in a constructivist fashion; knowing what sequentially follows understanding an aspect of an occupational practice (Heusdens et al., 2016). Therefore, the contextualization of vocational instruction is a blending of context informing constructivism, which provides the coherence of concepts in various situations.

Culinary students require various pedagogical strategies to maximize the learning process (Muller et al., 2009). According to Carlson and Daehler (2020), student attributes are the most critical aspect of the learning context; a skilled teacher draws from this knowledge to best facilitate learning. Specialized practices such as experiential learning, problem-based learning, group projects and discussions, and review sessions are most effective in helping vocational students develop and concretize various concepts’ skills, methods, and methodology (Bice, 2019). Moreover, culinary students require the appropriate equipment, resources, and technology to be made available to facilitate a
successful learning experience, making the content and pedagogical course design a dynamic creation. Through professional development, vocational instructors can learn to utilize sound methodology in course design so that learners are clear about the relevancy of pedagogical methods; this creates a dialogical relationship that can create pathways for students to understand how they achieve personal goals and aspirations (Bice, 2019).

Implications for Professional Development

Professional development is the process of continued career training that supports and promotes professional growth (Clarke & Hollingsworth, 2002). Professional development for educators is a series of learning opportunities designed to address best teaching practices to meet student needs (Hughes, 2017). The broad definition of professional development presented by Hughes (2017) includes the development of both pre-service and in-service educators. Empirical data shows professional growth and a lasting change in a teacher's pedagogy resulting from professional development (Clarke & Hollingsworth, 2002). Research widely views professional development as an essential part of the growth in teachers' subject matter knowledge and teachers' practices and instructional quality (Hughes, 2015). Clarke and Hollingsworth (2002) define teacher growth as a process of teachers' knowledge growth through participation in professional development programs and their experiences in the classroom. Professional development for expert teaching must include components
dedicated to growing the teacher knowledge bases and improving the processes that enact them (Magnusson et al., 1999).

Researchers (Guskey, 1986; Clarke & Hollingsworth, 2002) have long regarded professional development in education as the driving force behind improving and reforming it, with the most effective leading to changes in teachers’ beliefs and attitudes. In fact, according to Borko et al. (2010), broad-based educational reform is a derivative of pedagogy, student learning, and teacher professional development. Evidence shows that learning about teaching correlates to improved teaching; faculty who participate in pedagogical professional development activities have been shown to alter their classroom pedagogy (Condon et al., 2016).

Guskey’s (1986) traditional linear model (Fig 7) of this process proposes that professional development changes teacher knowledge to the point that it changes a teacher’s classroom practices, which leads to changes in student learning outcomes and eventually leads to changes in teachers’ beliefs and attitudes (Hashweh, 2013).

Figure 7 A Model of the Process of Teacher Change (Guskey, 1986)
Clarke and Hollingsworth (2002) built upon Guskey’s linear model to create an interactive model (Fig 8) that connects the changes in teacher cognition and classroom practices through the mediating processes of enaction and reflection. They described teacher change through six perspectives:

- Change as training
- Change as adaptation
- Change as personal development
- Change as local reform
- Change as systemic restructuring
- Change as growth or learning

Figure 8 The Interconnected Model of Teacher Professional Growth (Clarke and Hollingsworth 2002).

Clarke and Hollingsworth (2002) defined change from professional development as that of growth or learning, the inevitable change through
professional activity. In this regard, change occurs through a teacher’s learning, as they are themselves learners who work in a learning community (Clarke & Hollingsworth, 2002). Lee et al. (2007) found that professional development programs that foster collaborative work between beginning teachers and experienced teachers promote the growth of PCK in beginning teachers. No longer seen as a process of individual development but rather an opportunity to create a community of learners (Hashweh, 2013; Borko & Koellner, 2010), professional development should provide collaboration within professional communities. A community of teachers lends to a community of practice, an essential component of high-quality professional development (Van Driel & Berry, 2012; Clarke & Hollingsworth, 2002). The act of passing knowledge collaboratively in a community of scholars stimulates new perspectives on thinking, helps build a professional identity, and allows for adopting effective habits (Paris & Winograd, 2003).

A framework for professional development administration includes facilitating the knowledge and skills needed for teaching by facilitators with knowledge about both teaching skills and professional development. Professional development can be self-directed, informal, or part of a training model, all of which have been shown to produce measurable changes in the way participants teach (Condon et al., 2016). According to McLaughlin (1990), formal training models vary but should contain both macro and micro-level characteristics to be considered effective in design. On a macro-level, educators should design
Professional development to improve teachers’ content and pedagogical knowledge. Educators should also organize professional development with time directed towards collaborating, sharing, and aligning with colleagues and offer evaluation of the process and analysis of student learning data (Hughes, 2015). On a micro-level, research has shown that effective professional development should focus on teachers’ content knowledge, pedagogical content knowledge (PCK), self-regulation, reflection, and metacognition (Hughes, 2017).

**Effective Professional Development**

Professional development literature has proposed various characteristics considered essential for the effectiveness of professional development programs (Hughes, 2017). Effective professional development includes developing educators’ PCK, metacognitive awareness, self-regulation, pedagogical reasoning, self-efficacy, planning, and active teaching skills. Due to professional development and educational complexity, it has been challenging to identify specific elements that make professional development effective (Hughes, 2017). Professional development programs frequently consider improving teachers’ practices through professional development implementation to enhance student learning. There are few options available for improving teacher practices other than professional development (Hughes, 2017).
Researchers (Hashweh, 2013; Coenders & Terlouw, 2015) have debated, researched, and implemented professional development based on PCK in various ways over the last several years. Van Driel and Berry (2012) indicated that professional development based on PCK must supply teachers with subject matter input and closely align with teachers’ professional practice. The primary differentiating construct of PCK professional development is reflection as a tool for learning from experience and professional development activities (Hashweh, 2013). Examples of instructional practices for specific topics can lead to personal and collective reflection. Van Driel and Berry (2012) and Hashweh (2013) determined that programs aimed at developing PCK should be based on constructivist and situational theories because they have a higher aptitude for building upon reflection and experience.

Magnusson et al. (1999) found that because PCK is a definable construct, it can guide the critical dimensions of expertise in teaching when designing pre-service and in-service teacher education programs. They focused on the knowledge bases as the components educators should address when designing teacher education programs. Although their research addressed science teachers’ PCK, one can equally apply it to culinary teachers. Where they used the word science, it has been replaced with culinary. Magnusson et al.’s (1999) components of PCK professional development are as follows:

- Knowledge of orientations to teaching culinary
- Knowledge of culinary goals and objectives
• Knowledge of subject-specific strategies
• Knowledge of specific culinary curricula
• Knowledge of students’ understanding
• Knowledge of culinary assessment
• Knowledge of topic-specific strategies

The researchers realized that only a fraction of a teacher’s PCK can be developed from pre-service teaching programs. Practicing teachers will require critical perpetual PCK development through programs that focus on reflecting on teaching. Such programs should occur within a community of educators and be guided by those with the necessary expertise.

Gess-Newsome et al. (2019) conducted research that aimed at developing a model for PCK professional development. They focused their PCK Reflection Instrument on capturing how teachers plan for instruction. The two-step process had teachers describe the planning and teaching of a specific subject, then elicit their instructional decision-making through written reflection and interviews. The resultant data showed a strong correlation between a teacher’s subject matter knowledge and their content knowledge; they also found that content knowledge and pedagogical knowledge are moderately correlated, confirming PCK as a unique construct distinct from subject matter knowledge and general pedagogical knowledge. The same study provided evidence that professional development focused on content and pedagogy improved teachers’ knowledge about specific
topics, pedagogical knowledge, and teaching practice (Gess-Newsome et al., 2019).

**Enacted Pedagogical Content Knowledge**

Enacted PCK informs and is informed by personal PCK and collective PCK (Carlson & Daehler, 2020). The teacher and their particular set of knowledge and skills are at the center of the Refined Consensus Model. The centrality and innateness of the individual teacher within the Refined Consensus Model indicate that the model is unique to each teacher’s professional journey, attitudes and beliefs about students, and how experiences have shaped their personal PCK over time (Carlson & Daehler, 2020). The interchange of knowledge between personal PCK and enacted PCK is an idiosyncratic transaction with collective PCK where collective knowledge advises and is advised by the dynamics of the Refined Consensus Model inter-modalities. The Refined Consensus Model does not fully explain how a teacher enacts PCK. Instead, the literature (Uzuntiryaki-Kondakci et al., 2017; Paris & Winograd, 2003) defines a teacher’s pedagogical reasoning as requiring internal processes. In the following sections, I will discuss metacognitive awareness, teacher self-regulation, teacher efficacy, and pedagogical reasoning as the internal processes that both filter and make the enactment of PCK possible.

**Metacognitive Awareness**
Cognition is the acquisition and understanding of knowledge that permits goal-oriented behavior (Andrews & Monsó, 2021). Bloom (1956) defined knowledge as the behaviors that “emphasize the remembering, either by recognition or recall, of ideas, materials or phenomena” (p. 62). Bloom also categorized knowledge into specific types (remembering, understanding, applying, analyzing, evaluating, and creating), just as Polanyi and Collins categorized knowledge as either explicit or tacit. Individuals acquire knowledge through various mediums; the mediums and individuals processing the information shape the perception of the knowledge into one’s personal cognition (Rockmore, 1997). Whereas cognition is essential for the knowledge and understanding to invoke a task, metacognition is the comprehension of how to monitor and complete the task (Hughes, 2017).

Metacognition is often referred to as thinking about thinking; it is one’s regulation of their learning that allows for the observation, development, and evaluation of their knowledge (Hughes, 2017). Metacognition impacts cognitive goals and tasks by assessing outcomes that lead to new goals or revising or abandoning old ones (Flavell, 1979). Metacognition also refers to the awareness of one’s personal knowledge; a metacognitively aware person knows what they do and do not know (Meichenbaum, 1985). Shulman (1987) stated that a professional teacher is able to metacognitively reflect on the practice of their craft, leading to self-knowledge and improved professional decisions. Flavell
(1979) postulated that metacognitive awareness could be a valuable method for better comprehension in formal settings for both children and adults.

Metacognitive awareness is the perception of one’s knowledge of cognition and regulation of cognition (Hughes, 2017). A person with knowledge of their cognition knows what impact their and others’ learning and knows when, why, and how to accomplish cognitive tasks (Hughes, 2017). Regulation of cognition is the process of activities used to oversee learning (Hughes, 2017). Just as the Refined Consensus Model identifies the steps of enacting personal PCK as planning, teaching, and reflecting, Brown (1987) similarly identified the steps of regulation of cognition as planning behaviors, monitoring behaviors, and checking outcomes.

**Teacher Self-regulation**

Self-regulation, like pedagogical reasoning, is a process that is dependent upon one’s beliefs and motives (Zimmerman, 2000). Zimmerman (2000) defined self-regulation as “self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals” (p. 14). Teachers must self-regulate to effectively enact their instruction, a process Uzuntiryaki-Kondakci et al. (2017) call teacher self-regulation. A teacher that is a self-regulator possesses high self-efficacy and intrinsically motivates their goal-setting and strategic planning (Uzuntiryaki-Kondakci et al., 2017; Zimmerman, 2000). Self-regulation depends on one’s metacognition, self-beliefs, and reactions within specific performance contexts (Zimmerman, 2000). The three
metacognitive strategies of self-regulation are knowing what the strategy is, how the strategy operates, and when and why a strategy should be applied (Paris & Winograd, 2003). This self-management of thinking is unique to each person's experiences, capabilities, and beliefs (Uzuntiryaki-Kondakci et al., 2017; Paris & Winograd, 2003). Teacher self-regulation is influenced by one's beliefs, allowing them to complete professional tasks (Uzuntiryaki-Kondakci et al., 2017). Enacting one's beliefs requires a level of self-efficacy, defined as “personal beliefs about having the means to learn or perform effectively” (Zimmerman, 2000, p. 18).

The constructs of teacher self-regulation and PCK are related, distinct, and mutually interact (Uzuntiryaki-Kondakci et al., 2017). Uzuntiryaki-Kondakci et al. (2017) conducted a study on the interaction between teacher self-regulation and PCK and found PCK influential within each phase of teacher self-regulation. They found pre-service teachers with low PCK inadequately plan horizontally and vertically related topics in the planning phase. Pre-service teachers also focused more on which representations to use and not enough on effectively implementing them. Teachers with low subject matter knowledge did not adequately plan subject-specific strategies for their instruction. During the performance, or teaching phase, the researchers found low subject matter knowledge weakens the regulation of instruction. As domains of PCK developed, teacher self-regulation improved, which confirms the theory of PCK as one of understanding and enactment. In the self-reflection phase, the researchers found that teachers with limited experience demonstrate low levels of PCK, limiting self-
regulatory processes and resulting in superficial reflections. Because culinary arts education is contextually based, teacher self-regulation allows culinary educators to enact strategies across various relationships and situations. The lack of research in this area indicates a need to understand what factors are determinant in culinary teachers’ self-regulatory strategies so educators can construct professional development to improve the quality of culinary education.

Teacher efficacy

According to Park and Oliver (2008), the conduit connecting a teacher’s plan and its enaction is teacher efficacy. An efficacious teacher carries a genuine interest in the teaching profession and is likely to use self-regulatory processes (Uzuntiryaki-Kondakci et al., 2017). Bandura (2001) stated that efficacy is the foundation of human agency, where one’s belief to produce desired results ultimately affects adaptation and change. Social Cognitive Theory states that self-efficacy mediates behavior because it regulates motivation and outcome expectations (Bandura, 1986; Park & Oliver, 2008). The process of teacher efficacy is cyclical in that it is strengthened through experience, and the stronger it is, the more willing one is to try new strategies and experiences (Park & Oliver, 2008). Grossman (1990) depicted teacher efficacy as the knowledge of the purposes for teaching particular subject matter; Magnusson et al. (1999) called it orientations toward teaching. A high level of teacher efficacy reflects professional determination and a willingness to implement learned strategies (Park & Oliver, 2008; Guskey, 1988). Park and Oliver (2008) were able to link teacher efficacy
and PCK due to efficacy encouraging teachers to enact their understanding; teachers then execute PCK in the contexts they feel comfortable and competent.

**Pedagogical Reasoning**

Pedagogical reasoning is at the center of the Refined Consensus Model because it is where the teacher regulates the relationship between the procedures and principles of teaching. Within this state of reasoning, teachers make decisions based on their knowledge base and contextually enact them (Ong’ondo, 2017). Beliefs that are predominantly idiosyncratic or come from personal ethical, theoretical, empirical, or practical principles guide teacher actions (Shulman, 1987). A teacher’s knowledge base guides their choices and actions to allow skillful teaching grounded in sound reasoning (Shulman, 1987). Reasoning is a process of understanding a certain knowledge, eliciting that knowledge, reflecting on the elicitation, and imparting the gained knowledge back into the process (Uzuntiryaki-Kondakci et al., 2017; Shulman, 1987). This process of reasoning, which requires self-regulation, can be enacted for both learners and teachers (Uzuntiryaki-Kondakci et al., 2017).

