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Thematic analysis of influencers on continuing professional learning of tenure track engineering faculty as assistant professors at an RU/VH institution

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THEMATIC ANALYSIS OF INFLUENCERS ON CONTINUING PROFESSIONAL LEARNING OF TENURE TRACK ENGINEERING FACULTY AS ASSISTANT PROFESSORS AT AN RU/VH INSTITUTION

A Dissertation

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ABSTRACT

Cawthorne Jr., James E. Ph.D., Purdue University, August 2016. Thematic Analysis Of Influencers On Continuing Professional Learning Of Tenure-Track Engineering Faculty As Assistant Professors At An RU/VH Institution. Major Professor: Dr. Ruth Streveler.

"Although the need for lifelong learning of professionals is stressed through university education, the patent differences between learning as a student, within a controlled framework focusing on accessible outcomes, and learning as a professional have not been clarified" (Webster-Wright, 2009, p. 708). Assistant professors are entry level professionals in academia who been prepared through their extensive education process to be lifelong learners and yet it is unknown how these assistant professors are engaging, or being engaged by others, in continuing their professional learning (CPL) for short-term and long-term success in academia as a career. This study aimed to understand who and/or what influenced tenure-track engineering faculty's continuing professional learning early in their career.

An exploratory qualitative thematic analysis was conducted using responses to semi-structured interviews from 13 tenure-track engineering faculty members at a Carnegie classified as Research Universities (very high research activity) institution about their professional development experiences when they were assistant professors. A stratified purposeful criterion sampling strategy was employed to maximize the diversity in background and experiences participants brought to the study. The results that emerged from the data was that the influencers of CPL were (1) *institutional impacts on learning*, (2) *self-directed learning*, (3) *socially constructed learning*, and (4) *mentored learning*.

The findings identified within the themes was that (1) no one dominant pathway existed in the continuing professional learning of tenure-track engineering faculty as

assistant professors; and (2) the four influencers – *institution impacts on learning, self-directed learning, socially constructed learning, and mentored learning* – can be combined in multiple ways to construct the continuing professional learning experience for an individual faculty member. A series of metaphorical equations were constructed to model the collective continuing professional learning of an individual faculty member including the detailed contribution of the individual influencers. Additionally, a framework for constructing CPL environments was proposed as an adaptation of Bransford's How People Learn (HPL) framework.

The researcher acknowledges this was an exploratory qualitative research study with a small, specialized sample size (N=13) so these findings are not generalizable to the larger population of faculty, engineering faculty, or professionals.

CHAPTER 1. INTRODUCTION

> *Although the need for lifelong learning of professionals is stressed through university education, the patent differences between learning as a student, within a controlled framework focusing on accessible outcomes, and learning as a professional have not been clarified. Despite many innovative PD [(professional development)] practices, there remains a persistent didactic influence in a considerable proportion of PD practices following graduation that echoes an undergraduate framework (Webster-Wright, 2009, p. 708).*

Lifelong learning is identified as a positive, necessary trait in the growth and development of a professional. It is a concept people employ as a catchall phrase to represent the desire to have individuals continue to learn and grow within their chosen profession to be successful. Learning does not end with the completion of an academic degree and taking of a job, it only shifts from an exposure to a breadth of knowledge and skills associated with a profession to developing a level of expertise in one or two specific areas of the profession. On the contrary, the real learning, in terms of contribution to society and industry is just beginning at this time. The question of what kind of contributor a professional will be is dependent on his or her ability to continue learning and working with others in his or her field and organization. The challenge is: how do professionals go about learning once they have moved from the academy to the workplace? Even if the academy is their workplace.

The common thought voiced by many in industry and academia seems to be that professional development activities and the individual's personal drive to learn will

advance one's lifelong learning. While many researchers have been studying and thinking about how people learn and use knowledge in their professions, few gains have been made in understanding this phenomenon (Beckett & Hager, 2002; Billett, 2007). The challenge in many places is that learning as a professional is construed as a professional development activity and while formal opportunities are provided, informal learning activities may not be as well supported.

This study attempts to alter this conversation by framing learning not as simply professional development (PD), but one of continuing professional learning (CPL). Professional development, in this study, refers to formal discrete units of experiences designed to expose participants to new ways of thinking or doing in their profession, where clear delimiters mark the beginning and end of these activities (Wenger, 1998). There is a role for formal professional development activities, but it far from encompasses the space of learning in the profession. Continuing professional learning is a more inclusive activity. CPL for professionals encompasses any learning that "shapes their practice, from a diverse range of activities, from formal PD activities, through work interactions with colleagues, to experiences outside work, in differing combinations and permutations of experiences" (Webster-Wright, 2009, p. 705). The process of learning as a professional is an embodiment of all the experiences an individual has in his or her life, particularly informal, on-the-job experiences where people must learn to not only construct knowledge, but use their knowledge or skills.

There are many vocations in the world and each has its own unique idiosyncrasies related to performing successfully in the profession. In academia, the criteria for success is recognized to be obtaining tenure and, later, promotion to Full Professor. It is not always clear how this path is navigated through the production of research, grants, publications, and recognition within one's field, the engagement of students through teaching, and the fulfillment of service to the institution, at all levels (Finnegan & Hyle, 2009). Despite recognizing what faculty needs to do to be successful, it is unclear how individual faculty members learn the knowledge and skills required to achieve this success. No two tales about how faculty perform their work will ever be the same, yet

underneath their stories exists similarities and differences that may inform deans and department chairs about what faculty do to be successful.

1.1. Statement of the Problem

Tenure is the process by which junior faculty advance into the upper ranks of academia by demonstrating their capability of conducting research, receiving grant money, teaching classes, serving the department, engaging the community, and graduating doctoral students (Cohen & Kisker, 2010; Gappa, Austin & Trice, 2007; Schuster & Finkelstein, 2006). There have been many books written to guide assistant professors in the process of acculturating into academia with advice about what to do and ideas to consider. Some of these books support their ideas with the scant data available yet there is no clear study providing insight into how assistant professors experience the professional learning process (Boice, 2000; Lucas & Murry Jr., 2011).

This study was developed on the idea that continuing professional learning of an assistant professor as an engineering faculty member occurred through multiple entities influencing the faculty member's experience. Some of these entities, such as the department and individual faculty member, can be hypothesized yet it remains unknown if there are other entities to be considered as well as exactly how the various entities' interactions are perceived by faculty.

1.2. Expanded Explanation of the Research Problem

There are many pathways for individuals to become assistant faculty members on the tenure-track in US higher education institutions. Some individuals have a post-doc experience, others come with industry or professional experience pertinent to their fields, but many today arrive in the profession primarily straight from academia itself. There are many efforts today to provide preparation for the profession of academic faculty while students are still pursuing their PhD, but participation varies by university, majors, and even specific advisors within a given department. Incoming tenure-track faculty are generally well prepared in conducting and disseminating research in their field, but many

lack experience in teaching, grant writing, managing others, working with and not for others, engaging the community (both the university and the local), and managing their lives with expectations (Fagen, Suedkamp, & Wells, 2004; Golde & Dore, 2004; Wulff et al., 2004).

Junior faculty are hired as an investment in the future by a department on behalf of the college and/or university. It is hoped that all hires lead to successful academic careers, but success requires growth and development by the faculty member into competent and productive professionals within the academy which is generally recognized by the attainment of tenure. The continued professional learning challenge for junior faculty is to engage in scholarship production, scholarship dissemination, preparing future professional contributors in their field at multiple levels (undergraduate and graduate students), fostering community relations to their work, sustaining the academy through service, and managing their own personal lives (Austin & Wulff, 2004; Bakken & Simpson, 2011; Boice, 2000). This raises the questions of how faculty learn to be professionals and whether the type of professionals they become matters to their institution.

Developing professionally has always been a challenge for incoming faculty. Traditionally, faculty members were expected to learn what they need to in order to succeed (Wulff and Austin, 2004). This was short sighted because new assistant professors arrive on campus with a diversity of experiences and preparation, but still requiring growth and development. As Ann Austin (2002, p. 128) noted in a speech on professional development for the future professoriate:

> Various pressures and expectations external and within higher education are creating a time of significant change. The changes within the academy have a direct impact on the work and lives of faculty members. New expectations require the next generation of faculty members to have a range of abilities, skills, knowledge and understanding that goes beyond what entering faculty members typically have needed. The preparation of the next generation of faculty members cannot be “business as usual.”

This statement was prescient of the future. In 2002, expectations may have changed for faculty, but in the decade since the expectations have exploded with the expectations to include technology in the classroom, to adopt new teaching paradigms, to contribute to providing a quality undergraduate experience, to producing quality research, to finding funding for research in a time where academic research funding seems to be contracting, and still manage all of the previous expectations of being a faculty member. Given these conditions it is important to embrace any attempts to generate an understanding about how tenure-track assistant professors go about their continuing professional learning in today's Carnegie classified RU/VH institution (See Chapter 1.6 for explanation of RU/VH).

This study about the experiences of junior faculty can provide insight into the phenomenon of faculty's continuing professional learning. Each individual faculty member has a unique set of experiences in preparation and in their time as junior faculty. This qualitative study begins building this understanding by capturing the actual experiences of engineering faculty as assistant professors through inquiries into:

- What were their continuing professional learning/development experiences?
- What tactical and strategic approaches worked for them? What did not?
- What challenges did they face in their continuing professional learning?
- Who was involved in supporting, or possibly hindering, their continuing professional learning?

In addressing these questions, this study will capture the significant experience of the individual and begin to assemble a collective insight into the continuing professional learning phenomenon of junior faculty that can be impacted by policies or other support mechanisms (i.e. funding and resources) to benefit all faculty staff as well as the individual assistant professor.

1.3. Purpose of the Study and Research Question

The purpose of this study was to identify who and/or what influenced assistant professor's continuing professional learning using tenure-track engineering faculty members' descriptions of their experiences as assistant professors. The research question for this study was: *What are the influencers on continuing professional learning of tenure-track engineering faculty as assistant professors?*

1.4. Scope of the Study

The scope of the study situated the context for what this study attempted to address and what is outside its purview. This study captured the collective professional development experiences of an assemblage of tenure-track engineering faculty members at a Carnegie classified RU/VH institution and analyzed the responses to identify influencers on their continuing professional learning. The study did not attempt to analyze the responses relative to any subgroup representation such as gender, engineering discipline, or any other unique classifications provided in the demographics table in chapter 4. The study was exploratory and qualitative in nature generating an initial foray into understanding the phenomenon of continuing professional learning and this population with no expectation of generalizability of the findings produced. No frameworks were applied in the design or analysis of this study so as to avoid biasing the research with a favored lens.

1.5. Operational Definitions

The definitions supplied in this section are provided to assist the reader in having clarity into words or phrases commonly used, or unique applied, throughout this dissertation. Any definitions not accompanied by a citation have been developed by the researcher.

Assistant Professor: In the United States, the entry level position for faculty seeking tenure recognition within a higher education institution. At a Carnegie classified RU/VH

institution, he or she is a new hire who will engage in research, teaching, and service on behalf of their hiring department over the period of five to seven years (varies by institutions) in pursuit of earning tenure (Cohen & Kisker, 2010; Schuster & Finkelstein, 2006).

Associate Professor: In the United States, commonly references the position title for faculty who have earned tenure recognition from their peers and institution. Some non-tenured faculty may have earned this title at unique institutions, but for this dissertation it refers to faculty with appointments in tenure-track line.

Carnegie Classification (RU/VH): The basic Carnegie classification for higher education institutions in the United States that are recognized as doctorate granting institutions which conduct a high level of research. The doctorate granting component of the definition refers to the fact the institution awards a minimum of twenty doctoral degrees per year, excluding professional degrees. The high level of research is an indexing reflecting the amount of research an institution conducts, not the research quality or importance (Carnegie Classification, n.d.).

Collaboration: Colleagues "work[ing] together, especially in a joint intellectual effort" (Marlon & Nass-Fukai, 2000).

Collegiality: The "cooperative interaction among colleagues" (Uchiyama & Radin, 2009) based on "building strong relationships [between peers] and validation of colleagues as equals (Marlon & Nass-Fukai, 2000).

Continuing professional learning: "Describe[s] the learning of practicing professionals (Webster-Wright, 2009, p. 705). It encompasses all informal and formal learning required to grow and excel in a person's chosen profession.

Faculty: Individuals hired by a university to execute a part of its mission by teaching undergraduate and graduate students, conducting scholarly research within a discipline as they prepare the next generation of scholars, and reaching out to the community and university through service

Faculty development: "Process which seeks to modify the attitudes, skills, and behavior of faculty members toward greater competence and effectiveness in meeting student needs, their own needs, and the needs of the institution (Francis, 1975, p. 720). There are many other definitions but this one captures the broad sense in this researcher's mind while newer definitions start to include superfluous aspects.

Full Professor: A full professor ranking refers to a tenure-track faculty member who was tenured and has since been promoted again by their institution and peers in recognition for their continued contributions to the academy and the institution. This is the highest faculty ranking.

Influencers: "The capacity or power of persons or things to be a compelling force on or produce effects on the actions, behavior, opinions, etc., of others" (Dictionary.com Unabridged, 2014).

Institution(s): The various level of academic organizations within the university structure. Can be an academic center, a department, a college, or the university.

Junior Faculty: Colloquial designation used to speak about assistant professors on the tenure-track hiring line at US institutions of higher education.

Professional development: Formal discrete units of experiences designed to expose participants to new ways of thinking or doing in their profession, where clear delimiters mark the beginning and end of these activities (Wenger, 1998).

Professional learning: The processes engaged, whether formal or informal, by which professionals (faculty members in this study) learn the knowledge, skills, and attributes they will require to be successful in the profession in both the short and long term.

Tenure: That condition attained by a faculty member through highly competent scholarly activities which assures the faculty member security of employment and immunity from reprisals or threats due to an intellectual position or belief which may be unpopular and which guarantees annual reappointment for the faculty member until voluntary resignation, retirement, or removal for adequate cause (Bakken & Simpson, 2011).

Tenure-track: Designation, in the United States, of one type of faculty appointments within an academic institution where hiring and promotion of faculty centers around the concept of tenure. Other faculty appointments, such as adjuncts and instructors, do not have the same job protection as provided by tenure.

1.6. Dissertation Organization

This dissertation is organized into five chapters. Chapter one introduces the research study providing the purpose for conducting the study and the guiding research question. Chapter two provides a literature review of important concepts to contextualize the study. Chapter three details the methods for conducting the study, including participant selection and recruitment, data collection, data analysis, researcher bias. Chapter four introduces the participants and presents the thematic results that emerged from the data. Chapter five concludes the study discussing the themes that emerged from the data, the findings extruded from the themes, the implications and recommendations for stakeholders, the limitations of the study, and the suggestions for future research.

CHAPTER 2. REVIEW OF LITERATURE

This chapter reviews existing literature associated with professions, professional development, faculty, and faculty development to identify a research gap need for exploring the continuing professional learning experiences of tenure-track engineering assistant professors at Carnegie classified RU/VH institutions in the United States.

2.1. Profession

When thinking about professional development, or professional learning, it is key to understand what is being referred to when talking about a professional, or more generally, a profession. There are a variety of definitions of profession ranging from broad to narrow. The phenomenon of professionalism, or professions, can be viewed as a continuum from well-recognized undisputed professions to least skilled and least attractive occupations. Most occupations fall in between the two poles.

Most simple definitions of a profession situate advanced education as an important characteristic. The *Merriam-Webster Online Full Definition* of profession as "a calling requiring specialized knowledge and often long and intensive academic preparation" and the *Cambridge Dictionary Online* definition as "any type of work that needs special training or a particular skill, often one that is respected because it involves a high level of education" situate education as important in defining a profession. Dall'Alba and Sandridge (2006) back this up by claiming a traditional definition of profession to be "based on systemic, scientific knowledge" (p. 384).

Other definitions highlight additional characteristics as contributing to describing a domain of work as a profession. Troman (1996) makes the astute call that a profession is socially constructed concept. A sociological approach "views a profession as a group

which is constantly interacting with the society that forms its matrix, which performs its social functions through a network of formal and informal relationships, and which creates its own subculture requiring adjustments to it as a prerequisite for career success" (Greenwood, 2010, p.65). This view of a profession is an amalgamation of a series of insights generated by sociology about work from the 1940's to the 1960's.

Some professions, such as engineering, medicine, and law, ascribe service to the public welfare as a significant component of a profession. These professions define themselves partly as "a collective of expert service providers who have jointly and publicly committed to always give priority to the existential needs and interests of the public they serve above their own and who in turn are trusted by the public to do so" (Welie, 2004, p. 531). These beliefs are reinforced in the professional ethical codes of medicine, law and engineering.

From a systemic viewpoint, there are five elements that can be identified as distinguishing a profession from a standard job. The characteristics are "(1) systematic theory, (2) authority, (3) community sanction, (4) ethical codes, and (5) a culture" (Greenwood, 2010, p.65). A systemic theory refers to a *body of knowledge and skills* agreed upon as important to the work by the profession that is taught in institutions of higher education and periodically debated and evaluated by professionals in the domain at scholarly conferences. Authority and community sanction refer to the assertion of the individual as a professional and the building of confidence within the public of performing in their interests. Ethical codes are communicated by professional societies. Most ethical considerations are black and white, yet there are always gray areas that professionals are expected to use their training to act in the best interest of the public (Greenwood, 2010).

The most impactful characteristic is the culture of a profession. The ethics, technical knowledge, and public expectations change gradually over time, or in spurts, while the cultural component is always evolving. Culture is a collection of the symbols, values, norms, and other subjective components of a profession that are socially negotiated by each successive generation within a profession (Greenwood, 2010).

A profession, in the view of this researcher, is a socially constructed collection of individuals who receive specialized preparation in a domain, have acute awareness of their ethical responsibilities to others in the domain and the general public, and navigate the network of formal and informal relationships and cultural expectations of the domain in pursuit of career success.

2.2. Professional Development

Professional development (PD) is used by many people as a catch-all phrase for the experiences people have, or need to have, to grow within their profession (Ouellett, 2010). In many institutions and companies, PD exists as a series of activities provided to professionals by their employer, either on the job or outsourced, to enhance an individual's capabilities – knowledge, skills, or attributes – for doing his or her job (Butler, Lauscher, Jarvis-Selinger, & Beckingham, 2004; Lawless & Pellegrino, 2007; Guskey & Yoon, 2009). While many PD activities have tried to adjust to the needs of professionals by being open to topic suggestions and engaging participants more interactively, the problem still exists that many of these rarely align authentically with the requisite work needs of participants (Gravani, 2007; Hawley & Valli, 1999). Even if professional development activities were corrected so that all of them were authentic, engaging, socially-constructive learning experiences, PD would still only represent a fraction of the learning individuals experience on the job.

Some extend professional development by referring to it as continuing professional development (CPD) where self-directed learning experiences and organizational strategies are combined with formal professional development activities (Caffarella & Zinn, 1999). The problem with this definitional change is that it is simply taking on more actions by the individual and claiming their involvement justifies it being considered *continuing* professional development. The question raised by some researchers, such as Ann Webster-Wright (2009) and Dall'Alba and Sandridge (2006) is whether CPD captures the lived experience aspect of immersing in one's own professional development or is a new term, such as continuing professional learning a more appropriate construct.

2.2.1. Professional Development to Continuing Professional Learning

This research study envisions the learning that professionals do as all-encompassing of their experiences in life. This is reconciled by shifting the focus of how professionals learn from a focus on professional development (PD) to one of continuing professional learning. This is not to say that PD does not have a role to play in the professional learning process of people, but rather that it is a component and should not be recognized, nor relied upon, as the single process for promoting lifelong learning amongst professionals.

Professional development with all of its baggage in association with conducting of formal seminars and implication of needs of faculty requiring modification does not describe the experience professionals embark on throughout their career. A different term that captures the entire scope is professional learning which attempts "to describe the lived experience of continuing to learn as a professional" (Webster-Wright, 2009, p. 715). Professional learning encompasses the individual's self-directed learning moments, the formal professional development courses, the experiential learning opportunities, and the direct learning in classrooms. Professional learning is the holistic representation of work learning applied to an individual's chosen profession. It encompasses the informal and formal development activities as well recognizing that the development has to address not just work tasks but development in behavior and attitude in work, and personal growth as an individual.

Professional development should be reframed as continuing professional learning (CPL) to mirror the larger processes of learning that individuals experience in life and help them perform his or her professional work. The first consideration for why PD should be recast as CPL is a semantic argument. When an individual is told that he or she requires professional development to advance within his or her field, this focuses on the "professional as deficient and in need of developing and directing, rather than on a professional engaged in self-directed learning" (Webster-Wright, 2009, p. 712). Some people may argue that this is being overly sensitive to words. While this may be a correct assessment, reframing PD as CPL allows people to discuss in a positive framing about

how an employee will tactically and strategically engage lifelong learning for their own benefit, not framed as simply something required by his or her employer.

Reframing PD as CPL shifts the emphasis from development to learning. Development has a negative connotation for many, implying a generally passive experience of learning in a workshop where the emphasis is on training, development, or education (Beckett & Hager, 2000). The connection of this experience to one's professional work requires the individual to work to apply the takeaway messages of a seminar, or workshop, to their daily practice. This belies the truth that learning, even learning of formal information, occurs mostly informally as people try to square the new information garnered with what they already know and where they are currently going.

The final consideration for shifting the conversation from using the phrase professional development to continuing professional learning is about recognizing the process through a lens of holism rather than atomism. Holism is the belief that learning stems from all aspects of one's life (Jarvis & Parker, 2006) and that "learning is dependent on the interaction among the learner, the context, and what is learned" (Webster-Wright, 2009, p. 714). Atomism attempts to break the learning into individual parts that can be adjusted ignoring the interconnectedness of the various components. The process of lifelong learning is an integrated process and is best served when studied from a holistic perspective.

2.2.2. Barriers Experienced by Engineers in Lifelong Learning

In 2012 the National Academy of Engineering produced a report entitled *Lifelong Learning Imperative in Engineering: Sustaining American Competitiveness in the 21st Century* to strategically think about the continuing professional learning of engineers who have entered the workforce after graduation. The report can also be applied to engineering faculty, as well as the entry-level engineers mentioned the report, as engineering faculty are in need of lifelong learning support. In the report a series of barriers were identified to lifelong learning that translate well into faculty experiences with lifelong learning. The lifelong learning, or CPL, barriers individuals experienced were identified as (1) not enough time, (2) high cost, (3) lack of appropriate funding, (4)

inconvenient location, and (5) lack of employer support. The work of Caffarella and Zinn (1999, p. 243) identified "the four domains within which these supports and barriers [for professional development of faculty] are clustered: (1) people and interpersonal relationships, (2) institutional structures, (3) personal considerations and commitments, and (4) intellectual and psycho social commitments." It is clear that CPL constraints for engineers-in-practice and educators-in practice are similar.

The report provided insights for businesses, professional societies, educational policymakers and educational institutions about steps to consider taking to support the development of lifelong learning as a trait in students. To maintain its competitive edge, American universities need to consider supporting the following findings of the report for its faculty (Dutta, Patil, & Porter Jr, 2012, p.12-14):

- Invest in lifelong learning for employees.
- Communicate the value of lifelong learning.
- Enact policies that encourage financial support for lifelong learning.
- Develop a culture that supports a learning culture.
- Develop lifelong learning programs.

In the cases of all the suggestions above, lifelong learning can be exchanged with professional learning for faculty.

2.3. Academic Profession

The academic profession can be considered to encompass all individuals engaged in the formal education process. Differences in within the academic profession emerge as a variety of subcultures, such as K-12 education in the United States (Darling-Hammond & Sykes, 1999; Abdal-Haqq, 1998), higher education outside the United States (Knight, Tate & York, 2006; Fry, Ketteridge, & Marshall, 2008; Whitchurch, 2008), and types of higher education within the US (Hahn, & Lester, 2012; Mundy, Kupczynski, Ellis, & Salgado, 2012; Nicholls, 2014; Clark, 1987). In higher education in the United States,

the academic profession is perceived by many to be a full-time tenure-track position sought by many graduating doctoral students (Austin, 2002; Walker et al., 2009, Bieber & Worley, 2006; Adams, 2002). The traditional perceptions of the academic profession, commonly referred to as faculty in higher education institutions in the United States, are positioned around "their own fields of interest in teaching and research, [as well as their], aspirations for career success and recognition" (Brennan, 2007, p. 23). For this study, the academic profession will refer to the faculty position in higher education in the United States at a Carnegie classified RU/VH institution where academics are primarily viewed as tenure-track faculty conducting research, teaching in classrooms and labs, and providing requisite service to their department and university (Finkelstein, 2007, p.151).

2.4. Faculty and Faculty Development

Faculty are a specific set of professionals hired by a university to execute a part of its mission by teaching undergraduate and graduate students, conducting scholarly research within a discipline, preparing the next generation of scholars, and reaching out to the community and university through service (Schuster & Finkelstein, 2006; Boice, 2000). Faculty development can have a broad or narrow definition depending upon how the concept is being applied. A narrow definition refers only to the programs provided by institutions in order to further the preparation of faculty members for their roles of teaching, research, and service at an institution. A broader definition expands faculty development to be any activities that prepare a faculty member as a teacher, a scholar, and as a person (Ouellett, 2010).

Table 2.1 provides a list of the interchangeable ways people confer, and subsequently refer, to faculty development. From the various constructs, this study will construe faculty development as any formal or informal opportunities emphasizing the skills and knowledge development of faculty required to meet the minimum standards of tenured faculty at an institution of higher education in the United States.

Table 2.1 Alternative names for faculty development (Camblin Jr & Steger, 2000, p.3).

Alternative Names	**Definitions**
Instructional development:	Emphasizes the development of faculty skills involving instructional technology, micro teaching, media courses, and curricula.
Professional development:	Emphasizes the growth and development of individual faculty in their professional roles.
Organizational development:	Emphasizes the needs, priorities, and organization of the institution.
Career development:	Emphasizes preparation for career advancement.
Personal development:	Emphasizes life planning, interpersonal skills, and the growth of faculty as individuals.

Sections going forward will provide the integrated history of faculty and faculty development, the history and expectations of attaining tenure in US higher education, the exploration of results from three major studies about faculty development, and the current construct of faculty development in US higher education.

2.4.1. Integrated History of Faculty and Faculty Development in US

The history of faculty and faculty development are intertwined. The first academic institutions in colonial United States were opened to "educate and morally uplift the coming generation" (Boyer, 190, p.4). The profession of teaching was seen as being akin to the ministry in that individuals felt a need to do it as a service to their community rather than to receive wealth. "According to historian Theodeore Benditt, 'professors were hired not for their scholarly ability or achievement, but for their religious commitment'" (Boyer, 1990, p.5). Most professors at this time taught at their alma mater and engaged in secondary careers of medicine, law, or the ministry. It was

not until 1800 that professors' roles became bifurcated with supervisory responsibilities being added to those of college teaching (Schuster & Finkelstein, 2006). The beginnings of education and the professoriate lay in the preparation of mind, spiritually and intellectually.

Over time this changed as the United States grew from a colony into a country and found the need to produce its own technically competent workforce. The first technical school established in the US in 1802 was the U.S. Military Academy at West Point which prepared young men to use science and engineering in the course of protecting the nation. In the early 1800's other colleges such as Rochester Institute of Technology and Yale introduced engineering and science as education to support the nation's growth (Boyer, 1990). The 19th century would be the century of professionalization for faculty where the beginnings of (1) specialization, (2) graduate education, (3) faculty lifelong career commitment to the profession, and (4) emergence of the expert occurred (Schuster & Finkelstein, 2006).

Professionalization of the faculty meant that inevitably the faculty would require professional development to grow within their career. Thus, it was in 1910 at Harvard University that the concept of a sabbatical, the first form of faculty development, was introduced. Sabbatical provided early professors the opportunity to leave their responsibilities at their college and spend some time developing as a scholar. This was expected to be a benefit to both the faculty member personally and professionally as well as the reputation of the institution and the quality of education the faculty member would provide his students (Ouellett, 2010).

The major developments over the remainder of the 19th Century were provided by enactment of Congress. The first law passed was the Morrill Act of 1862 (later known as the Land Grant College Act) which provided land to each state to support "education in the liberal arts and training in the agricultural and mechanical revolutions" (Boyer, 1990). This law is responsible for the creation of the hundreds of agriculture and engineering schools in the United States and arguably for providing the institutional foundations for the future growth in the 20th and 21st Century of the United States as a technological and agricultural power in the world. The second law enacted was the Hatch Act of 1887

where money was provided to encourage and support universities to connect with the community in the form of agricultural experiment stations. These community connections allowed knowledge generated at the land grant institutions to be translated into use by the farmers responsible for feeding the nation (Boyer, 1990). The relationship still exists today in the form of agricultural consultancies and programs like 4-H for the next generation of agriculturalists and farmers.

The nineteenth century saw the emergence of the three pillars of faculty work that survive until today as the basic formulation of faculty work – teaching, research, and service. Teaching has always been a responsibility of faculty since the beginning, but over the course of the 19th century research emerged as an important activity of faculty in their scholarly pursuits. Early in the century, the research was of a basic nature in which researchers sought to better understand the world they lived in and it did not matter whether that understanding was derived in philosophy or biology. In the later part of the 18th century, the Industrial Revolution in the US prompted research to consider a more applied angle where "professors could spread knowledge that would improve agriculture and manufacturing" (Boyer, 1990). It was the dissemination of applied research that would bring service, the third pillar, to the forefront as researchers worked with farmers and industrialists to implement best practices and receive feedback about how things performed in reality as opposed to expectations created in one's mind or a lab (Boyer, 1990).