Self-regulation is rooted in Social Cognitive Theory, which Bandura (2001) describes as subscribing to a model of “emergent interactive agency” (Bandura, 2001, p. 4). From Bandura’s (2001) *Social Cognitive Theory: An Agentic Perspective*, agency refers to intentional acts. An agent is a self-regulator, a willful participant in the interaction of their environment (Uzuntiryaki-Kondakci et al., 2017; Bandura, 2001). Agentic interaction includes experiencing stimulation
and “exploring, manipulating, and influencing the environment” (Bandura, 2001). Intentionality requires a plan of action that considers the involvement of other participating agents (Bandura, 2001). Meaning, collaborative activities such as teaching and learning must purposefully and mindfully meld the collective common goals and intentions of all the interdependent plans of action. Bandura’s Social Cognitive Theory (1997) outlines human agency as requiring a plan consisting of intentionally driven forethought, self-reactiveness, and self-reflectiveness (Uzuntiryaki-Kondakci et al., 2017; Bechtol, 2020). Chan and Yung (2015) point to these same steps as leading to PCK development in teachers, defining it as “repertoire enrichment” (p. 1248). According to Paris and Winograd (2003), understanding these processes and deliberately applying them is the metacognitive aspect of self-regulated learning. Shulman (1987) identified these processes as pedagogical reasoning, consisting of comprehension, transformation, instruction, evaluation, and reflection.

Shulman depicted the aspects of pedagogical reasoning with his (1987) Model of Pedagogical Reasoning and Action (Fig 9.). His model began with teacher comprehension of both content and purposes. He believed teachers must first critically understand what is to be taught and how to present it in several ways so that it connects to other ideas within the subject matter and other subjects. He also viewed comprehension of educational purposes, such as developing student understandings, inquiry, and skills, equally as important in teacher development. Shulman’s comprehension of content and purposes is a
precursor to the transformation of comprehended ideas. Still, if more accurately viewed as idiosyncratic and cyclical, comprehension and transformation are cogs in the interconnectivity of pedagogical reasoning.

**Figure 9 Shulman’s Model of Pedagogical Reasoning and Action** (Juhler, 2017)

**Planning**

The first step in Shulman’s (1987) transformation of pedagogical reasoning is the preparation of clarifying purposes, which Bandura (2001) and Zimmerman (2000) identified as forethought, and which current PCK researchers refer to as planning (Table 3). Bandura (2001) described outcomes as the consequences of agentic acts, meaning individuals can intentionally design different outcomes with forethought. Anticipated outcomes are motivated by
projected goals and directed by strategic planning (Uzuntiryaki-Kondakci et al., 2017; Bandura, 2001). Self-regulation of personal standards and evaluation of possible outcomes augment expectations of outcomes during the planning, or forethought, phase (Bandura, 2001). Planning includes having the appropriate awareness to set goals and allocate resources concerning completing a cognitive task (Hughes, 2015). According to the Refined Consensus Model of 2017, planning is one of the three steps, along with teaching and reflecting, within pedagogical reasoning for enacting one’s PCK.

In education, teachers prepare for instruction by establishing objectives, determining strategies to accomplish the objectives, considering the contextual implications (i.e., physical setting, student conceptions and misconceptions, curricular impact), and selecting the appropriate assessment methods (Uzuntiryaki-Kondakci et al., 2017). Shulman (1987) similarly described these steps within the process of transformation as representation of the topic, selection of instructional repertoire, and adaptation and tailoring to specific student characteristics. He viewed these steps as “the essence of the act of pedagogical reasoning” (p. 16), those that guide the explicit and tacit acts of teaching.

Table 3

*Synthesized Models of Reasoning*
<table>
<thead>
<tr>
<th>Subprocesses</th>
<th>Cyclical self-regulatory phases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding of purposes, evaluation of possible outcomes, determine representational repertoire</td>
<td>Comprehension</td>
</tr>
<tr>
<td>Forethought</td>
<td>Plan</td>
</tr>
<tr>
<td>Transformation</td>
<td></td>
</tr>
<tr>
<td>Enacting knowledge, strategy of task, self-observation</td>
<td>Instruction</td>
</tr>
<tr>
<td>Performance</td>
<td>Teach</td>
</tr>
<tr>
<td>Self-reactiveness</td>
<td>Evaluation</td>
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<tr>
<td>Self-reflection</td>
<td>Reflection</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Reflect</td>
</tr>
<tr>
<td>Self-evaluation, reviewing affect, reconstructing</td>
<td></td>
</tr>
<tr>
<td>Self-reflection</td>
<td></td>
</tr>
<tr>
<td>Self-reflectiveness</td>
<td></td>
</tr>
</tbody>
</table>

Active Teaching

Gess-Newsome et al. (2019) found that the act of transforming instructional preparation into classroom representation is embedded within PCK. Park and Oliver (2008) found that PCK manifests itself during knowledge-in-
action; teachers often need to adjust during challenging moments throughout instruction. Shulman’s process of instruction within pedagogical reasoning is the culmination of enacting one’s teacher knowledge base through various teaching acts. Shulman (1987) defined active teaching as classroom management, presentation of topics, assigning and assessing student work, and effective interaction with students. The greater a teacher’s knowledge base and efficacy, the more flexible and interactive they can be in their classroom instruction (Park & Oliver, 2008). Love (2015) suggested that more experienced teachers tend to rely on their intuition rather than metacognitively reflecting in-action, indicating that experience (informal) and professional development (formal) create a teacher’s TK, which can improve teaching in-action.

Active teaching is an idiosyncratic process that is uniquely bound with comprehension and transformation of pedagogical understanding (Shulman, 1987). Paris and Winograd (2003) found that the more teachers understand their thinking processes, the more likely they can effectively model them to students. Self-regulation makes modeling of thinking possible, allowing it to influence the classroom context (i.e., goals, teacher-student relationship) (Paris & Winograd, 2003). Self-regulators are motivated and action-oriented; they implement their goal-driven plans while monitoring their execution (Bandura, 1986; Bandura, 2001). Monitoring behaviors within the context in which they occur is the first step in the self-reactive (reflection-in-action) process (Bandura, 2001). Within Shulman’s process of pedagogical reasoning, teachers enact the evaluation
phase during and after teaching as an assessment of both learning and teaching, revealing necessary adjustments to be understood as a new comprehension for the next phase of planning.

Reflecting

Self-reflectiveness is another feature of human agency within Social Cognitive Theory; it is the metacognitive ability to reflect upon the adequacy of one’s thoughts and actions (Bandura, 2001). Hughes (2019) indicated that the term reflection is used in “educational settings to circumscribe the process of being metacognitive” (p. 4). Hughes (2019) suggested that educators need to engage in reflection to develop the broader skillset, metacognitive awareness. Shulman’s (1987) reflection within pedagogical reasoning is a teacher’s action after teaching and learning have occurred. PCK reveals itself during reflection, both in-action and on-action (Park & Oliver, 2008). During evaluation and reflection, new understandings are realized for what did and did not work, based on expectations and outcomes, during the teaching phase, the planning phase, or both. Reflection (on-action) is a function of the knowledge base knowledge of assessment and is the evaluation of all the pedagogical reasoning processes that preceded a teaching outcome (Shulman, 1987; Park & Oliver, 2008). Individuals judge outcomes by personal predictive and operative thinking, the effects of other people’s actions and beliefs, and deductions from established collective knowledge (Bandura, 2001).
Reflective practice is a prerequisite for ongoing professional learning (Hoekstra et al., 2018). Palahicky and Andrews-Brown (2018) propose that when teachers critically reflect on their pedagogical values, they increase the effectiveness of their learning environments. Hegarty (2011) identified reflection from culinary teachers as central to critical inquiry about the profession’s assumptions and practices. Hoekstra et al. (2018) conducted a study that looked at two different types of teacher reflection: action-oriented and meaning-oriented. Action-oriented reflection is the evaluation of what worked and did not work during instruction; this type of evaluation can inform an instructor of necessary explicit instructional adjustments. Meaning-oriented reflection is more in-depth and evaluates why a strategy did or did not work; this type of evaluation can inform an instructor of necessary contextual and tacit adjustments. The researchers concluded that formal teacher training for instructors of CTE should include meaning-oriented reflection.
CHAPTER THREE
RESEARCH DESIGN

Overview

Chapter three explains the methodology used in this phenomenological study. The purpose of this study was to explore the pedagogical content knowledge (PCK) of culinary educators at the secondary and postsecondary levels based on their varying levels of experience. First, the chapter presents the research purpose and problem statement. Next, the research question is presented, followed by the rationale for the study design. Then, the chapter presents the data collection procedures, including the semi-structured open-ended PCK interview questions (see Appendix C). Finally, it describes the qualitative techniques used to analyze the data of the participants’ answers to the interview questions.

Purpose Statement

The purpose of this phenomenological qualitative study was to explore the theory of expert teaching by comparing culinary educators at the secondary and postsecondary levels based on their varying levels of experience. Experience for culinary educators included:

- Pre-service teacher training.
- In-service teacher training.
- Professional industry experience.
• Teaching experience.

The primary goal of this phenomenological study was to examine the impact professional experience has on culinary educators' PCK. Distinctions in PCK include collective PCK, personal PCK, and enacted PCK. The outcome of this study could be used to determine the need for designing a professional development program for culinary educators based on improving levels of PCK and tacit knowledge (TK).

Problem Statement

There have been numerous studies on expert teaching in many fields, primarily scientific and mathematical, but research is lacking for the field of culinary arts education. According to Hegarty (2015), we lack an abundance of effective professional culinary practice and how it should be taught. Research (Park & Oliver, 2008; Magnusson et al., 1999) shows that expert teaching necessitates the possession and enactment of PCK. PCK represents the knowledge that is unique to the profession of teaching and not something typically held by nonteaching subject matter experts (Marks, 1990). An expert teacher’s PCK allows them to transform content knowledge into pedagogical forms that are contextually adaptive. PCK is contextual TK that can be made explicit by regulating one’s cognition. Given that culinary education is a contextually taught art form, an expert culinary teacher requires the possession of PCK. In addition to possessing PCK, an expert culinary teacher contextually
enacts their PCK within various environments by regulating their pedagogical reasoning.

There have been two significant summits (2012 & 2016) to determine a consensus model for PCK. Before the most recent consensus, there had been many pre-service teacher education programs and continuous professional development programs based on the tenets of PCK. The most recent conceptualization, the Refined Consensus Model, is better suited to guide future research and target opportunities for professional development (Gess-Newsome, 2019). As a result of the Refined Consensus Model, the comprehensive definition and identification of the explicit and tacit nature of PCK have opened the possibility to design professional development activities that target specific types of knowledge for specific topics and students. In addition, the new model has identified contextual variables as amplifying or filtering PCK, which presents the opportunity to recognize and measure their mediation. Therefore, determining whether a pre-service teacher or professional development program model for culinary educators based on the Refined Consensus Model is warranted first requires understanding to what extent culinary educators possess and enact their culinary-specific PCK.

Most PCK research has been conducted on the teaching of science. In culinary education, there is an added dimension of tacit artistic knowledge. In ancient Greece, technê, translated as craft or art, was interchangeable with the term epistêmê, or knowledge (Stanford Encyclopedia of Philosophy, 2020). Plato
recognized that skill and art require a mastery of their relative materials, applicational control, and definite procedural order. Teaching art requires instruction of both explicit knowledge and TK (Polanyi, 1958). Therefore, art cannot solely be explicitly taught; the artist’s implicit skills cannot be scientifically explained. Instead, individuals partly formalize personal acts of all types with explicit, established rules that are the baseline of guidance, with TK filling in the gaps (Polanyi, 1958). Contextually based training addresses transferring TK, rooted in teaching both practice and experience (Johannessen & Olsen, 2003). It comprises active, experiential learning through a scaffolded approach of pedagogical skill development, uniquely designed for the transference of tacit knowledge (Johannessen & Olsen, 2003).

As a transference of knowledge, professional development is less a transformational act of explicit information sharing but more the socialization of tacit knowledge (Polanyi, 1958; Collins, 2010). To achieve optimal results in professional development, educators must account for a framework of collective and personal judgment. Polanyi (1958, p.) states,

*Rules of art can be useful, but they do not determine the practice of an art; they are maxims, which can serve as a guide to an art only if they can be integrated into the practical knowledge of the art. They cannot replace this knowledge.*

This study seeks to understand the intersectionality of culinary education, PCK, and TK. The resultant question then becomes, “how does one teach what
is implicit”? In professional development, mentor teachers reveal modeling and reflective practices when they provide contextually-based expert advice on their self-regulation strategies. The roadmap to the successful transference of explicit and tacit skills requires the proper methods to ensure the best intermediaries are facilitating its philosophies. Based on research by Hertzman and Ackerman (2010), who sought to evaluate quality in associate degree culinary arts programs, faculty and program evaluation procedures were considered the most critical indicators of quality culinary education. In addition, industry, teaching, and subject area experience were highly correlated as important faculty indicators. Their recommendation was for program administrators to assess their hiring standards to ensure they are assigning instructors with strong industry-related experience, training instructors in effective teaching methods, and requiring faculty to continue education.

Research Question

RQ: What is the essence of culinary educators’ pedagogical content knowledge based on experience?

The literature indicates that expert teachers possess PCK, an amalgamation of collective PCK, personal PCK, and enacted PCK. The literature also shows that culinary arts education is contextually taught, requiring pedagogical TK to be effective. If culinary educators’ PCK is insufficient, professional development is warranted to enhance those knowledge areas. The
central question in this study was designed to determine whether a culinary teacher’s PCK is impacted by the type and longevity of professional training they have received.

Loughran et al. (2001) described the essence of PCK as what makes a professional teacher an expert professional teacher. The nuances within the art of teaching are complex social phenomena, such as the interconnectivity of people, practices, and events (Mason, 2008). Gaining a better understanding of the phenomena requires exploring human experiences rooted in epistemological paradigms. Epistemological paradigms lend to the philosophical assumption that the researcher is intimately familiar with the participants’ environment (Creswell & Poth, 2016). As the researcher of this study, my firsthand understanding of the contexts from which I studied the participants offered a uniquely insightful subjective awareness. My familiarity offered the inimitable ability to phenomenologically develop both a textural (what they experienced) and structural (how they experienced it) description of the participants’ experiences. Participants revealed their experiences during the interview, then they were synthesized and interpreted to convey their comprehensive significance.

Study Rationale

The literature guided the rationale for the design of this study on culinary arts education, PCK, TK, and professional development. More specifically, I based the design of this study on the most recent PCK Consensus Model, the
Refined Consensus Model, and Loughran et al.'s (2001) concept of capturing and representing PCK through Content Representations (CoRes) and PaP-eRs (Pedagogical and Professional experience Repertoire).

PCK has offered a framework for pre-service teacher training, certification programs, and professional development opportunities for many disciplines for over thirty years (Hashweh, 2013). As a theoretical construct, PCK presents the potential to enhance the understanding of teacher learning (Abell, 2008). However, the complexity of PCK lends incredible difficulty in capturing teachers’ knowledge. A combination of approaches is required to qualitatively assess what teachers know, believe, do, and the pedagogical reasoning for their actions (Park & Oliver, 2008). The need for this study to explore the essence of a culinary teacher’s PCK based on experience necessitated a qualitative interview. Qualitative instruments required, such as observations, interviews, students’ work samples, and written tasks, typically equate to small sample sizes but can still offer generalizable results (Kirschner et al., 2016). Measurements of domain-specific knowledge for teachers have been developed (Hill et al., 2004; Jong et al., 2005). Researchers (Schmelzing et al., 2013; Dollny, 2011) have previously used these types of tests to measure teachers’ PCK through objective and subjective analyses and a sound coding system.