A significant structural emergence for university faculty in the nineteenth century was the standardization of faculty ranks. A dual approach to faculty responsibilities was created where the tutors of the college teaching model, present since colonial times, became instructors with only teaching responsibilities, while another line of professional faculty, known as professors, were created to undertake the new complex role of engaging in scholarly activities of research and service in addition to teaching (Schuster & Finkelstein, 2006).

The early 20th Century was a time of consolidation of membership in the profession and elaboration of roles, responsibilities, and significance for faculty. The first significant act was the establishment of the American Association of University

Professors (AAUP) in 1915 to represent the collective interests of faculty self-interests for the profession. The result was the establishment of committees to work with and within the institution to provide faculty perspectives to the administration about how to accomplish the goal/visions of the institution and in particular the role faculty could play. The penultimate effect was the AAUP's report on College and University Government in 1939 that postulated the premise that "faculty were not hired employees to be manipulated by the president and trustees, but were academic professionals whose role involved teaching and contributing to the direction and major decisions of an institution" (Schuster & Finkelstein, 2006, p. 31). This led to the ultimate action of professors leveraging tenure rights at their respective college campuses (Schuster & Finkelstein, 2006).

The next phase of faculty history extends from 1940 to 1969 with the growth and diversification of faculty. It also happens to encompass the beginning ages of modern faculty development. Post World War II, there was an explosion in higher education thanks to the GI Bill providing financial support to returning soldiers (Bennett, 1996; Bound & Turner, 2002) and from the emerging perception of an education as an opportunity to do something new. This required the faculty ranks to double from 120,000 in 1940 to 236,000 in 1960 and up to 450,000 by 1980 in order to handle the influx of individuals wanting to receive higher education. Simultaneously, the faculty ranks began to change demographically. It occurred at a snail's pace initially, but eventually the faculty ranks began to display the diversity present in the United States (Schuster & Finkelstein, 2006). This trend would continue into today where the diversity of faculty as a whole has begun to mirror societal numbers, although certain disciplines are disproportionately represented by one demographic group or another for a range of factors. This mid-century faculty explosion in numbers and initiation of diversity was significant in creating the university faculty population of today.

During the mid-20th century, modern faculty development experienced the first of its five ages. The naming of these time periods, or ages, come from the analysis work of Sorcinelli and colleagues (2005). The first age of faculty development was the "Age of the Scholar" which lasted from the mid 1950's to early 1960's. This time is recognized

as a time where faculty development focused on “improving and advancing scholarly competence” (Sorcinelli, Austin, Eddy, & Beach, 2005, p.2). The second age that began during this time was the “Age of the Teacher” from the mid-1960 into the 1970’s. This time period focused on extending faculty development to “include faculty, instructional, and organizational components of the improvement of teaching effectiveness” (Oullett, 2010, p.5). In this time of initial faculty growth and diversification, faculty development strove to assist faculty in becoming competent scholars and improving their teaching effectiveness.

The 1980’s brought the “Age of the Developer” where several faculty development programs emerged, many as a result of the Exxon Study conducted in the 1970’s by Centra (1976), and the faculty profession matured. The emergence of these faculty development programs meant the beginning of individuals thinking tactically and strategically in a daily way about what could be done to assist faculty as professionals (Sorcinelli, Austin, Eddy, & Beach, 2005).

The 1990’s became the “Age of the Learner” in faculty development. This is best encased in transitional clichés of faculty trying to move from being the “sage on the stage” to a “guide on the side” by infusing knowledge about student learning into pedagogical preparation. This time also experienced a rapid growth of faculty development programs and centers to support the faculty’s endeavors, primarily as teachers but also to support certain other professional needs (Oullett, 2010; Sorcinelli, Austin, Eddy, & Beach, 2005).

A reimagining of the faculty roles within the university was posited at this time. Ernest Boyer, President of The Carnegie Foundation for the Advancement of Teaching, produced a call in 1990 to alter the framing of research as well as promote a vision of how the three pillars of faculty roles – teaching, research, and service – should be envisioned relative to faculty work. Since the late nineteenth century, research has been divided in the sense of performing basic or applied research. Boyer proposed that faculty should be engaged in forms of scholarship that integrated teaching, research, and service in unique ways into the roles and responsibilities of faculty. He proposed faculty should be practicing the (1) scholarship of discovery, (2) the scholarship of integration, (3) the

scholarship of application, and (4) the scholarship of teaching and learning as described in Table 2.2 (Boyer, 1990; Braxton, Luckey, & Helland, 2002).

Table 2.2 Identification of Boyer's four scholarships (Braxton, Luckey, & Hellend, 2002)

Scholarship of:	**Focus of the Scholarship**
Discovery	"Aim is to acquire knowledge for its own sake [along with] the testing and generation of theory (p. 39).
Integration	"Serious disciplined work that gives new meaning and perspective to isolated facts, often overcoming the fragmentation of the disciplines to instead see the connectedness of things" (p. 46).
Application	"Application of disciplinary knowledge and skill to help address important societal and institutional problems" (p. 27).
Teaching	Based on "synoptic capacity, pedagogical content knowledge and what we know about learning" (p.57). Synoptic capacity is "ability to draw strands of a field together in a way that provides both coherence and meaning" (Rice, 1991, p.15).

Since the beginning of the 21st Century, it is perceived that faculty are on the cusp, or are entering, another new time period called the “Age of the Networker.” This is a time to “preserve, clarify, and enhance the purposes of faculty development, and to network with faculty and institutional leaders to respond to institutional problems and propose constructive solution (Sorcinelli, Austin, Eddy, & Beach, 2005, p.28). This means faculty developers need to be in tune with faculty and their needs more than ever. Furthermore, they need to act as the liaisons between faculty and the institution about how to support faculty development into the future.

The shift to the new age is being driven by five forces "(1) the changing attitudes and demands of higher education's patrons; (2) the changing characteristics of college students; (3); the changing conditions of employment in higher education; (4) the rise of new technologies; (5) the growth of private sector competitors" (Levine, 1997, p.1). All of these change forces are the result of changing economics and priorities of the US in relations to higher education. These changes are resulting in faculty seeking alternative means to boost their financial situation making faculty less exclusive and less preemptive. Less exclusive refers to faculty willing to engage outside consultancy, or semi-permanent opportunities to increase income while subsequently reducing time committed to roles as faculty (i.e. less preemptive) (Schuster & Finkelstein, 2006). There are questions as to whether a new paradigm of faculty will emerge as a result of these shifting demands on the profession.

This section has explored the history of faculty and faculty development over time in United States higher education institutions in general. The faculty referred to in this discussion has all been tenure-track, but across the multiple levels of positions – assistant, associate, and full professor. For the purpose of this study going forward, the faculty emphasis will be on junior faculty (assistant professors), unless otherwise stated, in pursuit of attaining tenure.

2.4.2. Assistant Professor and Tenure

In the United States of America, the assistant professor is the entry level tenure-track position into the faculty profession in higher education. Tenure-track is name demarking the faculty employment path associated with full time association with a college or university. Assistant professors engage in the process of tenure for 5-7 years depending upon institution and individual progress where upon completion the assistant professor is either granted tenure and promotion in the university or denied tenure and must seek employment elsewhere. Denial of tenure while seen as a failure by many in academia is not necessarily the end of one's academic career as the individual could move to another institution and try for tenure again, accept a non-tenure-track position as an instructor, or even possibly move into a staff or professional role within a university.

The focus here is on the process of tenure and what assistant professors can do to be successful in obtaining tenure.

The idea of tenure began with "the practice of assuring scholars [sic] safety in their academic pursuits" (Cameron, 2010, p. 1) as proclaimed in an edict from the Holy Roman Emperor Frederick Barbarossa around 1200 A.D. (Cameron, 2010). Building on this edict, European universities, during the Medieval and Renaissance Period, sought protection for its university faculty from political and religious attempts to influence education (Park, Sine, & Tolbert, 2010; Loope, 1995). This belief in separation of influence between the academy and outside forces naturally migrated from Western Europe to Colonial America.

Initially in the 1700's 1800's in America, there were battles over academic tenure. With separation from Britain and many of its common practices, faculty protection in universities and colleges was not an emphasis. This resulted in faculty removal from their jobs for political and institutional whims. In the early 1800's, Harvard changed higher education by appointing faculty to serve indeterminately (Cameron, 2010). This initiated the view by faculty in the United States that tenure was "the ultimate guarantor of free speech in the classroom" (Loope, 1995, p.3). Despite this embrace of academic freedom by Harvard and other leading educational institutions, it would be decades before a comprehensive movement to unite all tenured faculty occurred.

Conflicts existing between faculty and individuals outside the academy resulted in a series of well-publicized dismissals of tenured faculty in the late-1800's and early-1900's. This prompted action by the professors at Johns Hopkins University to call for the formation of an organization, the American Association of University Professors (AAUP), in 1913 to advocate on behalf of faculty (Park, Sine, & Tolbert, 2010; Cameron, 2010; Loope, 1995; Batterbury, 2008). The two primary responsibilities originally defined for the AAUP were the development of (1) policies for faculty termination and (2) procedures for mediating academic freedom violations (Park, Sine, & Tolbert, 2010).

Position papers published in 1915, 1925, and 1940 articulated the collective view of faculty on a number of issues, including tenure. One paper, the 1915 "General Declaration of Pronouncements" defined some of the "basic tenets [of] … universities

[as] exist[ing] to advance human knowledge (discovery), to provide instruction (pedagogy), and to develop experts for public service" (Peterson, 2007, p.355). The protection of faculty with tenure was eventually delineated by the AAUP to allow faculty to approach the basic tenets from a variety of perspectives without fear of recrimination. The germinal paper about tenure is the 1940 Statement of Principles on Academic Freedom and Tenure that defines tenure as "arrangement under which faculty appointments … are continuous until retirement … subject to dismissal for adequate cause or unavoidable termination on account of financial exigency or change of institutional policy" (Park, Sine, & Tolbert, 2010, p. 345).

Post World War II, tenure became ingrained over the next thirty-plus years in the academic structure as a representation of academic freedom. Tenure partially grew at first as a response to the influx of students after the war. Academic institutions sought to lure the best faculty to their schools by promising tenure with its protection of academic freedom and virtual lifelong employment as benefits (Cameron, 2010). Additionally, faculty tenure gained traction as a means to protect academic freedom after its challenges from the McCarthy era ideological witch-hunts of the 1950's. The attacks on individuals, including faculty, during this time period proved to be ideologically and politically motivated, as opposed to legitimate concerns about academic thought. Many faculty members were terminated for failure to take loyalty oaths or questionable institutional designated incompetence (Batterbury, 2008; Cameron, 2010; Brown & Kurland, 1990). It would take two Supreme Court Cases in the 1970's, *Board of Regents of State College v. Roth* and *Perry v. Sindermann*, to formalize due process protection, including appeal and legal representation, for tenured faculty (Cameron, 2010).

Tenure today is considered to be a normative aspect of higher education and "a college shifting from tenure to contracts moves away from the professional norms of higher education" (Mallon, 2001, p.6). Critics of tenure believe that tenure promotes laziness amongst its faculty, as well as a negatively influencing student experiences. Younger faculty bemoan tenure as a structural obstacle to obtaining full-time employment as tenured faculty persist in their jobs beyond common retirement ages

(Perley, 1998). Institutional economic concerns arise from the fact that tenured faculty are paid upwards of twice as much as adjunct faculty (Cameron, 2010).

Supporters of tenure counter with arguments about the academic quality of tenured faculty, the intellectual academic experience that academic freedom protection allows tenured faculty to provide students, and the value of a faculty motivated to provide an environment of academic freedom of intellectual exchange (Cameron, 2010; Batterbury, 2008; Park, Sine, & Tolbert, 2010).

The reality is that tenure is due to some alteration in the United States as its placement as an institutional structure prompts the upcoming generations to challenge its validity and purpose going forward. The challenge going forward, in this researcher's opinion, is balancing academic protection to faculty in their teaching and research as means for continuing honest intellectual pursuits with the shifting economic situation of higher education.

Tenure is the process by which junior faculty prove their worthiness to their colleagues in a specific discipline and the university administration. Every university has its own definition of tenure modified to situate itself into the negotiated space of faculty academic protection and the university's worldview. The definition for tenure in this study will be:

> That condition attained by a faculty member through highly competent scholarly activities which assures the faculty member security of employment and immunity from reprisals or threats due to an intellectual position or belief which may be unpopular and which guarantees annual reappointment for the faculty member until voluntary resignation, retirement, or removal for adequate cause (Bakken & Simpson, 2011).

Tenure primarily exists as a policy applied as long as funding and need for individuals with expertise to teach and lead research in a given discipline exists. There is no legal guarantee associated with tenure.

The tenure process requirements can vary by institution in the United States, but it is common amongst Carnegie classified RU/VH universities that assistant professors are responsible for teaching courses to undergraduates, producing scholarly research related to their specialty within their field, providing service to the university, community, and their professional society, develop the next generation of scholars for academia, and, if possible, have a life that is personally fulfilling (Bakken & Simpson, 2011; Boice, 2000; Boyer, 1990, University of Minnesota Policy Library, (2016); University of Purdue Provost Office, (2016), University of Michigan Provost Office, (2016)). The assistant professor engages in their professional activates documenting all of their contributions and experiences during this time for eventual review. Over the course of the 6- to 7-year process, the assistant professor should receive feedback from their mentor, if they have one, and the departmental head and/or tenure committee, time dependent on university and department policy, on their trajectory towards the arbitrary line of tenure (Bakken & Simpson, 2011).

Faculty response to tenure is that the tenure process expectations are mystifying, they are worried about looking weak to senior peers who have influence on their prospects, and concerns about institutional turnover in leadership at lower academic levels (Austin and Rice, 1998; Gappa, 2002; Rice Sorcinelli, Austin, 2000). Engineers also add from the "Heeding New Voices Study" worries about the inflexible time frame of tenure and the challenge initially of obtaining graduate students, funding as well as lab space and equipment (Gappa, 2002; Rice Sorcinelli, Austin, 2000). Assistant professors want to be successful in their faculty work, but many worry the process of tenure is structured against them and they must construct a way to professionally learn to do the work.

Tenure is achieved when a committee of senior colleagues within the assistant professor's department vote for their approval for tenure. Additional steps in the process requires approval at the college-level, the university-level and eventually confirmation by a university's Board of Trustees, or appropriate governing body. Upon granting of tenure, the individual faculty member is promoted to the rank of associate professor and assumes a new set of roles and responsibilities in the department and university. Tenure

success results in a mutual relationship between university and faculty member where faculty receive “job security, autonomy, and academic freedom [while] institutions receive long-term commitments” (Gappa, Austin, & Trice, 2007, p. 129).

2.4.3. Faculty Development Studies

There are three studies on faculty development over the last several decades that have been national studies capable of influencing academic policies and behavior. These studies are the Exxon Study in 1976 (Centra, 1976), the Professional and Organizational Development Network in Higher Education Study in 2001 (Sorcinelli et al., 2005), and the Faculty Development Practices in the Southern Association of Colleges and Schools Study in 2009-10 (McKee, Johnson, Ritchie, & Tew, 2013). What makes these three studies important is they are (1) national, or semi-national, in nature, (2) surveyed the leaders in academia about faculty development needs and issues; and (3) have been conducted with long enough time lapses between them to be providing snapshots of unique times in modern faculty development.

The first study, and arguably the most important study, is the Exxon Study conducted in 1975-76 and published in 1976. It is called the Exxon Study because funding was provided by the Exxon Education foundation. It is the arguably the most important study because it was the first national study to provide insight into faculty development at the time on university campuses and its results would contribute to the explosion of faculty development programs in universities around the United States in the coming decades. The goal of the survey was to understand the “estimated use and effectiveness of various development activities, types of faculty members involved, funding and types of programs” (Centra, 1976, p.1).

The study was conducted as a survey of higher education institutions in the United States identified as 2-year, 4-year, and professional colleges. There were 756 respondents to the survey from individuals with insight to the faculty development programs on campus, although the study does not clearly indicate who and where these respondents exist within the university structures except as college coordinators of information by the researcher. The only additional information that could be gleaned was

that 408 of the 756 respondents were from 4-year colleges, 308 were from 2-year colleges, 12 from professional schools, and 10 did not self-identify as one of the above institutions (Centra, 1976).

The survey was designed to inquire about the institutions approximate use and effectiveness of faculty development workshops and seminars, assessment practices of faculty, technology development on campus, miscellaneous inquiries relevant to faculty, and finally policies, such as awards, in practice at the institution. The questionnaire used a combination of Likert scale (range of 1-5) questions and short open responses to capture institutions' responses. Results were provided as percentage of respondents in a category (i.e. 4-year College) who selected a 1,2,3,4, or 5. Factor analysis was performed on the section of faculty development practice for use and effectiveness. The open-ended data was summed up as percentage representations based on researcher's construction of boundaries.

The results of the study were that funding for faculty development primarily came from the institution, a variety of faculty members were participating in faculty development, and most units were relatively young being in existence less than 4 years. The other finding was that there were four categories of faculty development practices: (1) traditional activities (sabbaticals), (2) programs conducted by experienced faculty, (3) instructional assistance from specialists, and (4) assessment of teacher quality. The results in this study align with the historical timing of the 1970's being the "Age of the Teacher" where faculty development consisted of assisting faculty in scholarly competence and teaching effectiveness (Centra, 1976; Oullett, 2010).

The second study conducted by Mary Deane Sorcinelli, Ann E. Austin, Pamela L. Eddy, and Andrea L. Beach in 2005-06 explored the issues of faculty development at the turn of the century and where respondents predicted change to faculty development to emerge in the coming decade. The study targeted members of the Professional Organizational Network in Higher Education (POD), representing 300 institutions, to inform understanding about the goals of the various faculty development units, what programs they were providing, and again their effectiveness in serving faculty. POD (www.podnetwork.org) serves as a professional organization supporting individuals

seeking resources, technical information or network contacts, to assist in the development of faculty in higher education across a variety of institutions in the United States.

Respondents to the survey represented nine different academic titles within academia and six different Carnegie classifications as they existed at the time of the study. Of particular interest to this research study, only 21% of respondents were faculty with 56% of those faculty respondents having been faculty for less than 5 years (Sorcinelli, Austin, Eddy, & Beach, 2005, p. 34). This indicates the results are constructed with very little input from faculty at large research-oriented institutions. The instrument used was an adapted version of the Exxon study's survey, where some of the previous questions remained, with some questions these researchers deemed relevant for this study.

The findings of the study are broken down into subcategories identified within the presentation of the report. In regards to influences on developers and programs, the major finding was that programming should be co-constructed with all constituencies – faculty, administrators, and students – to be most relevant and well-received. Under current issues, the study reports that "faculty developers are currently addressing many of the issues they and other academic leaders believe are important to higher education institutions today" (Sorcinelli, Austin, Eddy, & Beach, 2005, p. 99). This raises some concerns because it is not clear where the faculty are involved in the identification of faculty needs for development. Are faculty developers to be considered proxies for faulty members? Is there any dissonance between faculty and faculty developers? Even in addressing future issues, the study concludes that faculty respondents believe they know what the future issues are and how to address them. The survey instrument never asks faculty developers how they are developing their insight into the faculty needs.

The third major study on faculty development targeted the Southern Association of Colleges and Schools in 2009-10 by C. William McKee, Mitzy Johnson, William F. Ritchie, and W. Mark Tew. The study was positioned as a continuation of the Exxon study and the Sorcinelli group's work on faculty development. The McKee study's participants were the chief academic officers and faculty developers in universities located in the southern region of the United States to classify their faculty

development efforts in programming and faculty reached in order to allow the researchers capture and describe the development opportunities provided for faculty (McKee, Johnson, Richie, & Tew, 2013).

Only a limited set of data exists, but it appears the study used a similarly constructed instrument, with maybe a few adaptations, as the Sorcinelli and Exxon studies for comparative purposes. Of the limited results reported are agreements by respondents (chief academic officers – CAO /faculty development officers – FDO) that faculty development programs improve academic programs at the institution (65% of CAO/ 67% of FDO), improves student learning outcomes (55% of CAO / 59% of FDO), and improves faculty competence (65% of CAO / 62% of FDO). Similar to previous reports, this Southern Association Report demonstrates a set of institutional administrators believing in the value of the faculty development and the impact that their institutions programs have provided faculty (McKee, Johnson, Richie, & Tew, 2013). It would be interesting to discover if these administrators' views align with the faculty's perceptions about the value of faculty development provided.

The three studies presented provide insight into faculty development in American universities at distinct times in history. The results of the studies are beneficial for faculty developers and administrators thinking about their programs and centers relative to others around the country. The problem with these studies is they are recognized as foundational studies in faculty development but have little to no participation from actual faculty relative to whether the faculty development opportunities are valued, or how they are working, or the challenges associated with participation in faculty development. It is hard to take their findings as actual insights into the faculty development experience of departmental faculty rather than studies indicating practices of faculty development offices and their perceptions of faculty needs.

2.4.4. Forms of Faculty Development

Fostering professional learning has become a cottage industry. One can find dozens of general books on Amazon.com with advice for faculty and numerous books about grant writing, teaching, and mentoring. Along with books about faculty

professional development are websites, such as the POD Network, that provide connections to resources for faculty to direct their own professional learning. The resources vary from addressing broad roles and responsibilities of faculty to the specific uses of writing a grant. These books are based on the intersection of personal experiences and research with the degree of research evidence provided differing by book. *Advice for New Faculty Members* by Robert Boice (2000) includes research by the author as evidence to its claims of effective actions for faculty, while other books like *New Faculty: A Practical Guide for Academic Beginners (3rd Ed)* by Lucas and Murry Jr (2011) support their claims by integrating their research with other researcher's work. These kind of books provide resources for motivated faculty to access and design their own professional learning plan.

Another common way to experience informal faculty development is through the concept of communities of practice. Communities of practice comes from the workplace literature and discusses bringing peers together for informal interactions. This is part of the framework of communities of practice of Lave and Wenger (1991) where the key to informal learning in the community is the social interaction between peers whether it is collegial or collaborative (Wenger, 1998). Collaboration is where peers "work together, especially in a joint intellectual effort" (Marlon & Nass-Fukai, 2000). Collegiality is the "cooperative interaction among colleagues" (Uchiyama & Radin, 2009) based on "building strong relationships [between peers] and validation of colleagues as equals (Marlon & Nass-Fukai, 2000).

The community of practice as an informal network provides opportunities for peers to engage in conversations about (1) mastery of topics, technical or organizational, (2) negotiating the political issues that arise, and (3) ways of handling the unusual events that arise and one is not prepared to address individually (Boud & Middleton, 2003). It is the relationships established within the collegial and collaborative format which will determine the success of communities of peers for being beneficial for learning and support.

Finally, there are studies about the role of mentoring (Wright & Wright, 1987; Darwin & Palmer, 2009; Johnson, 2015) role in faculty development. Most of these

studies focus on about junior medical faculty. However, in this researcher's opinion, the mentoring discussed is applicable to the experiences of junior engineering faculty. In a recent study of junior medical faculty at the University of California San Francisco (UCSF), nearly a third of the junior faculty could not find a mentor and were at risk for isolation (Feldman, Arean, Marshall, Lovett, & O'Sullivan, 2010). In this isolation (i.e. no mentor), there is evidence among medical junior faculty of a risk of becoming too dependent on trial and error as a professional learning strategy and thereby struggling blindly through the CPL process (Kalet, Fletcher, Ferdman, & Bickell, 2006). One interesting result of this study was the presence of higher self-efficacy and general work satisfaction for those junior faculty who had mentors (Feldman et al., 2010). These results are not surprising but speak to an interesting dynamic of how a good mentor can help the junior faculty navigate through the process of professional learning required to be successful, while individuals on their own may fail despite the best of their abilities to self-direct their learning.

2.5. Gap

The research on faculty and on faculty development overlap in capturing the experience of being faculty. The research on faculty emphasizes the unique experiences of doing various tasks, the ways diverse groups are experiencing faculty work, the satisfaction of being faculty and the alignment between faculty and their perceptions of their tasks. The research on faculty development is a complex maze to navigate because the term faculty development does not just refer to the professional development of the ranks in higher education but also K-12 teachers. Faculty development research can be reduced into the five categories of (1) the development of K-12 teachers (Fenton & Watkins, 2007; Archambault, Wetzel, Foulger, & Williams, 2010; O'Hara & Pritchard, 2008), (2) the improvement of teaching effectiveness of faculty in higher education (Steinert et al, 2006; Nakamura & Csikszentmihalyi, 2005; Klenowski, Askew, & Carnell, 2006), (3) the evaluation of formal faculty development activities such as seminars and workshops (Sorinola & Thistlewaite, 2013; Taylor & McQuiggan, 2008; Steinert, McLeod, Liben, & Snell, 2008), (4) the assessment of faculty developer's

programs (Brent & Felder, 2003; Felder & Brent, 2010; Kucsera & Svinicki, 2010)), and (5) the professional learning of faculty (Webster-Wright, 2009; Dall'Alba & Sandberg, 2006).

The research gap addressed in this dissertation results from the dearth of research on how professionals actually engage in learning. And, guided by the work of Webster-Wright, hopes to "investigat[e] the lived experience of learning as a professional rather than an aggregate of factors in developing the professional" … And this … "leads to a different understanding of continuing learning" (Webster-Wright, 2009, p. 728). This call for capturing the lived experience approach to CPL is echoed by Dall'Alba and Sandberg's appeal for further research "into how professional education can promote the development of understanding of, and in, practice … [by] the *learning by participants*" (2006, p. 402). To assist researchers in capturing the construct of learning Dall'Alba and Sandberg's proposed the following guiding questions (2006, p.402):

1. What constitutes professional skill in a range of professions?
2. Why do some professionals perform better than others?
3. What form and shape do development trajectories take for a range of professions?
4. How, and to what extent, can professional development be promoted in both formal and workplace settings?

The *lived experience* approach for capturing CPL (rather than focusing on existing professional development opportunities identified in past) is the main gap in research literature this study tries to address. By identifying the influencers on the continuing professional learning of engineering faculty as assistant professors the research provided participants the opportunity to identify their perceptions about what contributed to their CPL.

An additional gap addressed in the research is shifting the choice of population to engineering faculty. Most research work on faculty development has utilized a general faculty population with a sparse STEM participant pool, university administrators, or

faculty developers (McKee, Johnson, Richie, & Tew, 2013; Sorcinelli, Austin, Eddy, & Beach, 2005; Centra, 1976). This may be the case because of the reticence of engineering faculty, and some other STEM areas, in participating in these endeavors. The focus on the time as assistant professor is not unique relative to faculty or faculty development research studies yet it serves to limit the ground to be covered in the study.

The two significant aspects driving this study are the shift in focus from *development* to *continuing professional learning* and the attempted identification of current influencers by the faulty participants. The continuing professional learning emphasis shifts this study by reframing the faculty development as a form of lifelong learning that is inclusive of formal and informal learning activities, as well as embracing the notion that part of professional development is personal development as a professional. Capturing junior faculty's perception of existing influencers on CPL provides insight into how faculty have negotiated the development and learning process to date and sheds light onto the strengths and weakness that currently exist. Faculty's metacognitive understandings from their experiences in the process could also provide additional suggestions for better strategies in developing future faculty CPL experiences.

2.6. Summary

This study transitions from thinking about the constructs of faculty and professional development into the realm of continuing professional learning for preparing assistant professors as faculty. This study will address the research question of: *What are the influencers on continuing professional learning of tenure-track engineering faculty as assistant professors?*

CHAPTER 3. RESEARCH METHOD

3.1. Introduction

The research methods described below were selected to answer the research question: *What are the influencers on continuing professional learning of tenure-track engineering faculty as assistant professors?*

This chapter describes the methods used to conduct the research study. The reasoning behind selection of methodology and sampling will be provided. The actual methods employed developing the interview protocol, collecting the data, managing the data, analyzing the data, managing researcher bias, and controlling for validity will be discussed. The chapter is written primarily in a first person voice since the methods represent the choices of the researcher.

I designed this exploratory, qualitative research study to identify the ways tenure-track engineering faculty managed their continuing professional learning (CPL) as assistant professors. Research according to Creswell (2009, p. 5) is the "intersection of philosophy, strategies of inquiry, and specific methods." I will now explain my worldview, methodological choices, and how I conducted the study.

3.2. Research Design Worldview

The worldview of the researcher is an often unacknowledged influence on research design. Qualitative researchers often control well for their biases, as I do in a later section, but sometimes fail to acknowledge the researcher's view of how people interact with each other and how people interact with their surroundings. A philosophy or worldview is "a basic set of beliefs that guide action" (Lincoln & Guba, 1985, p. 17).

These beliefs influence the choices of the researcher in how they choose to conduct a research study.

My worldview is social constructivist. I believe the world consist of a "truths" constructed socially by individuals as opposed to the existence of an absolute "Truth (Noddings, 2003)." In research terms this means I believe the participants construct the reality of their world socially and subjectively. I believe I am also involved in this construction of understanding as I interpret participant responses. I am interested in how individuals navigate their lives constructing meaning with others about the context of their world, including the social, historical, and current settings of reality. Furthermore, what processes do they construct for themselves to manage their interactions with people and the world? Therefore, I selected a qualitative research method to co-construct a beginning understanding about how engineering faculty experience continuing professional learning (Creswell, 2009; Patton, 2002).