The most recent consensus model of PCK, the Refined Consensus Model, was the instrument model I used to design this study. The Refined Consensus Model is a culmination of decades of research from the most prominent experts
in the field of PCK from around the world (Berry, 2017). The Refined Consensus Model establishes three modalities involved in a teacher’s PCK. The five teacher knowledge bases of PCK are:

- content knowledge
- pedagogical knowledge
- knowledge of students
- knowledge of assessment
- knowledge of curriculum

The five knowledge bases of PCK inform the three modalities of PCK: collective PCK, personal PCK, and enacted PCK.

- Collective PCK is a teacher’s explicit, topic-specific professional knowledge that has been codified by experts and made available for use by teachers (Gess-Newsome, 2015; Rodriguez & Towns, 2019). The knowledge bases inform collective PCK for a specific topic, filtered by the learning context and interpreted by the teacher’s personal PCK.

- Personal PCK is a teacher’s implicit, fluid, contextual, and private knowledge (Kind, 2009). According to Loughran (2001), collective PCK informs personal PCK to explicate a teacher’s TK. Conversely, the learning context filters personal PCK to inform collective PCK.

- Enacted PCK is the manifestation of a teacher’s metacognitive awareness, which is a culmination of their self-regulation, efficacy, and pedagogical reasoning (Uzuntiryaki-Kondakci et al., 2017). In this modality,
teachers process their collective PCK and personal PCK by contextually eliciting that knowledge and then reflecting on the elicitation.

Collective PCK, personal PCK, and enacted PCK are informed by each of the five knowledge bases and impacted by their learning context. These three modalities are critical in assessing a teacher’s PCK because they shape the specialized professional knowledge of different educators in different settings. It accounts for the collected knowledge of many, the unique personal knowledge of an individual, and the enactment of the two within distinctive contexts.

Gess-Newsome (2015) and Hashweh (2013) define PCK as personal and private knowledge, and Kind (2009) defines PCK as tacit or hidden knowledge. These definitions directly correlate with Polanyi’s (1967) definition of tacit knowledge. He declares that it is not public or empirical knowledge but rather an indwelling of objective and subjective personal knowledge. Hashweh (2013) suggested PCK can be made explicit, “efforts by some researchers to capture and represent PCK, as well as teacher self-reports, cases, and teacher research, can transform it into more public knowledge” (Hashweh, 2013, p., 121). Making personal knowledge available to others is the central activity of knowledge creation (Nonaka, 1991). Loughran et al. (2001) made progress in this respect with the application of Content Representations (CoRes) and Pedagogical and Professional-experience Repertoire (PaP-eRs), where collective PCK informs and combines with personal PCK to make a teacher’s TK explicit.
The concept of capturing and representing PCK was the genesis of the work developed and implemented by Loughran et al. in 2001. They realized their concept from their search to find the triggers of the practice of expert science teachers. Although developed for science teachers, it can be adapted to all disciplines because they designed it for content-specificity. Their format, called Content Representations (CoRes), is a topic-specific representation that addresses PCK concepts for each topic. Complimenting CoRes are what they called Pedagogical and Professional-experience Repertoires (PaP-eRs), which are narrative accounts of specific instances of PCK on-action. Combined, CoRes and PaP-eRs represent a teacher’s tacit, personal PCK and a discipline’s collective PCK that informs and is informed by the pedagogical reasoning that a teacher needs within the enacted PCK modality.

PCK is topic-specific (Shulman, 1987; Magnusson et al., 1998; Hashweh, 2005). The topics of culinary arts education deemed essential to the knowledge of a Certified Culinary Educator were derived from the American Culinary Federation’s assessment of a Certified Culinary Educator. As the premier organization for culinary certification training, the American Culinary Federation has established protocols for the designation of a Certified Culinary Educator. To become a Certified Culinary Educator, one must possess an associate degree in culinary arts, must complete 30-hour courses in nutrition, food safety and sanitation, and supervisory management. In addition, they must meet additional education requirements in curriculum planning and development, evaluation and
testing, teaching methodology, and educational psychology (acfchefs.org, n.d.). A Certified Culinary Educator candidate must have a minimum of two years of work experience in the hospitality industry, a minimum of 1,200 secondary or postsecondary teaching contact hours, submit a classroom video demonstration, and complete written and practical exams. The written exam contains 100 questions that the candidates answer in 90 minutes with a minimum passing score of 75%. The practice exam for the Certified Culinary Educator was obtained through the American Culinary Federation website; they claim the practice exam resembles the style and composition of the actual exam and offers an indication of being ready to test.

Research Design

Constructivist methodology guided the research of this study. The constructivist approach to research recognizes that experiences are developed idiosyncratically and shape people within cultural contexts (Creswell, 2003). The intent is then to make sense of the meanings of those experiences; the constructivist researcher attempts this by illuminating the experiential pattern within (Creswell, 2003). The research, therefore, focused on examining how the participants understood the meanings of their experiences as the methods for collecting data in this study. Qualitative measurements that include broad and general questions allow the participants to construct the meaning of a situation (Creswell, 2003). The pragmatistic processes by which the researcher enables
individual participants to interpret and enact their personal and collective knowledge illuminates meaningful and situational actions. Qualitative measurements that are semi-structured in a way that allows for participants to elicit their tacit knowledge allows for an interpretive phenomenological perspective (Van Driel et al., 2002).

The present study was informed not only by the PCK and methodological literature but also by research design literature. Specifically, this study used a descriptive phenomenological qualitative design, best suited to understand multiple individuals’ experiences of the phenomenon, the professional teaching of culinary education (Creswell & Poth, 2016). Researchers use qualitative methods to strengthen the comprehension of a single complex phenomenon (Greene et al., 1989). The importance of understanding their shared experiences was to gain a deeper understanding of the phenomenon; this will guide the development of improved practices or policies (Creswell & Poth, 2016).

A descriptive phenomenological approach was chosen for the qualitative portion of this study. Descriptive phenomenology investigates participants’ personal experiences of a phenomenon and their interpretation or description of its meaning (Padilla-Diaz, 2015). This study’s qualitative approach allowed the participants to describe the essence of their PCK related to their teaching practices. According to Padilla-Diaz (2015), open or semi-structured interviews are the most appropriate data collection strategy for descriptive phenomenological research. The phenomenological investigator is tasked with
extracting the lived experiences common to the participants within the interview. This study used semi-structured interviews, which offered a consistent structure among all interviews and allowed the participants to express their experiences in detail. Interview questions were designed to allow the participants to articulate and profoundly address the phenomenon of teaching culinary arts.

Creswell and Poth (2016) recommend that data collection for phenomenological studies consist of in-depth interviews with five to twenty-five participants. This study interviewed eleven participants. In general, interview questions should address what the participants have experienced in terms of the phenomenon and what contexts have influenced the experiences of the phenomenon (Moustakas, 1994). Therefore, the qualitative data analysis was performed separately, with the PCK interviews conducted after the participants completed their demographic surveys. The analysis consisted of exploring the transcribed data from the interviews to detect significant statements and understand how the participants experienced the phenomenon of teaching culinary arts. The data analysis and interpretation involved the transference of the participants’ explicit information into implicit information, revealing the meanings behind what they said. The understanding gained from the data analysis offered a composite description representative of the essence, or what Creswell and Poth (2016) call the *essential, invariant structure* of teaching culinary arts.

**Qualitatively Measuring Pedagogical Content Knowledge**
The interview of this study was designed to gather a complete perspective of the participant’s PCK. The semi-structured and open-ended characteristics of the interview enabled participants to provide an unbiased depth to their responses and promoted the emergence of themes and patterns stated by the interviewee. Using interviews with broad, open-ended questions to investigate PCK was supported by the literature (Kirschner et al., 2016). The PCK interview consisted of seven primary questions (see Appendix C). Additional questions were only used as guidance for the interviewee if the interviewer felt they were straying from the focus of the question. Research (Sun & Strobel, 2014) supported the use of the phenomenological approach, the demographic survey, and the follow-up interview. The phenomenological approach was selected to achieve a comprehensive understanding of teachers’ experiences and how they impact their PCK, whether they were formally trained as teachers, not formally trained as teachers, or had extensive professional development training as a teacher. The interview model was based on Loughran et al.’s (2001) CoRes and its components to elicit a teacher’s PaP-eRs to ensure that the qualitative interview offered structural and textural descriptions of a culinary teacher's PCK. Questions from the PCK interview asked the participants to detail their understanding of how best to represent content for a specific topic. The information shared by the teacher was designed to offer insight into their collective PCK, their personal PCK, their personal TK within the learning context, their enacted PCK, and their pedagogical reasoning on planning, teaching, and
reflecting. The PCK coding rubric (Appendix D) was used to help determine each participant’s PCK based on their answers to the interview questions.

Each participant was asked a series of questions based on a specific culinary topic and its sub-content. The questions asked included:

- (1) Describe your general process for preparing instruction for any culinary topic.
- (2) What are the main concepts students must learn about this topic?
- (3) What factors influence the teaching of this topic/idea?
- (4) What knowledge about students influences the teaching of this topic/idea?
- (5) Why is this important?
- (6) What difficulties/limitations are connected with teaching this idea?
- (7) What are the best ways to represent this content? Explain teaching strategies (and particular reasons for using these to engage with this idea).

Participants

Participants who were current culinary educators at either secondary or postsecondary schools with various professional experiences such as pre-service teacher training, in-service teacher training, and industry experience were sought for this study. Qualitative methods allow smaller groups to represent
characteristics of larger groups through more in-depth and subjective analysis (Creswell & Clark, 2017). Typically, randomly selecting a sample from a population is preferred in qualitative research to minimize extraneous variables (Creswell & Guetterman, 2019). Conversely, phenomenological qualitative research requires participants of a study to be carefully chosen individuals that have all experienced the phenomenon in question; this offers a common understanding of their shared experiences (Creswell & Poth, 2016). In addition, this type of purposive sampling has been known to provide significant insights for exploratory research (Passmore & Baker, 2005). Therefore, participants were selected for this study based on their personal training and experience.

**Domain**

Once participants were identified, they were invited by email to participate in the survey designed explicitly for culinary educators. The participants were instructed to choose a setting with internet access and where they would feel comfortable answering demographic survey questions for approximately fifteen minutes. The participants were informed that it could take up to an hour of their time for the follow-up interview. They were instructed to choose a similar setting to the one they used for the survey; a controlled environment free of distractions.

**Pedagogical Content Knowledge Interview for Culinary Educators**

The interview questions were specifically designed and developed for this study. They are an amalgamation of the frameworks of Loughran et al.’s (2001) Content Representations (CoRes), the Refined Consensus Model, and the
Certified Culinary Educator exam. The semi-structured open-ended interview questions were designed to explicate a culinary teacher’s PCK for a specific culinary topic. The specific culinary topic was moist heat cooking. Moist heat cooking was chosen as the instructional topic based on its inclusion in the American Culinary Federation’s Certified Culinary Educator exam and its generalizability to culinary teaching for secondary and postsecondary education levels. In addition, moist heat cooking is generalizable among food and hospitality disciplines such as baking and pastry, culinary arts, and food and nutrition.

Open-ended questions are used in PCK tests to collect as much information as possible (Kirschner et al., 2016). In research with a constructivist perspective, open-ended questioning is desired for researchers to understand how people process interactions within specific contexts (Creswell, 2003). In PCK research, open-ended questions examine teaching actions and teachers’ instructional decisions across teaching tasks (Hume et al., 2020). The goal of the open-ended questions in this study was to extract considered reflective responses, which compelled verbal responses. Interviews are known to elicit sophisticated data and expression of earlier understanding (Maclellan & Soden, 2003). Open-ended questions require teachers to self-report their PCK, allowing researchers to investigate what a teacher knows and why a teacher makes certain judgments (Hume et al., 2020). In Hume et al.’s (2020) investigation of PCK research, they identified three sub-processes of self-reported PCK: use of
questionnaires and surveys, numerically scored teacher responses, and self-reports of experience. The open-ended questions of this study were taken from the CoRes model and attributed to each modality of the Refined Consensus Model and the learning context filter between personal PCK and collective PCK. The framework of the CoRes model allowed for open-ended questioning and all three sub-processes of self-reported teachers’ accounts of their PCK. In this regard, this study was designed to examine a culinary teacher’s procedural and strategic knowledge and their capacity to reason.

A sound, polytomous coding system was required to be developed to identify in what ways a participant’s answers revealed their PCK. The interval coding option was derived from the PCK test instrument developed by Kirschner et al. (2016) as part of the ProwiN Project (professional knowledge of teachers in the natural sciences). They gave partial credit for answers that contained parts but not all solutions. In addition, not all answers were empirically evident as revealing one’s PCK, creating difficulty in determining the magnitude of PCK in their responses. In making determinations, the literature was referred to, as depicted in the coding options for each item (see Appendix D).

Researcher Reflexivity

My relation to the subject matter is present throughout the research process as the researcher. My social identity and positionality shape my subjectivity, which directly influences my research methods and interpretation of
the data and its findings (Ravitch & Carl, 2019). As a Certified Executive Chef (CEC), I am a subject matter expert and uniquely qualified to impart my understanding of what content knowledge a culinary teacher should possess. As a culinary instructor in higher education, I have first-hand insight into the importance of how content knowledge is pedagogically shared. Hegarty (2011) referred to research conducted within the discipline as reflexive ethnography. Reflexive ethnographers successfully demonstrate their expertise and that the problem has theoretical and practical significance. I possess no formal teacher training, but I am aware of the need for educators of all disciplines to be taught how to teach and be allowed to develop their teaching skills over time. As a doctoral student and researcher, I am interested in advancing the literature related to improving culinary teacher knowledge. As Hegarty (2011) put it, the hope is for culinary research to bring "an awareness of taken-for-granted assumptions and tacit theories and so enable articulation and transformation to occur in the manner of the work in order to improve it" (p. 58).

Through the literature, I have learned what constitutes an expert culinary teacher. An expert culinary teacher possesses culinary-specific PCK: pedagogical content knowledge that is distinctively designed to teach an art form that requires sharing tacit knowledge. From this study, I anticipate gaining an understanding of the impact that various influences of professional development have on a culinary teacher’s PCK. I will personally use the information gained from this study to inform my teaching style and habits. I am also interested in
using the study to guide the creation of professional development aimed at improving the teaching of CTE and, more specifically, culinary arts education.

Limitations and Delimitations

Limitations and delimitations establish boundaries, exceptions, qualifications, and reservations inherent in qualitative studies (Creswell, 2005). The objective of this qualitative study was to describe the degree of association between culinary educator training and their explication of PCK. The limitations and delimitations of the study included:

- The interview for this study was constructed to explore culinary educators’ aptitudes to articulate their PCK. It did not consider the individual’s ability to articulate their experiences based on their personal beliefs, attitudes, or values, which often form the basis of personal, educational philosophy (Weshah, 2013)
- Phenomenological studies may examine data beyond interviews, including group interviews, live observations, recorded observations, and journals. Data collection for this study was delimited to individual interviews.
- Participants were culinary educators with either teacher training or no teacher training, less than or more than one hundred hours of teacher professional development, and various industry experience. Other types of experience were not considered, such as the culinary discipline or administrative duties within education.
• Participants freely opted into the study; the act of willfully participating in a study may predispose an individual to have increased efficacy over those that choose not to participate (Creswell & Guetterman, 2019).

Limitations of the study included:
• The collection of quantitative data was attempted but proved to be inconclusive. Reliable quantitative measurements for culinary educators’ PCK were not present in the literature.
• The number of participants was small due to the participatory nature of the study. The time and scope of the study also constrained the number of institutions and possible participants.
• All studies based on the Refined Consensus Model have been in fields other than culinary arts education. This study was the first to use the Refined Consensus Model for research in culinary arts education.