3.3. Inquiry Approach

I selected a qualitative approach to the study to facilitate an in depth exploration of the phenomenon of continuing professional learning. An underlying point of emphasis in the design for me was limiting the participants' feelings and instead focus on the what, or how, they identified as their continuing professional learning. This qualitative approach reduced generalizability from the findings, but produced a deeper level of contextual understanding about the phenomenon. The exploratory claim in the design acknowledged the lack of previous insights into the phenomenon to guide research design, which led to the simple desire to openly capture whatever emerged from the participants about CPL (Patton, 2002; Creswell, 2009; Miles & Huberman, 1994).

3.4. Methodological Frameworks

I employed two distinct methodological frameworks in this study. I applied the framework of phenomenography to the design of the study. This meant I made choices about sampling, interview protocol, and recruitment of participants envisioning the

phenomenographical lens to capture the various ways engineering faculty spoke about experiencing the phenomenon of continuing professional learning. I faced challenges in recruitment of faculty to satisfy the diversity required to complete a phenomenographical study so I selected applied thematic analysis as the methodological framework for conducting the data analysis in this study. Thematic analysis allowed me to construct prevalent themes about the broad ways engineering faculty identified having navigated the continuing professional learning experience as assistant professors.

3.4.1. Phenomenography

Phenomenography was one of the methodological frameworks applied in this study. Phenomenography, as defined by Ferrence Marton, is used for "mapping the qualitatively different ways in which people experience, conceptualize, perceive, and understand various aspects of, and phenomena in, the world around them (1986, p. 31). In other words, it attempted to capture the various ways people speak about experiencing a given phenomenon and creates relationships to understand the differences and similarities that exist. The responses a person provided when discussing a concrete experience related to the phenomenon of interest has meaning about the way the individual experienced the phenomenon, as well as what the phenomenon means to him or her (Marton & Booth, 1997).

There are two types of approaches to conducting phenomenography – "pure" phenomenography and developmental phenomenography. "Pure" phenomenography is represented by research conducted to capture people's descriptions of experiencing a phenomenon as detailed by Marton's work. Developmental phenomenography is an emergent form of phenomenography where researchers expand beyond Marton's simple description of the relationship between individuals' experiences and a phenomenon to embracing the context of the phenomena being studied. The shift allowed researchers to go beyond just the descriptive phase and consider how the relational descriptions can be used to inform and change the way people currently operate (Bowden, 2000). While I did not directly apply these branches of phenomenography in conducting the analysis of the data, I embraced the construct of developmental phenomenography as a lens within

thematic analysis because of its idea of contextual importance to the way participants related their experiences to the phenomenon.

3.4.2. Thematic Analysis

Thematic analysis was selected as a methodological framework to handle the analysis of the data. Thematic analysis in the past had served as a method used to manage the data analysis process while application of a specific framework such as grounded theory or phenomenology was applied as lenses for evaluating the data. Boyatzis (1998) and others (Ryan & Bernard, 2000) situated thematic analysis as methodological tool to be used within other methodological frameworks. Recent work, particularly in psychology, have argued that thematic analysis should be recognized as its own methodological approach to handling data.

Thematic analysis is described as a "method for identifying, analyzing, and reporting patters within [textual] data" (Braun & Clarke, 2006, p. 83) that entailed the researcher engaging the data deeply in a rigorous process in order to construct themes that represent the participant's experiences. In this study, the approach included the adjective applied as I sought to provide enlightenment about continuing professional learning within engineering faculty as assistant professors to impact that phenomenon (Guest, MacQueen, & Namey, 2011). Thematic analysis as a framework provided the structure for proceeding through the data analysis process in the dissertation. I elaborated more on the use of framework in the coding process in a future section – Data Analysis Process.

Thematic analysis offered many advantages for as a framework for data analysis. It was flexible providing the researcher many choices in the execution of the method. Thematic analysis was well documented in how to approach the data analysis process making it easy to learn and execute. Another advantage was the ability to condense large amounts of data into segments that are rich and descriptive about a specific phenomenon or area of interest. Several other advantages dealt with production of unexpected findings, ease of dissemination of findings to the public, and even the potential to play a role in shaping policy (Braun and Clarke, 2006; Guest, MacQueen, & Namey, 2011).

The takeaway of thematic analysis as a framework for data analysis was its accessibility and simplicity if you follow the proscriptive approach in production of useful and insightful data.

The biggest concern related to conducting thematic analysis was the alignment between data collection and data analysis. This was mediated in that the lens of phenomenography existed in the construction of the data collection techniques and in the production of codes and categories from the participants' responses.

I discuss thematic analysis framework's impact on validity and reliability as well as coding in later sections.

3.5. Research Team

Before talking about the research design, I need to acknowledge that I did not proceed through this process alone. Qualitative research requires many check-ins and feedback from peers to construct and conduct the study rigorously. My team in this process consisted of three individuals in distinct roles. My first team member was my advisor. As co-PI on the study Dr. Streveler had access to the data and I could engage in conversations without concerns about identity. We engaged in conversations about design, interview protocol, data meaning, theme construction, and most importantly writing of findings as a dissertation document. This was useful in the beginning. My advisor also played a role in steering me through the dissertation process as a whole helping me to avoid as many pitfalls as possible.

The second member of my research team was my dissertation buddy, Dr. Daniel Ferguson. A dissertation buddy is a fellow graduate student, or recent graduate, from the program. I used my dissertation buddy as a sounding board throughout the entire design and analysis process. His role was to challenge all of my assumptions, assertions, and general thinking until I could defend the choices I made and support them with evidence. At no time did the dissertation buddy engage identifiable data; however, he did come in contact with data that had been de-identified as part of debating codes, code definitions, categories, category relationships, themes, and intercoder checks. A good dissertation buddy strengthens the qualitative study with their feedback.

The final member of my research team was my blind member, Dr. Michele Strutz. I only periodically engaged this team member after significant stretches of time had passed. The role of the blind member was to have no contact with the data, design process, or the analysis process but listen at summative points – design proposal and final themes – and provide criticisms from someone who has not become immersed in the study in any way.

The research team combined to challenge me continuously in my thinking as I navigated the study.

3.6. Sampling Framework

I applied phenomenography as the guiding principle in determining sample size in order to capture as much variation in how participants have experienced the phenomenon of interest (Akerlind, 2005; Akerlind, Bowden, & Green, 2005; Åkerlind, 2005). A guiding tenet of mine in this study was to use the diversity in engineering faculty's background and experiences in constructing any understanding about continuing professional learning experiences. I decided upon a sampling approach that was an amalgamation of multiple sampling techniques identified by Michael Quinn Patton (2002) for qualitative research – *stratified purposeful criterion sampling*.

The foundation of this sampling approach is *purposeful sampling*. Purposeful sampling identifies a population that can provide in-depth insight into the phenomenon of interest in the research study (Patton, 2002). The object of this study was early career continuing professional learning by engineering faculty, so engineering faculty who experienced the process of professional development spoke about how this phenomenon occurs in the context of their profession. This study focused on faculty at an institution with Carnegie's highest basic classification (RU/VH) where the emphasis is on faculty members conducting research while contributing to providing a quality undergraduate education at the institution. Carnegie's RU/VH institutions are designated as such because the university grants a minimum of twenty doctoral degrees every year, not including professional degrees (medicine, law or pharmacy); and conducts a very high level of research activity indexed by the amount of research conducted, not the quality or

importance of the research being conducted, at the university (Carnegie Classification, n.d.).

The dimension of *criterion sampling* was added to purposeful sampling to refine the population to exclude factors that the researcher considers to be potential outlier concerns. Criterion sampling is a type of purposive sampling that looks at all participants who satisfy a specific set of criteria (Patton, 2002). Participants were (1) tenure-track faculty members in engineering departments at a large Midwestern Carnegie designated RU/VH institution, (2) who graduated with their doctorate degree from institutions of higher education within the United States, and (3) received degrees in science, technology, engineering or mathematics (STEM). Additional degrees earned by participants in the social sciences was accepted, but no education degrees or employment in education-oriented department such as the Department of Engineering Education.

The first criterion restricted the sample to tenure-track faculty rather than the multiple positions that exist within the academic community. Tenure-track faculty form the heart of the academic community in universities as individuals who have the unique academic experience of navigating the tenure process as part of their professional path.

The second criterion of required all participants to have graduated with their doctorate from US higher education institutions to control for the concept of future faculty preparation when pursuing the doctorate. It is acknowledged that individual institutions and departments engage in future faculty preparation with different levels; however, at least all participants graduated from institutions that had a choice about the degree to which they prepare their doctoral students for the next level. The final criterion will be that all participants earned their educational degrees in a STEM-field, but not in any education or social science program. The restriction of degrees attained to engineering and STEM-based programs only mitigates any potential bias from pursuing education-based courses outside the participant's own initiative.

A final dimension applied to the sampling technique is *stratified sampling*. Stratified sampling is used to control for identifiable subpopulations (nested groups) within the larger sample population. This population will be stratified along three dimensions to help provide the maximum amount of variation in participant responses.

3.7. Qualitative Data Collection

The lack of specific methods to conducting thematic analysis allowed me to pull from various qualitative research traditions in this study. I retained a phenomenographical bent in my data collection in order to capture the multitude of ways participants described experiencing the phenomenon of continuing professional learning. The data collected is strictly the participant's experiences as related to the researcher through a semi-structured interview. The data collected was a semi-structured interview with questions designed to elicit experiences about the faculty member's continuing professional learning experiences as an assistant professor in engineering. I probed deeper into those experiences for uniqueness, and to elicit variations from the participants about their perception of the process.

The interviews were recorded by the researcher using a handheld audio recorder with the permission of the participant. All interviews were saved on a password protected hard drive accessible only to the researcher of this study. I provided all audio files with a pseudonym designation corresponding to a participant.

The audio recordings were provided to a transcriptionist using a password secure drive service, Dropbox, for conversion into verbatim text format. Upon completion of transcription, the text transcript was saved in same Dropbox file as the audio files by the transcriptionist. A completed text transcription was transferred into a password protected file system, where a copy of the audio recording already exists. Upon completion of all transcribing, the Dropbox file with the transcriptionist was closed and deleted. All transcripts and notes related to individual interviews were saved under the pseudonym assigned to a participant. I ascribed pseudonyms from a list of androgynous names supplied from a google search for a list of androgynous names. I chose androgynous pseudonyms for participants to assist in masking their identity, including gender, as much as possible.

3.7.1. Interview Protocol

I developed the interview protocol with the idea of prompting engineering faculty participants to divulge their learning experiences to me. The interview protocol required

eight iterations through two pilot studies and initial data collection to be finalized. Figures 3.1 and 3.2 capture the shift in verbiage as the interview protocol changed from the pilot to studies to a finalized version. Figure 3.1 focuses on the *learning-professional development-experience* change in the primary prompting question of the interview.

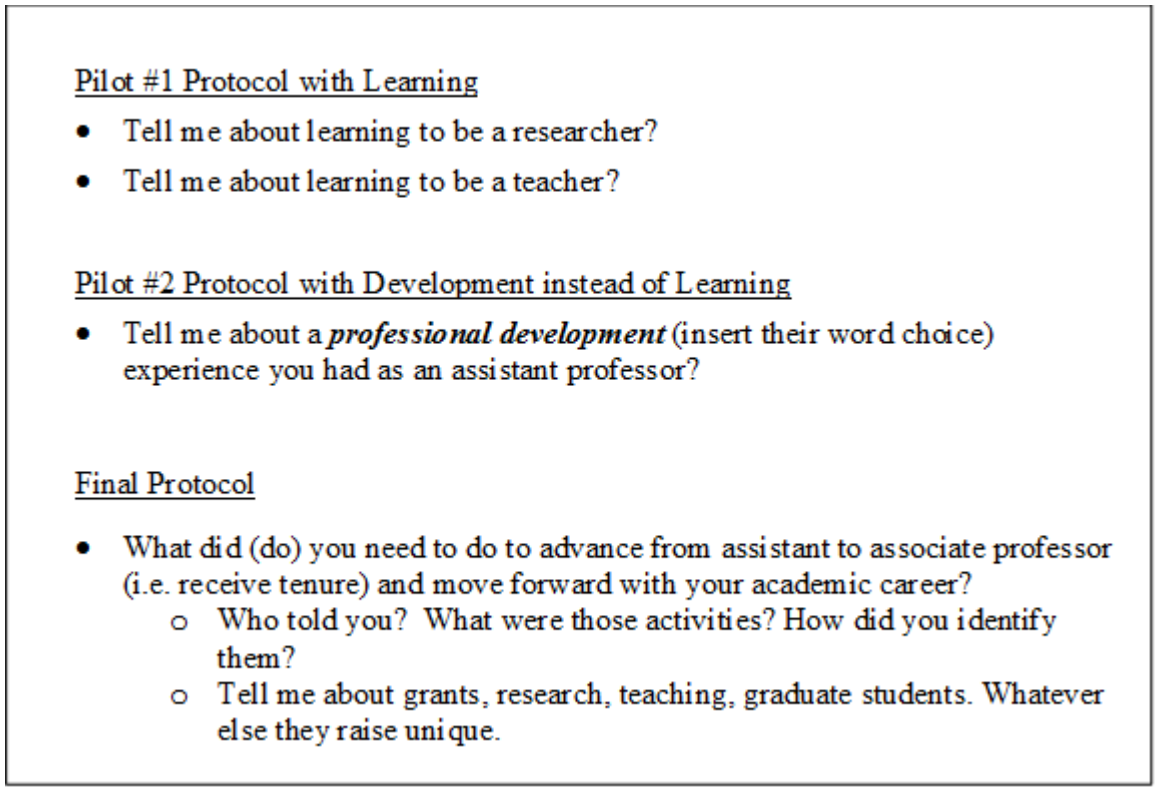

Figure 3.1 Evolution of primary interview question from *learning* to *development* to *experience*.

3.7.1.1. Pilot Study One

The first iteration of the interview protocol can be viewed in Appendix A. This protocol was designed as a test protocol to determine what faculty participants would divulge when asked about their professional learning. The pilot participants were all engineering faculty attending the national conference of the American Society for Engineering Education (ASEE). Ten engineering faculty members were interviewed over the course of the five-day conference.

Two findings emerged from this pilot study. The first finding was that faculty could not describe their learning or what they had learned. The word *learning* caused cognitive distress in my participants as they struggled to identify what they had learned as assistant professors. This was probably related to the fact that people don't store information with an "I" learned and when learned construct. After altering the question to be *development* instead of *learning*, the second finding was that faculty could provide rich contextual descriptions about their experiences of becoming capable grant writers, teachers, and researchers.

3.7.1.2. Pilot Study Two

The second pilot study conducted used a more formalized interview protocol as seen in Appendix B. The participants for this pilot study were from the same institution as the targeted population for the study. The six participants came from the institution's College of Technology, a close relative of engineering, and individuals in the College of Engineering who had been identified as ineligible because of the study's sampling criterion. In the interview, I reduced the focus of the interview protocol to just teaching or research in each interview as I only requested 30 minutes of their busy time from these participants. The pilot study resulted in producing clear data relative to the phenomenon which gave me confidence that future participants could provide rich descriptive contextual responses. Some questions needed rewording, in particular the prompting questions under consideration.

3.7.1.3. Final Interview Protocol

The final protocol used with the majority of participants (11 of 13) is in Appendix C. The first two interviews provided rich contextual data but I found my prompting questions going in a direction different than the protocol. I incorporated the changes I made in the first two interviews into the protocol for the final interviews. The main change was the introduction of a triangulation question where I prompted the participant

to provide advice to me as an incoming assistant professor about managing my professional learning experiences (Figure 3.2) instead of phenomenological questions.

Pilot #2 Protocol

Phenomenographical Questions:

- Based on what we have discussed, what is professional development?
- When you think about ***doing*** professional development, what does that mean?
- As a faculty member, what things are important to think about when engaging in professional development?
- What experiences do you believe contributed the most to your development as a faculty member?
- Please describe any experiences that challenged your way of thinking about professional development?
- Reflecting back on your experiences, if you were to change anything related to professional development, what would it be?
    - Step through each experience.

Final Protocol

- I am an incoming assistant professor and have come to you seeking advice?
    - What do I need to do over the next 6 years to grow professionally to be successful in the short term (tenure)? But also the long term (career)? How do I do them?

Figure 3.2 Evolution of secondary interview question from a phenomenography to a triangulation orientation.

This resulted in participants reiterating what they believed went well in their professional experiences as advice while rejecting the viability of many of the experiences that did not go well for them.

3.7.2. Participant Recruitment

Participant recruitment was a challenge in this study. I started recruitment with a completely random approach. I identified all eligible participants within the College of Engineering at the institution for this study. I bracketed the participants into nine groups. The matrix designed had rank on one axis and three groups of engineering departments on the other axis. The engineering departments were grouped by relatedness in the mind of the researcher as seen below:

Group 1 - Builders: Civil, Construction, Environmental and Ecological, Nuclear Engineering
Group 2 – Process and chemicals: Agricultural and Biological, Biomedical, Chemical, Industrial, and Materials Engineering
Group 3 –Design: Aeronautics and Astronautics, Electrical and Computer, and Mechanical Engineering.

I assigned numbers to each professor in all nine corresponding boxes of the matrix. I ran a random number generator based on the numbers in the boxes and identified four potential participants for the study from each box. This created a list of thirty-six engineering faculty members eligible to participate for the study. I eliminated the participants selected in round 1 and re-ran the random number generator to produce another list of thirty-six names. I continued this process until all faculty members identified as eligible populated an email list.

I decided, in consultation with my dissertation committee, that my dissertation advisor would send the recruitment email in Appendix D to potential faculty participants. The logic was that faculty would be more likely to participate in a study if solicited by a peer than a graduate student. The process was that Dr. Streveler would send the email out to the faculty identified on the list. The email requested faculty participation in a study about faculty professional development as assistant professors. A week later, another email reminding them about the opportunity to participate was sent out to any faculty members from the list who had not already responded.

The first round of emails resulted in receiving one contact willing to participate in the study. Dr. Streveler released a second and third email solicitation to faculty on the round 2 and 3 lists which resulted in no additional participants. At this time, we decided to release a mass email to all faculty members inviting them to participate including the faculty already included in the first three lists. This resulted in an additional three participants. The result of random recruitment was a general failure as only four participants emerged to participate in the study.

Another form of recruitment that emerged was personal recruitment by the researcher. This was not an intent based form of recruitment but emerged from random interactions between the researcher and some engineering faculty namely in the form of sitting down and eating, or drinking coffee, in close proximity and striking up a conversation. Two participants were recruited by the researcher from this accidental form of recruitment.

The final form of recruitment used in this study was faculty member referrals. This occurred through faculty acquaintances ineligible to participate in the study encouraging some of their peers and collaborators in other engineering departments to reconsider participating in this study. I do not know the exchanges between the faculty members I am familiar with and the peers they contacted; however, I eventually received emails from an additional twelve faculty members willing to consider participation in the study. I responded with a follow up email to these faculty members (see Appendix E) and eventually recruited seven additional participants for the study. This recruitment was technically not snowball recruitment since no participants in the study was involved in the recruitment of additional participants.

In the end, the participants in this study were recruited by random email selection (30%), personal recruitment by researcher (15%), and faculty referrals (55%).

3.7.3. Interview Setting

The interview setting is important for providing participants a comfort zone in which to speak about their experiences (Patton, 2002; Weiss, 1995). I conducted all interviews except one with faculty in their offices. The exception was an interview in the

professor's classroom between bookended classes. The office setting allowed the faculty participant to remain in an environment of control where they would hopefully be most comfortable speaking about their experiences. Most participants sat behind their desks while I sat across from them in an office chair. Once again this maintained a measure of power for them as I am a graduate student and they are faculty. A couple faculty members moved from behind their desks and engaged me in the conversation in a more peer-like fashion of face-to-face in chairs by a working table. Regardless of power setup, participants openly answered the questions I posed about their experience. I do not believe the setting influenced the study beyond allowing faculty participants to be comfortable by constructing the interviewing environment most comfortable for them.

3.7.4. Pre-Interview Routine

Upon receipt of agreement via email to participate in the study, I contacted the prospective faculty participant to arrange a date and time that worked best for their schedule. Forty-eight hours ahead of the scheduled meeting I sent an email reminding the faculty member of the scheduled meeting. I also provided contact information for contacting me in case an emergency arose and they needed to reschedule. This occurred twice due to unavoidable circumstances. Also included in the interview was a reminder that we were going to talk about their time as assistant professors and what they did to develop as researchers, teachers, and as a professor in general.

Priming in the interview provided the faculty member time to think about what they had done as assistant professors with the expectation that this would result in richer descriptions of the experience than momentary recall in an interview. This hypothesis was not tested in this study.

If the interview was not rescheduled, I arrived at the professor's office 30 minutes ahead of the scheduled meeting. After locating the office, I went around the corner or down the hall and engaged in a pre-interview routine of identifying and writing down my thoughts about professional learning, professional development, and faculty development. This process allowed me to recognize my biases and prepare me mentally to listen to the participants' story and not the story in my head.

Five minutes before the scheduled meeting I officially arrived at the faulty member's office. If the door was open, I informed them I was outside and ready at their convenience. If the door was closed, I waited patiently until 1 minute before meeting time and knocked politely to inform them of my arrival for our scheduled meeting. When the faculty participant was ready, I entered their office and conducted the interview.

3.7.5. Interview Procedure

I started the interview with faculty participants at the identified time and periodically glanced at time since I had requested a specific block of time and I wanted to not extend past the time commitment faculty had provided me. I initiated each meeting with handshakes and heartfelt comments of appreciation for their agreeing to participate in my study and talk to me about their experiences. I began by informing the participant that I would gladly answer any questions about my study post-interview so as to minimize the bias beyond the earlier pre-interview priming effect. After reviewing common background requirements listed in the IRB, I confirmed the participants understood their rights, especially the right to withdraw at any point in the study including post-interview. At this point I requested permission to record the interview for transcription later allowing me to focus on taking notes to assist in the interview questions.

The interview followed the semi-structured design located in Appendix C. I started by asking demographic questions about the position in the university and past experiences in graduate school, industry, and post-doctoral settings. I concluded this area by asking participants to provide a sense of identity (how do you see what you do? others?) and why they chose to enter academia as faculty. I proceeded from these questions to focus on their professional development experiences.

As discussed earlier in development of interview protocol, participants can not register and respond to questions about what they learned. In the interview I asked about their professional development experiences by framing all activities associated with a faculty member such as research, teaching, and working with graduate students as areas to be "developed." This framing worked well in generating faculty responses about how

they engaged in a variety of ways to learn (my words for their terms develop). The professional learning experiences section of the semi-structured interview was developed around the following key questions:

- What did you need to do to advance from assistant to associate professor (i.e. receive tenure) and move forward with your academic career?
- What is the most important thing you have done as an assistant professor (i.e. early in your career) that you feel has contributed to being successful in your career?
- What does the phrase *professional development* mean to you?

In this part of the interview I focused intently on the activities they identified and how they discussed maneuvered through them as assistant professors. The notes I took during this phase of the interview, combined with the pre-designated prompts present on the interview protocol directed the majority of the interview.

Upon completion of the interview I thanked the participant once again for participating in the study and answered any questions they had about my study and my thinking about faculty and professional development. These conversations varied from 2 minutes to 15 minutes depending on the faculty participant. Questions related to the study inquired about who was going to see this data, who was on my committee, and what did I think about faculty professional development. Additional questions, inquired about my educational background and my career aspirations.

3.7.6. Data Handling

Upon completion of the interview, I transferred the audio recording from my Sony recorder to a password protected file on my home computer with a backup copy on a password protected external hard drive. The audio file was relabeled with the pseudonym assigned to the participant and uploaded to a password protected folder on Dropbox that provided access only to me and the transcriptionist. The audio files were

transcribed into a Word file and reloaded into the same Dropbox folder. I downloaded the Word file transcripts into another password protected file folder attached to the audio files on my computer and saved a backup copy on the password protected external hard drive. Finally, I erased both the audio file and the Word file from the Dropbox folder shared with the transcriptionist. The thirteen interviews resulted in 327 pages of transcribed conversations for analysis.

3.7.7. Data Analysis Process

I followed the prescriptive tenets of conducting data analysis according to the six phases outlined by Braun and Clarke (2006). They identified the six phases of thematic data analysis to be:

1. Familiarize yourself with the data;
2. Generate initial codes;
3. Search for themes
4. Review themes;
5. Define and name themes;
6. Produce report.

The first step in analysis was familiarizing myself with the data. I accomplished this by listening to the audio files several times to become familiar with how participants spoke about their experiences. When I received transcripts of the interviews, after correcting them for missing data or transcription errors, I read each transcript twice before beginning the coding process. In part this process was performed to become familiar with the data but I also believe the process allowed me to have a sense of the faculty participants' continuing professional learning from a holistic perspective.

Coding the data was the next phase in the data analysis process. I performed the coding of the transcripts using both a deductive and inductive approach. In a deductive approach, analysis is conducted from using a theory to guide the researcher's interaction with data, while an inductive approach required the researcher to generate the ideas, themes, or theories from the data (Hesse-Bieber and Leavy, 2011; Lincoln and Guba,

1985; Patton 2002). In this study, the deductive approach contribution was that I approached the analysis using a definitive research question as a lens for thinking about the data. I applied an inductive approach to coding consistent with thematic analysis.

The inductive approach meant that I tried to condense the raw data into a coherent set of relationships, or categories, from which themes relating the data, or a full theory, can be constructed (Thomas, 2006). The process involved me identifying quotes of text as significant and applying a code to these quotes. The codes received a definition to understand what the code applied to and what was not related to the code. Coding was an iterative procedure to finalize what quotes applied to which code and how many codes could be combined or refined to better make sense of the data. The next step was constructing categories to consolidate similar codes into a related understanding that provided meaning to the codes. (Guest, MacQueen, & Namey, 2011; Thomas 2006). Participant responses related to the research question resulted in 53 codes that were pared down over time to a final count of 28 codes. Initially 11 categories were constructed from the codes, but continual rethinking reduced this eventually to 8 categories with a couple of orphan codes that did not fit any one category.

Phase three was the search for themes; phase four the refinement of the themes; and, phase five the defining and naming of themes occurred in an iterative fashion. This involved contemplating the codes and categories relative to the research question to determine how the data can combine to form a theme. Saldana stated that theme was “a phrase or sentence that identifies what a unit of data is about and means” (Saldana, 2009, p. 139). This reduction of themes from codes and categories was through researcher interpretivism where I constructed larger meaning from the participant’s experiences. (Guest, MacQueen, & Namey, 2011). This study resulted in the generation of four themes from the data. The themes were iterated on several times with the assistance of my research team – dissertation advisor and dissertation buddy. It was through the process of challenging and re thinking that the final verbiage for the themes eventually emerged.

I produced a thematic map for every theme for clarity in relating the codes and categories used in constructing a theme. An example of how the thematic map was

placed in the last section of chapter 3 where I provided a contextualized timeframe to the data analysis process.

The dissertation produced here is the completion of the sixth phase of the process where the themes and findings are presented for public consumption.

3.7.8. Validity and Reliability Process

Validity and reliability are associated with conducting rigorous research studies. Validity has been referred to as whether the study conducted has measured what was intended to be measured. Thematic analysis proponent Greg Guest and colleagues (2012, p. 80) preferred Ian Dey's definition where the "dictionary defines 'valid' as 'sound,' 'defensible,' and 'well-grounded' … despite the more technical interpretations of validity." I embraced this definition because it makes it clear for a qualitative research that is transparent, well-defined and properly executed data collection and data analysis structure would provide validity. A challenge with validity dealt with identifying how I would handle the numerous types of validity as sub-categories. Reliability referred to "consistency when repeating or comparing assessments within a study" (Guest, MacQueen, & Namey, 2011). Thematic authors, and subsequently I, challenged the importance of reliability in a qualitative study since qualitative studies are impossible to reproduce as the experiences of participants, the researcher's informative experiences, and the interaction of crating meaning between participant and interviewer can never be exactly copied. Additionally, building on the previous statement, data collection methods can never be matched, particularly for semi-structured interviews as used in this study, since the interview's instincts for follow up questions will differ based on the researcher's motivations and biases (Guest, MacQueen, & Namey, 2011). I addressed reliability here, but it is not a significant concern.

I have constructed Table 3.1 to describe the actions I took to ensure validity and reliability in this study. It was adapted from a table enumerating the techniques for enhancing validity and reliability for applied thematic analysis (Guest, MacQueen, & Namey, 2011).

Table 3.1 Research actions to achieve validity and reliability from thematic analysis framework perspective. Adapted from Guest, MacQueen, & Namey (2011).