Validity and Trustworthiness

Research of complex phenomena inherently assumes the subjectivity and assumptions of the researcher (Hughes, 2019). The researcher’s lens directly impacts a reader’s interpretation of the results from the study. Therefore, a reader must understand the inseparability between the researcher and their presentation of findings. As the researcher in this study, my assumptions and subjectivity directly impact the analysis and presentation of the discoveries. PCK is a vitally important construct to culinary arts educators’ success because
culinary arts education is a contextually complex discipline. Objectively, PCK offers the unique ability to transform content knowledge into pedagogical forms that are contextually adaptive (Shulman, 1987; Park & Oliver, 2008). I based the assumption that PCK is a redeeming attribute for culinary educators on my reflexivity of PCK within the discipline of culinary arts education. My assumption of PCK’s importance for culinary art educators has led to the belief that its integration into pre-service and in-service training for culinary arts educators will improve their pedagogy and subsequently improve student outcomes.

This descriptive phenomenological qualitative study was designed so that the inferences drawn were true and correct. In addition, the construct validity was ensured by designing the study based on the literature. According to Creswell and Guetterman (2019), internal and external validity are the two most primary threats to consider for both quantitative and qualitative studies. Qualitative internal threats include descriptive validity, observational bias, researcher bias, and reactivity (Onwuegbuzie & Leech, 2007). Qualitative external threats include interpretive validity, evaluative validity, and effect size.

Internal validity can relate to the participants or the treatment within a study. Since no treatment was given, the selection of the participants posed no threat to validity. Participants allowed to self-select into a study can threaten the validity of a study because they might already be motivated individuals with a higher proclivity to excel and improve (Creswell & Guetterman, 2019). Their agency and motivation are attributes that are accounted for within enacted PCK.
The participants were chosen based on their prerequisites for the study and availability, which removed the threat of self-selection from the participants. Due to the specificity of the participant criteria, random selection was not an option; the participants were chosen based on the needs of the study. The participants’ backgrounds (demographic, socioeconomic) are commonly a threat to the validity of the instrument scores (Creswell & Guetterman, 2019). For this study, that threat was realized and accounted for by recording demographic data for each participant. Assessments are not inherently valid but are valid for particular uses or decisions (Wilson et al., 2020). The data was analyzed using a deductive approach, using a pre-determined framework. The deductive examination has the potential to threaten internal validity because of its inflexibility and potential bias within the coding framework (Burnard et al., 2008). The pre-determined themes were a threat to validity. Therefore, they were based on the literature. Anonymity was ensured to maintain any possible bias or interaction with the selected participants in recording data.

Threats to the external validity of a study include the interaction of selection, setting, and history; these factors primarily exist when a study involves a treatment, and results must be generalized (Creswell & Guetterman, 2019). Settings differed among the participants, which affected the generalizability of the results. Interpretation of the data accounted for this when the data was examined between groups. The demographic survey was distributed on 12/15/2021. The interviews were conducted between 1/5/2022 and 1/22/2022. The timing of the
interviews did not take place at an exceptional time in the school year, which contributed to its generalizability. The participants all had no prior history of interacting with this study or participating in a study that measured their PCK or TK levels.
Overview

The primary goal of this phenomenological qualitative study was to explore the distinctions in pedagogical content knowledge (PCK) between and among culinary educators with varying levels of experience. This study determined experiences for culinary educators as pre-service teacher training, in-service teacher training, professional industry experience, and teaching experience.

This chapter presents the findings from interviews among eleven culinary educators who have various experiences. The interviews were conducted over three weeks during the winter of 2021-2022. All interview participants were currently teaching either secondary or postsecondary culinary arts at the time of this study.

The first section of the chapter presents the participants’ demographics. The second section of this chapter describes the results of the qualitative data analysis. The qualitative data is an explication of interviews aimed at gaining a deeper understanding of the participants’ pedagogical content knowledge specific to culinary education.
Demographics

There was a demographic survey completed by each participant before the PCK interview (see Appendix C). The demographic survey offered insight into how the participant’s experiential background affected the essence of their PCK. In addition to the survey asking each participant their levels of experience, the demographic survey asked each participant for personal data, including their sex, age, ethnicity, the highest level of education completed, professional certifications, and level of education taught. When exploring the interview data, the personal demographic variables were inconclusive and, therefore, did not factor into the resultant findings of this study. Ultimately, the differentiated professional experiences between the participants yielded substantial qualitative data.

Eleven culinary educators participated in and completed the demographic survey and the PCK interview. The survey asked each participant to complete a section to identify the participants’ demographics. All participants were currently teaching either secondary or postsecondary culinary arts at the time of this study. Therefore, the demographics questions were used to determine each participants’ amount of formal teacher training, if any, experience in the food and hospitality industry, and experience as a culinary teacher.

Six of the eleven participants had pre-service teacher training that resulted in a certificate or degree. Six of the eleven participants had in-service teacher
training of over one hundred hours of teacher professional development; of those six, five had more than twenty years of industry experience. Seven of the eleven participants were employed in the food and hospitality industry for over twenty years. Five of the participants had less than ten years of experience as culinary teachers. In comparison, three had more than ten but less than twenty years of experience as culinary teachers. Three had more than twenty years of experience as culinary teachers. All participants with over twenty years of teaching experience also had a pre-service teaching degree or certificate and had over one hundred hours of in-service teacher professional development (Table 4).

Table 4

Demographics

<table>
<thead>
<tr>
<th>Participant</th>
<th>Formal Teacher Training</th>
<th>Years Employed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Certificate or Degree</td>
<td>&gt;100 hours Professional Development</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>&gt;20</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>6-10</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>&gt;20</td>
</tr>
<tr>
<td>4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>5</td>
<td>✓</td>
<td>11-20</td>
</tr>
<tr>
<td>6</td>
<td>✓</td>
<td>11-20</td>
</tr>
<tr>
<td>7</td>
<td>✓</td>
<td>&gt;20</td>
</tr>
<tr>
<td>8</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Themes

The guiding themes of this study addressed the central research question. The research question prompted an examination into the essence of culinary educators’ PCK based on experience. Before the qualitative data collection, the literature determined the components and subcomponents of PCK as the guiding themes. In addition, the selection of participants and phrasing of interview questions relied on an extensive review of the literature to guide it. Based on the literature, the components of PCK were determined as collective PCK, the learning context, personal PCK, enacted PCK, and pedagogical reasoning. (Table 5)

Table 5

*Components and Subcomponents of Pedagogical Content Knowledge*

<table>
<thead>
<tr>
<th>Component of Pedagogical Content Knowledge</th>
<th>Subcomponent of Pedagogical Content Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collective PCK</td>
<td>Instructional Strategies</td>
</tr>
<tr>
<td>Learning Context</td>
<td>Content Representations</td>
</tr>
<tr>
<td></td>
<td>Discipline-specific Practices</td>
</tr>
<tr>
<td></td>
<td>Educational Climate</td>
</tr>
</tbody>
</table>

Participant | Formal Teacher Training | Years Employed |
-------------|-------------------------|----------------|
             |                         | 6-10           |
9            | ✓                       | 11-20          |
10           | ✓ ✓                     | >20            |
11           | ✓ ✓                     | >20            |
Learning Environment
Student Attributes

<table>
<thead>
<tr>
<th>Personal PCK</th>
<th>Explicit Reflection On-action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Explicit Reflection In-action</td>
</tr>
<tr>
<td></td>
<td>Tacit Reflection In-action</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enacted PCK</th>
<th>Metacognitive Awareness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teacher Self-regulation</td>
</tr>
<tr>
<td></td>
<td>Teacher Efficacy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pedagogical Reasoning</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>An understanding of purposes, an evaluation of possible outcomes, and requiring a determination of representational repertoire</td>
</tr>
<tr>
<td>Teaching</td>
<td>An enactment of knowledge, a task rooted in strategy, and requiring self-observation</td>
</tr>
<tr>
<td>Reflecting</td>
<td>A process of self-evaluation, reviewing affect, and reconstructing planning and teaching based on expectations and outcomes</td>
</tr>
</tbody>
</table>

Pedagogical Reasoning

In the interviews, the first question (Q1) was, “Describe your general process for preparing instruction for any culinary topic.” The purpose of the question was to elicit a teacher’s pedagogical reasoning. A teacher exhibiting a full locus of pedagogical reasoning will display the subcomponents of pedagogical reasoning: planning, teaching, and reflecting. (Table 6)
Participants were evaluated as to whether they described planning in detail, which includes understanding purposes, an evaluation of possible outcomes, and a determination of representational repertoire. Ten of the eleven interviewees elicited a detailed description of planning for instruction by describing at least two of the three planning processes. For example, Participant 6 described an understanding of purposes as, "I look at what are the key components I need them to take away from this week, and then I kind of emphasize that as my basic core content. And then, how can I put real-world experiences to that concept or that real core content I need them to retain?"

Participants were assessed as to whether they described the act of teaching as an enactment of knowledge, a task rooted in strategy, and requiring self-observation. Nine of the eleven interviewees described conducting at least two of the three teaching processes that indicate the possession and enactment of meaningful pedagogical reasoning. Participant 6 continued their explanation of planning to describe its implementation as a task rooted in strategy and as an enactment of knowledge,

\[\ldots\text{they'll have to demonstrate basically the same steps I did in the demo, and then we finish off with, you know, did they really get comprehension?}\]

\[\text{So, normally by that fifth day, they get to create something for me with those general concepts that we taught. I'm looking again for those core}\]
competencies to be met, but also that little bit of creative influence and control that they can make and that's kind of how I base all my lessons.

Participants were also assessed whether they acknowledged reflecting as a part of preparing for instruction by describing reflection as a process of self-evaluation, reviewing affect, and reconstructing planning and teaching based on expectations and previous outcomes. The reflection aspect of pedagogical reasoning was most apparent in participants that had formal pre-service teacher training and were employed in the food and hospitality industry for over twenty years. One such participant, Participant 8, described the act of reflecting on preparing for instruction by stating,

… I'm updating my lectures constantly, my PowerPoints, you know, if I see some of the things I realized were too long and the things I was talking about really weren't pertinent at this point in their education, so why bother? So, you know, streamlining, revamping the curriculum…

In this statement, Participant 8 described the self-evaluation function and the reconstructing processes for planning and teaching based on previous outcomes.

Only one participant, Participant 6, had formal training and was in the industry for less than twenty years described at least two of the three reflective aspects of pedagogical reasoning. Of the participants with no formal pre-service teacher training, only one identified some aspect of reflection, while the others did not describe reflection as part of their class preparation.
Participants were asked to describe their general process for preparing instruction for any culinary topic. Overall, participants with pre-service teacher training were more likely to display the subcomponents (planning, teaching, and reflecting) of pedagogical reasoning than those with no pre-service teacher training. Similarly, participants with over one hundred hours of professional development were more likely to display subcomponents of pedagogical reasoning than participants with less than one hundred hours of professional development.

Collective Pedagogical Content Knowledge

The second question (Q2) asked in the interview was, “In your experience, what are the main concepts students must learn about moist heat cooking”? The question was designed to elicit the participants’ collective pedagogical content knowledge about the general culinary topic of moist heat cookery by gaining insight into their instructional strategies, content representations, and discipline-specific practices. (Table 7)

Table 7

Subcomponents and Elicitation of Collective Pedagogical Content Knowledge

<table>
<thead>
<tr>
<th>Subcomponent of Collective Pedagogical Content Knowledge</th>
<th>Elicitation of Pedagogical Content Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional Strategies</td>
<td>An understanding of collective culinary instructional strategies based on knowledge of assessment, pedagogy, content, students, and curriculum</td>
</tr>
<tr>
<td>Content Representations</td>
<td>An understanding about the content in terms of discipline-specific knowledge, topic-specific knowledge,</td>
</tr>
</tbody>
</table>
The participants’ descriptions of collective culinary instructional strategies were based on their knowledge of assessment, pedagogy, content, students, and curriculum. Most participants described instructional strategy based on their knowledge of pedagogy, content, and students. Two participants with less than ten years of teaching experience failed to demonstrate that more than one knowledge base informs their instructional strategies. One such participant, Participant 2, demonstrated collective knowledge of content, “temperature control comes into play; keeping things from drying,” but did not indicate any other teacher knowledge bases that informed their instructional strategies. Participants with more than twenty years of industry experience were more likely to display knowledge of instructional strategies when compared to participants with less than twenty years of industry experience. Industry-experienced participants tended to express the need to describe multiple cooking methods as part of their instructional strategies and how and why they interconnect versus only describing what they are. For example, Participant 8 stated

I spend a lot of time trying to instill the processes of braising. In fact, one of my final test questions is an essay type question: ‘explain to me about braising, why we use it, what meats are used in braising’ that type of thing, because I think it’s important, you know.
Participant 8 is looking for a deeper understanding from the student by asking them to explain why they use a particular cooking method for particular items. Here, Participant 8 displayed an understanding of moist heat cooking instructional strategies based on their knowledge of pedagogy, content, and assessment.

Q2 was designed to determine if a participant’s collective PCK was present in their content representations. The more a participant elicited an understanding about the content in terms of discipline-specific knowledge, topic-specific knowledge, and concept-specific knowledge, the more the findings considered them to possess collective PCK. Participants employed in the food and hospitality industry over twenty years were more likely to demonstrate their collective knowledge about moist heat cooking at all three levels. Participant 4 was able to display all three elements of content representations in one statement,

*Making sure there is enough broth or moisture in the pan or device and not doing it too fast, allowing enough time to complete the process. Not rushing anything and not cutting corners to be able to let everything take its time, its course of action, and so, that’s what we try to teach; that’s how we do it.*

“Not cutting corners” is discipline-specific knowledge; doing so during cooking processes can result in undesirable results and create issues in safety. “Making sure there is enough broth or moisture in the pan or device” is topic-
specific knowledge; different moist heat cooking processes require different amounts of liquid, particularly when considering the item an individual is cooking. “Allowing enough time to complete the process” is concept-specific knowledge; it underlies the principle of moist heat cookery.

The final measure of collective PCK was how the participant described discipline-specific practices that address the topic, student understandings, and habits of mind. There was a general lack of acknowledging discipline-specific practices among all the participants. The few participants who displayed collective discipline-specific practices also displayed higher collective PCK, including the subcomponents, instructional strategies, and content representations. For example, Participant 7 revealed an understanding of student habits of mind; “Typically, students want to take stuff (fish en papillote) out of the paper before they serve it and you know you got to remind them, you know, it’s you’re serving paper, and that’s part of the presentation.” The context of specific culinary practice, “that’s part of the presentation”, required the culinary educator to offer the student explicit knowledge for the explicit-to-tacit knowledge interchange.

The participants were asked to describe the main concepts students must learn about moist heat cooking. Participants who responded in ways that reflected comprehension of instructional strategies, content representations, and discipline-specific practices exhibited collective PCK required for effective culinary instruction. Again, industry experience was the most significant
differentiator in this context; participants with more than twenty years of food and hospitality industry experience were most likely to exhibit collective PCK.

**Learning Context**

The third question (Q3) of the interview asked, “In your experience, what factors influence the teaching of moist heat cooking?”. The fourth question (Q4) asked, “In your experience, what knowledge about students influences the teaching of moist heat cooking?”. The two questions were designed to allow the participants to describe their understanding of how the educational climate, learning environment, and student attributes influence how they teach the general topic of moist heat cookery. (Table 8)

**Table 8**

*Subcomponents and Elicitation of the Learning Context of Pedagogical Content Knowledge*

<table>
<thead>
<tr>
<th>Subcomponent of the Learning Context</th>
<th>Elicitation of Pedagogical Content Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational Climate</td>
<td>Describing the educational climate in terms of the organizational structure, political structure, and social structure</td>
</tr>
<tr>
<td>Learning Environment</td>
<td>Describing the learning environment in terms of space, time, and equipment</td>
</tr>
<tr>
<td>Student Attributes</td>
<td>An understanding of how to shape instruction based on a student’s prior experiences, dispositions, and developmental readiness</td>
</tr>
</tbody>
</table>

A participant demonstrated their understanding of the educational climate when addressing it in terms of organizational, political, and social structures.
Participants with a pre-service teaching degree or credential were more likely to address two or more of the components of the educational climate; one such participant was Participant 4. Here, Participant 4 is describing the impact the social structure and organizational structure has on the educational climate:

*These kids don’t have, you know, don’t have stable families, some are foster, some live in shelters, so it’s all kinds of different parameters that we deal with…but we have faculty that they struggle with this, they just shake their head, maybe that’s why some people are retiring.*

Participants that displayed an understanding of the learning environment were able to describe the learning environment in terms of space, time, and equipment. Those with a teaching degree or credential employed less than twenty years in the industry and had less than one hundred hours of professional development were more likely to describe the impact components of the learning environment have on teaching the topic. Participant 6 stressed the importance of time and space and how they impact their students, “Some of my students lose outright because I can only work with so many at a time. Space does become that issue, and the fact that you know, we might have a truly teachable moment today that the next group is going to miss something because they weren’t in the kitchen at that time.”

Participants who displayed an understanding of how student attributes affect the learning context were able to elicit their understanding of how to shape instruction based on their prior experiences, dispositions, and developmental
readiness. All the participants described at least two of the elements of the student attributes subcomponent. For example, Participant 5, who has a teaching degree, but less than twenty years of industry and teaching experience and less than one hundred hours of teacher professional development, stated,

_I think you need to know what the student’s background is. So, build that relationship with them and find out what they know. Most of my students their cooking background is the microwave or top ramen, so we kind of start with what they know and then move from there and try and build onto their knowledge. And I think just in that relationship, we talk about what they know, we know, and it helps the teaching._

Participant 5 described shaping instruction based on a student’s prior experiences and developmental readiness. Similarly, Participant 10, who has a teaching degree, over twenty years of experience in the industry, and over one hundred hours of teacher professional development, related instruction to a student’s prior experiences and dispositions,

_You really want the students to not be blank slates and say ‘I don’t know anything’; you’ve got to take your own background and your own experience…Are you a scientist? Are you in the construction trade? Are you in medicine? Whatever your experience is, there’s some way to apply it to cooking._

Participants were asked what factors influence their teaching of moist heat cooking and what knowledge about students influences their teaching of it.
Throughout the assessment of the learning context, those with a teaching degree or credential were more likely to exhibit an understanding of the impact that the educational climate and learning environment have on a student’s learning. Although most participants, regardless of experience, demonstrated an understanding of how student attributes affect the teaching of moist heat cooking, those without a degree failed to consider the impact of organizational (external), classroom (internal), and social contexts.

Personal Pedagogical Content Knowledge

The interview’s fifth question (Q5) asked, “In your experience, why is moist heat cooking important to know?”. The question was designed to explore a participant’s personal pedagogical content knowledge; it was designed to allow participants to describe their understanding of how they implement explicit reflection-on-action, explicit reflection-in-action, and tacit reflection-in-action in the teaching of a general topic (moist heat cooking). (Table 9)

Table 9
Subcomponents and Elicitation of Personal Pedagogical Content Knowledge

<table>
<thead>
<tr>
<th>Subcomponent of Personal Pedagogical Content Knowledge</th>
<th>Elicitation of Pedagogical Content Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explicit reflection on-action</td>
<td>The participant describes knowledge of the topic, the reasoning behind teaching the topic, and the planning for teaching the topic to enhance student outcomes; this is informed by their knowledge of assessment, pedagogy, content, students, and curriculum</td>
</tr>
<tr>
<td>Explicit reflection in-action</td>
<td>The participant describes in detail the explicit act of teaching the topic in a particular way and for a particular purpose.</td>
</tr>
</tbody>
</table>
Tacit reflection in-action: The participant describes in detail the tacit skill of implementing instructional planning and reasoning during active teaching for enhanced student outcomes.

A participant demonstrated explicit reflection-on-action when they articulated knowledge of the topic, the reasoning behind teaching the topic, and the planning for teaching the topic to enhance student outcomes. In addition, explicit reflection-on-action is informed by a teacher’s knowledge of assessment, pedagogy, content, students, and curriculum. Participants with formal teacher training and over twenty years in the food and hospitality industry were more likely to display explicit reflection on-action than those with no formal teacher training and less than twenty years in the food and hospitality industry. For example, participant 10 explicated reflection-on-action in this way:

Because we have found through experience that certain items respond better to moist heat than to dry heat, it’s important because if you stripped away everything else aside from sanitation and some basic knife skills, the cooking methods have to be what you know, cold. So, I would say just knowing a variety of applications of moist heat on multiple items, whereas most of my students would much prefer to fry chicken.

Participant 10 described knowledge of the topic informed by content knowledge, “certain items respond better to moist heat than to dry heat.” They also described the reasoning behind teaching the topic, which was informed by knowledge of pedagogy and students, “the cooking methods have to be what you know cold…knowing a variety of applications of moist heat on multiple items,
whereas most of my students would much prefer to fry chicken." There was a
difference in explicating reflection-on-action from Participant 2, a participant with
little teaching and industry experience: "It is important because it depends on the
quality of work you want to give to a specific client or group. So, it all depends on
quality and taste." Participant 2 gave reasoning behind teaching the topic but
lacked reflection on its importance to student outcomes. The low experience
levels of the participant were realized by a lack of understanding the importance
of transferring discipline-specific knowledge through the TK interchange.

A participant revealed explicit reflection-in-action when describing the
explicit act of teaching the topic in a particular way and for a particular purpose.
The contrast in this subcomponent was vastly apparent between participants with
over twenty years in the food and hospitality industry and those with less than
twenty years of industry experience, as well as those with less than ten years of
teaching experience and those with more than ten years of teaching experience.
All participants who had less than twenty years in the food and hospitality
industry and those with less than ten years of teaching experience failed to
demonstrate any explicit reflection-in-action. Participants with formal teacher
training, over twenty years in the food and hospitality industry, and over ten years
of teaching experience displayed moderate amounts of explicit reflection-in-
action. Participant 10 responded,

*I do like to try to incorporate a scientific method into it, so they can
compare right then and there. What’s the difference? Here’s a carrot done*
with moist heat, here’s a carrot on the grill, here’s a carrot deep-fried, let’s talk about it. And so, then it’s not me telling you this is what the cooking method is. It’s not just, ‘oh, I did the cooking method’, but you’re doing it in a greater context of what it does to an individual item.

Participant 10 is explicitly describing teaching the topic in a specific way: “I like to try to incorporate a scientific method into it”; “here’s a carrot done with moist heat, here’s a carrot on the grill, here’s a carrot deep-fried, let’s talk about it.” They follow the description by an explicit understanding of what the purpose of the teaching method is: “so they can compare right then and there”; “you’re doing it in a greater context of what it does to an individual item.” The specific way (explicit-to-tacit) in which the participant described teaching the topic demonstrated an understanding of facilitating the TK interchange.

The third subcomponent of personal pedagogical content knowledge examined was evidence of tacit reflection-in-action. A participant was determined to express tacit reflection-in-action if they detailed the tacit skill of implementing instructional planning and reasoning during active teaching for enhanced student outcomes. Results were highly similar to those for explicit reflection-in-action. Participants with formal teacher training and over twenty years of experience in the food and hospitality industry were more likely to describe the tacit implementation of instructional planning during active teaching. Only one participant with less than ten years of teaching experience displayed any tacit reflection-in-action. Those with more than ten but less than twenty years of
teaching experience were most likely to express tacit reflection-in-action. One participant, Participant 11, with over twenty years of teaching experience, displayed tacit reflection-in-action. Participant 11 described receiving varying shipments of fruits and vegetables and implementing instructional strategies for enhanced student outcomes. Participant 11 described receiving a shipment of pumpkins and how that turned into teachable lessons for the students:

*I could turn the pumpkin into a full week of instruction. What does your pumpkin weigh? OK, so now I want you to carve your pumpkin, and every time you carve the pumpkin, go back to the scale and write it down…and I said there’s gonna be, you know, a contest here. Now we’re gonna go for beauty, who can carve it the nicest, who could do a 3D relief, whatever the case may be, and then we’re gonna go for an award for yield; who’s gonna give me the best yield ratios, and then we’re gonna cook it and turn it into a beautiful puree.*

Participants were asked why moist heat cooking is important to know. Those that exhibited explicit reflection-in- and on-action and tacit reflection-in-action elicited personal PCK. Comprehensive personal PCK was most prevalent in participants with over twenty years of experience in the food and hospitality industry, along with those with formal teacher training and more than ten years of teaching experience.

**Enacted Pedagogical Content Knowledge**
The sixth question (Q6) of the interview asked, “What do you find to be the difficulties/limitations that are connected with teaching moist heat cooking?”. The seventh and final question (Q7) was, “What are the best ways to represent moist heat cooking? Explain teaching strategies and particular reasons for using these to engage with this idea.” Combined, these two questions were designed to evoke a participant’s enacted PCK. Participants displayed increased enacted PCK the more they described their enacted PCK as a process requiring pedagogical reasoning, metacognitive awareness, teacher self-regulation, and teacher efficacy. (Table 10)

Table 10

*Subcomponents and Elicitation of Enacted Pedagogical Content Knowledge*

<table>
<thead>
<tr>
<th>Subcomponent of Enacted Pedagogical Content Knowledge</th>
<th>Elicitation of Pedagogical Content Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedagogical reasoning</td>
<td>Describing the planning, teaching, and reflecting on the planning and teaching of the topic</td>
</tr>
<tr>
<td>Metacognitive Awareness</td>
<td>Describing what impacts the learning of the topic, how and why tasks are accomplished, and the process of activities used to oversee the learning process</td>
</tr>
<tr>
<td>Teacher Self-regulation</td>
<td>Representing the topic by identifying what the strategy is, how the strategy operates, and when and why a strategy should be applied</td>
</tr>
<tr>
<td>Teacher Efficacy</td>
<td>A belief to produce desired results through experience, a belief to affect adaptation and change, and a willingness to implement learned strategies</td>
</tr>
</tbody>
</table>

Q1 offered insight into the pedagogical reasoning among groups. Results of pedagogical reasoning based on Q6 and Q7 were generally similar to results
from Q1. Most participants, regardless of demographic, identified the processes of planning, teaching, and reflecting as integral in representing the topic, while acknowledging the topic creates difficulties and limitations. Participant 6 described limitations of representing moist heat cooking as a matter of budget combined with representational choice and how they plan accordingly, "Protein selection…I still have a budget that I have to stay within, and being able to pick the right medium to cook or showcase that cooking method presents challenges, especially right now; logistically, you know we're having some logistical issues."

Participants were evaluated as to whether they displayed metacognitive awareness; this occurred if they described what factors impact the learning of the topic, how and why tasks are accomplished, and the process of activities used to oversee the learning process. Only three participants, all of which teach or have taught at the secondary level, failed to mention more than one component of metacognitive awareness. The remaining participants exhibited metacognitive awareness in various ways. First, participant 3 described having proper equipment as critical to teaching moist heat cookery. "The biggest obstacle is having the right equipment to give that kind of demonstration, so they can see how it works in the application of other techniques." Then Participant 3 described the process of how and why they represent moist heat cookery as they do to a student:

…have lower temperatures so that way you can catch things with your own employees or whoever you're going to help. Because I'm going back
to day one when I said this is a learning experience. That way, when you operate, you're going to be the teacher; you're going to not necessarily be teachers, I guess, but you're gonna have to teach your staff how to do this, you know, you can't do all this by yourself.

Teacher self-regulation was determined to be present if the participant described representing the topic by identifying what the strategy is, how the strategy operates, and when and why they apply a strategy. Teacher self-regulation was most apparent in the participants among all subcomponents of PCK. All participants displayed elements of teacher self-regulation when determining how to represent the topic based on the difficulties and limitations it provides.

Teacher efficacy was determined to be present if the participant described a belief to produce their desired results through experience, a belief to affect adaptation and change, and a willingness to implement learned strategies. Teacher efficacy was also highly present in almost all of the participants. Only three of the participants failed to describe more than one of the components of teacher efficacy. For example, Participant 9, a teacher with no pre-service degree, less than ten years of teaching experience, less than twenty years of industry experience, and over one hundred hours of in-service training, struggled to describe difficulties and limitations in teaching moist heat cookery: "If the students don't understand or grasp the concepts, that would be kind of hard not
to be able to grasp. I don't know about this.” This statement demonstrates Participant 9’s lack of belief to affect adaptation and change.

Participants were asked what they understood to be the difficulties and limitations connected with teaching moist heat cooking. They were also asked what the best ways to represent moist heat cooking are and to explain teaching strategies and particular reasons for using those ways to engage with moist heat cooking. Within enacted PCK, teacher self-regulation and efficacy were most apparent among all participants. Enacted PCK was not highly differentiated between and among all participants. Generally, the more industry experience a participant had, the more likely they linked difficulties and subsequent teaching strategies, as well as a belief to implement those strategies for moist heat cooking.

Summary

This chapter presented the researcher’s findings with eleven participants over three weeks. All interview participants were currently teaching either secondary or postsecondary culinary arts at the time of this study. The first section of the chapter presented the participants’ demographics. The second section of this chapter described the results of the qualitative data analysis. The qualitative data was an explication of interviews aimed at gaining a deeper understanding of the participants’ PCK.
The primary goal of this descriptive phenomenological qualitative study was to explore the distinctions in PCK between and among culinary educators with varying levels of experience. The resultant research question aimed at exploring distinctions in pedagogical content knowledge was:

RQ: What is the essence of culinary educators’ PCK based on experience?

The research question of this study was designed to guide the analysis of the interview data. The study realized experience for culinary educators as pre-service teacher training, in-service teacher training, professional industry experience, and teaching experience. Determining the essence of culinary educators’ PCK was guided by the literature to pre-determine themes, which are the components and subcomponents of PCK. The components of PCK are pedagogical reasoning, collective pedagogical reasoning, the learning context, personal pedagogical reasoning, and enacted pedagogical reasoning.

Participants with pre-service teacher training were more likely to display the subcomponents (planning, teaching, and reflecting) of pedagogical reasoning than those without pre-service teacher training. Similarly, participants with over one hundred hours of professional development were more likely to display subcomponents of pedagogical reasoning than participants with less than one hundred hours of professional development.

The participants were asked to describe the main concepts students must learn about moist heat cooking. Participants who responded in ways that
reflected comprehension of instructional strategies, content representations, and
discipline-specific practices exhibited collective PCK. Again, industry experience
was the most significant differentiator in this context; participants with more than
twenty years of food and hospitality industry experience were most likely to
exhibit collective PCK.