Research Design Stage	
Team-based Instrument	Did not have a team based instrument. Instead engaged my dissertation buddy and advisor in multiple conversations in redesigning all aspects of the study, particularly participant recruitment and interview protocol development.
Data Collection Stage	
Train field team in data collection techniques.	Used experience data collecting in previous qualitative studies (5 others) to inform behavior. Discussed with research team prompting questions and other probing considerations best suited for interacting with faculty.
Adjust structure of instrument	Conducted 2 pilot trials in addition to multiple research team conversation centered on interview protocol. Resulted in 9 versions of interview protocol. Even willing to adjust protocol after first 2 interviews to better capture relevant data.
Monitor data as produced	Reviewed interview notes and listed to a couple of interview audio files to make sure data captured was participant's experiences relative to phenomenon.
Elicit feedback from participants	Provided transcripts to participants. Several responded with a few notes about what they said. Most did not respond. Email only asked for response if a problem or if they wanted to respond
Data Analysis Stage	
Transcription protocol	Verbatim transcription of interviews checked by researcher by listening to audio files and making corrections to transcripts.
Develop/Use Codebook	Created and managed codebook. Final representation present in appendices of dissertation.
Intercoder agreement checks	Conducted intercoder code checks three times with dissertation buddy with results of agreement > 80% on all checks.
External code/summary review	Engaged dissertation buddy and advisor multiple times to discuss definitions and meanings of codes, categories and themes.
Audit Trail	Documented process in methods section of dissertation. Old files of old codebooks exist for review of how codes changed. Also have documents of category and theme development over time.
Support Themes and interpretations with quotes	Directly quoted participant's responses in transcripts as evidence in construction of categories and themes. Located in chapter 4.

3.7.9. Human Research Protection

I considered the protection of my participants as very important in conducting this study. I followed the guidelines from the Human Research Protection Program (HRPP) at my institution to ensure that I conducted responsible research using human participants. Part of this process included my training on the conducting of research on human subjects and the development of a protocol for how I would proceed in this study to endure the protection of my participants. I received initial approval for an exempted study with minor revision required. The revision required was clarification of transcriptionist's role in the project. I completed the revision and received approval from the institution's IRB in November of 2012 (see Appendix F) under IRB protocol number 1209012729. I followed the research plan identified in the IRB for recruitment of participants, which included random identification and potential faculty referrals, and a clear procedure for management of all data as password protected. I was careful in constructing my results and findings to protect my participants' identity.

3.7.10. Researcher Bias

The choices made in the course of conducting a research study are subjectively influenced by the background, experiences, and biases of the researcher involved. As a qualitative research study, it was particularly important I acknowledged potential biases and developed robust methods that minimize the impact of my biases. The following statements described my background, experiences, and biases relative to the continuing professional learning of faculty.

I was raised in an environment in which higher education and continual learning were highly valued. My mother was a faculty member at a community college. Thus, a significant portion of my youth was spent on the campus of the college interacting with books in the library, students and teachers in various classrooms (began auditing classes starting when I was 12 years), and engaged with faculty in general conversations about career and content in the hallways and their offices. From these interactions, I gained early insight into the machinations of the academy at low level student-oriented and community-oriented institution from the perspective of a faculty member.

I pursued undergraduate and graduate degrees in engineering and technology. The degrees in Chemical Engineering (B.S.), Pulp and Paper Science and Technology (B.S.), Paper and Printing Engineering (M.S.) and Paper and Imaging Science (PhD-ABD), and Engineering Education (PhD-in progress) have all contributed to channeling the growth of my thinking and engagement of the world through the lens of engineering as process. Additionally, extensive time spent in graduate school has provided opportunities to become familiar with academia, in particular the preparation and development of early career faculty.

In my time as a graduate student, I have worked in The Graduate College, in the Dean's Office of the College of Arts and Sciences, and in the Dean's Office of the College of Engineering. I have worked extensively on projects designed to support the development of doctoral students in their pursuit of becoming future faculty members in various engineering and science disciplines. Part of this work required I interact with faculty about their experiences, particularly about career mentoring and development, which resulted in the preparation of materials and insights aligned with preparing graduate students as the next generation of faculty.

As I complete this dissertation, I am interested in finding a role in academia that assists faculty in their professional learning throughout their career. I have many ideas for how I could serve within a university, whether the institution is research intensive or teaching intensive, and contribute to professional growth of faculty, administrators, and even students. My recent focus has been on faculty, but the underlying motivation for me is the development of other individuals. I prefer academia and working with students, faculty, staff, and administrators to identify ways to assist in their lifelong learning path, but I can also envision doing this in industry.

3.8. Data Analysis

I analyzed the data using applied thematic analysis with a phenomenographical lens focusing the study on the second-order aspect of what and how participants discussed their continuing professional learning experiences.

I structured the presentation of my data analysis into rounds to better capture the collective actions taking place at a given time moving through the process. Rounds one and two dealt with preparing of the data transcripts and familiarizing myself with the data. Rounds three to six described my engagement with the data to develop codes representative of the participant's responses through my interpretive lens. Rounds seven and eight involved my efforts at validity. Rounds nine to eleven described my process of developing categories and themes from the codes that emerged from the interview data. Not all rounds were consecutive. Later rounds of validity and category development prompted some rethinking of certain codes and resulted in code definition modifications or combining/splitting of codes to be better representative of the data.

First round. While waiting for the transcriptionist to convert the audio files to written transcripts, I listened to the audio files for each participant at least twice to begin familiarizing myself with each participant's interview.

Second round. Upon receiving the transcripts from the transcriptionist, I saved a copy in the password protected file with the audio transcripts. I also saved a copy of the transcript and audio file in a subfolder and renamed both files with the pseudonym I ascribed to each participant. I did this to begin thinking of the participant's responses in terms of their pseudonym name instead of actual name to aid me in the future to minimize the likelihood I would accidentally identify my participant by using their real name. The transcript was read in tandem with listening to the audio file to make corrections to the transcript where the transcriptionist could not determine what was said or did not understand a technical word.

Third round. I selected a set of four interviews and began reading them. I did not code these transcripts, rather I marked made marks acknowledging key points discussed in the transcript. An example would be marking for presence of graduate school experience, of working with graduate student, mentoring mentioned, etc. I developed a list of these large topics to use as a side prompt for all interviews as checklist for determining if an interview contained information relative to the topic.

Fourth round. I started with the four interviews above and began coding them using an inductive approach. This first and second passes of open coding was performed

on printed versions of the transcripts. After the coding was completed, I loaded the transcripts into Atlas.ti, a qualitative data management software package, and transferred the quotes and codes from my paper copy into the software.

Coding was a time consuming and meticulous process. The first step was to remind myself of the context in which I was coding by reviewing the research question guiding the study. I read the text, highlighted an applicable segment of the text as a quote and ascribed a code name. On a notepad, I recorded the codes ascribed and jotted down a shorthand definition that captured what I was thinking in the moment. After coding all four transcripts, I reviewed the code list and combined similar looking codes and strengthened the definition associated with the code. In some cases, I identified what specifically belonged to the code and what did not. I re-coded the four initial transcripts using the adjusted codebook and negotiated with myself whether the code fit the new definition or was unique and deserved its own representation. Upon completion of this process, I had an initial draft of the codebook.

An example of the case mentioned above about defining what does and does not belong in a code would be the initial code, *learn from research with peers,* which I identified as having to be a co-constructed working relationship along the lines of collaboration and not simply interactions with peers. I needed to distinguish the code from another code at the time, *learning from peers*, that only applied to the informal interactions with peers and learning from observing their actions.

I coded all of the transcripts using a segmentation practice of capturing all, or as much, of the contextual meaning associated with the code. Inclusion of contextual content is important when using thematic analysis in order to accurately represent what the participant meant in their statement. Failure of the code segment to capture context would result in my inability to understand the reasons of what and why the participant acted in a particular way (Gibson & Brown, 2009; Guest, MacQueen, & Namey, 2011).

Fifth round. I systematically coded the remaining nine transcripts all by hand on printed manuscripts. I entered the transcripts into Atlas.ti and applied my selected quotes and codes from the hard copies to the text in Atlas.ti. The use of printed copies for initial coding passes is a personal preference because I have found it to be easier for me to

negotiate the process of selecting a text segmentation as a quote, ascribing a code that represents the quote, and decide if the definition of the code needs adjustment. After the initial coding passes, I found it easier to work using a qualitative data management program that allows for easy access to all quotes listed under a given code.

Sixth round. I used Atlas.ti to print out the individual codes with all pertinent quotes from all participants. I used the printouts to justify whether each quote fit the code it had been assigned or whether the quote needed its own code, required a rewriting of the code definition, or should be shifted to another code. This represented approximately three months of work to arrive at the point in the data analysis process.

Data saturation was a key concern for me in this study. I had been limited to thirteen participants in the study. Recommendations about number of interviews required varied with recommendations varying from five to thirty-five, dependent upon methodology applied. Given the unique methodological approach I selected for this study, the methodology described that was most akin to my approach was phenomenology. The minimum acceptable appeared to be five to eight for a somewhat homogeneous population. Data saturation, according to Guest, Bunce, & Johnson (2006), was accomplished when analysis of subsequent interviews no longer produces new codes.

In my study, I reached data saturation in nine interviews. Most of the codes emerged in the first six interviews. I must be careful to acknowledge here that the last unique code arose in the coding of transcript number thirteen (of thirteen); however, there were no new codes generated in coding transcripts five, eight, ten, and eleven. Removing the randomness associated with the timing of when a transcript was coded means that only nine interviews were required to achieve data saturation. Achieving data saturation was important since I believe a random unique code or two may still exist in the population, but they would be outliers.

Seventh round. I identified this as a unique round for consistency of activities performed, yet these actions occurred in conjunction with the previous round as I was working through finalizing the codes. I engaged my dissertation buddy in a pair of intercoder reliability checks. The first intercoder check was performed by culling a significant portion, about ten pages, of a single transcript and having him code it in an

open manner. We then met and discussed his open coding and my open coding of the transcript. This resulted in fruitful conversation about applying the research question to the transcript and identifying interesting statements made by participants but had no relevance to the study.

A second round of intercoder reliability was performed on a specially designed transcript that culled four different participants' responses together in six pages. My dissertation buddy was provided the codes and code definitions of all the codes present in the document plus an additional five codes with definitions. Analysis of the coding of this test transcript yielded an 82% agreement between us about codes. This rose to 94% agreement if you allowed for more than three words of contextual captured differences. This demonstrated significant agreement with my coding choices in the analysis meaning I was not identifying and/or interpreting the data in an unusual or unacceptable way.

Eighth round. This round occurred co-currently with the end of round six and the beginning of round nine. In this round of analysis, I engaged in the strength testing of quotes relative to a code. In strength testing, quotes are selected and ranked with a 1 (low agreement), a 3 (good agreement), or a 5 (excellent agreement). I used a three pronged strength test because I believe it is impossible for an individual to discern differences at a finer point than three stages. The separation of 1-3-5 provided space for consideration of the code as closer to one number or another by the individual(s) conducting the strength test.

My dissertation buddy and I both strength tested two code sets. One code set was self-directed learning and the other was mentoring guidance. We had 85% direct agreement on self-awareness of learning and 82% agreement on mentoring guidance. In conversation, we identified that four or five codes between the two code sets we both had on the proverbial fence but decided to go different ways based on our own interpretations. Given the results of the congruence in strength testing combined with the previous round's intercoder agreement I am comfortable that I have achieved a satisfactory level of validity in my selection of quotes and codes to represent the participants' voices in the data.

It is important to note that there were numerous other conversations with my dissertation buddy and dissertation advisor over the course of the coding process. The last two rounds described my attempts at providing validity to the study. Earlier interactions with my research advisory team provided feedback and clarification to specific questions about certain codes and quotes I struggled to parse during the early coding process.

Ninth round. This round dealt with the construction of categories and eventually themes to represent the codes developed through analysis of the data. It occurred concurrently with rounds six, seven, and eight. This round involved many iterations as categories were constructed, destroyed, merged, and ultimately connected to themes. This process was captured in the production of thematic maps. The thematic map allowed me to reconcile codes, pair codes to categories and eventually construct themes.

I used the construction of the codes, categories and theme associated with participant's self-description that emerged from the supplemental demographic data. The process applied to the other themes developed were the same as this example. I chose to use these codes and categories in modeling the thematic map because they have fewer codes compared to the themes developed to answer the research question.

The thematic map in Figure 3.3 illustrated the reduction of codes for the category of graduate student experiences down to three representative codes. This code reduction related to codes that were ascribed earlier in the coding process and the subsequent maturation of the codes through the analysis process. The thematic map in Figure 3.4 captured the relationship of the mature codes of GS Teaching, GS Teaching Opportunity, and GS Teaching to the category of Graduate Experiences. Finally, the thematic map in Figure 3.5 tied the three categories that emerged from the data to the theme of Participants' Self-description. In chapter 4, thematic maps are provided showing the relationship between codes, categories, and themes for all themes developed answering the research question about continuing professional learning of tenure-track engineering faculty as assistant professors.

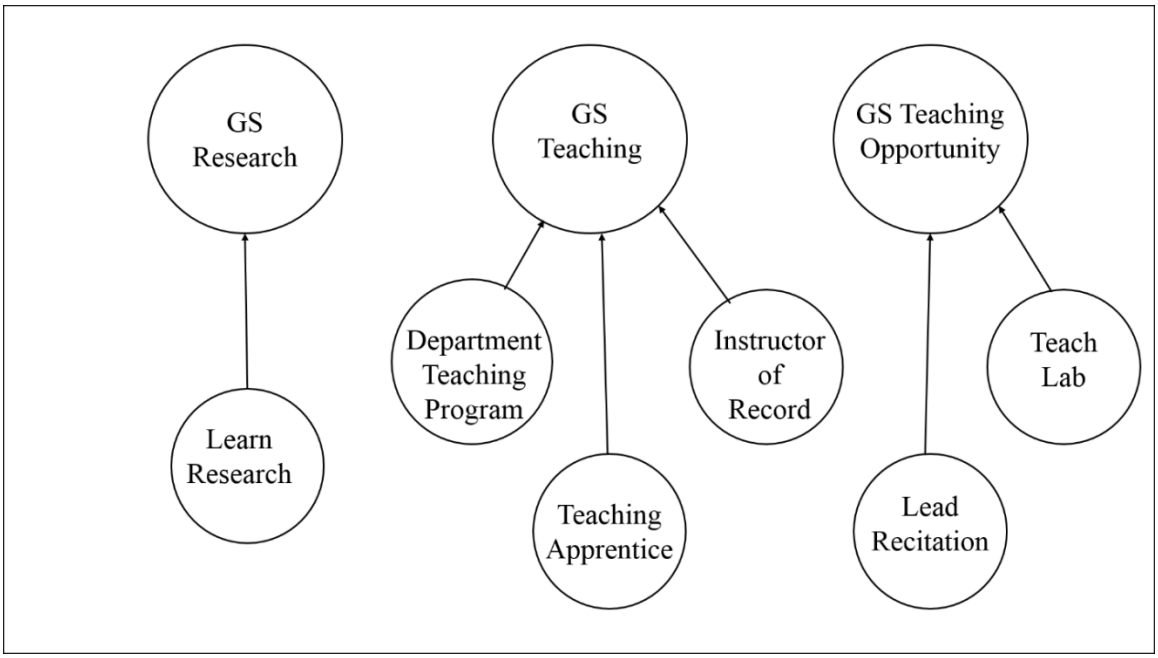

Figure 3.3 Thematc mapping of code development related to graduate experiences.

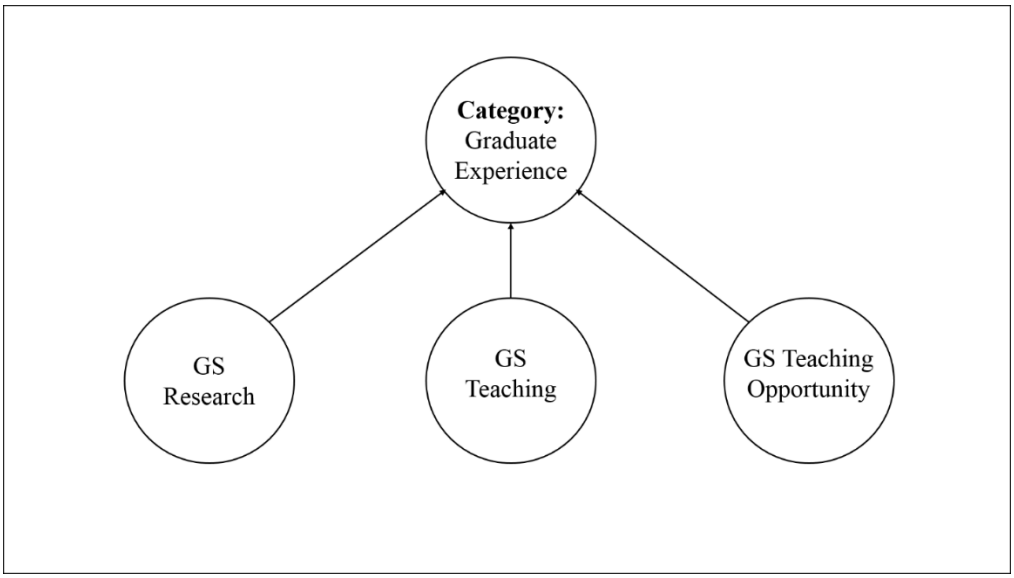

Figure 3.4 Thematic map of development of graduate experience category.

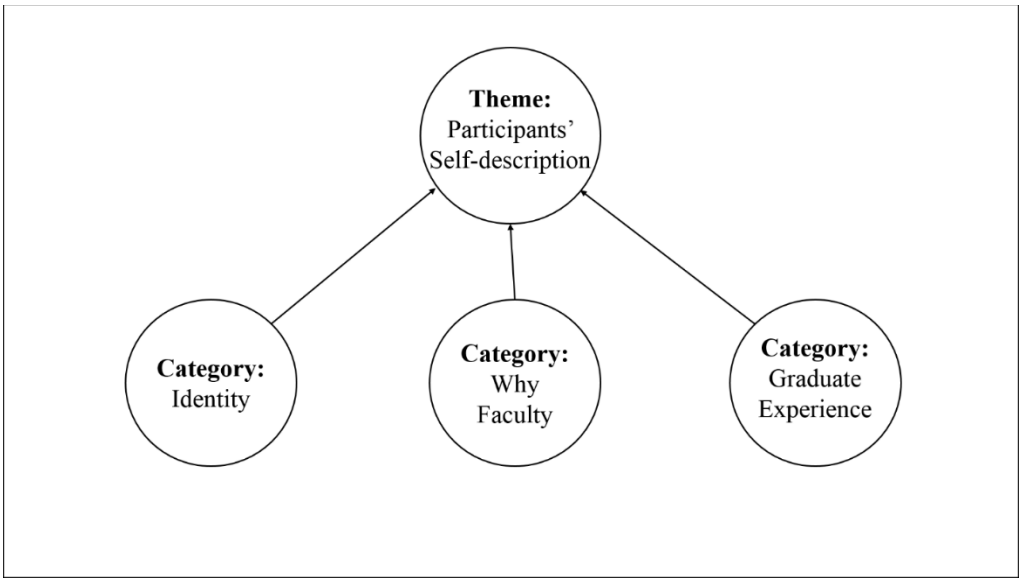

Figure 3.5 Thematic map development of participant's' self-description theme.

Tenth round. This round centered on the selection of quotes to support the development of the story based on the themes identified in the ninth round. The themes were constructed into a story by arranging the categories associated with the theme and any stray codes (i.e. categorical codes) in a coherent format. Quotes were selected to support the categories and codes and provide evidence for the existence of the code/category and ultimately the presence of the theme. This was presented in the next chapter as results. The final action was to examine the themes and identify the findings from within the themes. The findings were presented in chapter five of the dissertation as part of the discussion of results.

Quotes that were selected were modified to remove any distracting commentaries, words like umm or ahh, from the quote. Also all quotes were scrubbed to minimize potential for identification. All traces of gender, proper names, identifiable groups, and institutional names were replaced with neutral representations. If the participant identified going to Hong Kong University (made-up example) it would be represented in the dissertation as [the institution]. Another example of change was gender from "he said" to "[they] said" or "[he or she] said." By doing this, I believe I have protected my participants from identification as much as I can.

3.9. Summary

I designed this study of tenure-track engineering faculty's continuing professional learning as assistant professors using the methodological framework of phenomenography. This framework influenced the sampling and interview protocol by emphasizing the desire to capture as many different ways that engineering faculty engaged in their continuing professional learning. I analyzed the data using an applied thematic analysis methodology designed to generate themes that described the influencers of engineering faculty's continuing professional learning. I achieved validity and reliability through data confirmation interactions with a dissertation partner. I present the results of conducting this study in chapter four of the dissertation.

CHAPTER 4. PRESENTATION OF DATA

4.1. Introduction

This chapter presents the emergent findings from participant responses to answer the research question: *What are the influencers on continuing professional learning of tenure-track engineering faculty as assistant professors?*

The chapter introduces the participants and presents the four emergent themes with supporting evidence from participant responses. Discussion of the meaning and significance of the themes will follow in Chapter 5.

4.2. Participants

The participants in the study worked at a large Midwestern research university with a Carnegie classification of very high research activity (RU/VH) and met the criteria of (1) being tenure-track engineering faculty, who (2) graduated with Ph.D.'s from higher education institutions within the United States, and (3) the degrees earned were in STEM or social science fields.

Qualitative research studies usually proceed to introduce the participants and provide personal insights into individual participants that inform readers about unique experiences that contributed to a particular participant's lens on a phenomenon. This study does not provide this form of individual participant understanding because to do so work risk subjecting participants to identification. The focus in the study was to capture an amalgamated insight into how faculty navigate their continuing professional learning, so an integrated picture of the participants is presented. Contextual insight into the participants who participated is provided through emergent data about participant identity and reasoning for becoming engineering faculty.

Table 4.1 Participant demographics.

Faculty Rank	
Assistant Professors	3
Associate Professors	6
Full Professors	4
Departments	
Aeronautics and Astronautics	1
Agricultural and Biological Engineering	3
Chemical Engineering	2
Electrical and Computer Engineering	1
Industrial Engineering	3
Materials Engineering	3
Assistant Professor Tenure Institution	
At Primary Institution	9
At Another Institution	4
Gender	
Male	8
Females	5
Early Life Experiences	
Domestic	11
International	2
Industry Experience	
Yes	5
No	8
Post-Doc Experience	
Yes	5
No	8
Research Emphasis	
Within Engineering Discipline	8
At Intersections of Engineering	5

4.2.1. Participant Demographics

Participant demographics are presented in Table 4.1. The primary takeaway from this table is the diversity of participants providing insight into the phenomenon of interest. The diversity in tenure rank provided participants immersed in the process of tenure and others who reflected their time as assistant professors. Almost half of the departments (6 of 14) in the institution's College of Engineering contributed a participant to the study. The variety in post-doctoral experience, industry experience, type of research emphasis, and tenure institution was further evidence that the participants brought a diverse perspective to discussing the continuing professional learning of assistant engineering professors. The diversity was good for representing the range of potential experiences for the phenomenon.

4.2.2. Participant Self-description

In this section, participants discussed their identity, why they chose to enter the profession of educating engineers, and the contribution of their graduate school experiences.

4.2.2.1. Participant Identity

The participants all identified as professors. The participant's construct of identity as professors was based on the tasks associated with being a faculty member such as research, teaching, and service. Casey and Jesse provide examples in their responses.

> *I'm a professor at* [this institution] … *for me it means that I do research, teaching, and service at a Research I Institution. ~Casey*

> *It means that I have a responsibility for teaching, conducting research, and there are – I mean there are both engagement responsibilities and administrative responsibilities. ~Jesse*

Simply grounding their identity in task orientation was not enough for some faculty who expounded on their identity by identifying linking specific actions to who they are as engineering faculty. Morgan and Sandy extended the teaching and research into outreach as an important representation of themselves.

> *I guess professor. I think it's teaching and research. And then teaching research obviously has a service component. I see them as kind of integrated with teaching and research so, so there. Service may be related to kind of outreach. It could be professional, support for professional societies, or it could be outreach to the community that would apply to some things. ~Morgan*

> *I look at helping to educate the next generation of engineers that will work in the* [discipline-specific] *industry. I work on developing the solutions to current problems in* [discipline-specific] *applications. And I think I also feel that I do a lot to promote our discipline, or promote our capabilities, promote what an engineer is to my community, but also to the wider community of both kids as well as adults. ~Sandy*

Interestingly only a couple of participants directly mentioned engineering as part of their initial statement of identity. When directly asked if they were engineers, a majority (9 of 13) responded that they did see themselves as engineers. While some responses included recognition that they are engineers because it is in their title, all of those who responded they see themselves as engineers attributed it to their professional training as engineers (i.e. schooling), in particular how they approach solving problems.

> *The way I tell people engineering it's an overused term for problem solving. So, what I love is seeing the problems, and getting the right pieces of information, the right team together, doing the background research. You know, and thinking about problems in the way that might*

be a little different than just saying, "Oh, this is the way it's always been done let's do it this way." ~Kelly

The problem solving approach to everything. I mean my kids would tell me that I do that cleaning house, you know. So it's just a way – I mean it's just the way I think I guess. ~Sandy

Being identified as an engineer was not enough, or incorrect, in the minds of the remaining engineering faculty participants who believed that part of whom they are now is a scientist. This attribution of being a scientist stemmed from their association with the research they do at a fundamental level being more of a form of inquiry akin to a scientist than an engineer.

I consider myself a [discipline] scientist, not necessarily an engineer but a [discipline] scientist. I think my research is more geared sometimes towards the fundamental aspects of [discipline] discovery. ~Jamie

Not all professors are engineers, but certainly engineering professors – that's a big advantage if they are engineers… I think I see myself more as a scientist who – who's also an engineer. But I think that's – I think the ones who are scientists that who are exclusive scientists have some advantage on the research at times. ~Morgan

The participants are all professors who have inculcated the research intensive university expectation of faculty – teaching, research, and service – into their beliefs of whom they are as professionals, although there is some divide amongst whether that role is carried out as an engineer or scientist.

4.2.2.2. Why Faculty

Identity provided insight into how faculty see themselves today, but additional insight into the worldview of the participants can be gained by contemplating why these individuals decided to enter the academic profession as faculty. Participants entered the profession for its professional freedom, to teach, and to prepare others.

The primary reason participants (9 of 13) became engineering faculty is professional freedom. Professional freedom is an extension of academic and intellectual freedom. Academic freedom, according the AAUP (1940) is "the belief that the freedom of inquiry by faculty members is essential to the mission of the academy as well as the principles of academia, and that scholars should have freedom to teach or communicate ideas or facts without being targeted for repression, job loss, or imprisonment." Intellectual freedom emerged from the court battles of libraries to protect the written word and is "the right of every individual to both seek and receive information from all points of view without restriction. It provides for free access to all expressions of ideas through which any and all sides of a question, cause or movement may be explored."

Professional freedom is defined here to be the right of the individual to engage in activities of inquiry, internally and externally, for the accumulation, production, and dissemination of knowledge that is of interest as an individual and/or as a professional without fear of being targeted for suppression, loss of employment, or legal persecution. The caveat to this is that a professional must recognize situations in which espousing of information as beliefs, such as in a classroom, may not be in accordance with their professional duties. Taylor, Robin, and Casey provided evidence about the professional freedom participants sought were the ability to direct their own lies of inquiry and general atmosphere.

> *I thought that it would give me the most flexibility to work on things that I thought were important. ~Taylor*

> *I liked the idea of being able to pick the things that I worked on for myself. That's absolutely real important. And that's part of what I liked about being a professor is that you can have control of your own time. ~Robin*

> *I have not ever been bored in this job. And, when I do start to get tired of something I just go start working on a different project, you know, and you can't really – you never really just let everything go. I mean it all is tangential and there's a web of things that you're working on but I – this is a great gig. ~Casey*

Cameron extended the appreciation for self-directedness, but provided contextualization understanding that there are limitations to this power.

> *I really like the self-directedness of my job. I really get to decide what I want to do. Of course there are limitations within that because I do have some things that I have to do such as, you know, class prep and all that stuff. But, I really – and even with that I get to decide what I want to do for class. So if I, you know, I mean the class has to include these things but I can say, "Well, today we're going to talk about this, or today we're going to do that," and I really like being able to decide what I want to do. ~Cameron*

Beyond freedom to direct themselves professionally, teaching was the most significant reason (6 of 13) for becoming an engineering faculty member. Teaching was an acknowledged activity of value to the participants whose only outlet was available at higher education instructions.

> *I struggled with going into engineering because I really liked to teach; I really liked the classroom, I really liked those things. And this is a job I can do all that stuff and work on whatever I want. ~Sandy*

> *I value teaching quite a bit because I see our roles, you know, especially in a land-grant institution, and I think particularly as part of … a land-grant institution of what that stands for and that is providing an avenue for the sons of toil to get an education to move on to, you know, socioeconomic mobility, and* [I] *still see the university as a tool for socioeconomic mobility. ~ Shawn*

> *I liked teaching. I learned about the research process as I went and then enjoyed that. And then I thought it was useful to try to teach students about the research process. So if it was just teaching I probably could've been anywhere. If it was just research I probably didn't have to be a professor. But to try to teach the research process I needed to be in this kind of a role. ~Morgan*

The final reason cited (5 of 13) for becoming faculty was the ability to prepare future scholars. Preparing future scholars is a specialized form of teaching in moving beyond simply leading in the classroom environment to taking a stake in the development of an individual scholastically, and possibly professionally. Subsequently, while Taylor ascribes this to working with students at large, a special emphasis is provided by Kelly, Lou, and others to the preparation of graduate students as the future of the profession.

> *So it may be a little different than some* [of the institution's] *people is I see probably my largest impact on the undergrad, Master's, and Ph.D. students I get to work with. ~Kelly*

> *I like watching the students grow. It's really satisfying seeing you know someone that twitters over the course of a semester or how many years as a graduate student and seeing them – how they change and it's very rewarding when they actually do something that you ask them to do. ~Lou*

The most important thing to me is the development of students really. I see my students as the most important product, products I've ever produced. ~Taylor

The participants in this study became faculty primarily for the professional freedom academia provided them to control their own career activities. As part of this professional, some participants were enabled to build on other potential career motivating factors, such as teaching and the preparation of others.

4.2.2.3. Graduate School Preparation

All of the participants have earned a doctoral degree. Earning a doctoral degree required attendance at a graduate school and emersion into the core knowledge of a specific discipline. Part of this process was beginning to learn and contribute to the discipline as an emerging member in the academic profession. The two main areas of development in graduate school align with research experiences and teaching experiences, although other opportunities may be available depending upon institution. For the participants in this study, graduate school was a training ground for research and exploration of teaching.

The prime focus of earning a doctoral degree is demonstrating the ability to conduct research on one's own. The participants all confirmed their graduate school to have provided extensive preparation in the conducting of research, although ancillary activities such as grant writing was dependent upon individual experiences.

It taught me how to learn and how to do research. The things that I know now aren't things that necessarily was trained or formed in classes. It's not like the research I did, particularly my Master's on, I'm doing anything in that field now. But in terms of all the skill sets I learned and I'm using all the same processes and backgrounds. ~Kelly

> *It was just a time of just a lot of growing, and learning how to think, and learning how to do research, ~Sam*

Kelly and Sam above indicated clear learning related to their experiences, while Robin struggled to assert that he or she learned research, but clearly experienced it fully.

> *The most important thing is research. So, that was basically ... well I'm not sure whether I learned it or not, but I knew that I enjoyed it. What I liked was discovering new things, working on new things, solving problems that hadn't necessarily been solved before. ~Robin*

It is important to acknowledge that the research experiences had variety as well. All participants discussed having extensive training in the design, conducting, and presentation of research that was discussed above. The variety existed in grant writing experiences.

Teaching was the other common area of the graduate experience that was discussed by participants. Not all participants had teaching opportunities, but the majority (11 of 13) identified some teaching experience while in graduate school. The distinction amongst the participants was the variety in experiences. Some participants, like Jamie and Sandy, had teaching assistantships where they experienced interacting with students through leading labs and recitations, but no larger set of preparation for the classroom.

> *I was a TA for* [science-discipline] *labs although I was in* [engineering discipline] *I was TAing in the* [science discipline] *department for many years. And, you know, I was familiar with teaching labs. ~Jamie*

> *As I went through the program, the graduate program, I gained more and more confidence. They also gave me an opportunity to be a teaching assistant. ~Sandy*

Other participants reported more extensive teaching experiences where they were involved in the instruction of a course.

> *I had an opportunity to teach so – a full course – I taught the same course two semesters. There were – I had an opportunity to practice teaching in a low-stakes environment which I think was good. I was never really worried about that piece of it but it was good to have that under my belt. ~Casey*

> *I taught as a recitation instructor, basically a sophomore* [discipline] *course….* [Later] … *I taught with a very famous professor at [the institution], and I taught the sophomore level* [discipline specific] *course, but in this case I was one of the instructors not a recitation leader. ~Sam*

Finally, a couple participants received extensive preparation in teaching while they were doctoral students.

> *I also was an instructor for the Research Methods class a number of times. In my doctoral program we had a kind of a unique part of our curriculum. We had a required year-long seminar on the teaching of* [discipline]. … *Discussing pedagogy, and teaching methods, and you know, how to do exams, and how to pick textbooks, and all that stuff.* [Later] *we had responsibility for co-teaching the Introductory to* [discipline] *course. So, in that sense, I did have a specific course sequence on academic teaching. ~Jesse*

The participants in this study had a similar graduate school experience steeped in learning discipline-appropriate research, while having a wide-range of teaching experiences.

4.2.3. Participants Summary

The tenure-track engineering faculty who participated in this study represent a diverse set of background and experiences. Within the diversity of the participants, responses provided aspects of commonality such as identity as professors, reason for becoming a faculty member as professional freedom, and a graduate experience with extensive research training and some teaching experience.

4.3. Themes of Influencers of CPL

The research question for this study was: *What are the influencers on continuing professional learning of tenure-track engineering faculty as assistant professors?*

The following four themes (See Figure 4.1) emerged from analyzing tenure-track engineering faculty's responses about their continuing learning experiences.

- Theme 1: All tenure-track engineering faculty experienced an institutional impact on their professional learning.
- Theme 2: All tenure-track engineering faculty self-directed a portion of their professional learning.
- Theme 3: Most tenure-track engineering faculty socially constructed a part of their professional learning.
- Theme 4: Tenure-track engineering faculty reported a diverse set of mentoring experiences influencing their professional learning.

The next several sections of this chapter presents definitions and evidence in the form of quotes to build a narrative supporting the existence of the themes identified above. Definitions are provided where there is researcher concern about contextual understanding of the words used in defining and describing a theme. Quotes are provided in italics to ground the constructed narrative and themes in the participant's responses demonstrating an emergence from the data. All quotes will have the pseudonym assigned to a participant attached at the end.

Quotes are direct evidentiary representations of participant responses to the semi-structured interview protocol, but may have been modified in a couple of minor ways to improve readability while retaining the intended meaning. One alteration to some responses is the removal of excess umms, ahhs, and other interruptive forms of speech that broke up the quote in the transcript in order to improve the readability of quote in the dissertation document. A somewhat significant alteration in the dissertation is the removal of identifiers in the quotes such as he or she and specific names of people, places and institutions to ensure the anonymity of participants. My changes of information, as well as additions made to improve clarity of reading, were performed using square brackets that are not italicized. The final convention used in the quotes was ellipses to represent the omission of words not relevant to a participant's response.

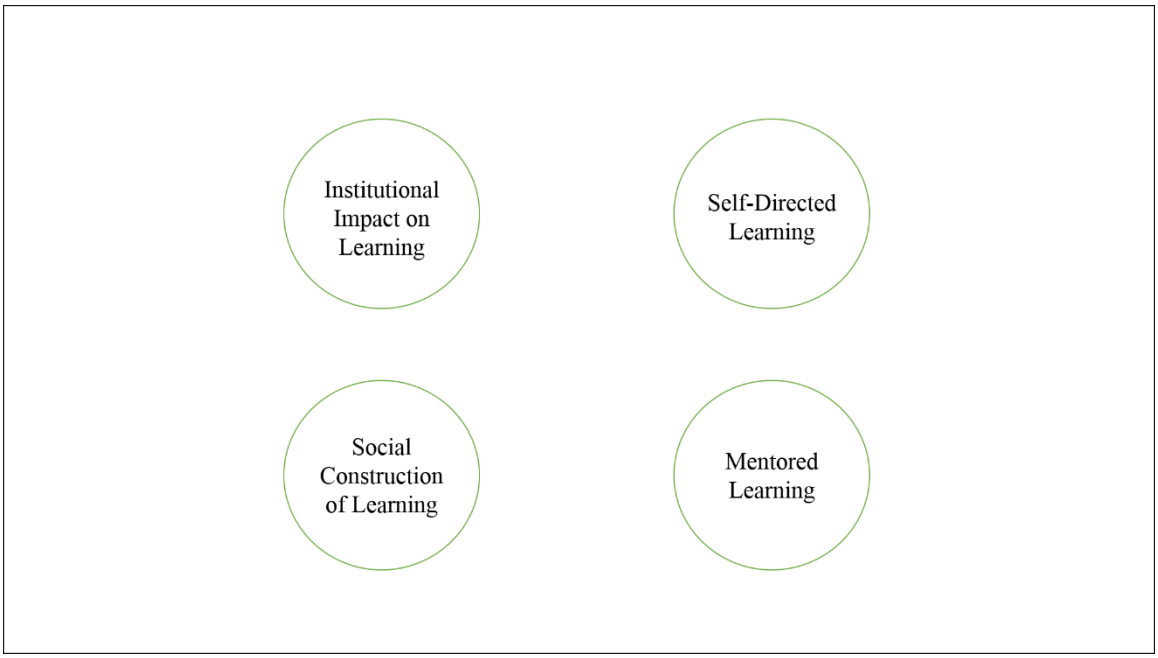

Figure 4.1 Emergent four themes influencing continuing professional learninig.

4.3.1. Theme 1: Institutional Impact on Learning

Theme 1: All tenure-track engineering faculty experienced an institutional impact on their continuing professional learning.

This theme reflected the engineering faculty member's reported interaction with the policies, actions, and formal activities established by the collective institution – academic units of the university or the university itself. The terms in the theme should be clear except the words experienced and impact. *Experienced* was used to confer participants' awareness that the policy or seminar in their responses affected them through direct or indirect channels. The term *impact* in the theme meant faculty recognized the institution playing a role in their CPL experiences or their perception of CPL. Figure 4.2 illustrated the thematic development of the institutional impact on learning theme.

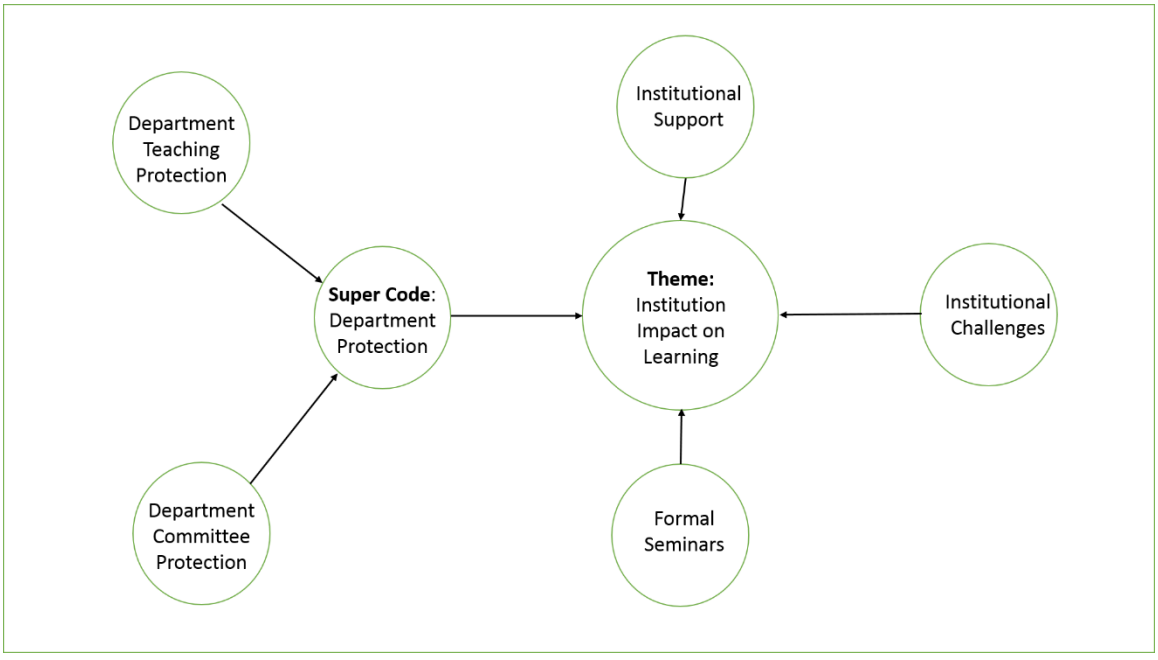

Figure 4.2 Thematic mapping of institutional impact of learning.

The institutional impact on learning described by faculty participants stemmed from policies of protection, formal professional development opportunities, and general forms of challenges and support by units within the institution.

Professional learning provided to assistant engineering professors was not always through formal skill development. Sometimes an informal benefit or challenge, such as time, played a significant role in the continuing professional learning process. Participants (7 of 13) identified department teaching and committee policies and actions executed by the department head provided forms of protection that impacted their time available to engage in professional learning. Sandy provides a good overview of the new assistant professor.

> *The first couple of years that you're an assistant professor, you're just clawing to stay alive, and in those days, there was no protection for the assistant professor. So I walked in the door and the first semester I was here I taught two classes I had never seen before. I was trying to start a research program. And … I got assigned to every blooming committee there was. So, it was you know drown or you'll be good. ~Sandy*

This quote captured the wide array of new experiences faculty are dealing with in the beginning and some of the powerlessness a junior faculty member has in controlling their schedule. One way the institution played a role was assisting faculty in procuring more time to be able to engage in the professional learning necessary to be successful. Casey described the benefit teaching protection through limiting the influence of course load on time.

> *I taught three different classes during the five years before I went up for tenure. That was it. And I just taught them over and over and over again. And so I was protected* [compared to] *… colleagues who were teaching something different every semester…. And so that gave me a lot of time to work on research and stuff. They were really good about that type of*

thing. ~Casey

Shawn concurred with Casey about when departments allow a faculty member to teach same courses the resource of time frees up. Shawn also provided insight into why continual course development reduces time new faculty have for other professional learning.

> *I have lost count of how many different courses I've taught. I've kind of just been given a new course almost every semester. So I have to develop new materials and try to do it. But* [eventually] *teaching the same course a few times that I can kind of just show up and teach the material because I know it. ~Shawn*

Teaching load protection (5 of 13) was one policy participants credited to department heads for contributing to their professional learning through time creation. Another form of department protection came through limiting service on committees (4 of 13) throughout the university. Casey and Lou reported on how department heads stepped in to limit the service of faculty members on committees.

> *They tried to put three assistant professors on some search committee … So, I just went to him and I said, "You know, this seems kind of odd. Why are you picking three assistant professors?"* [They responded], *"You know, I'll just serve on that, you don't need to." ~Casey*

> *I think what he did try to do in the beginning and maybe now a little bit later was to protect me from administrative duties, which assistant professors really aren't supposed to be doing that much of that. ~Lou*

The question not answered in most faculty responses was whether department heads were doing this spontaneously as a matter of overall policy or were they responding to

becoming informed about the level of additional assignments as clearly stated in Casey's case. There is some evidence that the department worked with faculty by providing some form of service protection when informed by the faculty member that the load was becoming a challenge. Sam related this experience of a peer and the results of too much time in service to the department.

> *One of the faculty members in our department did not do that and really got saddled with too much service and it's affected* [their] *research still today quite frankly. So… you know you did have to stand up at times and say that, "That's not good," or, "I can't do that and still do these other things." ~Sam*

Sam further elaborated about the challenges of females in the department and committee assignments.

> *I think for women assistant professors I think they are asked to serve on so many committees that they really need – they really need to have their head run interference for them. And the head needs to sort of say, "No, not this one. Yes, this opportunity." … But, I think when you're a female professor I think that people think, "Oh, it's a female professor we ought to get their perspective," and that's good. But, if there aren't many of you then you get asked to be on everything, right? … So, that would be a barrier to them getting work done is serving on those committees. ~Sam*

Policies and actions designed and implemented by the department can play a role in providing more time for the assistant faculty member to engage in the professional learning required to be successful. It also appeared that the assistant professor, or a colleague of theirs, needs to inform the department that the load of expectations is getting high and will impact performance rather than the department knowing this on their own.

The institution played a direct role in the formal development opportunities afforded to faculty in the form of seminars and workshops. Seminars received a mixed review from participants (9 of 13) about being a positive or negative contribution to their professional learning. Positive responses (4 of 13) about the seminars emerged from faculty members who perceived a beneficial learning experience to themselves.

> *I'm always willing to learn. And, you know, like I would go to teaching – I went to teaching things you know hearing [expert] and these guys, these fabulous teachers to just kind of figure out what I could take from that and just sort of learn and apply. So, the same way with the proposal writing. It's like well what can I learn from this, right? So I tried to learn from these guys. ~Sam*

> *I went to the workshops. Just because I wanted to be a better teacher…. In fact probably if you polled the audience in those, most of the people that are dedicated to – or you know value undergraduate teaching are there, and the people that don't care about it aren't there. ~Kelly*

The responses provided by Kelly and Sam demonstrated that faculty members genuinely interested in gaining knowledge from seminars benefited from the experience, but also that the people present at the seminars were individuals committed to learning about the seminar topic. Another interesting point immersed in Sam's quote was the identification of the seminars attended being conducted by [experts]. Does this mean there is different valuation for non-expert seminars? No responses answered this question.

The negative response (5 of 13) afforded to participation in formal professional development opportunities related to a mismatch of learning preference and time wasting. Casey attended seminars possibly for political reasons but has found they do not align with his or her learning preferences.

> *I might've gone to a seminar. But, I am not a lecture learner. I know, I know I'm not…. If I went it was only because I thought somebody might see me there that I needed to be there or something… I haven't really ever found that useful when I've gone to them. ~Casey*

It was interesting to note Robin's qualms about participating in seminars at all. Robin built on Casey's experience of not learning useful information and expanded it to being a waste of time since nothing useful was learned.

> *I've done some training things for things that you have to get training on. And, I always find those pointless honestly. And so I've never been one for sitting in a room …. I think I've always regretted it because it seemed like the time invested for the return was just not sufficient, and I can always find something better to do with my time than go to some of those clinics and stuff. ~Robin*

The lack of alignment in learning accounted for much dissatisfaction with seminars and was not surprising since not everyone learns well in workshop/seminar environments. A different concern was raised by Shawn when participation was looked forward to, but failed to deliver on expectation.

> *I took this* [Expert] *grant-writing workshop that* [the institution] *offered. And they helped me polish up my … proposal but it backfired because all of my scores went down from my first submission. 'Cause I think the* [Expert] *workshop really emphasized at making sure everybody understands* [grant writing] *well, you remove all the technical content, so people understand it. Then it just doesn't have the intellectual merit to support it. So, even though his workshop it kind of backfired on me in that sense. I know how to write a better first page because of the program. ~Shawn*

The challenge of seminars identified by Shawn was meeting the needs of the individual faculty participating in the seminar. The Institution wanted to support opportunities for professional learning by faculty but the experiences varied by how the individual faculty member's approach their participation.

The final component of how the institution influenced professional learning of assistant engineering professors occurred in the way challenges were handled and the presence of support provided. Departmental challenges (5 of 13) centered on lack of alignment in expectations, whether this is ethical behavior or the general experience. One serious concern raised by a participant's response was when the department behaves unethically. In the situation described by Taylor, the faculty member is not the focus but simply an observer.

> *You run into heads who make decisions that are clearly unethical decisions, clearly abusive decisions. They do things that right, my biggest problem as an assistant professor was keeping my mouth shut and not saying, "You can't do that." … But that was problem number one. And probably the only serious problem I ran into [was] they were afraid that if they disagreed with a senior faculty member that someone would take it out on them at tenure time. ~Taylor*

This situation and quote about ethical behavior can be considered by some to have nothing to do with professional learning. In truth, the modeling of expected behavior by the department or institution regarding ethical behavior will have influenced the professional learning about how the institution expects a faculty member to behave ethically and solve ethical problems. Taylor handled this one way by rejecting the actions; however, another faculty member may have learned that ethics are deemed malleable by this institution.

Other challenges of misalignment of expectations discussed by participants was in the form of feedback and working environment. Sam referred to a set of tenure responses from individuals representing the department and institution as lacking direction.

> *We got feedback annually from the – from the full – from the full professors but that was mostly useless and anecdotal sort of stuff; it wasn't very helpful ~ Sam*

Lou expounded on disappointment in the departmental atmosphere.

> *I've found it to be a very uncollaborative environment. … So that's actually been quite a shock for me. I came here not expecting it to be like that. Now at one point our department head a meeting where* [they] *said, you know, "It's every man for himself." And that was very, very unexpected for me. ~Lou*

Lou was espousing frustration that department expectations ran counter to the policies and expectations of the university and arguably the trend across academia.

For all the challenges presented by the actions and policies of institutions, sometimes they were supportive in aiding assistant professors to advance their professional learning. One form of support was supporting programs that grew the institution's name. Morgan discussed the support received to build a professional program that provided the opportunity to develop several professional skills that would not have happened without institutional support.

> *They really wanted to make a name. They really wanted to be recognized internationally and within the field. So, anything and anybody that was successfully supporting that mission was treated with care. There wasn't always agreement on how to get there and there was some disagreements that sometimes led to what you would think of as not really care. ~Morgan*

Even with institutional support that backed the program, Morgan noted it was not free reign. An additional form of support provided by the institution recognized the value of

good teachers. Casey discussed being the beneficiary of a fellowship based on previous teaching success since the institution valued trying to keep good teachers around.

> *What was really insightful about this fellowship is it gave you release time to work on your research because they – the people that constructed it understood that if you're at a research institution you need to be a good teacher but you can't be there and be a good teacher in the long term if you don't have the research record to support you getting tenure so you can stay and be a good teacher. And so I negotiated with my head … so I got a semester off from teaching. And I kicked butt and wrote [several] manuscripts. ~Casey*

This was an example of an institutional policy recognizing part of its mission is teaching, but to keep excellent teachers sometimes they must be provided the resource of time to learn and complete other professional activities required for tenure.

Participant responses supported recognition that the institution impacted the continuing professional learning of tenure-track engineering faculty as assistant professors through the policies and actions of the institution, primarily the department, and formal development opportunities.

4.3.2. Theme 2: Self-directed Learning

Theme 2: All tenure-track engineering faculty self-directed a portion of their professional learning.

This theme reflected the role of the engineering faculty member being assertive and deciding what they needed to learn to be successful as faculty and going out and doing those tasks. The terms in the theme should be clear except the words *self-directed* and *portion*. *Self-direction* denoted that the individual faculty member was responsible for what occurred through their own decisions on what to do. Portion represented the notion that the amount of professional learning pursued by the individual faculty member

varied by participant. Some participants identified directing their entire professional learning experience with only the institution sometimes interfering, while others mention future influencers also playing as significant a role as their own contribution. Figure 4.3 illustrated the thematic development of the self-directed learning theme.

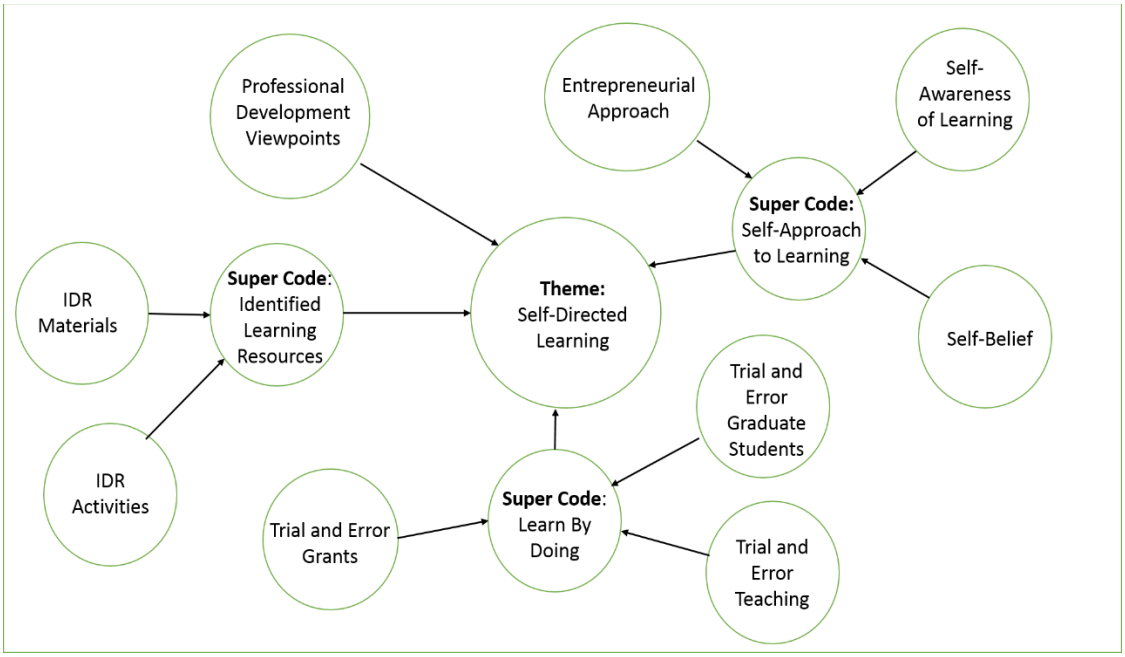

Figure 4.3 Thematic development of self-directed learning theme.

Self-directed learning (13 of 13) encompassed the participant's description about their ability to identify learning resources, to apply a self-approach to their learning, and to learn by doing, as well as clearly expressed views on professional development. One action identified by all faculty participants was identifying resources for their own learning needs (13 of 13). The acknowledged resources was accessible materials such as books, videos, and internet materials.

> *I get a book…looked for resources on the internet… when I came to* [the institution] *I read a bunch of books about how – advice books for new faculty members, like five of them that touched on funding too. And, this was on the internet…I'm always going and reading the books…you*

engage in growing in that you read about it, became more familiar with it. ~Jamie

I Googled stuff; …I read a lot about teaching actually before I got my first faculty job. So, you know, you could just go on chronicle.com, they keep a site, a million things about it. So, I read a lot about it. ~Lou

I bought a few books on grant writing to help me, you know, write grants. ~Robin

Robin, Jamie, and Lou characterized the common actions of all participants in locating a resource to support their professional learning. The collection of materials was supported by some faculty (5 of 13) by pursuing activities to support their own engagement of resources on specific topics.

Then if you wanted to know more started to find activities such as workshops and seminars. ~Jamie

*I went to a course on writing on NSF proposal, like a one-day workshop**.*** *~Lou*

The engagement of resources to support their own desire to learn was the foundation to the self-directed learning behavior of the engineering faculty participants. The acquisition of resources was supplemented by a course of action termed learn by doing.

Learn by doing (12 of 13) accounted for the trial and error process faculty discussed using to advance their professional learning about teaching (3 of 13), grant writing (8 of 13) and working with graduate students (10 of 13). Trial and error described the process of trying an approach to teaching, grants, or students, receiving feedback about its effectiveness, and adjusting future actions to teach, write, or engage

more effectively. Jamie provided a nice overview to how faculty participants think about moving themselves through the professional learning required for tenure.

> *It's just you know every day you just wake up and you try to do the best you can, and then it doesn't – some days you go to be and go, "Hah, today was a good day." And some days you go to bed and go, "Dang it, darn let's not do that again." And, you know, and I guess it's – you make a mistake you try to learn from it. ~Jamie*

Shawn identified how learn by doing applied to advancing a faculty member's teaching experience. Shawn conceived of a classroom environment that did not play out the way he or she expected and adjusted based on the experience.

> *And the first thing I tried … was note cards where I'd have every student fill out a note card and then I'd step to the front of the room and when I want questions from lecture and things I'd pull a note card out to call on somebody and that did backfire 'cause that apparently established a culture of fear. So, I've tried to modify that and to have everybody involved with questions instead of just one student I called on the spot. But, it did keep them awake. But, not the right way to do it. ~Shawn*

Learn by doing was discussed as important in how they learned to write grants.

> *Lots and lots of drafts. There are – there's a paper that actually got published in [recent times] that basically went through about six or seven major revisions and the initial ideas for the paper can be traced, maybe at the level of individual sentences and paragraphs back to a draft that I wrote [a decade or so ago]. ~Jesse*

I think I was a pretty decent writer from the beginning but obviously the only way to get better is to do it more. So again try to keep writing more. Getting feedback and rejections. We get a lot of rejections in this field … And then you get feedback. Your paper's been rejected and so then you get, you know, see what you are doing wrong and improve, right? ~Jamie

I think I developed my own way of doing it. Umm, you know, you look at other papers and okay they have these parts so I'll put these parts in, you know. And then I'd say well that doesn't make sense. ~Sandy

Well I feel like it's one of those things I think that it gets better with practice. So the more I write the easier it will become, I assume. My gosh I hope. But, I think it's just making yourself and setting aside the time to do it … But just making yourself do it and that's that self-motivation thing too. But I think yeah, just with practice and getting that feedback from the grant is also really helpful. ~Cameron

The faculty respondents here acknowledged repetitiveness and feedback as essential to the professional learning process for writing grants. It was also interesting to capture Cameron's take on the presence of self-motivation contributing to grant writing. The other realm participant's described the process of learning by doing as contributing to their professional learning was managing graduate students. Jamie, Lou and Sam described the transition from a set of expectations they possessed for handling graduate students to new realizations about the process.

I guess at the beginning I tried to apply like one size fits all, I tried to apply a mentoring style to everybody. And I learned through my experience that it doesn't work with everybody. I made choices as a general philosophy of course. But some people need more direction; some people need less direction; or some people don't like too much direction.

And some people they want you to do a lot for them. So, identifying what type of students you're dealing with is very important. I guess it develops in time. You kind of have to adjust your course based on how you see the students react. ~Jamie

I think gotten more experience at handling my students. More students they need more handholding. And that sounds a little bit negative but I don't mean it that way. I think they – most of the students actually need me to provide a lot more guidance in the beginning. And then some of them will then go on to kind of run with that and they'll become very independent. And I have one Ph.D. student now like that who's just great. Took a lot of guidance in the beginning but [they] *just sucked it all up and now* [they are] *really, really good. ~Lou*

Learning how to manage people is pretty challenging. I think I was too probably hands-off initially because I assumed that they were like I was and that, you know, I assumed that they would want to be treated hands-off. But, a lot of them cannot handle that. A lot of students can't handle that 'cause they don't really get it. They don't really understand, yeah, they don't really understand that. You know, a lot of students aren't as driven as you are… I think I do a better job. I have weekly meetings and I haven't always done that, so. But there's a huge learning curve there in trying to figure out how to get the most – how to train people the most, and how to help them so that they – you know, so that they're successful and that's challenging to do. ~Sam

Another component of self-directed learning identified within the faculty responses was a self-approach to learning (8 of 13). The self-approach to learning was composed of self-belief and self-awareness about learning. Self-belief (4 of 13) captured

faculty respondents underlying confidence in themselves to learn whatever is required to be successful.