Participants were asked what factors influence their teaching of moist heat
cooking and what knowledge about students influences their teaching of it.
Throughout the assessment of the learning context, those with pre-service
teacher training were more likely to exhibit an understanding of the impact that
the educational climate and learning environment have on a student's learning.
Although most participants, regardless of experience, demonstrated an
understanding of how student attributes affect the teaching of moist heat cooking,
those without a degree failed to consider the impact of organizational (external),
classroom (internal), and social contexts.

Participants were asked why moist heat cooking is important to know.
Those that exhibited explicit reflection-in- and on-action and tacit reflection-in-
action elicited personal PCK. Comprehensive personal PCK was most prevalent
in participants with over twenty years of experience in the food and hospitality
industry, along with those with formal teacher training and more than ten years of
teaching experience. Most participants failed to demonstrate an understanding of
the reflection required to facilitate the TK interchange between a teacher and
student.
Participants were asked what they understood to be the difficulties and limitations connected with teaching moist heat cooking. They were also asked what the best ways to represent moist heat cooking are and to explain teaching strategies and particular reasons for using those ways to engage with moist heat cooking. Within enacted PCK, teacher self-regulation and efficacy were most apparent among all participants. Enacted PCK was not highly differentiated between and among all participants. Generally, the more industry experience a participant had, the more likely they linked difficulties and subsequent teaching strategies, as well as a belief to implement those strategies for moist heat cooking.
CHAPTER FIVE
RECOMMENDATIONS AND CONCLUSIONS

Overview

This phenomenological qualitative research study deductively examined the distinctions in pedagogical content knowledge (PCK) between and among culinary educators with varying industry and teaching experience levels. The data from the interviews with culinary arts educators were analyzed and have been further explained in this chapter. Researcher reflection and the literature was used to understand and interpret the more significant meaning of the data. First, the research question is presented and reviewed for its directional impact on the study. The research question, along with the literature review, guided the design of the data collection. This chapter provides a descriptive analysis of the findings from the data collection so that the reader may further understand what the answer is to the research question. Answering the research question required an interpretation of the meaning of the results by reflecting personally on the impact of the study’s findings. Next, the research analysis is discussed, which offers in-depth connections between the data collection findings and the literature. The literature also informed the findings in an iterative process that revealed a more profound understanding of the phenomenon of teaching culinary arts education. Finally, I offer implications, future recommendations, and conclusions based on the study’s results.
Research Question

RQ: What is the essence of culinary educators’ pedagogical content knowledge based on experience?

In qualitative research, the research question(s) narrow the purpose and direct the study (Creswell & Guetterman, 2019). The research question for this study was instrumental in guiding the research process to examine the phenomena of the study: experiences of teacher training, industry, and teaching culinary arts. Research on improving the profession of teaching culinary arts is lacking and warranted (Hertzman & Ackerman, 2010; Zopiatis, Theodosiou, & Constanti, 2014). Existing research (Hertzman & Ackerman, 2010; Zopiatis et al., 2014) on what constitutes quality culinary education has determined that faculty with industry and pedagogical experience are directly correlated. Hertzman and Ackerman (2010) found that industry experience, teaching techniques, and subject matter experience are the most important quality indicators for educators of culinary arts education. They determined that additional research was needed to gain specific guidance on appropriate faculty credentials and training needs.

The search to find a deeper understanding of the phenomenon of culinary teaching led to an examination of what effect professional experiences have on the PCK of culinary educators. This study has defined PCK for culinary educators as contextual tacit knowledge (TK) that can be made explicit by regulating one’s cognition of PCK. Van Driel and Berry (2012) found that expert teaching requires an abstract methodology that ties into the principles and strategies of PCK.
Loughran et al. (2001) defined PCK as the tacit cognition of teaching content influenced by teacher understandings on learning, teaching, and explicit versus tacit elements of knowledge. In addition, PCK is influenced by content knowledge, teacher experience, the context of the environment, knowledge of students, knowledge of pedagogy, knowledge of assessment, knowledge of curriculum, and critical reflection. According to Bruner (1996), expert teaching is an amalgamation of a teacher’s personal level of knowledge and social collaboration within their learning community. The capacity to transform content knowledge into contextually and socially adaptive pedagogical forms is the enactment of an expert teacher’s PCK (Shulman, 1987; Park & Oliver, 2008). Therefore, expert teaching is the possession and application of one’s PCK (Park & Oliver, 2008; Magnusson et al., 1999).

Anastasiou (2019) indicated that culinary arts education is contextually taught, requiring TK and PCK to be effective. As a contextually taught art form, culinary education requires those that teach it to possess culinary-specific PCK. If (culinary) educators’ PCK is insufficient, professional development is warranted to enhance those knowledge areas (Hughes, 2017). The guiding question was designed to examine whether their professional training and experiences influence a culinary teacher’s PCK. The following section of this chapter analyzes the findings that address answering the research question.

Analysis of Research
The following is the analysis of the eleven one-on-one interviews interpreted through personal assessment and the pre-determined themes that offered this study's framework. The questions posed in the one-on-one interviews were structured to illuminate a culinary teacher’s explication of teaching the culinary arts discipline within different contexts. The interview questions were based on the review of the literature. Most significantly, they were based on the most recent PCK Consensus Model, the Refined Consensus Model, and Loughran et al.'s (2001) concept of capturing and representing PCK through CoRes (Content Representations) and PaP-eRs (Pedagogical and Professional experience Repertoires).

First, each participant was asked to describe their general process for preparing instruction for any culinary topic. The question was designed to allow the participant to give a general account of how they prepare for instruction in their specific capacity. Then, each participant was asked a series of questions based on a singular culinary topic and its sub-content. The specific culinary topic was moist heat cooking. Moist heat cooking was chosen as the instructional topic based on its inclusion in the American Culinary Federation’s Certified Culinary Educator exam and its generalizability to culinary teaching for secondary and postsecondary education levels. In addition, moist heat cooking is generalizable among food and hospitality disciplines such as baking and pastry, culinary arts, and food and nutrition.
Interviews were conducted via videoconference over eighteen days. The interviews were recorded, transcribed, coded, and analyzed by the researcher. The analysis process minimally impacted researcher bias. Although a researcher’s positionality impacts their subjectivity, a reader should understand that the researcher is innate in the presentation of findings. My subjectivity allowed me to comprehend PCK as it exists, but it also may bias my perception of reality, rendering the analysis and presentation critical. Subjectively, PCK is extremely important for culinary educators’ and students’ success.

Once the interview data were recorded, transcribed, and coded, it was analyzed to discover the findings being represented. Often, qualitative researchers use tools that allow the findings to be visually displayed (Creswell & Guetterman, 2019). For this study, the PCK coding rubric (Appendix D) was used to help determine each participant’s PCK based on their responses to the interview questions. The PCK coding rubric helped visually identify the components of PCK along with its subcomponents to determine how individuals demonstrate their understanding. In addition, the data visualization allowed the narration of the descriptive analysis based on the connections between the findings and the literature.

Analysis from the demographic survey and the interviews revealed that culinary educators with a degree or credential in teaching exhibit PCK more readily than culinary educators with no pre-service degree. Similarly, culinary educators with more than twenty years of food and hospitality industry
experience more clearly exhibited PCK than those with less than twenty years of industry experience. Culinary educators with more than one hundred hours of in-service training demonstrated PCK more readily than those with less than one hundred hours of in-service training. In addition, culinary educators with more than ten years of teaching experience more clearly revealed PCK versus those with less than ten years of teaching experience. The differences in how experiences influence PCK are further explained in the following sections, broken down to reveal the differentiation of culinary educators’ PCK among and between those with different professional experiences based on the components and subcomponents of PCK.

**Pedagogical Reasoning**

To begin the interview, participants were asked a preliminary question designed to gain insight into their pedagogical reasoning.

(Q1) *Describe your general process for preparing instruction for any culinary topic.*

Just as researchers designed the Refined Consensus Model to begin and end with pedagogical reasoning, so did the interview sessions. Research (Liepertz & Borowski, 2019) shows that for one to perceive PCK fully, pedagogical reasoning must be considered to account for complex teaching contexts. As the center of the Refined Consensus Model, pedagogical reasoning regulates the procedures and principles of teaching. Hashweh (2005) described pedagogical reasoning as shaping what, why, and how a teacher teaches
specific topics. A teacher exhibiting a comprehensive repertoire of pedagogical reasoning will display the subcomponents of pedagogical reasoning, which are planning, teaching, and reflecting.

Participants were asked to describe their general process for preparing instruction for any culinary topic. Overall, participants with pre-service teacher training were more likely than those with no pre-service teacher training to display the subcomponents (planning, teaching, and reflecting) of pedagogical reasoning. Participant 6 had pre-service teacher training and described planning instruction as a product of reflection,

*I kind of expected they had some knowledge coming in, so taking them with zero knowledge or zero kitchen time zero kitchen sense has really altered the way I look at design in my instruction. I have to really break it down a lot farther, bare-bones, than what I really like simply because of the comprehension levels. So, I start there.*

Similarly, participants with over one hundred hours of professional development were more likely than participants with less than one hundred hours of professional development to display subcomponents of pedagogical reasoning. For example, Participant 7, who’s had over one hundred hours of teacher professional development, described the planning for instruction based on collective industry knowledge,

*…we have an advisory board of industry professionals that give us feedback on what the industry needs are as well as we have certain
competencies that are set forth by the American Culinary Federation.

Okay, so, you know, after we get that feedback, we set up menus based on different competencies.

The results of this analysis are congruent with the findings of Park and Oliver (2008). They stated that the greater a teacher’s knowledge base, the more flexible and interactive they can be in their classroom instruction. Love (2015) similarly suggested that more experienced teachers rely on their intuition rather than metacognitively reflecting in-action, indicating that experience and professional development create a teacher’s TK, improving teaching in-action. Grossman (1990) compared teachers who received teacher education; she found that teacher education offers teachers better professional preparation by linking pedagogical understanding to subject matter. In addition, reflective practice, a prerequisite for ongoing professional learning (Hoekstra et al., 2018), was only evident in one participant with no pre-service teacher training. All other participants without pre-service teacher training never described reflection as part of their class preparation.

Collective Pedagogical Content Knowledge

I asked participants to describe the main concepts students must learn about moist heat cooking.

(Q2) What are the main concepts students must learn about moist heat cooking?
Participants who responded in ways that reflected comprehension of instructional strategies, content representations, and discipline-specific practices exhibited collective PCK. All participants with extensive experience in the industry revealed themselves to be subject matter experts. Participants with more than twenty years of food and hospitality industry experience were most likely to exhibit collective PCK. Participant 7, with more than twenty years in the food and hospitality industry, displayed collective knowledge of content representations in terms of discipline-, topic-, and concept-specific knowledge by relating culinary procedures, equipment, product, and techniques:

…and this goes back to previously what I said, especially with things like the combi oven and steamers, you need to teach proper procedures so that they do these things safely. You teach the difference between shallow poaching, deep poach, talk about what proteins are good for poaching. The other one I would add to this would be, you know, you can talk a little bit about combination cooking things like stewing and braising but I tend to keep those in a separate category.

The results confirm what the literature states, that knowledge in this realm is said to be collective because it is the explicit knowledge that has been codified by experts and made available for use by teachers (Gess-Newsome, 2015). The findings of this study on collective PCK coincide with the findings of Hertzman and Ackerman (2010). They found that industry experience, teaching techniques,
and subject matter experience are the most important quality indicators for educators of culinary arts education.

**Learning Context**

I asked participants what factors influence their teaching of moist heat cooking and what knowledge about students influences their teaching of it.

*(Q3) What factors influence the teaching of moist heat cooking?*

*(Q4) What knowledge about students influences the teaching of moist heat cooking?*

The two questions were designed to allow the participants to describe their understanding of how the educational climate, learning environment, and student attributes influence how they teach the general topic of moist heat cookery. If there is a lack of a supportive learning culture, one that promotes high productivity and personal excellence, the expert-to-student TK exchange is hindered (Anastasiou, 2019). Students significantly impact PCK development; understanding their misconceptions plays a significant role in shaping one’s PCK. Throughout the assessment of the learning context, those with pre-service teacher training were more likely to exhibit an understanding of the impact that the educational climate and learning environment have on a student’s learning.

Participant 10, who has a teaching degree, over twenty years of experience in the industry, and over one hundred hours of teacher professional development, exhibited an understanding of the impact students have on the learning environment and how it shapes the learning context,
You know, when it comes to learning, it’s not about just getting to the material; and it’s not about teaching something. ‘I presented everything okay’. Well, why did everybody fail? Or, why does everybody hate your class? But the same class taught by another instructor, it’s their favorite course. It’s because that instructor is very aware of the student. The collective environment…if you have one student out, the whole environment changes. You have two students go to the restroom, the environment, the classroom changes, and you know these are the type of things, you know, again not overthink it, but it makes a difference, it really does.

Here, Participant 10 is exhibiting PCK because it is not simply the possession of the five domains of teacher knowledge, but it is the blending and enactment of these domains within unique contexts of instruction (Love, 2019; Park & Oliver, 2008).

Although most participants, regardless of experience, demonstrated an understanding of how student attributes affect the teaching of moist heat cooking, those without a degree failed to consider the impact of organizational (external), classroom (internal), and social contexts. Most participants demonstrating proficient content knowledge confirms Chan and Yung’s (2015) study that found a high level of content knowledge will allow a teacher to notice a student’s misconceptions. Higher levels of pedagogical knowledge enable teachers to accommodate the context of the learning environment.
Personal Pedagogical Content Knowledge

I asked participants why moist heat cooking is important to know.

(Q5) Why is moist heat cooking important?

The question was designed to explore a participant’s personal PCK; it allowed participants to describe their understanding of how they implement explicit reflection-on-action, explicit reflection-in-action, and tacit reflection-in-action in teaching a general topic. The explicit aspects of personal PCK are the agentic acts of planning for and reflecting on the instruction. Participant 11, who had over twenty years of industry experience, pre-service training, over twenty years of teaching experience, and over one hundred hours of in-service training, made explicit the aspects of personal PCK through reflection-on-action:

as I got a little bit more sophisticated in my teaching techniques (I learned) how to apply for grants so that I could get the rolling refrigeration in the shop…and I remember when I got the first one and then I realized, ‘wow, did I make a mistake with this grant’, so I went back to it and thought I got to have seven of them…the other thing about food I find today is taking nothing for granted with the kids, so every bit of produce gets washed every bit of food gets in check because I was amazed, you know, kids just didn’t know what certain foods were.

The tacit aspects of personal PCK can be found in implementing instructional planning and reasoning (Gess-Newsome, 2015). Those that exhibited explicit reflection in- and on-action and tacit reflection-in-action elicited
personal PCK. Comprehensive personal PCK was most prevalent in participants with over twenty years of experience in the food and hospitality industry, along with those with formal teacher training and more than ten years of teaching experience.

The realm of personal PCK offered the most significant contrast among participants regarding professional experience. Evidence shows that learning about teaching correlates to improved teaching; faculty who participate in pedagogical professional development activities have been shown to alter their classroom pedagogy (Condon et al., 2016). The results of the eleven interviews demonstrate the need for the implementation of pedagogical professional development activities in culinary arts education. Professional development activities offer an exchange of socially explicit collaboration based on shared best practices; in turn, the learner is more likely to accumulate and transfer the new knowledge through an explicit-to-tacit or tacit-to-explicit interchange into personal TK (Nonaka & Takeuchi, 1995).

**Enacted Pedagogical Content Knowledge**

I asked participants what they understood to be the difficulties and limitations connected with teaching moist heat cooking. I also asked what the best ways to represent moist heat cooking are and to explain teaching strategies and particular reasons for using the strategies to engage with the topic of moist heat cooking.
(6) What difficulties/limitations are connected with teaching moist heat cooking?