> *I think I just always had the right idea. I – obviously it never worried – never bothered me… I just did it. It was just – it just seemed [chuckle] honestly, I never really thought about that that much. ~Robin*

> *I was really on my own. And honestly I didn't – I knew – thankfully I was older and I had a little – I did have that professional – I had some confidence at being a professional; maybe not a professional professor, but a professional person. ~Casey*

> *Pretty much I just did it on my own and figured it out along the way. Which was okay. I don't know that I would've been as successful at that if I hadn't gone back to those other industrial experiences and so on to give me that feeling that I can do this and I may have some burps along the way but I can get through it. ~Sandy*

This professional confidence in their learning underlined the self-awareness faculty recognized as contributing to their ability to direct their learning as needed to advance their professional knowledge and skills. The quotes below captured the awareness of the faculty participant about their capability to control their professional learning embedded within the description of engaging resources or learning by doing.

> *I have in fact read other grants to see kind of what needs to go in there; what people who do write them that are successful how it's done. And workshops are good. But, more than anything for me is like self – like going either finding a book, or online, well mostly online resources 'cause a lot of that stuff is out there. ~Cameron*

I started to see the patterns in what I was doing. And but again, it was pretty much self-taught …. A lot of it I had to learn on my own, but that's part of being a faculty. A lot of faculty work is on your own…I teach myself. I do what I need to do. I figure it out. ~Casey

Well I mean you start – you're like, "Okay, I just wrote an introduction." And, you know, this is actually how I teach my students to write papers. I'm like, "Go get a pad and paper. What journal are we targeting? What method are we using? Now, I don't care what the topic is go find a paper that uses that kind of method in the journal we want. And now let's look at it. How did they construct the first paragraph? Now let's take how they constructed it and let's construct our own first paragraph that's our content in there." I mean, so we're not plagiarizing, but we are constructing it in a way that was published in that journal in the recent past. ~Casey

This is the way I'm going to do it." And they're going to appreciate it or not, but this is the way I'm going to do it. And that's maybe the wrong approach. … And I realize now from a lot of that education that some of the things I did was really bad ideas that really didn't help anything. But at the time I just was trying to forge my own way, I, and not everybody agreed with me. ~Sandy

I looked at a number of other proposals … so I could see the structure needed. You have – you know you need your basis, you need rationale, you need hypothesis, you need, you know, like there's a very rigorous straightforward way of doing it. ~Shawn

Shawn and Casey expressed awareness of constructing an approach to writing built on other people's successful ventures. Sandy and Cameron built on confidence in

themselves that they would construct the professional learning required to be successful even repetitive attempts at the endeavor would be required.

A final special case of self-directed learning was the construct of entrepreneurial approach (1 of 13). This occurred in a faculty member who identified moving self-directed learning beyond awareness of how engaging the learning process to constructing the individual faculty member as their own brand.

> *And one of the most useful, telling things that I heard was that every, every faculty member at a research university, particularly every science and engineering faculty member, should consider themselves as the CEO of their own startup. So that teaches you first that, yes you do have to market your brand. I mean your research area is your brand. The name of your – your lab is a brand. ~Jesse*

> *So you have to have a brand. You have to have a product. Managing people as a founder culture startup, you have to work with people who aren't like you because by your very nature as an entrepreneurial CEO you're not like most people. That's explicitly said. I mean Jack Welch spends a lot of time talking about management styles for different sorts of people; you know, Drucker talks about it; Senge talks about it. And we were told to get our hands dirty with those sorts of thought processes. So that really accelerated a lot of my work. ~Jesse*

A faculty member's ascribed view of them self as a brand is the highest form of self-direction as the individual must continually rethink what is being presented publicly and engage learn the professional skills, knowledge, behaviors to keep their brand relevant.

A final commentary required about self-directed learning is the interaction between the individual and the institution associated with professional development.

Many faculty participants described professional development as a negative concept. Most of these people ascribed the failures and challenges within the institution.

> *Gobbledy-gook. Just something somebody came up with once to pretend like the institution cares. ~Casey*

> *I don't know, it makes me – it doesn't – it makes me feel just like it's like some kind of like psychological-speak or something. I really don't feel like [the institution] cares about my success as a faculty member as much… I know like from a rational point of view that [the institution] should care about the faculty being successful. And I know that as herd they care about us being successful. But I don't see that translating to an individual level. ~Lou*

> *I have no idea really what truly means, okay? I mean there's – it kind of depends on what your goals are what that means. Learning how to do the things to do solo… but it's kind of like a training for future administrators. ~Robin*

The contrasting group termed professional development as an opportunity and recognized themselves as playing a role in the beneficial nature of professional development.

> *Doing things to increase my skills, in my case, as a faculty member. So anything from research knowledge, to teaching skills, to grant writing skills, to you know presentation skill, whatever is going to make me more effective at my job. ~Kelly*

> *Getting better at your job… If you learned everything you need to learn to be a professor if your first year as an assistant professor, you're not very good. So professional development is scanning the world, finding out*

> *what else that you can bring in, shamelessly borrow or steal or acquire, to be better at what it is that you do…So professional development is not just a formal workshop on how to write a winning NSF proposal, it's how do you learn at being better at disseminating what you do, communicating what you do, connecting what you do to the broader world. ~Jesse*

> *When you say that then what I see generally an upwards trend, right, towards becoming a well-known recognized researcher that has a strong program, and becomes someone in your field. So, we are all trying to reach that end. ~Jamie*

Self-directed learning captured the assistant professors' personal impact on professional learning through obtaining resources, learning by doing, and a self-awareness to learning. Entrepreneurial approach described the highest form of self-directedness. Finally, professional development is negotiated between the individual and institution yet the main driver depends upon whether professional development is viewed as a positive or negative.

4.3.3. Theme 3: Social Construction of Learning

Theme 3: Most tenure-track engineering faculty socially constructed a part of their professional learning.

This theme reflected the engineering faculty member's recounting the engagement of people, primarily peers, resulting in formal and informal professional learning experiences. The terms in the theme should be clear except the words *socially constructed* and *part. Socially constructed* meant that the individual faculty member was engaging in conversations with other people to construct new knowledge, skills, or simply understanding that would advance them in their professional capacity as a faculty member. *Part*, similar to portion in precious theme, captured the fact that only some of a faculty member's reported professional learning occurred through interacting with other

people. Figure 4.4 illustrated the thematic development of the social construction of learning theme.

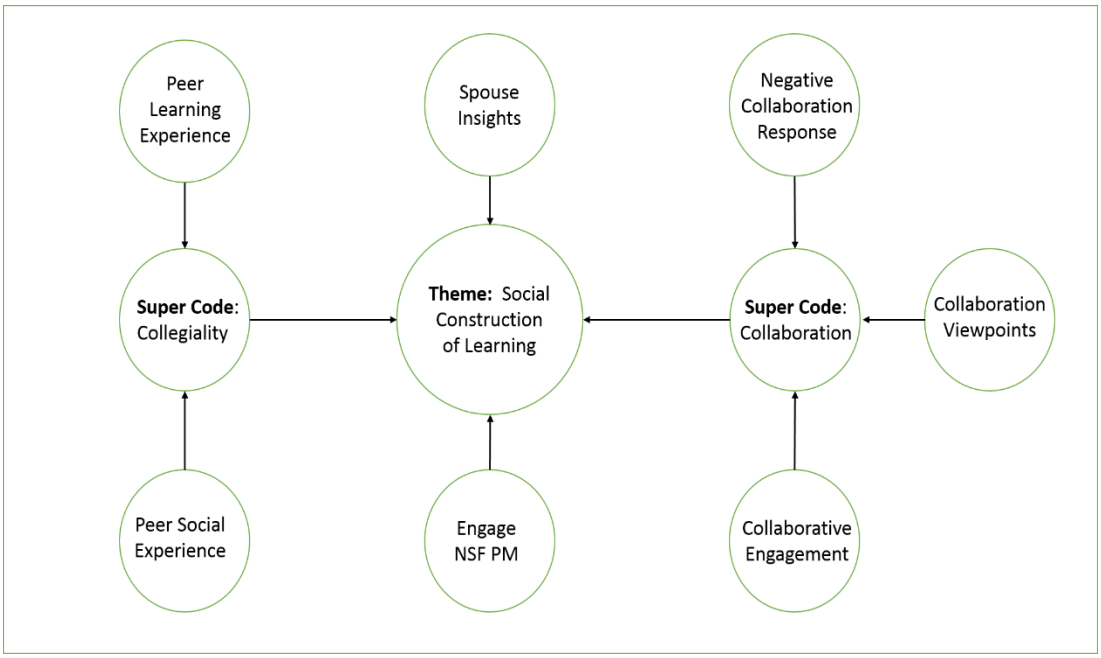

Figure 4.4 Thematic development of social construction of learning theme.

Participants described the social construction of learning (10 of 13) through collaboration, collegiality, NSF program managers, and spouses. The responses revealed that some faculty do not rely solely on themselves for professional learning but also enjoy engaging their peers and outside people to supplement their professional learning.

One collection of people who contributed to the professional learning of faculty participants was the spouse. Only two individuals reported their spouse's contributions to their professional learning, the contribution was considered significant. Both Casey and Sam credited their spouse with contributing to their writing.

> *My* [spouse] *is an amazing grant writer. And* [they were] *very, very helpful in that process. ~Casey*

> *My* [spouse] *is a – was very good in helping me to understand how to do this…* [My spouse] *was strong in writing and some of even the reasoning that I just hadn't had…. my* [spouse] *who would read my proposals and say, "I've got no idea what you're trying to say here."…having* [my spouse] *read most of the things that I'd written, having* [them] *help me with the arguments because it's like, you know, I just want to dump information on someone as opposed to really making an argument, right? ~Sam*

Additionally, Casey ascribed his or her spouse with providing valuable guidance about interacting with their peers and department for recognition of ability and capability.

> *A lot of support from my* [spouse]*…my* [spouse] *says, you know, you're doing some really great things but nobody knows about them because you don't talk about them. I'm like, yeah but they should just know.* [My spouse was] *like, you know they don't. You know you have to talk about them. ~Casey*

Besides the spouse, another outside social resource was the program managers at NSF (5 of 13). Participants who connected with NSF program managers received professional learning about the funding process at NSF, the grant writing process, and establishing personal connections with people associated with the funding process at NSF.

> *I was able to meet some, you know, a program manager and connect with* [them]. *And I know that that made a difference whenever my career proposal ended up on* [their] *desk because I know that* [they were] *– I think there was one review that was suspect there and* [they were] *able to overlook that I think because* [they] *felt comfortable with me as, these are* [their] *words not mine, so that was getting that early grant, and getting that first grant. ~Sam*

> *Talked to the program managers. You know, read a lot and then call the program managers, don't be shy to do that. Try to get them – I tried to get on research panels on proposal writing panels and this way you learn about, first-hand, how proposals are written, and how are they evaluated, and then also the program managers gets to know you if you do a good job in reviewing, he or she may make a good impression about how serious you are, how dedicated you are, and if you are doing a lousy job and other people are not doing a good job in reviewing their proposals, come unprepared, if you go there prepared and you make a good impression. ~Jamie*

> *I learned from the process that I called and I talked to the program officer and I solicited their advice on how to handle some of the criticisms and the suggestions that I had gotten. And, you know, academics love to see their words put back to them and so I very strategically answered the issues. And I put some of* [their] *words back to it. And I – and so I not only wrote a better proposal the second year but I also wrote a more politic – I mean I incorporated politics into what I wrote. ~Casey*

The social connections developed interacting with NSF program managers and the NSF panels resulted in professional learning for these faculty participants about how to prepare grants likely to be funded by understanding the process, what NSF panels were looking for, and establishing credibility with people responsible for funding.

The majority of social interactions that contributed to assistant professor's professional learning involved peers. Peers and participants engaged in two types of relationship, collaboration (9 of 13) and collegiality (10 of 13). Collaboration was the interaction between peers and the faculty member in formal working environments to advance a research or teaching objective. Collaboration was described by some participants as interacting with people who had similar interests and using the connection to grow together as both contributors learned from working together.

> *But the one I teamed up with here was* [they] *and I both had very specific interests that sort of meshed and it was a fortuitous collaboration. It was a pretty even collaboration. I did most of the experimental work and* [they] *did most of the theoretical work. ~Pat*

> *I've definitely become a better collaborator. I met the group that I'm partnering with on this big project and when faculty here in [different] engineering [department]. So we collaborate and co-advise a lot of students and that's been going really well which is – you know, [my collaborator's] a great researcher and our scientific goals align in a way that we can contribute to each other's projects and not be redundant. ~Shawn*

> *So I went over to [another] department and talked to this one* [person] *who had become friends with me and I said, "Well here's a thing that just bugs me."…so we ended up putting this project together … which really had nothing to do with anything I'd been trained to do, but at least I had a collaborator… And, it was very helpful to actually find someone to work with…. and I kinda' – I led group and so it was – and so I kinda' learned how to make ideas, and learned how to push the research process through that. ~Casey*

Pat, Shawn and Casey all described making connections with someone who was interested in working together and used that working relationship to construct professional learning to advance them in their career. Jamie discussed that sometimes collaborations are only necessary as connections to provide access to an area.

> *I remembered that I met a person at a conference. So I called, I picked up the phone and I called them up. They had more papers then in that area and that was a new area for me. So I said, well, I wrote the whole proposal myself, I just added this person on the proposal to overcome the fact that my previous work was not on that particular subject, right? So that – this way you can say, well that I gave that person a bunch of money while I was in the lower, but I think if I got 100% of nothing would have been less then. So, you know, if you don't have the expertise you want to get into a new area you can team up with people who have the experience and can help you with that. ~Jamie*

Jamie gained access to a new area of research through their collaboration and someone to work with who had experience and credibility that would contribute to her professional learning and growth in the new area. Sometimes collaboration engendered a negative response from peers as Lou experienced.

> *So, I wrote a proposal last year with* [a more senior] *faculty* [member]… *The proposal was basically all my ideas, but I needed* [them] *on the proposal because I needed to have a senior person, and there was also a chunk of the work that was very much within* [their] *field …So, immediately the assumption was that I was a junior partner … then it's like, "Oh,* [this] *professor needs help from the senior professor."~ Lou*

Lou tried to duplicate the experience of Jamie by using an expert as a collaborator to access a new research area and gain someone to work with yet received a backlash from other peers because collaboration does not appear to be valued in Lou's department. Additional participant responses provided insight into the thinking of some assistant professors about managing collaboration. Casey remarked on how to collaborate in a way that may be valued by the department and possibly the tenure committee.

> *Yeah, if you are collaborating with colleagues you need to make it very clear what your contribution is, what you've brought to the table, how you've led parts of, or pieces of the effort. You have to show that you on your own have research chops to bring to the table. ~Casey*

Pat established collaboration within a research intensive environment.

> *Collaboration is good, can be good but it's not necessary to be successful in a research institution. If you have a specific area that you dominate in some ways and if you're getting grants, and recognition, and all this other stuff you don't necessarily need to be collaborating with fellow faculty members in order to be successful in that career. But one part is develop a quality research, important research area that is recognized by your fellow faculty. ~Pat*

Finally, Morgan espoused that collaboration for some faculty members is valued as a personal choice of learning that is necessary for the certain faculty members even if peers, department, and tenure committees do not value collaboration.

> *I sought out colleagues that I could work with, or students that I enjoyed working with and that yeah became some of my sustenance for the success. ~Morgan*

Collaboration provided a source of professional learning opportunities through formal connections between peers seeking research or teaching answers together. The informal connection where information was exchanged between peers without commitments to working together was collegiality. Collegial interactions occurred through peer learning activities (10 of 13) and peer socialization (10 of 13).

Peer learning was where the faculty participant described continuing professional learning through direct interaction with peers. This interaction was a more formalized

engagement than a social function. Professional learning through exposure to ideas and opportunities was described by Jesse and Shawn.

> *I got some exceptionally good advice from some of the senior faculty… I actually got the announcement for these seed grants before I had arrived on campus, to say, "Here's this new grant program for seed grants you ought to apply, you ought to put some ideas together, it'll be good for you to get a habit or reputation of getting some money." ~Jesse*

> *I participated in this* [educational] *group on campus where they teach you about technology and different strategies for teaching. And from that I learned the effectiveness of … videos. So, I started putting … videos of problem solving. And that's gone over well with the students. ~Shawn*

Jesse and Shawn received access to knowledge and opportunities through peers. Others learned through peer engagement where their ideas were challenged.

> *But hearing all these other people say, you know, like really looking at you know is this feasible? … So it's just like hearing the way other people kind of talked about it you're like, "Oh yeah, that was – yeah, I should've looked at it that way." So getting some of the perspective I thought was really helpful. ~Cameron*

Robin commented on learning from peers by being exposed to what faculty members should avoid doing.

> *I think I learned more how not to do it by probably the people I worked with. There were a couple of times when one faculty member, basically* [they] *would … work all night working on the proposal. … What I saw was people that were really super-successful writing grants and then not*

> *being able to actually do the research themselves they were so busy managing the research. ~Robin*

Not all peer learning interactions reported were positive. Jesse confronted the challenge of interacting with peers where there is no way to control how others will perceive another's work. In fact, even if outside a peer's realm of expertise, the peer may judge the faculty member which can be negative, neutral, or positive.

> *I actually did have my senior colleagues review drafts. … And, I didn't realize first that people would make a judgment of my overall intellectual capability based on the draft. And, I didn't realize that people are much more narrowly siloed in their research activity than I had assumed. They would tell me how bad it was, but not tell me that it was outside of their specialty and they didn't understand it. ~Jesse*

The other form or informal peer interaction conveyed was peer socialization. Peer socialization was where participants described the value and concerns of mingling with peers informally. One aspect of socializing was informing peers about what was happening in the faculty member's research, teaching, and/or other professional activities.

> *Being socially connected with faculty during the day, having lunch with them has been very important because it's just taught me a lot about expectations and there's just a lot of information that is exchanged between faculty, that made a huge difference … We were all assistant professors… I felt like we could have honest conversations about things without worrying about the rough – the implications or whatever that might come out of them. ~Sam*

> *You can't do it by yourself. You have to be part of the community, and part of the national community, part of the professional community, part of your departmental community. If you are not doing those things it doesn't matter how much work you do by yourself. Nobody will know and you won't be seen as a colleague that people will want to work with for the next 10-20-40 years. Those are absolutely critical. You've got to find your professional home. You've got to be seen as a colleague who will help take out the garbage and help do, you know, rake the leaves ~Jesse*

> *I think the social part is important. I really do. We have a new faculty member who's over at [L] and he seems, you know, he may be completely fine; however, he's not a part and doesn't understand the culture very well of our department. Didn't understand how to interact. ~Sam*

> *I invited people to lunch frequently… I would invite people, "Do you want to have a beer after work?" or something frequently. And so there was sort of a core group of people that I socialized with at work so to speak frequently. And that was – and so I had very, very I'd say excellent relationships with about half of the – half of my faculty colleagues, and cordial relationships with the remainder. ~Taylor*

Taylor, Jesse and Sam all discussed how engaging peers in social environments contributed to peers learning about who the faculty member was and the contributions the faculty member brings to the department. This was perceived as valuable to senior faculty to understand the assistant professor's contribution to the department while other junior faculty can identify peers to collaborate with in the future or possibly commiserate with about the tenure process. Casey provided the sober warning about engaging peers socially.

You need to choose wisely who you decide to confide in. Maybe I'm not trusting enough but a faculty are a fickle bunch and you never know when they're going to change their mind and decide they're going to use something against you. ~Casey

Social construction of learning occurred for faculty through engagement of outside people such as spouses and NSF program mangers as well as collaborative and collegial opportunities with peers.

4.3.4. Mentored Learning

Theme 4: Tenure-track engineering faculty reported a diverse set of mentoring experiences influencing their professional learning.

This theme reflected the engineering faculty member's experience with mentoring as an assistant professor. The terms in the theme should be clear except the word or phrase *reported and diverse set. Reported* stood for the recanting of participant's perceptions about the mentoring experience. *Diverse set* referred to the fact that there was a wide array of responses and thinking provided about mentoring by the participants. Figure 4.5 illustrated the thematic development of the mentored learning theme.

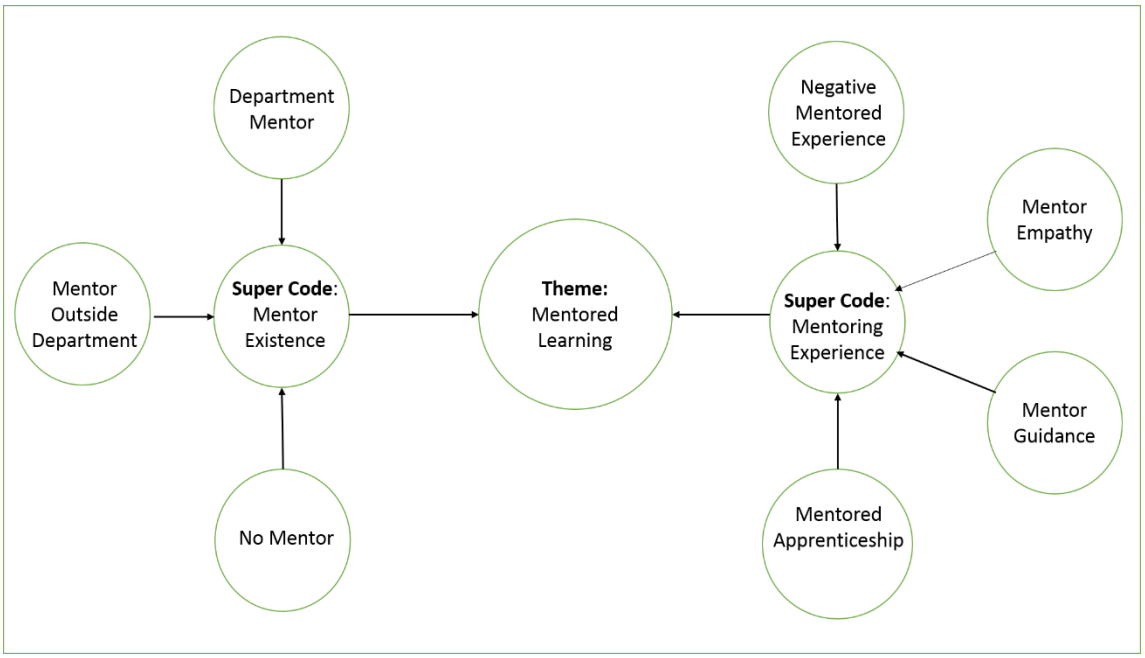

Figure 4.5: Thematic development of mentored learning.

A mentored learning experience occurred when another faculty member, or administrator, in academia established a mentor-mentee relationship with the new engineering faculty member. Participants' diverse experiences began with discussion of whether they had mentors or not. A third of engineering faculty (4 of 13) reported having no mentor.

There was never any mentoring situation here. ~Pat

I don't have a mentor. ~Jamie

The remaining participants (9 of 13) identified having a mentor divided between their departments (4 of 13) and outside their department (7 of 13).

I found a senior person in my academic unit. ~Taylor
I had a few mentors… one or two in my department. ~Jesse

> *I do have someone who has been a mentor to me. It's in a different department. ~Lou*

> *Outside mentor. ~Cameron*

> *There was a faculty member in [non-engineering department] who became my mentor. ~Casey*

The wide array of existence of mentors and location of the mentors connected to the diverse set of mentor experiences reported by participants. Not all experiences were expected to be good, but participants (6 of 13) responded with significant negative experiences about mentoring. Sam and Shawn related a set of broad negative experiences with mentoring.

> *Early on there wasn't a strong mentoring component. And that was true of I think everywhere at* [the institution]. *~Sam*

> *They're just official capacities. Yes, we have our meetings once a year… it's kind of like one lunch a year out of this group. ~Shawn*

Sam and Shawn captured the negative experience of some faculty members where mentoring was seen as a pro forma response by individuals serving as mentors in name only and little impact on the actual personal learning of the assistant member assigned. Lou relayed another concern about the mentor's assistance being perceived by others as weakness in the assistant professor.

> *[I had a mentor] who has actually been helpful to me. Then of course I got in trouble in one of my reviews because … I got told that I looked like I needed too much help. So then subsequent to that I was like fine, I'll be independent and I won't ask for help. It's a great system, you know. ~Lou*

This negative experience of a faculty member's professional capability being questioned was taken to another level by Casey in identifying a unique underlining concern of some faculty members about working with mentors at all.

> *I know I'm supposed to say you need one. I – I have hard time with that because, you know, when you're an assistant professor and they give you a mentor, are you really going to go talk to somebody, one of your senior colleagues, and say, "I don't even know what the hell to do to get through the day. I'm staring at my computer screen." That's not the impression that I wanted anyone to have of me. ~Casey*

These negative cases highlighted the concerns of some engineering faculty with engaging in a mentored learning experience. Many of their fellow participants reported a different set of experiences where a mentor provided empathy (4 of 13), guidance (10 of 13), and even an apprenticeship (1 of 13).

Some participants reported mentors being empathetic. This support was identified as providing understanding about the challenges the assistant professor was experiencing. Jesse discussed not being standard but made to feel okay about approaching their career differently, while Shawn conveyed receiving backing when struggling some issues.

> *So both social/emotional support. Some support on what it was like to be other….And working in a new area. And having an interdisciplinary background there was no way for me to be standard. So other people who weren't standard helping me to feel better about not being standard instead of telling me how to be more standard, that was extremely helpful. ~Jesse*

> *Just, you know all these issues that you're dealing with, you can't control them. So just focus on doing good science and hopefully in the end it'll all work out." ~Shawn*

Faculty members who had support from their mentors was one type of mentoring experience that supported their professional learning. The most significant prevalent mentoring experience was the guidance faculty received from their mentors. The simplest form of guidance provided was given to Lou in the form of straightforward advice.

> *Told me I needed to publish and bring in money. ~Lou*

Jamie received a longer litany of the professional experiences required for tenure and how to navigate the process from his or her mentor.

> *Well you have to talk to your department head, you know, colleagues and your colleagues. See who is calling the shots there and ask what is required for tenure. And they will tell you. And then prioritize that against everything else and say no to other things. Don't let your time be sucked into other – and you have to write every day. You have to write and read every day. You know, don't take a lot of meetings, you know make a block of time where you can write. You know, just meetings, meetings, meetings does not benefit. ~Jamie*

> *My mentor said, "Well maybe it's good to organize a conference now, but don't organize another one next year because that's going to be too much. But you should organize now so you will become well-known, but not too early because it's time consuming." ~Jamie*

This advice about how to proceed through tenure is valuable in helping an assistant professor prioritize their activities. The next level for a mentor engaged in the professional learning was to provide direct feedback to the actions the assistant professor is considering or has attempted. Cameron, Casey and Jamie discussed how the mentor probed the engineering faculty member's preparation and then provided directions to be considered by the assistant professor going forward.

> *Like how is your tenure package coming? Do you have any concerns with classes? How is the grant writing coming? Do you have any concerns with that? And like, you know, helping me put together my documents. ~Cameron*

> *Gave me some things about writing papers that he used to give his doctoral students and was very helpful in me – helping me put papers together*. [They] *knew* [they] *needed to help me, you know, and we'd talk about things. And one day,* [they were] *like, "Oh my goodness, here I'm going to send you this." So* [they] *emailed me this thing about how to write a paper that* [they're] *like, "This is what I put together over the years to help my graduate students." ~Casey*

> *Instrumental support of, "Make sure you document this. Make sure you make yourself visible. Make sure you get in the media. Make sure you don't hole yourself up in your office all of the time 'cause that won't work for you. It works for the standard model, it won't work for you because I'm not in the standard model and I had to learn that it wouldn't work for me. ~Jesse*

The professional learning provided by mentors identified here was guidance about navigating the process of tenure and learning what is needed to be a professor. This

included some specific instruction like Casey received about writing papers, while others received guidance in the form of consider this or that.

One faculty participant reported a unique experience in the form of a mentored apprenticeship. The mentor provided a sounding board for the assistant professor to consider alternatives before proceeding forward without judgment.

> *It was more of an apprenticeship… consulted with him frequently when it was time to make decisions and that helped me very much to sort of figure out how to do things. ~Taylor*

The mentored apprenticeship involved professional learning through direct observation of the mentor dealing with a specific aspect of professional life as a professor such as graduate students.

> *Watching the way that* [my mentor] *worked with the students helped me tremendously sort of understand how I needed to interact with them to help them come along. ~Taylor*

The professional learning extended beyond learning the skills of the profession, such as grant writing, teaching, etcetera …, into how to conduct themselves professionally as a faculty member.

> *It sort of showed me, it was a model for professional behavior and professional success, professional conduct. Basically, this is how you're supposed to do it. And so then I followed that. That was the single most important thing I did. ~Taylor*

Finally, the mentored apprenticeship embraced true collaboration between professional equal where both were expected to contribute to the work but the mentor provided access

to the apprentice to see what the final product should be and assist them I reaching that level of professional accomplishment.

> *Wrote collaborative proposals. So* [they] *would sit down and* [they] *would carry the ball a certain distance down the field then* [they would] *throw it to me and then I'd carry it, right? And sometimes I would do the overwhelming majority and* [they] *would add a relatively small amount. And sometimes* [they] *would do the majority and I'd add a small amount. But working with* [them]*, I got to see what it was supposed to look like, right? ~Taylor*

The collection of mentoring experiences varied for engineering faculty but nonetheless contributed to the professional learning of some assistant professors of engineering through the empathy, advice, and guidance provided.

4.4. Summary of Themes

The tenure-track engineering participants described influencers on their continuing professional learning and provided examples about the way the different influencers impacted the professional learning process. Four themes emerged from the participants' responses about their continuing professional learning experiences:

- Theme 1: All tenure-track engineering faculty experienced some level of institutional impact on their professional learning.
- Theme 2: All tenure-track engineering faculty self-directed a portion of their professional learning.
- Theme 3: Most tenure-track engineering faculty socially constructed a part of their professional learning.
- Theme 4: Tenure-track engineering faculty reported a diverse set of mentoring experiences influencing their professional learning.

CHAPTER 5. DISCUSSION

5.1. Introduction

In this chapter the major themes that emerged from the data are discussed and the findings that emerged from the themes are identified. If reading this chapter without having read entire dissertation, operational definitions for important terms can be found in Chapter 1.6. This research question addressed was: *What are the influencers on continuing professional learning of tenure-track engineering faculty as assistant professors?* The study's conclusion, implications and recommendations, limitations, and future research considerations are presented.

5.2. Discussion of Themes and Findings

This study has explored the continuing professional learning of engineering faculty focusing on the experiences faculty undergo to learn to be better researchers, teachers, colleagues, collaborators, mentors, and preparers of future scholars. From the participants' own responses, it is clear that incoming assistant professors have learned a lot about how to conduct research and have a variety of teaching experience. Now the newly minted assistant professor must learn the skills necessary to navigate the expectations of the academy and become leading researchers, qualified teachers, and preparers of the future members of the academy. What influencers will impact how these assistant professors of engineering learn their profession and earn tenure?

The results of this exploratory qualitative investigation into the influencers on continuing professional learning for tenure-track engineering faculty as assistant professors yielded four themes:

- Theme 1: All tenure-track engineering faculty experienced some level of institutional impact on their professional learning.
- Theme 2: All tenure-track engineering faculty self-directed a portion of their professional learning.
- Theme 3: Most tenure-track engineering faculty socially constructed a part of their professional learning.
- Theme 4: Tenure-track engineering faculty reported a diverse set of mentoring experiences influencing their professional learning.

The themes that emerged from the data align well with a previous study conducted by Ferguson, Cawthorne, Schimpf, and Cardella (2013) entitled "Learning Strategies and Learning Traits Critical to Practicing Engineers after College." In this study of engineers with over 20 years of industry experience reflecting on their professional learning the same themes emerged. The engineers exhibited self-directed learning, social construction of learning through collaborative and peer engagements, and a high appreciation for quality mentored engagement. The only theme not explicitly present was the role of the company (i.e. institution equivalent); however, indirectly the engineers acknowledged the company influenced their professional learning through their policies of support (Ferguson, Cawthorne, Schimpf, & Cardella, 2013). It is clear from combining these two studies that the institution, individual, social interactions, and mentors are the influencers of professional learning.

Returning to the themes of the dissertation, it is possible to the findings that that there is (1) no one dominant pathway in the continuing professional learning of tenure-track engineering faculty as assistant professors; and (2) the four influencers – *institution impacts on learning, self-directed learning, socially constructed learning, and mentored learning* – combine in multiple ways to construct the continuing professional learning experience for an individual faculty member. This discussion will look at the significance of the individual themes before addressing the larger findings presented.

The institutional impact on learning of engineering faculty seems omnipresent in the data. The theme itself is constructed on the policies of protection and the role formal

professional development opportunities were identified as influencing professional learning. One of the clear ways the institution impacts assistant professors in through the department chairs and tenure committees because of the immediacy in the lives of the faculty member. All participants mentioned the department head making decisions about whether to protect the time of the assistant professor. The policies of teaching loads and committee service is one of the most directly noticed influences on professional learning. Its influence is in the creation or destruction of the faculty member's time to engage in learning. The participants clearly reported that the more protection, thus freed time, they received from the department head translated into additional time to pursue grant writing and research funding.

Faculty participants want to engage in professional learning but the formal development activates provided were rarely embraced as a means to do this. The reason formal development seems to fail is misalignment. Faculty who participated reported the seminars were addressing a need of theirs, either learning or personal motivation, while those who dislike the offerings reported misalignment to their needs and a perceived waste of their time subsequently.

One final consideration about the impact of the institution is that it appears it is an imbedded influence in the other themes developed. Statements by participants like Lou about collaboration and Shawn's about the behavior of the departmental assigned mentor show how the institutional actions influence faculty experiences.

> *I've found it to be a very uncollaborative environment… at one point our department head a meeting where* [they] *said, you know, "It's every man for himself." ~Lou*

> *They're just official capacities. Yes, we have our meetings once a year… it's kind of like one lunch a year out of this group. ~Shawn*

The self-directed learning of faculty is not a surprising theme. Success as a faculty member in obtaining tenure is structured as an exercise in proving oneself. It

probably explains why there are numerous books such as Advice for New Faculty Members: Nihil Nimus (Boice, 2000) and New Faculty: A Practical Guide for Academic Beginners (Lucas & Murry Jr, 2011) on the market and shelves of assistant professors. The faculty participants described a self-awareness of their learning capabilities and a willingness to engage proactively with experiential learning through trial and error.

With everyone identifying the self-capacity to learn on their own, why is there such discrepancy in performance of faculty. The two possibilities to be further explored are (1) if the difference exist within the individual – level of resilience, level of persistence, and forms of motivations – or (2) if the individual prefers learning through other means, particularly socially constructed ones, but is being stifled in ability to find and access these resources. I cannot address number 2 above, but Robin provides an insight into the first possibility.

> *I remember distinctly thinking that I was going – I wasn't going to kill myself. I was going to do what I enjoyed. I mean I was going to, you know, obviously not just play fun and games. But I figured if I had to kill myself to get tenure, then this isn't really what I wanted to do. I had to enjoy what I was doing. ~Robin*

The social construction of learning theme captures the fact that may people prefer constructing their knowledge through social interactions with others. It is obvious that interactions with peers, whether collegially, or collaboratively, can assist in the professional learning of an assistant professor. Peers are either experiencing, have experienced, or will experience the challenges the assistant professor may be contemplating. This means it behooves them to engage in the development of a solution, or a negotiated understanding of a requisite piece of skill or knowledge because it will benefit them in the future.

Work on communities of practice of work has found that peers come together as community to learn mastery of organizational processes, to learn how to negotiate the political aspects, and to develop approaches to deal with the atypical (Boud & Middleton,

2003). This exactly is what is happening when faculty participants discussed seeking out feedback and opportunities from the NSF program managers. Participation on, and interaction with, the panels funding NSF and NIH grants provides insights and grants a form of access to faculty members. Collaboration benefits can also be linked to the community of practice model with peers working in the same direction, in not necessarily the same way, who can exchange discernments.

The concerns raised in social construction of learning are one of valuation and support. Faculty participants recognize the contradiction of the institution in saying "be collaborative," but no one seemed to state that they expected their collaborative efforts would be rewarded by the tenure committee. In fact, some acknowledge negative responses from senior faculty in the department (i.e. possibly tenure committee members – not clarified in interview) and department heads to engaging collaboratively. Although some faculty such as Kelly disregarded the concerns of their peer as the act of collaboration was beneficial and constructive in their own professional learning.

> *I've heard the concern from other people. And once in a while with my stuff, and I guess maybe naively, but you know, if I want to work with people and we're going to share the work and trust each other I'm going to do it. ~Kelly*

The final theme is mentored learning. Mentored learning is structured around having a guide to professional learning endeavors of the profession. For those participants who had mentors, it was clear that the mentors were providing advice and guidance, while some went further to show empathy and even provide and apprenticed learning experience. The key outcome of mentored learning theme is the lack of consistency between mentoring experiences. This is not to say that any two mentoring experiences will ever be the same, but there should be some consideration of a minimum expectation to be executed, especially if mentors are being appointed by the department or college.

The sum of all the themes above is the recognition that faculty participants have navigated their professional learning experience in multiple ways. These multiple pathways are constructed by the individual preferences of the faculty member, the policies and actions of the institution, and availability of social interactions and mentoring.

The final finding is that if multiple pathways exist, then unique pathways can be constructed for individual faculty members through the creation of policies and actions of the institution, combined with the resources of availability to engage collaboratively, collegially, and/or in a mentor-mentee relationship.

5.3. Conclusions

Four themes emerged from the data describing what influenced the continuing professional learning of tenure-track engineering faculty as assistant professors. All tenure-track engineering faculty experienced an institutional impact on their professional learning through the policies and actions of the institution or the formal professional development opportunities offered. All tenure-track engineering faculty self-directed a portion of their professional learning by identifying resources, developing a self-awareness towards learning and learning by doing. Most tenure-track engineering faculty socially constructed a part of their professional learning with peers or other people whose input they valued. Finally, tenure-track engineering faculty reported a diverse set of mentoring experiences influencing their professional learning. These themes were analyzed to construct a set of findings to answer the research question about continuing professional learning in faculty.

The findings in this study were that (1) no one influencer accounted for how individual engineering faculty members navigated the continuing professional learning process and (2) that the four influencers will be uniquely integrated in a variety of ways within any faculty member pursuing CPL. This will require faculty, administrators, and faculty developers to recognize that no one set of approaches will be sufficient for addressing all of the tenure-track engineering faculty's CPL needs.

5.4. Implications of Findings

Implications of research studies provide insights into how the findings of the study extend beyond the simple conveyance of the findings' meaning. In the methodology section of the dissertation, the researcher's worldview was identified as being constructivist, specifically social constructivist. This social constructivist worldview plays a role in the research implications posited since the researcher should act as "a co-constructor of knowledge of understanding and interpretation of the meaning of lived experiences" (Guba & Lincoln, 2005, p.196) relayed by the research participants. The implications emerge from the belief that "realities exist in the form of multiple mental constructions that are socially and experientially based, local and specific, dependent for their forms and content on the persons who hold them" (Guba, 1990, p. 27). Furthermore, the "observing dialogue allows us to construct a meta-narrative of whole people, not reducing people to parts, but recognizing in the interplay of parts the essence of wholeness. Only then can we begin to imagine the real" (Josselson, 1995, p. 42) world.

The implications presented from this study are the development of a series of representations about the findings to provide readers multiple ways for informing future research or practice. A visual representation provides an illustration of how the continuing professional learning influencers may be exerted by a specific faculty individual as he or she attempts to navigate their professional learning as junior faculty. Building on the visual representations model is a set of equation models designed to represent continuing professional learning in a single faculty member. This provides a framework for thinking about the individual components of each influencer that combines in constructing the specific influencer used by the faculty member. The final framework constructed is an educational framework for thinking about these findings relative to providing formal professional development for faculty. All of these framework representations are the envisioned implication of the findings generated from the data by the researcher to provide insightful guidance into ways this research can contribute to other future endeavors.

5.4.1. Visual Representation of CPL in a Faculty Member

The visual representation in Figure 5.1 illustrates the myriad of ways that the four identified influencers – institutional impact on learning, self-directed learning, social construction of learning, and mentored learning – can combine to as a representation of the continuing professional learning process of assistant professors as tenure-track engineering faculty. This visual representation emerges from a meta-look at the influencers developed from the data and reflective thinking, by the researcher, on the individual participants holistically from their transcripts. There are several caveats that need to be mentioned about the visual representation presented in Figure 5.1.

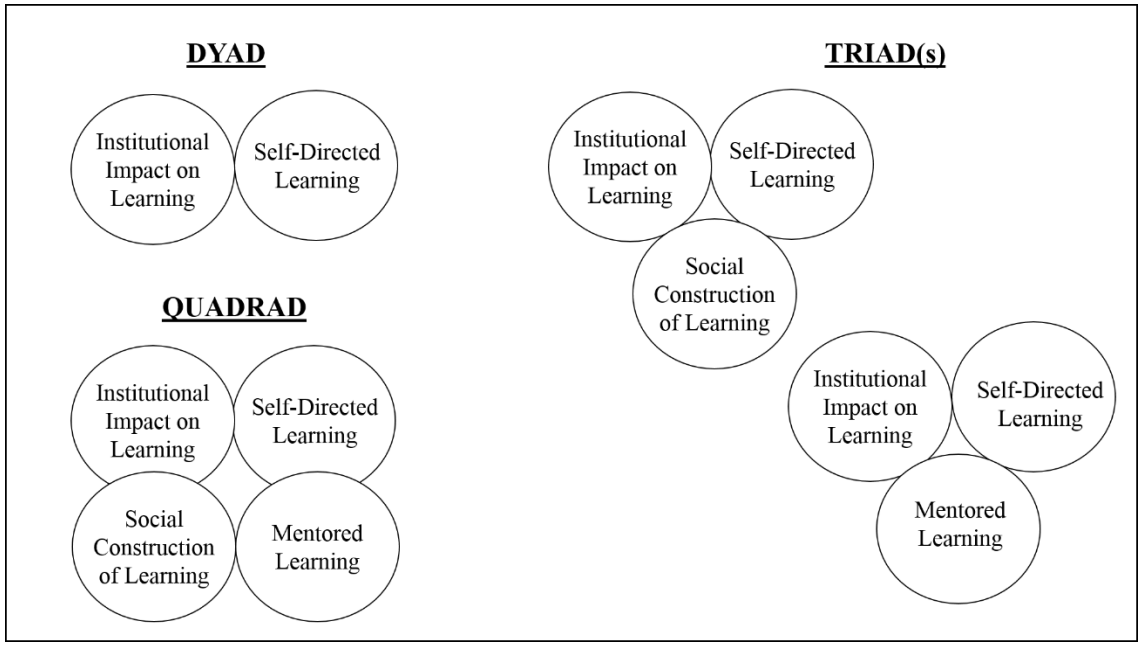

Figure 5.1 Visual representation of possible interactions of influencers for continuing professional learning.

The first caveat is a reminder that the visual representations serve as a general schematic of how the influencers may interact within a given individual junior faculty member. The visual representations presented should be recognized as interpretations of the data and utilized as a means for thinking about how CPL may reside preferentially in junior faculty. This is not to say that a faculty member who primarily acts as a dyad may

not have a few collegial or mentored experiences. The primary behavior for the dyadic faculty member's CPL experience would not fully embrace all four influencers *continuously* throughout the process.

A second caveat is the realization that all of these representations capture the potential prominent and preferential perceptions of what junior faculty members identified from their narration of their experiences of how they navigated his or her continuing professional learning experience. This is also the reason the word potential proceeds all representations. The visual representations created are generated from a single interview of faculty (13 participants) about their CPL experiences as junior faculty at a single Carnegie classified RU/VH institution. The researcher acknowledges that a larger collection of participants, especially where diversity in the population could be explored, and a different method of collecting data, the inclusion of metacognitive priming perhaps, could contribute to an improved set of visual representations of CPL in junior faculty. Nonetheless, the data collected and analyzed in this dissertation supports this first iterative step in thinking about how to visually represent the preferential CPL experience in assistant professors in a College (or School) of Engineering seeking tenure.

The final caveat of note is about how the visual representations are constructed in Figure 5.1. The current construction of the dyads, triads, and quadrads presents the influencers coming together as being equivalent in size. This is only a simplistic representation. The data supports the construction of the visual representations, but does not provide significant depth to support any analysis of a quantitative nature to generate relative differences in the size of the influencers in any of the polyads constructed. This researcher can envision a series of future studies to build and understand the nuances in the construction of the dyads, triads, and quadrads where one influencer or another is most significant, while other influencers have only moderating influence. Future research will ascertain the degree of significance for each influencer, but for now it is sufficient to develop the existence of the basic visual representation models based on the existing data.

The subsequent paragraphs will build the case for each type of potential visual representation model – monads, dyads, triads, and quadrads. The case for the existence,

non-existence, of each visual representation will be argued and developed from the model. Finally, a collection of statements about each of the influencers by a single participant that is consistent with their entire transcript will be presented to develop the case that there is an individual faculty participant in this study whose perception of his or her CPL experience as junior faculty aligns with the visual representation structure being proposed.

The researcher would like to provide the reader one final reminder about the limited nature of the quotes and contextual data used to construct these visual representations all stem from a single set of interviews. The implications developed by the researcher have been constructed from their immersion in collecting and analyzing the data that provide important insights to be considered extending from this work. Future confirmation, or refutation and replacement, of the proposed visual representations is an expectation of proposing these models as implications of the findings in this study.

The first potential representation of a faculty member's continuing professional learning paradigm would be a monad. In the case of a monad, a single influencer would be responsible for propelling a faculty member's CPL. It is evident from the data and subsequent findings that there is no single influencer, or monad representation, responsible for driving CPL. In the case of the influencers of self-directed learning, socially constructed learning, and mentored learning, all three of these influencers must function in conjunction with the institutional impact on learning influencer. At minimum, the institutional impact on learning influencer plays a co-role to other influencers as the guideline of policies for obtaining tenure that exists as the contextual environment in which these cases of CPL are being considered. Additionally, it is clear from the data that all participants mentioned specific input and experiences associated with department chairs, tenure committee members, or other university administrators, as representatives of the institution, who provided feedback and messaging about their pursuit and preparation pathways for gaining tenure.

The institutional impact on learning influencer itself cannot be a monad representation of CPL either. Consideration of the institution as the only contributor to CPL for a junior faculty would imply that the institution performed all of the faculty's

tasks for gaining tenure. The faculty member would have had provided no self-input to the process, followed no mentor's advice, and engaged no colleague in any activity relevant to obtaining tenure. This stated case is impossible. If this case were possible, it would imply that an institution could just award tenure to a junior faculty member whose research or teaching work may not meet the quality expected by their peers and the current tenure process. If this case was to arise within higher education institutions that conduct a high level of research, then tenure critics call for an end to tenure would be justified as tenure would have moved into the realm of political appointments and no longer be a part of career achievement.

The second potential representation of a faculty member's continuing professional learning paradigm would be a dyad. The dyad representation is a construction where two influencers come together to play a role in the CPL pathway of a junior faculty. It is important to remember that the contributions of the two components in the dyad do not need to be equivalent. It is unlikely the components are even close to similarity in contribution, but rather one dominates the other. Despite the dominance of a given influencer, the significance of the minority influencer in the CPL of a faculty member should not be discounted. One component of the dyad has to be the institutional impact on learning influencer as it represents the policies for tenure, the informal and formal messaging about tenure, and formal development opportunities that form the environment in which CPL for faculty occurs. The consideration then is which other influencer(s) can combine with institutional impact to form a dyad.

Technically all three of the other influencers would be prospects to form a dyad, but after examining the data and considering how each influencer would interact as part of a dyad only one other influencer can contribute to forming a dyadic representation of CPL. Only the self-directed learning influencer can form a dyad. The self-directed learning influencer encompasses all of the decision making choices of the faculty member engaging in CPL. This means that the choice to have a mentor, or engage a colleague socially or professionally, stems from the individual's self-choice to undertake that action. Hence, both mentored learning and socially constructed learning influencers derive from the self-directed learning influencer. Therefore, the only possible dyad

representation of faculty CPL consists of institutional impact on learning and self-directed learning.

Constructing the dyadic representation of CPL between institutional impact on learning and self-directed learning can be supported by the reported experience of Robin. Robin stated the following experiences in each of the four influencers:

Institutional Impact on Learning Influencer

Talking about professional development activities provided by institution.

I think I always regretted it because it seemed like the time invested for the return was just not sufficient, and I can always find something better to do with my time than to go to some of those clinics and stuff. ~Robin

Self-Directed Learning Influencer

Talking about directing and controlling own professional experiences.

What I liked about being a professor is that you can have control of your own time… I think I just always had the right idea. I – obviously it never worried – never bothered me… I just did it. ~Robin

Social Construction of Learning Influencer

Observation of colleagues' actions, but no engagement with colleagues.

I think I learned more how not to do it by probably the people I worked with… What I saw was people that were really super-successful writing grants and then not being able to actually do the research themselves. ~Robin

Mentored Learning Influencer

Observation of a previous mentor, but not interactive guidance as faculty.

> *I learned a lot from my major professor about you know just watching him operate… I probably used him as a model for what I did. ~Robin*

Robin experiences clearly identifies the institutional and self-directed influencers contributing to his or her CPL experience. The social construction of learning and mentored learning influencers are not present as active influencers in his or her continuing professional learning pathway as a junior faculty. Robin provides a participant example of a dyadic representation of junior faculty CPL.

Quotes by Robin related to social construction of learning and mentored learning does not equate to being a contributing component to his or her CPL. Robin mentions colleagues and mentors, but these statements, and others in their transcript, situate the interactions as observational and not engagement oriented. Observation of others, even when identified as a mentor or colleague, does not rise to the level of those individuals operating as a direct influencer on the CPL of the faculty member. In the mind of this researcher, the analysis of the data would situate the observation of others as being a component of the self-directed learning influencer similar to learning from reading someone else's previous grant writings. An influencer must be actively engaged, regardless of being a positive or negative experience, to be considered as actively contributing to CPL of a junior faculty member. Therefore, social construction of learning and mentored learning do not serve as influencers of Robin resulting in a simple dyadic representation being appropriate.

The third potential representation of a faculty member's continuing professional learning paradigm would be a triad. The triad is an extension of the dyad created previously, where the social construction of learning or mentored learning are added as noteworthy contributors to a tenure-track faculty's CPL experience. If the influencer added is the social construction of learning influencer, this would represent a junior faculty member who valued the contribution of colleagues in a collegial or collaborative manner to their CPL process. Alternatively, a tenure-track assistant professor could identify a mentor within his or her academic department, another academic discipline's department, academic departments within other universities, or administrators in their

university. Regardless, the inclusion of either mentored learning or social construction of learning means the formation of a triad of influencers on CPL requires the inclusion of external input from social interaction.

The faculty participant construction of the triad presented as evidence in support of this visual representation comes from Shawn who introduces social construction of learning to the dyadic combination of institutional impact and self-directed learning. Shawn stated the following experiences in each of the four influencers:

Institutional Impact on Learning Influencer

Talking about the influence of department teaching decisions.

I have lost count of how many different courses I've taught. I've kind of just been given a new course almost every semester. So I have to develop new materials to try and do it. But [eventually*] teaching the same course a few times that I can kind of just show up and teach the material because I know it. ~Shawn*

Self-Directed Learning Influencer

Talking about recognizing the conducting and driving of own work.

I've definitely transitioned from doing most of the work myself to being more of a manager… when I started here I did a lot of work on my own; independent research. ~Shawn

Social Construction of Learning Influencer

Observation of engagement with colleagues.

I've definitely become a better collaborator… so we collaborate and co-advise a lot of students and that's been going really well which is – you know [my collaborator's] *a great researcher and our scientific goals align*

in a way that we can contribute to each other's projects and not be redundant. ~Shawn

Mentored Learning Influencer

Describing mentoring existing in name but not function.

They're just official capacities. Yes, we have our meetings once a year … it's kind of like one lunch a year out of this group. ~Shawn

Shawn gives consistent voice to the two most prevalent influencers identified by participants – institutional impact and self-directed learning. In Shawn's case, the quote supplied talks about the role the institution plays on available time for CPL by the choices made by the department on how many new courses he or she must prepare and deliver every semester. Shawn also identifies a self-directed component to accomplishing the learning required to succeed as a junior faculty seeking tenure.

The significant change to Shawn's experience is the acknowledgement of engaging a collaborator in the continuing professional learning of conducting research and developing graduate students. The outside voice of a collaborator provides Shawn with input beyond his or her own thinking and beliefs to consider in making decisions about his or her CPL actions. It should be noted here that Shawn's experiences with mentors to be one of official designation, but no substance. Having a mentor in name only who meets once a year, but contributed nothing in terms of actionable advice and/or protection in the process of tenure to assist the CPL of an assistant professor on tenure-track does not meet the standard for being a mentored learning influencer. In fact, this researcher would argue the "mentor in name only" individual is functioning as another representative of the institution by most likely repeating the standard messaging of the tenure committee or department head about what is expected to gain tenure without any insight into best practices for navigating the CPL required to be successful in the process.

In the data collected, none of the participants were identified as forming a visual representation of a triad from institutional impact, self-directed, and mentored learning.

A thought experiment can be used to visualize a case where an individual faculty member develops a socially engaged interaction with a mentor who provides advice and direction while not fully engaging their colleagues collegially or collaboratively in the CPL process. This case does not exist in the data of this research study.

The final potential representation of a faculty member's continuing professional learning paradigm would be a quadrad. The quadrad visual representation is where all four influencers identified in this study – institutional impact of learning, self-directed learning, social construction of learning, and mentored learning – are recognized as positively contributing to the junior faculty members CPL. The junior faculty heeds the institution from a policy perspective, but make choices about their own CPL process from internal and external sources. In addition to valuing their own mind, the faculty member engages colleagues, collegially and collaboratively, and mentors in constructing their CPL pathway.

Taylor was the best participant modeling the quadrad and stated the following experiences about each of the four influencers:

> Institutional Impact on Learning Influencer
>
> Talking about administrative leadership representing the institution and the message they provide that influences other faculty in their CPL process.
>
> *You run into heads who make decisions that are clearly unethical decisions, clearly abusive decisions. They do things that right, my biggest decisions, clearly abusive decisions. They do things that right, my biggest problem as an assistant professor was keeping my mouth shut and not saying, "problem as an assistant professor was keeping my mouth shut and not saying, "you can't do that." ~Taylor*
>
> Self-Directed Learning Influencer
>
> Talking about self-belief in directing own professional experiences.

From my perspective the most important thing about being a successful faculty member is what matters to me. ~Taylor

Social Construction of Learning Influencer

Talking about collaboration experience.

We wrote collaborative proposals…he would sit down and he would carry the ball a certain distance down the field then he'd throw it to me and then I'd carry it. ~Taylor

Mentored Learning Influencer

Discussing relationship with mentor.

It was more of an apprenticeship…consulted with him frequently when it was time to make decisions and that helped me very much to sort of figure out how to do things. ~Taylor

Taylor's collective experiences with the four influencers illustrates that Taylor was swayed by all four influencers. Like all other participants, Taylor's quote identifies a negative, but important influence by the institution on their thinking relative to CPL. What is unique about Taylor is the acknowledgement of positive guidance from a mentor, their colleagues, and Taylor's own thinking on how to advance through their continuing professional learning pathway.

The data in this study supports the dyad, triad, and quadrad visual representation models of the CPL process for junior faculty in engineering departments in university with very high research activity. The visual representation models constructed in this study illustrates how the four influencers – *institutional impact on learning, self-directed learning, social construction of learning, and mentored learning* – can interact within an individual junior faculty member in his or her pursuit of continuing professional learning.

5.4.2. Construction of Equation Models Representing CPL in Faculty

The equation modeling of the continuing professional learning of engineering faculty takes a step beyond the high-level aggregation of influencers that are developed in the visual representation models by trying to think about how the influencers interact and the individual composition of the influencers themselves. The development of the general equation to represent how the four influencers come together and the independent influencer's equations are all developed as explicit extensions based upon the analysis of the data in this research study and the larger thinking of the researcher about faculty and personal development. This equation modeling implication, like the visual representation implication, is an attempt to combine the data and researcher thinking to identify and justify extensional thinking about continuing professional learning of junior faculty.

The overall equation model is an equation designed to help us think about how the four influencers combine and interact to produce an individual faculty member's specific approach to continuing professional learning. In thinking about how the four influencers could produce an overall model, the researcher fails to see a describable and defensible equation with specific mathematical functions. For the moment, the researcher is only comfortable positing a simple overall equation to describe faculty CPL based on an undeveloped functional representation:

$$\text{Faculty Member's CPL} = f\,(I, S, P, M)$$

The overall equation model above equates a faculty member's CPL as a function of the four influencers – *institutional impact on learning (I), self-directed learning (S), socially constructed learning (P), and mentored learning (M)*. It does not offer insight into the development of the function itself. The function equation above does not provide insight into the contribution strength of any one influencer on CPL. The model provides the insight that there is a baseline relationship based on the contributions of the individual influencers to a faculty member's continuing professional learning approach. The important implication from this study for readers to consider is the development of the four individual equation models representing the individual influencers below.

5.4.2.1. Institutional Impact on Learning (*I*)

The first individual equation model focuses on the contribution of the institutional impact on learning influencer on continuing professional learning of faculty. The equation attempts to differentiate how different levels of the academic institution, such as the department, tenure committee, college, or university, influences the continuing professional learning for engineering faculty. The contribution of the institution towards faculty continuing professional learning is represented by the following equation:

$$I = \sum_{x=0}^{n} I(x)$$

This equation is designed to argue that the total institutional impact of learning (*I*) is the sum of all the different and discrete individual actions of institutional impacts on learning, *I*(x).

The institutional impact term (*I*) developed in the model can be either positive or negative depending on the amalgamation of the institution's impact on CPL. A positive value for the institutional impact term would correlate with the expressed perception of a faculty member that the collection of institution's direct interactions was contributing to the advancement of the individuals CPL. A negative value for institutional impact would conversely indicate the expressed perception that the institution's direct attempts to influence CPL have been more of a hindrance that a form of support.