(7) What are the best ways to represent moist heat cooking? Explain teaching strategies (and particular reasons for using these to engage with this idea).

These two questions were designed to evoke a participant’s enacted PCK. PCK is idiosyncratically enacted due to its internal construct, context, and interrelationship between domains (Shuman, 1987). Participants displayed increased enacted PCK the more they described their enacted PCK as a process requiring pedagogical reasoning, metacognitive awareness, teacher self-regulation, and teacher efficacy.

The capacity to transform content knowledge into pedagogical forms that are contextually adaptive is the enactment of an expert teacher’s PCK (Shulman, 1987; Park & Oliver, 2008). Furthermore, teacher efficacy has been found to affect one’s PCK (Park & Oliver, 2008), meaning teacher beliefs about their ability to enact specific methods of teaching specific subject matter affects the ability to teach effectively.

When examining participants’ enacted PCK, teacher self-regulation and efficacy was most apparent regardless of experience. For example, Participant 1, who had over twenty years of industry experience, no pre-service teacher training, less than five years of teaching experience, and less than ten hours of professional development, exhibited teacher efficacy as a belief to affect
adoption and change and a willingness to implement learned strategies in this way:

… we’re going to do twelve other steps of repetition, as far as writing it (a concept) down, talking about it, recording it, producing it, evaluating it, and then critiquing it and then reviewing it afterwards. So, if I can get twelve steps in there, then I feel that the student can learn the idea or absorb the ideas that we’re trying to teach.

Enacted PCK was not highly differentiated between and among all participants. Generally, the more industry experience a participant had, the more likely they linked difficulties and subsequent teaching strategies and a belief to implement those strategies for moist heat cooking. For example, Participant 7 had over twenty years of industry experience and stressed the importance of time and practice, difficulties and limitations that culinary students often endure, and how teaching strategies are applied to address such difficulties.

So many of my students work. Whether in the business, or they’re working another job because they, you know, want to get into the business. And it’s a time constraint, you know. Do they have time to practice? You know, the days of when I went to school and had an enough financial aid that it paid for school. And I didn’t have to work full time. While I was in school, you know, so you had time to practice, you had opportunities to practice. This is the third school I’m working at, the other two schools were proprietary schools, but one of the nice things they did is they offered a
skills lab for students so students can come in, and, you know, they had a two-to-four-hour time slot that they could come in and practice whether it was knife cuts, moist heat cooking, whatever.

As a subcomponent of PCK, a teacher’s enacted PCK is central within the Refined Consensus Model (Carlson & Daehler, 2020). The model depicts this centrality as the individual teacher, their pedagogical reasoning, and their particular set of knowledge and skills. The innateness of the individual teacher within the Refined Consensus Model indicates that the model is unique to each teacher’s professional journey, their attitudes and beliefs about students, and the way their pedagogical reasoning has been shaped over time (Carlson & Daehler, 2020). The literature (Uzuntiryaki-Kondakci et al., 2017; Paris & Winograd, 2003) defines a teacher’s pedagogical reasoning as requiring the internal processes of metacognitive awareness, teacher self-regulation, and teacher efficacy. Each subcomponent (internal processes) of enacted PCK is a complex construct that did not prove to be highly identifiable with experience levels among culinary arts educators and may best be identified in future research.

Implications

Research (Park & Oliver, 2008; Magnusson et al., 1999) shows that expert teaching is the possession and application of one’s PCK. Therefore, this study aimed to examine the profession of culinary education through the lens of PCK theory. As a contextually taught art form, culinary education requires its teachers
to possess PCK. In addition to possessing PCK, an expert culinary teacher uses TK to contextually enact their PCK within various environments by regulating their pedagogical reasoning. This construct makes culinary-specific PCK a unique dynamic that culinary educators should display to be effective. Every taught profession requires specific modes of teaching called signature pedagogies. Each discipline’s signature pedagogy differs from every other discipline’s signature pedagogy. Signature pedagogies suggest that there needs to be education designed to identify, assess, and improve the modes of teaching in every profession, including teaching culinary arts. Therefore, learning the essence of a culinary teacher’s culinary-specific PCK based on experience can help inform the future training of professional culinary educators.

For Shulman, PCK began with the concept that teaching starts with a teacher’s understanding of how to teach what is to be learned. His inquiry into conceptualizing teaching also considered its contextual application across all disciplines. The resultant theory of PCK is that it is a distinct construct that identifies the idiosyncratic bodies of knowledge for teaching. Magnusson et al. (1999) found that because PCK is a definable construct, it can guide the critical dimensions of expertise in teaching when designing pre-service and in-service teacher education programs. Consequently, they focused on addressing the knowledge bases when designing teacher education programs. Although they based their research on addressing science teachers’ PCK, it is generalizable enough to be equally applied to culinary teachers for culinary-specific PCK.
Marks (1990) characterized the application of pedagogical principles to contexts of particular subject matter as *specification* “the appropriate instantiation of a broadly applicable idea in a particular context” (p. 8). Shulman (1987) stated “It represents the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction” (p. 8). Therefore, culinary education must include instructors well-versed in culinary subject matter, culinary pedagogy, and contextual knowledge to the extent that they are cognitively aware of and able to enact their culinary PCK.

As the conceptual framework of this study, pragmatism and constructivism theories were integral in foreshadowing the impact teacher training has on a teacher’s PCK. The implication of these findings reveals, as constructivist theory indicates, knowledge is actively constructed. Constructivism is the active process of obtaining knowledge through a learner’s self-regulation (Piaget, 1977). PCK is a unique construction of teacher knowledge that is both personal and collective (Rodriguez & Towns, 2019). One’s truth, or understanding, is both personal and collective knowledge formulated by a continuous construction of beliefs (Murray, 1912). Constructivism theory begins with the concept that knowledge instructs our thinking and behavior and that building knowledge is an active process situated in context and culture (Maclellan & Soden 2003). The findings indicate the need for culinary educators to have increased experience levels before and during their teaching careers. Learning from experience requires connecting
previous circumstances through experimentation and reflection so that we may adopt new methods as a rule (Dewey, 2016). Van Driel and Berry (2012) and Hashweh (2013) determined that programs aimed at developing PCK should be based on constructivist and situational theories because they have a higher aptitude for building upon reflection and experience.

Recommendations

The findings of this study indicate that educators of culinary arts are generally lacking in PCK. Culinary educators with increased amounts of professional experience exhibit culinary-specific PCK more readily than those with lesser amounts of professional experience. Experienced culinary educators were more likely to explicate the tacit and contextual knowledge required to effectively teach culinary arts. Yet, regardless of experience and training, culinary educators consistently lacked the ability to display culinary-specific PCK; its domain-specificity and TK interchange between teacher and student.

Culinary educators at the postsecondary level are often not required to have pre-service teacher training; experience in the food and hospitality industry and experience in teaching are more heavily weighted. Consistently, culinary educators with industry experience exceeding ten years presented characteristics of PCK over those with less than ten years of industry experience. Additionally, those without pre-service teacher training did not present characteristics of PCK as readily as their counterparts with pre-service teacher
training. Hertzman and Ackerman (2010), who sought to evaluate quality in associate degree culinary arts programs, found industry, teaching, and subject area experience highly correlated as quality faculty indicators. Their recommendation was for program administrators to assess their hiring standards to ensure they assign instructors with strong industry-related experience, train instructors in effective teaching methods, and require faculty to continue education. The findings of Hertzman and Ackerman (2010) remain true but can also be applied to culinary educators of secondary education. Improving hiring standards and facilitating the expert-to-student TK interchange enables institutions to promote a supportive learning culture that supports high productivity and personal excellence through improved in-service teacher training.

A quantitative survey was attempted to measure culinary educators’ PCK, but the results were inconclusive. The results indicated that culinary educators might believe they have higher-level expert teaching characteristics than they genuinely possess. The inconclusive results were a concerning development and suggested that pre-service and in-service teacher training must include the explicit and tacit tenets of PCK, particularly reflecting on and in the act of teaching. Additionally, as Lee et al. (2007) found, professional development programs should also foster collaborative work between beginning educators and experienced educators to promote the growth of PCK in beginning teachers. Collaborative programs can facilitate the process of deconstructing one’s
teaching through CoRes and PaP-eRs. As Loughran et al. (2001) explained, the articulation of a teacher’s TK is an essential element of a profession so that it may be analyzed and understood by others.

The literature informed the study that an expert culinary teacher requires the possession of PCK. The data collected from the study’s interviews revealed that although culinary educators with increased professional experience possess and exhibit PCK more readily than those with lesser amounts of professional experience, there is room for much improvement in this area for all culinary educators. Expert teacher training and development hinges on the notion that mediation of pedagogical tools will vertically build upon a teacher’s knowledge (Maclellan & Soden 2003). Hashweh (2005) defined the pedagogical tools to build teacher knowledge as teacher pedagogical constructions. Pedagogical constructions are a collection of knowledge entities that inform other teachers how to teach specific topics, coinciding with Vygotsky’s theory of constructivism, that knowledge develops from individuals’ environmental and social interactions. Hashweh (2005) found that the experience of a teacher allows for the development of pedagogical constructions as a result of repeated planning, teaching, and reflecting on teaching. Gess-Newsome et al. (2019) provided evidence that professional development focused on content and pedagogy improved teachers’ knowledge about specific topics, their pedagogical knowledge, and their teaching practice.
How knowledge is interpreted lies within an individual’s socially constructed mediators; the mediators are the tools that interpret experiences and process reasoning (Maclellan & Soden 2003). The interpretation of knowledge is the theory behind Loughran et al.’s (2001) Content Representations (CoRes) and Pedagogical and Professional-experience Repertoires (PaP-eRs). As Maclellan and Soden (2003) stated, “restructuring of thought is related to the acquisition and use of powerful new tools and signs for mediating thought” (p. 112).

Individuals and groups create new knowledge when attempting to make sense of their experiential world (Maclellan & Soden 2003). In this regard, culinary educators can create new knowledge, personal and collective, by implementing CoRes and PaP-eRs for pre-service and in-service teachers.

This study revealed that highly experienced industry chefs are the best candidates to teach culinary arts, yet many have not been formally trained or credentialed as educators (Gersh, 2016). In general, culinary educators lack training in pedagogical knowledge, lack experience with school culture, and are ill-prepared to assume teaching tasks and duties (Hegarty, 2015; Hussain, 2016). New standards for culinary educators must include pre-service teacher training rooted in the tenets of culinary-specific PCK. In addition, the in-service training for culinary educators is likely not to include culinary content knowledge, discipline-specific practices, nor the principles of PCK. Professional development must address this issue, offering a bridge for untrained and novice culinary educators to improve the tacit-to-explicit and explicit-to-tacit interchanges.
between teacher and student. The tacit-to-explicit and explicit-to-tacit knowledge interchanges for culinary educators is specific to the discipline because culinary arts is taught in exclusive contexts. The interchanges are facilitated through reflection-on action which requires increased pedagogical reasoning; more specifically, metacognitive awareness (Shim & Roth, 2007). Therefore, it is recommended that culinary educators at the secondary and postsecondary levels receive pre-service teacher training and in-service teacher training that is specific to the teaching of culinary arts: PCK that accounts for its content specificity, its discipline’s practices, and the TK that accounts for its distinctive contexts. Academia that fails to realize the needed improvements in culinary education is not only failing the future viability of its workforce, but it is failing its students in the process.

PCK must be more apparent in culinary teachers if the profession is to progress and offer transformational outputs, both tangible and intangible. For the food and hospitality industry to grow and sustain itself with a quality workforce, those entering it must receive quality training from qualified educators. Academia’s failure to acknowledge culinary arts education and CTE as equivalent to all other forms of education has created inequities in programs, ultimately failing its greatest asset, the student.

Future Research
Hertzman and Ackerman (2010) determined that research was needed to gain specific guidance on appropriate culinary faculty credentials and training needs. The present research study sought to contribute such guidance; it has offered insight into experiential phenomena attributable to the profession of culinary education. Recommendations have been made consistent with the analysis of the findings and the literature connected to the study. Although limitations have presented themselves, they provide useful direction for new research exploring further and connected inquiries into culinary arts education and the role PCK has within it.

The analysis of culinary educators’ enacted PCK offered some insight into its complexity and interconnectivity with the components of PCK. Given the complexity of each subcomponent (pedagogical reasoning, metacognitive awareness, teacher self-regulation, and teacher efficacy) of enacted PCK, further investigation, and a focused commitment to address them more in-depth is warranted. Although the literature guided the study’s design and the questions to address the subcomponents of enacted PCK, the specificity in which they each need to be addressed would be better suited in future research.

The collection of quantitative data was attempted but proved to be inconclusive. Reliable quantitative measurements for culinary educators’ PCK were not present in the literature. The results indicated that culinary educators might believe they possess higher-level expert teaching characteristics than they genuinely have. The results were a concerning development and illuminated the
need for researchers to develop quantitative measurements for PCK in culinary arts education. Researchers may also develop studies to identify a teacher’s perceived PCK against their demonstrated PCK.

Due to the time constraints of this study, data collection was delimited to individual interviews. An expanded approach to this phenomenological study may examine data beyond interviews, including group interviews, live observations, recorded observations, and journals.

Conclusion

This study was not an effort to establish the status quo; rather, it intended to seek ways to affect change. Culinary arts education programs are considered Career and Technical Education (CTE). CTE does not fall within traditional models of educational pathways. Often, CTE’s unorthodoxy results in an unwarranted knock for its lack of academic rigor. Although there have been strides to improve perceptions of CTE, there are still those that view it as lesser than (Tucker, 2019). Establishing the professionalization and legitimization of culinary arts education begins with establishing practical standards and assessments for its teaching (Hegarty, 2016). The research conducted for this study found that culinary education is still early in its development compared to many other disciplines. More well-established disciplines, such as science and mathematics, have been thoroughly researched, professionalized, and legitimized over time by academia. According to researchers of culinary
education (Hegarty, 2004, 2016; Traud, 2016; Milster, 2019), culinary arts education lacks legitimization because there is a lack of research that would lead to its improved development through standards of professionalization.

Academia has a duty to create and uphold standards that benefit its stakeholders, particularly the workforce, the community, teachers, and students. As bastions of its current and future integrity, professional culinary educators must accept the task of legitimizing their profession’s existence. Legitimization begins with bold and rigorous research that examines how student outcomes are affected by the complex contexts in which culinary education is taught. Then, with new data, it is up to academia to implement new standards through training, budget, and administrative support.

Pre-service teaching programs for culinary teachers for secondary and postsecondary teachers focused on emphasizing the tenets of culinary-specific PCK should become standard practice for the profession. Secondary schools should better emphasize the importance of experience in the food and hospitality industry when hiring culinary arts educators. Postsecondary schools should better emphasize the importance of pre-service teacher training that is specific to culinary content and pedagogy when hiring culinary arts educators. Both secondary and postsecondary schools should emphasize in-service professional development that is discipline-specific and teaches the tenets of culinary-specific PCK. In addition, administrators should ensure programs are in place that create collaboration between experienced teachers and novice teachers. The act of
passing knowledge collaboratively in a community of scholars stimulates new perspectives on thinking, helps build a professional identity, and allows for adopting effective habits (Paris & Winograd, 2003).

PCK theory has been an integral part of educational research for over three decades; it has been studied, refined, and implemented into educational programs worldwide. TK theory has existed in the literature longer than PCK. Still, they have not been intimately linked to examine teaching a contextual subject, like culinary arts, as it is in this study. This study is the first to connect the constructs of PCK and TK and apply them to an examination of culinary arts education. The findings of this study indicate that culinary educators must possess the exclusive construct of PCK that includes TK to account for the contexts in which the culinary arts are taught.

This study's processes illuminated that teaching culinary arts education lacks the depth of research needed to improve its professionalization. As Hegarty (2014) stated, the professionalization of culinary education requires its educators to design, plan, and deliver programs that foster and support student learning. The professionalization of culinary education will lead to a community of professional practitioners enabled to reflect on their practice, engage with the research, and build toward professionalism. In addition, Hegarty (2011) identified reflection from culinary educators as central to critical inquiry about the profession’s assumptions and practices. This study was my attempt as a chef, an educator, and now a researcher to reflect on my practices and those of my
teaching colleagues to become better informed about our profession, which is often misunderstood and underrepresented in the world of professional educators.
APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL
November 16, 2021

CSUSB INSTITUTIONAL REVIEW BOARD

Expedited Review IRB-FY2022-149 Status: Approved

Prof. Andrew Hughes and Danny Babin COE - Educ Leadership&Tech ELT California State University, San Bernardino
5500 University Parkway

San Bernardino, California 92407

Dear Prof. Andrew Hughes and Danny Babin:

Your application to use human subjects, titled “Culinary Arts Educators Pedagogical Content Knowledge” has been reviewed and approved by the Institutional Review Board (IRB) of CSU, San Bernardino. The CSUSB IRB has weighed the risk and benefits of the study to ensure the protection of human participants. The study is approved as of November 16, 2021. The study will require an annual administrative check-in (annual report) on the current status of the study on November 15, 2022. Please use the renewal form to complete the annual report.

This approval notice does not replace any departmental or additional campus approvals which may be required including access to CSUSB campus facilities and affiliate campuses. Investigators should consider the changing COVID-19 circumstances based on current CDC, California Department of Public Health, and campus guidance and submit appropriate protocol modifications to the IRB as needed. CSUSB campus and affiliate health screenings should be completed for all campus human research related activities. Human research activities conducted at off-campus sites should follow CDC, California Department of Public Health, and local guidance. See CSUSB's COVID-19 Prevention Plan for more information regarding campus requirements.

If your study is closed to enrollment, the data has been de-identified, and you’re only analyzing the data - you may close the study by submitting the Closure Application Form through the Cayuse Human Ethics (IRB) system. The Cayuse system automatically reminds you at 90, 60, and 30 days before the study is due for renewal or submission of your annual report (administrative check-in). The modification, renewal, study closure, and unanticipated/adverse event forms are located in the Cayuse system with instructions provided on the IRB Applications, Forms, and Submission Webpage. Failure to notify the IRB of the following requirements may result in disciplinary action. Please note a lapse in your approval may result in your not being able to use the data collected during the lapse in the application's approval period.

You are required to notify the IRB of the following as mandated by the Office of Human Research Protections (OHRP) federal regulations 45 CFR 46 and CSUSB IRB policy.

Ensure your C1TI Human Subjects Training is kept up-to-date and current throughout the study.
Submit a protocol modification (change) if any changes (no matter how minor) are proposed in your study for review and approval by the IRB before being implemented in your study.
Notify the IRB within 5 days of any unanticipated or adverse events are experienced by subjects during your research.
Submit a study closure through the Cayuse IRB submission system once your study has ended.

The CSUSB IRB has not evaluated your proposal for scientific merit, except to weigh the risks and benefits to the human participants in your IRB application. If you have any questions about the IRBs decision please contact Michael Gillespie, the IRB Compliance Officer. Mr. Michael Gillespie can be reached by phone at (909) 537-7588, by fax at (909) 537-7028, or by email at mgillesp@csusb.edu. Please include your application approval number IRB-FY2022-149 in all
correspondence. Any complaints you receive regarding your research from participants or others should be directed to Mr. Gillespie.

Best of luck with your research.
Sincerely,
Nicole Dabbs

Nicole Dabbs, Ph.D., IRB Chair CSUSB Institutional Review Board

ND/MG
<table>
<thead>
<tr>
<th>Year level for which this Celtte is designed:___________</th>
<th>Important Science ideas/concepts</th>
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</thead>
<tbody>
<tr>
<td>Content Area:___________</td>
<td>Big Idea A</td>
</tr>
</tbody>
</table>

- What do you intend the students to learn about this idea?
- Why is it important for students to know this?
- What else do you know about this idea (that you do not intend students to know yet)?
- What are the difficulties/limitations connected with teaching this idea?
- What is your knowledge about students’ thinking that influences your teaching of these ideas?
- Are there any other factors that influence your teaching of these ideas?
- What are your teaching procedures (and particular reasons for using these to engage with this idea)?
- Specific ways of ascertaining students’ understanding or confusion around this idea (include a likely range of responses).

Loughran et al., 2001
APPENDIX C

PEDAGOGICAL CONTENT KNOWLEDGE INTERVIEW FOR CULINARY EDUCATORS
My name is, Danny Babin. I am a doctoral student at CSU, San Bernardino, currently working on my dissertation on *Measuring the pedagogical content knowledge of culinary teachers: an assessment of teacher training and professional development.*

This document will act as framework for the interviews that I will conduct in relation to my dissertation. The participants will be culinary teachers at the secondary and postsecondary levels in California.

**Questions to ask.**

1. Describe your general process for preparing instruction for any culinary topic.

   For the remainder of the interview, the culinary topic we will be discussing is moist heat cooking. (Consider the planning process and how you’re going to teach it)

2. In your experience, what are the main concepts students must learn about moist heat cooking?

3. In your experience, what factors influence the teaching of moist heat cooking?

4. In your experience, what knowledge about students influences the teaching of moist heat cooking?

5. In your experience, why is moist heat cooking important?

6. What do you find to be the difficulties/limitations that are connected with teaching moist heat cooking?

7. What are the best ways to represent moist heat cooking?

   Explain teaching strategies (and particular reasons for using these to engage with this idea).
APPENDIX D

PEDAGOGICAL CONTENT KNOWLEDGE INTERVIEW CODING RUBRIC
<table>
<thead>
<tr>
<th>Question Number: Component of Pedagogical Content Knowledge</th>
<th>Subcomponent of Pedagogical Content Knowledge</th>
<th>High Level of Pedagogical Content Knowledge</th>
<th>High to Medium Level of Pedagogical Content Knowledge</th>
<th>Medium Level of Pedagogical Content Knowledge</th>
<th>Medium to Low Level of Pedagogical Content Knowledge</th>
<th>Low Level of Pedagogical Content Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 1: Pedagogical Reasoning</td>
<td>Planning</td>
<td>The participant describes planning as an understanding of purposes, an evaluation of possible outcomes, and requiring a determination of representational repertoire</td>
<td>The participant describes 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the items in detail and 2 items generally in the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the items in detail in the column “High Level of Pedagogical Content Knowledge”.</td>
</tr>
<tr>
<td>Question 1: Pedagogical Reasoning</td>
<td>Active Teaching</td>
<td>The participant describes active teaching as an enactment of knowledge, a task rooted in strategy, and requiring self-observation</td>
<td>The participant describes 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the items in detail and 2 items generally in the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the items in detail in the column “High Level of Pedagogical Content Knowledge”.</td>
</tr>
<tr>
<td>Question 1: Pedagogical Reasoning</td>
<td>Reflecting</td>
<td>The participant describes reflection as a process of self-evaluation, reviewing affect, and reconstructing planning and teaching based on expectations and outcomes</td>
<td>The participant describes 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the items in detail and 2 items generally in the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the items in detail in the column “High Level of Pedagogical Content Knowledge”.</td>
</tr>
<tr>
<td>Question 2: Collective Pedagogical Content Knowledge</td>
<td>Instructional Strategies</td>
<td>The participant describes collective culinary instructional strategies based on their knowledge of assessment, pedagogy, content, students, and curriculum</td>
<td>The participant describes collective culinary instructional strategies based on 3 or 4 of the knowledge bases listed in “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes collective culinary instructional strategies based on 2 of the knowledge bases listed in “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes collective culinary instructional strategies based on 1 of the knowledge bases listed in “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant generally describes collective instructional strategies based on 1 of the items in detail in the column “High Level of Pedagogical Content Knowledge”.</td>
</tr>
<tr>
<td>Question 2: Collective Pedagogical Content Knowledge</td>
<td>Content Representations</td>
<td>The participant describes what they understand about the content in terms of discipline-specific knowledge, topic-specific knowledge, and concept-specific knowledge.</td>
<td>The participant describes what they understand about the content in terms of 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes what they understand about the content in terms of 2 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes what they understand about the content in terms of 1 of the 3 items in detail and 2 items generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes what they understand about the content in terms of 1 of the 3 items in detail in the column “High Level of Pedagogical Content Knowledge”.</td>
</tr>
<tr>
<td>Question 2: Collective Pedagogical Content Knowledge</td>
<td>Discipline-specific Practices</td>
<td>The participant describes discipline-specific practices that address the topic, student understandings, and habits of mind.</td>
<td>The participant describes discipline-specific practices in terms of 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes discipline-specific practices in terms of 2 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes discipline-specific practices in terms of 1 of the 3 items in detail and 2 items generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes discipline-specific practices in terms of 1 of the 3 items in detail in the column “High Level of Pedagogical Content Knowledge”.</td>
</tr>
<tr>
<td>Questions 3 and 4: Learning Context</td>
<td>Pedagogical Content Knowledge</td>
<td>Content Knowledge</td>
<td>Pedagogical Content Knowledge</td>
<td>Content Knowledge</td>
<td>Pedagogical Content Knowledge</td>
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<tr>
<td>Educational Climate</td>
<td>The participant describes the educational climate in terms of the organizational structure, political structure, and social structure</td>
<td>The participant describes the educational climate in terms of 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes the educational climate in terms of 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes the educational climate in terms of 2 of the 3 items from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes the educational climate in terms of 1 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes the educational climate in terms of 1 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
</tr>
<tr>
<td>Learning Environment</td>
<td>The participant describes the learning environment in terms of space, time, and equipment.</td>
<td>The participant describes the learning environment in terms of 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes the learning environment in terms of 2 of the 3 items from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes the learning environment in terms of 1 of the 3 items in detail and 2 items generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes the learning environment in terms of 1 of the 3 items in detail and 2 items generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes the learning environment in terms of 1 of the 3 items in detail and 2 items generally from the column “High Level of Pedagogical Content Knowledge”.</td>
</tr>
<tr>
<td>Student Attributes</td>
<td>The participant describes an understanding of how to shape instruction based on a student’s prior experiences, dispositions, and developmental readiness.</td>
<td>The participant describes an understanding of how to shape instruction based on 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes an understanding of how to shape instruction based on 2 of the 3 items from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes an understanding of how to shape instruction based on 2 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes an understanding of how to shape instruction based on 2 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes an understanding of how to shape instruction based on 2 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
</tr>
<tr>
<td>Explicit reflection on-action</td>
<td>The participant describes knowledge of the topic, the reasoning behind teaching the topic, and the planning for teaching the topic to enhance student outcomes; this is informed by their knowledge of assessment, pedagogy, content, students, and curriculum</td>
<td>The participant describes 2 of the 3 items in detail and 3 or 4 knowledge base items from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 2 of the 3 items in detail and 1 or 2 knowledge base items from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the 3 items in detail and 1 knowledge base item in the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the 3 items in detail and 1 knowledge base item in the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the 3 items in detail and 1 knowledge base item in the column “High Level of Pedagogical Content Knowledge”.</td>
</tr>
<tr>
<td>Explicit reflection in-action</td>
<td>The participant describes in detail the explicit act of teaching the topic in a particular way and for a particular purpose.</td>
<td>The participant describes in general the explicit act of teaching the topic in a particular way for a particular purpose.</td>
<td>The participant describes in general the explicit act of teaching the topic in a particular way or for a particular purpose.</td>
<td>The participant describes in general the explicit act of teaching the topic in a particular way or for a particular purpose.</td>
<td>The participant describes in general the explicit act of teaching the topic in a particular way or for a particular purpose.</td>
<td>The participant describes in general the explicit act of teaching the topic in a particular way or for a particular purpose.</td>
</tr>
<tr>
<td>Tacit reflection in-action</td>
<td>The participant describes in detail the tacit skill of implementing instructional planning and reasoning during active teaching for enhanced student outcomes.</td>
<td>The participant describes in general the tacit skill of implementing instructional planning and reasoning during active teaching for enhanced student outcomes.</td>
<td>The participant describes in general the tacit skill of implementing instructional planning and reasoning during active teaching for enhanced student outcomes.</td>
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</tr>
<tr>
<td>Question 5: Personal Pedagogical Content Knowledge</td>
<td>The participant describes the planning, teaching, and reflecting on the planning and teaching of the topic.</td>
<td>The participant describes 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
</tr>
<tr>
<td>Pedagogical reasoning</td>
<td>The participant describes what impacts the learning of the topic, how and why tasks are accomplished, and the process of activities used to oversee the learning process.</td>
<td>The participant describes 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 2 of the 3 items in detail and 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
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<td>The participant describes 1 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
</tr>
<tr>
<td>Metacognitive Awareness</td>
<td>The participant describes representing the topic by the participant describes 2 of the 3 items in detail</td>
<td>The participant describes 2 of the 3 items in detail</td>
<td>The participant describes 2 of the 3 items in detail</td>
<td>The participant describes 1 of the 3 items in detail</td>
<td>The participant describes 1 of the 3 items in detail</td>
<td>The participant describes 1 of the 3 items in detail</td>
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</tbody>
</table>

**Notes:**
- **Educational Climate:** Describes the educational climate in terms of organizational structure, political structure, and social structure.
- **Learning Environment:** Describes the learning environment in terms of space, time, and equipment.
- **Student Attributes:** Describes an understanding of how to shape instruction based on a student's prior experiences, dispositions, and developmental readiness.
- **Explicit Reflection on-action:** Describes knowledge of the topic, the reasoning behind teaching the topic, and the planning for teaching the topic to enhance student outcomes.
- **Explicit Reflection in-action:** Describes the explicit act of teaching the topic in a particular way and for a particular purpose.
- **Tacit Reflection in-action:** Describes the tacit skill of implementing instructional planning and reasoning during active teaching for enhanced student outcomes.
- **Pedagogical Reasoning:** Describes what impacts the learning of the topic, how and why tasks are accomplished, and the process of activities used to oversee the learning process.
- **Metacognitive Awareness:** Describes representing the topic by the participant.
<table>
<thead>
<tr>
<th>Teacher Efficacy</th>
<th>Identifying what the strategy is, how the strategy operates, and when and why a strategy should be applied.</th>
<th>And 1 item generally from the column “High Level of Pedagogical Content Knowledge”.</th>
<th>Items in detail from the column “High Level of Pedagogical Content Knowledge”.</th>
<th>And 2 items generally from the column “High Level of Pedagogical Content Knowledge”.</th>
<th>Items in detail from the column “High Level of Pedagogical Content Knowledge”.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The participant describes a belief to produce their desired results through experience, a belief to affect adaptation and change, and a willingness to implement learned strategies.</td>
<td>The participant describes 2 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 2 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
<td>The participant describes 1 of the 3 items in detail from the column “High Level of Pedagogical Content Knowledge”.</td>
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</tbody>
</table>
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