The individual institutional impact on learning actions (*I(x)*) encompasses the policies and actions of academic units that influence the continuing professional learning experiences of faculty and the formal professional development opportunities provided by the institution. One example of an institutional impact action would be a departmental policy to limit teaching load for assistant professors in his or her first three years as an assistant professor. This would be perceived by most faculty to be a positive action by the institution to improve the continuing professional learning opportunities of faculty by providing an increase in available time for engaging in the CPL actions required to

acquire grants and initiate a research program as opposed to additional time preparing for additional class content.

The data and findings in this research study supports the development of this potential equation model of institutional impact of learning influence on the CPL of a faculty member as being a sum of the various individual institutional actions with the existence of both positive and negative experiences. This data has several quotes that express the participants having a valuation of his or her experience with a specific institutionally supported activity:

Department chair influence.

I think what he did try to do in the beginning and maybe now a little bit later was to protect me from administrative duties, which assistant professors really aren't supposed to be doing that much of that. ~Lou

Formal professional development (seminar) experience.

I went to the workshops. Just because I wanted to be a better teacher…. In fact probably if you polled the audience in those, most of the people that are dedicated to – or you know value undergraduate teaching are there, and the people that don't care about it aren't there. ~Kelly

I might've gone to a seminar. But, I am not a lecture learner. I know, I know I'm not…. If I went it was only because I thought somebody might see me there that I needed to be there or something… I haven't really ever found that useful when I've gone to them. ~Casey

The Lou quote above illustrates how the decision of an institutional member, the department chair, can make a decision that impacts the time available for an assistant professor to spend on his or her CPL. The quotes from Kelly and Casey supports the

thinking that specific institutional supported experiences, in this case seminars but could extend to other institutional actions and activities, can be experiences as a positive or a negative depending on how the individual faculty member values the experience.

5.4.2.2. Self-directed Learning (*S*)

The second individual equation model is constructed to capture the role self-directed learning of engineering faculty contributes to the continuing professional learning process of faculty. Study findings found all faculty engaged in some degree of self-directed learning, but the degree of motivation and resilience present in each faculty member may account for differences in performance levels of faculty members. The contribution of the self-directed learning (*S*) of faculty to overall continuing professional learning can be represented by the following equation:

$$S = I'D' \sum_{x=0}^{n} S(x)$$

This equation states that the total impact of self-directed learning (*S*) towards the overall CPL is based on the number and quality of different activities, *S*(*x*), pursued by the individual faculty member. Different activities, *S*(*x*), have different levels of impact. A low *S*(*x*) would be simply identifying resources for acquiring new knowledge; however, a high *S*(*x*) activity would be engaging in a trial and error learning process where feedback and multiple attempts facilitate not just knowledge advancements but professional skill development.

The significance of the self-directed actions towards CPL are modified by institutional impact (*I'*) and the individual's desire (*D'*). The term accounting for an individual's desire (*D'*) represents the unknown traits of motivation, resilience, etc.… that modifies an engineering faculty member's engagement in continuing professional learning.

An example of an institution's policy impact on self-directed learning is the current understanding of tenure in the mind of many faculty as an independent endeavor.

> *I told myself when I came as an assistant professor correct or not I said, this is what I want to do they will – I'm going to do it and either they will appreciate it and keep me or I'll move on, but I'm not going to change what I love to do to get tenure. ~Sandy*

If engineering faculty view tenure to be a process accomplished on one's own, it will impact their continuing professional learning choices by possibly reducing engagement of other options if they do not align with the faculty member's vision of achieving tenure.

A negative institutional impact on self-directed learning choices is a possibility when considering how participants described their understanding of the institutions' view of professional development. Referring back to the results section, several faculty members expressed a view that the institution did not really care about the development of its people. If this view is held by a faculty member, it may skew their consideration of engaging in professional development seminars and workshops.

The two participant examples above provide support to the component of self-directed learning requiring the modifiers of the institution and the individual's desire (i.e. motivation) in the equation.

5.4.2.3. Social Construction of Learning (*P*)

The socially constructed learning of engineering faculty represents the impact of people, whether they are peers or not, on their continuing professional learning. The research findings showed that some engineering faculty advance their professional learning through engaging others socially while other faculty avoided their peers. The contribution of socially constructed learning (*P*) of engineering faculty to their overall continuing professional learning can be represented by the following equation:

$$P = S' \sum_{x=0}^{n} P(x)$$

This equation states that the total impact of socially constructed learning is the sum of the quality of interactions with people, *P*(*x*), in learning situations moderated by the valuation of the interactions by the faculty member (*S'*). The faculty member's valuation (*S'*) is the interaction between institutional messaging and the independent beliefs and motivation of the individual. The proposed model is supported by a participant's example about the role of collaboration in the tenure process.

Quality interactions with people, either collaboratively or collegially, can contribute to the CPL of faculty. Two participants in the study, Pat and Taylor, describe experiences with others that advanced their professional learning and enhanced their ability to obtain tenure and thus promotion to associate professor. In both examples, collaboration was a valued experience.

> *But the one I teamed up with here was* [they] *and I both had very specific interests that sort of meshed and it was a fortuitous collaboration. It was a pretty even collaboration. I did most of the experimental work and* [they] *did most of the theoretical work. ~Pat*

> *Wrote collaborative proposals. So* [they] *would sit down and* [they] *would carry the ball a certain distance down the field then* [they would] *throw it to me and then I'd carry it, right? And sometimes I would do the overwhelming majority and* [they] *would add a relatively small amount. And sometimes* [they] *would do the majority and I'd add a small amount. ~Taylor*

Taylor's and Pat's description of collaboration illustrate that collaboration played a role in their CPL experience and other faculty can experience similar social contributions to their CPL.

Most universities have clear messages about valuing collaborative efforts, but the policy is not necessarily valued similarly in the institution's tenure process. Faculty sometimes receive the message to be careful about collaborating, or not to do it at all. This negative institutional perspective of collaboration communicated to an assistant professor may stop the engineering faculty member from engaging in collaboration, or significantly reduce it as an option for contributing to the continuing professional learning of engineering faculty. To some faculty members the stance of the institution does not matter and their own views superseded the potential impact of the institution. Kelly provided an example of this in the following statement when asked about his or her engagement in collaboration:

> *I've heard the concern from other people. And once in a while with my stuff, and I guess maybe naively, but you know, if I want to work with people and we're going to share the work and trust each other I'm going to do it. ~Kelly*

Kelly's statement provides evidentiary support for the socially constructed component of the model needing a modifier that accounts for both the influence of institutional policy and the worldview of the individual faculty member about interacting with other people.

5.4.2.4. Mentored Learning (*M*)

The mentored learning term represents the impact engaging a mentor can exert on the continuing professional learning of engineering faculty. The mentored experience of engineering faculty ranges from non-existent, to desired, to an apprenticeship. The contribution of mentored learning (*M*) of engineering faculty to their overall continuing professional learning can be represented by the following equation:

$$M = S'' \sum_{x=0}^{n} M(x)$$

This equation states that the total impact of mentored learning is the sum of the quality of mentoring interactions, $M(x)$, moderated by the valuation of the interactions by the faculty member (S''). Similar to the socially constructed model, the mentored term modifier (S") is an amalgamation of any institutional policy about mentoring and the faculty member's view about mentoring.

Despite mentoring experiences of faculty being quite varied, the data provides a clear presence of potential mentoring interactions, M(x), influencing the continuing professional learning of faculty. The quotes from Jesse and Taylor provide examples of mentoring interactions that junior faculty may experience. In Jesse's experience, he or she received advice directed and tailored for them from a mentor. The mentor suggested a variety of ideas for how to work, and be seen working, that could be beneficial to Jesse in advancing their CPL. Contrast this with Taylor discussing his or her mentoring experience as a collection of observations through which they constructed an interpretation about what is expected behavior in the profession.

> *Instrumental support of, "Make sure you document this. Make sure you make yourself visible. Make sure you get in the media. Make sure you don't hole yourself up in your office all of the time 'cause that won't work for you. It works for the standard model, it won't work for you because I'm not in the standard model and I had to learn that it wouldn't work for me. ~Jesse*

> *It sort of showed me, it was a model for professional behavior and professional success, professional conduct. Basically, this is how you're supposed to do it. And so then I followed that. That was the single most important thing I did. ~Taylor*

Both participants described mentoring experiences that influenced their CPL. Mentoring experiences, as described above, seem relatively easy to design for faculty, but in reality these experiences do not always occur because mentoring experiences do not exist in a

vacuum, but are colored by the perceptions of the individuals, mentor and mentee, and the policy of the institution.

The modifier proposed in the equation above stems from an intersection of institution policies and a faculty member's perception and reaction to the policy and the opportunities offered. For some faculty, the institutional support for mentoring has been non-existent, or has been minimalized in the mind of the individual. Pat and Shawn provide examples where institutional policy on mentoring eliminated the mentoring term from their CPL approach.

> *There was never any mentoring situation here. ~Pat*

> *They're just official capacities. Yes, we have our meetings once a year… it's kind of like one lunch a year out of this group. ~Shawn*

In Pat's case, mentoring was not provided as an option, while Shawn's perception of institutional mentors is the process is a formality with no intention of actually helping.

Casey is a different case of how the self-directed modifier can negate mentoring as a contributor in CPL. Casey's quote provides voice to the inside concern of inadequacy that professors struggle with in opening to outsiders for help and can minimize a valuable CPL resource in a mentor.

> *I know I'm supposed to say you need one. I – I have hard time with that because, you know, when you're an assistant professor and they give you a mentor, are you really going to go talk to somebody, one of your senior colleagues, and say, "I don't even know what the hell to do to get through the day. I'm staring at my computer screen." That's not the impression that I wanted anyone to have of me. ~Casey*

Casey's experience underscores the role the individual faculty member can play in minimizing a particular influencer because of personal perception. This is

important to remember since the biggest barrier to participation in various continuing professional learning experiences will always be an individual's perception, and thus willingness to authentically participate.

In this section and the above sections, I have proposed a series of mathematical operations to provide insight to how the various influencers can contribute to a faculty members continuing professional learning experience. I have provided support from the data collected to justify the design of the different terms. It should be remembered that these operations are designed as a means to envision how the influencers mentioned in the study can be brought together to construct a faculty's CPL experience and would require additional research to ascertain actual contribution.

5.4.2.5. Summary of Metaphorical Equations

The metaphorical equations constructed above describes how the four influencers – *institution impact on learning, self-directed learning, socially constructed learning, and mentored learning* – may be visualized in thinking about an individual faculty member's continuing professional learning process.

5.4.3. Educational Framework of CPL

The metaphorical equations above provide one way to think about the findings generated in this study. An alternative implication of the findings is to think about the construction of continuing professional learning for engineering faculty based on the four influencers identified. This can be accomplished by modifying the How People Learn (HPL) framework.

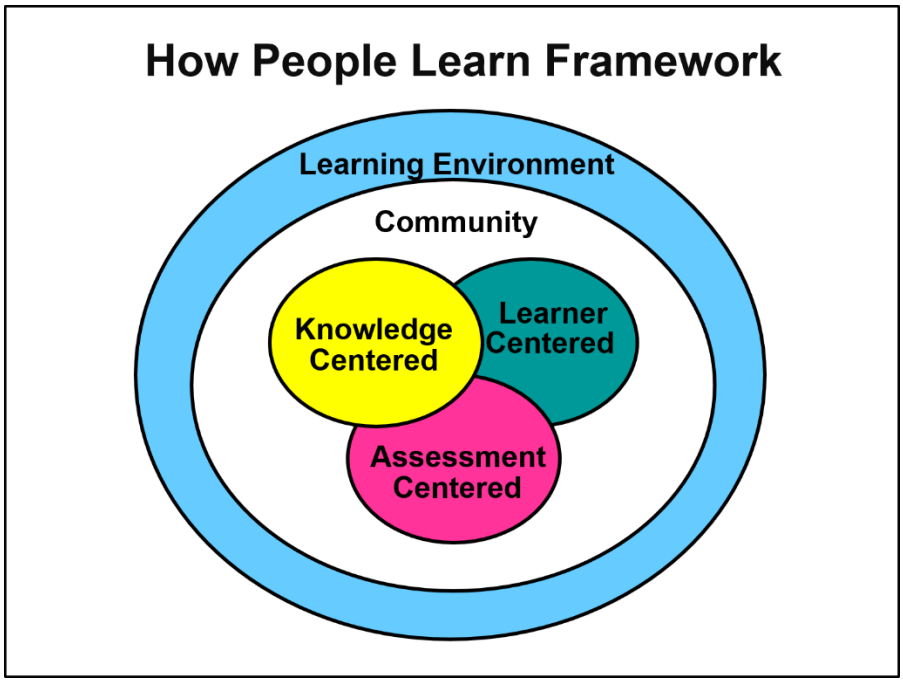

Figure 5.2 How People Learn Framework (HPL) adapted from Bransfrod, Brown & Cocking (2000).

The HPL framework (Figure 5.2) provides a set of lenses for the construction and evaluation of learning environments. The framework lenses influence the designer's or student's perception of the learning experience. In HPL the lenses are the learning environment, the community, knowledge-centered, assessment-centered, and learner-centered (Bransford, Brown, & Cocking, 2000). Each of these lenses provides a contextual way to engage in designing instruction that result in a conducive learning environment. The VaNTH Engineering Research Center was a collaborative effort amongst several universities – Vanderbilt, Northwestern, Texas-Austin and Harvard/MIT – that applied the HPL framework as learning theory with biomedical engineering course topics to design a learning environment for biomedical engineers (Cordray, Pion, Harris, & Norris, 2003). This framework can be modified to using lenses to frame continuing professional learning programs.

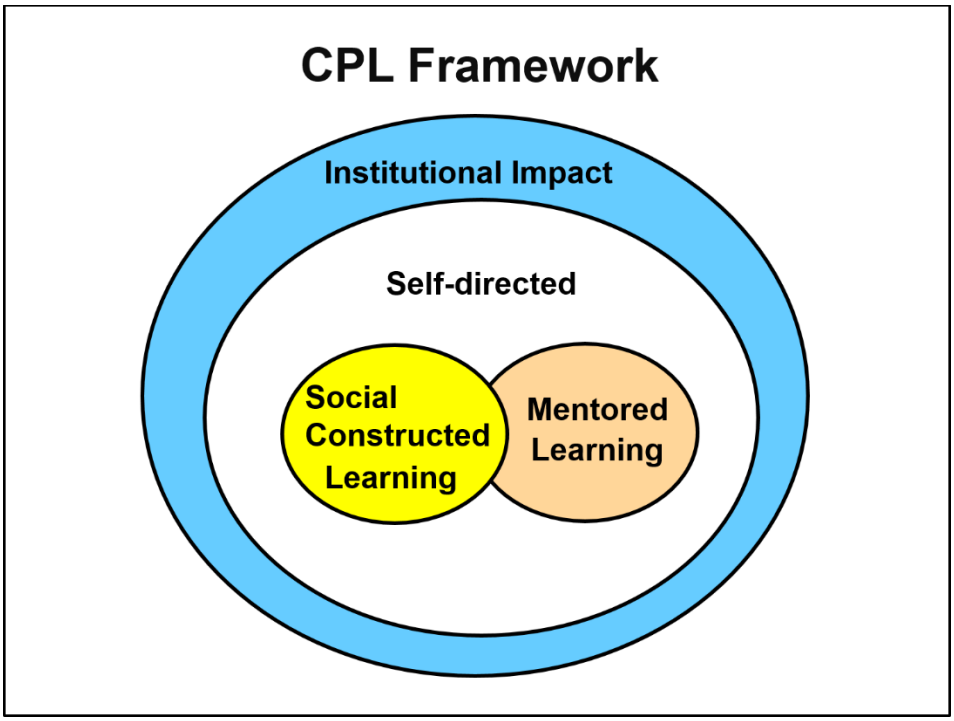

Figure 5.3 Continuing Professional Learning (CPL) Framework.

The CPL Framework (Figure 5.3) modifies the HPL framework by substituting the CPL influencers identified in this study as lenses for thinking about professional learning programs. The outermost ring is institutional impact. The institution, which can be the department, college, university, or community of professionals, influences the professional learning of faculty through the formation of policies and formal development opportunities. It is the various institutional policies that reverberate downward in the framework. The next lens is self-directed. It accounts for the choices the individual faculty member makes for directing their own learning. This includes whether to engage in socially constructed learning or mentored learning. The institution and the individual have the most power in this framework for how successful professional learning occurs.

The final two lenses in the CPL framework are socially constructed learning and mentored learning. The socially constructed lens considers the role peer interaction can play in professional learning programs. Interactions between peers can be a powerful

form of engaged learning for all participants as socially constructed knowledge is the integration of multiple people's thoughts on an idea. The final lens for consideration is mentored learning. Mentored learning, if done correctly, is a guided engagement of a junior faculty member by a senior faculty member through the socialization required to succeed in academia. The CPL Framework should be used as a reference in thinking about the framing of CPL activities, the type of faculty members who may benefit from a particular activity and what barriers may arise from the different influencers.

5.5. Recommendations for Key Stakeholders

The findings and implications produced in this study should be used to shape the thinking of the various stakeholders involved in faculty development. This dissertation does not provide a prescriptive "wonder approach," but rather identify some clear ideas for different stakeholders to consider in his or her thinking about the continuing professional learning of tenure-track assistant professors. The following three sections of the dissertation presents considerations for the three major stakeholders – faculty, administration, and faculty developers – by providing a condensed bullet point listing of thoughts followed by a discussion of each of the proposed ideas.

5.5.1. Engineering Faculty

The following recommendations are proposed for tenure-track engineering faculty as assistant professors to consider:

1. Engage in purposeful metacognition to understand how you learn best and apply this to your continuing professional learning process.
2. Identify and consider the significance of the continuing professional learning support a given institution provides when seeking an academic job.
3. Reflect on personal experience seeking tenure AND the current/future professional needs of an academic in your field to be a change agent for modifying the tenure process within your department, college, and university.

The first recommendation for engineering faculty is to engage in purposeful metacognition about how he or she has learned new information in the past as well as the context in which the learning occurred. Do you learn best from reading and introspection? What role does conversations with colleagues play in analyzing and evaluating an idea? If a faculty member is struggling with the metacognition process about their learning, he or she should consider talking with colleagues he or she has worked with in the past such as their dissertation advisor, dissertation buddy, mentor, or other colleague who has observed them work and learn in the past. The process of identifying and embracing their best learning approaches, whether it involves self-direction, social engagement, mentoring, or some combination, provides a framework for the faculty member to construct future plans to advance their professional learning.

The second recommendation is to be proactive when applying for faculty positions about how the department, college, and university will act to support their continuing professional learning. It is in the interest of both the incoming faculty member and the institution to construct an environment that fosters the growth and development of the faculty. While not being the most important when considering a given job, when deciding between two institutions, the policies and identified opportunities of faculty support should be considered as significant in potentially contributing to an individual's long term success as a faculty member. A quick reminder that CPL encompasses activities such as initial startup funds/grants, teaching release to work on grant writing/research early in tenure, and even early faculty preparation seminars and support mechanisms. An institution with a clear plan for supporting the CPL of an assistant professor seeking tenure should contribute significantly to the process of seeking tenure.

The final recommendation for faculty is to reflect on his or her experience pursing tenure, along with identifying the future professional capabilities of faculty in your field to act as change agents for the tenure process as needed. It is hard, if not impossible, to enact change as an assistant professor. This does not mean you cannot work with senior faculty and department heads to recognize policy inconsistencies. There is no guarantee of change but sometimes the discrepancy is not noticed, or understood, and it takes the

recognition of these facts to prompt change. As a faculty member advances into the tenured rank, he or she should not, in my opinion, accept the tenure process as static and appropriate just because he or she endured the process.

Academic leaders talk incessantly about being leaders, but fail to be proactive leaders in their own profession's development. It is easy to accept the status quo of the tenure process, but leadership requires an honest assessment of the tenure process and making adjustments as needed. The most common incident identified in this study was collaboration. Numerous participants discussed how collaboration was stated as desirable by existing policies and/or institutional administrators, but treated neutrally or even negatively in the tenure process. Some even reported how tenured faculty were uncomfortable with collaborating with assistant professors because they were unclear about the benefits for the senior faculty member and concerns about negative perception impacts on the junior faculty member. If an institution values collaboration, change the tenure process to include a component demonstrating collaborative abilities. Rewarding senior faculty in their promotion process for collaborating would also have to be considered to encourage senior faculty participation in this culture change.

Culture change is difficult. The tenure process at most universities is perceived as a fixed process that faculty and administrators are unwilling to change. Alignment of the tenure process with actual current messaging, let alone aligning the process to better prepare junior faculty for their career as an academic in a specific field requires acts of leadership. Faculty advancing into senior faculty ranks as associate professors, and later full professors, need to ask themselves how am I ("we" as a department) supporting the preparation of future academics in my field with the existing tenure process? Are there common sense modifications to the tenure process that would better serve the academy, the institution, and junior faculty development?

5.5.2. University Administrators (Institution)

The following recommendations are proposed for university administrators, representing the institution, to consider:

1. Recognize that engineering faculty engage professional learning along multiple paths so no one set of institution-based professional development activities will meet all engineering faculty, particularly assistant professors', needs.
2. Co-construct policies and support mechanisms at various academic levels to provide support to the continuing professional learning of engineering faculty.
3. Support the construction of professional learning opportunities that are authentic, pragmatic, and tiered (APT method) for engineering faculty.

The first recommendation for university administrators is recognizing the individual and independent approach of every faculty member to CPL. Administrators need to balance the independent nature of faculty with collective designs when trying to engage faculty, co-construct policies, and support professional learning opportunities. Administrators should recognize that engineering faculty all develop through professional learning along multiple paths. Some faculty are solely dependent on themselves and the assistance provided by the institution, while others prefer constructing their professional learning through social interaction with peers. Administrators also need to remember that regardless of administrative rank, committee-department-college-university, they will always be perceived by faculty as representing the interests of the institution. Regardless, negotiating an understanding about how a particular faculty, or set of faculty, would like to progress in their professional learning should provide the institution a better sense of what can work best in working with faculty.

Administrators need to co-construct policies and action plans with faculty. A university can have any policy it wants but needs to find consistency between the messages and the experiences of faculty. An example discussed here will be collaboration since it was such a hot topic amongst this study's participants.

If the message of the university/college/department is "We believe in collaboration and want our people to be collaborative in their engagement of research, teaching, and service to the community." This means a policy for assistant professors, which proscribes how to engage and report collaborative efforts in the tenure package for

credit for being collaborative as opposed to questioning the assistant professor as a capable researcher. An explanation to tenure committees about how to discern between appropriate forms and inappropriate forms of collaboration by assistant professors. A policy for senior faculty that describing how to be collaborative with new assistant professors and what benefits it will have towards their promotion cases or future raises. This begins to illustrate that policies to support professional learning activities are complicated and integrated throughout the university structure. Half developed policies will fail if contributions of all parties engaged in supporting the professional learning initiative do not clearly understand how participation benefits them.

The third recommendation for university administrators is to consider his or her role in facilitating the continuing professional learning of junior faculty. A challenge I have observed is that many university administrators are interested, or are already active, in supporting the CPL process of junior faculty. However, lack of participation, particularly by engineering faculty, sends a message that faculty are "not interested" in professional development opportunities. An approach to address this issue is to construct formal professional development activities using an authentic, pragmatic, and tiered approach, or the APT method.

There are many ways to construct a definition of authentic learning but I believe it is fundamentally based in constructing learning to address real-world contextual needs (Lombardi, 2007; Stein 2004). By this I mean a grant writing workshop for new assistant professors can address the basics, but this is inadequate for any faculty who have been writing grants. A grant writing seminar that focused on specific needs, such as writing the educational component for an NSF grant, would be a more authentic learning environment for most engineering faculty. A quote by Jesse provides support for this insight:

> *The problem is they are working to the lowest common denominator of here's how you work in a crowded area and follow the boilerplate to show the community what they want to see in a relatively standard area for a relatively standard research project. I don't do standard research. So*

that was always of limited value. ~Jesse

In addition to authenticity, the professional development activities need to be pragmatic.

Pragmatic in this sense refers to an individual gaining something – new knowledge, new skills, or new insights – that they can apply to their work and is worth the time required to attend the event. The need for pragmatism can be traced back to the participant's responses about seminar. Robin described a couple participants' sentiments about seminars:

> *I always find those pointless honestly. And so I've never been one for sitting in a room especially because it always, I probably have done something like that. And I think I've always regretted it because it seemed like the time invest for worth the return was just not sufficient, and I can always find something better to do with my time. ~Robin*

Professional development opportunities should not require faculty to take time away from other parts of their jobs without providing some tangible benefit to their professional learning in return. If a development opportunity is not designed to be a pragmatic use of a faulty member's time, then they will not participate.

The final component of the APT method is tiered. Tiered represents the fact that engineering faculty on campus are all at different stages of understanding the different tasks of being an academic professional. With this diversity in levels of experience, professional development opportunities need to consider offering seminars/workshops to engage the faculty at the level beneficial to them. This means an introductory course in teaching or grant writing for new assistant professors, but more interactive feedback workshops for writing specific sections of NIH (National Institutes of Health) and NSF (National Science Foundation) grants for senior faculty.

I will provide a vision of the APT method applied to grant writing. The academic unit responsible (most likely a center) would offer three professional development opportunities in the semester. One would be an introduction to grant writing targeting

new professors discussing the grant writing process and important considerations for NIH and NSF grants. A second working seminar would be offered targeting assistant professors present for 2-3 years and senior faculty discussing how to explain the diversity impacts of your research to NSF/NIH, or whatever is the hot section that is influencing the awarding of grants from US government funding agencies like DOD (Department of Defense), DOE (Department of Energy), NSF/NIH, or others. Finally, an interactive workshop for 3-5 faculty members to meet and engage in providing and receiving feedback on a grant that is near completion, or needs key changes. This program is an example of seminars/workshops that engineering should find authentic and pragmatic if the particular professional development exercise applies to them. By tiering, there is a chance of impacting the professional development of a larger swath of engineering faculty because there is a chance that a seminar would be relevant to them.

The final recommendation is to change the current paradigm by constructing a monetary reward system for departments and/or individuals to encourage faculty participation in continuing professional learning activities. I recognize this may be a little radical in the sense that it would require the institution to make a significant change in budgeting and financial operations; however, if the institution truly values the development of its greatest assets, the faculty, over the long term, a small reinvestment in the CPL process of faculty can be accommodated.

The reward structure would be based upon refunding a portion of the university collected indirect costs associated with the grants of the faculty in a department. For faculty participation in a given number of CPL related activities, the department would receive a percent of ALL the indirect costs collected from their faculty's grants added to their discretionary funds for the year. Another option would be to reward individual faculty for participating by returning a portion of the indirect costs collected by the university, but I favor motivators for the collective faculty of a department over specific individuals. The program could be all or nothing (receive 0% or 5%), or tiered where meeting a level 1 set of participation earns 2% while achieving level 2 participation receives full 5%. It should be recognized that this approach favors STEM-oriented fields

in a university based on the number and total dollar amounts in grants brought in by STEM-affiliated departments.

This final recommendation has a high risk-reward balance requiring any institution attempting this option to create clear rubrics and metrics for identifying and confirming authentic CPL participation by a department's faculty as opposed to allowing departments to "game the system."

5.5.3. Faculty Developers

The following recommendation are proposed for university administrators working to advance faculty development, whom I will refer to collectively as faculty developers, to consider:

1. Recognize, embrace, and support the self-directed nature of professional development of faculty.
2. Serve as proactive liaisons between university administrators and engineering faculty by constructing professional development opportunities using APT method to increase value to all parties.

I propose the first step for faculty developers is to develop a cognizant, consistent approach for valuing and appealing to faculty as individuals to mindfully enter and engage the continuing professional learning process. One of the major findings in this study, in my mind as researcher, is the significant role the individual faculty member asserts in the process of their continuing professional development. This approach requires faculty developers to assist each faculty member in developing and recognizing their "voice" for self-directed, lifelong learning. An initial model can be extrapolated from a proposed conceptual framework for development in the medical field for lifelong learning. Faculty developers should strive to design materials and interactions that work to aide in developing faculty who are able to (Miflin, Campbell, & Price, 2000, p. 300):

1. identify deficiencies in their own knowledge, skills, and attitudes;
2. identify, access, and use resources wisely and efficiently;
3. generate a learning programme to address deficiencies, including finding and using the best evidence;
4. evaluate [their] learning efforts;
5. commit [to this as a] repeating cycle.

This designed approach specifically targets providing a faculty with a bare minimum toolset for going forward with their continuing professional learning, but also can provide a pathway whereby faculty developers and faculty can co-construct opportunities for working together in the future.

The proposed approach is based in ensuring all faculty have a foundational approach for addressing their continuing professional learning as faculty. Nothing in the list should be new to a faculty member as it is essentially what doctoral students learn as part of their development as researchers in their domain area. The challenge for junior faculty, and the role faculty developers can play, is the transition from research to developing the additional skills, knowledge, and attitudes of the profession, such as teaching in a classroom.

This entry-level design approach may appear naïve and simplistic, maybe even a waste of time, yet I contend it is a necessary step to ensure developing a strong base of competency for all junior faculty, particularly engineering faculty, going forward. In talking to the participants in this study, everyone relayed a different story about their doctoral experiences and how it did, or did not, prepare them for being faculty in higher education. Their doctoral experiences and preparation varied by the policies and interactions provided by their institution, advisors, mentors, and colleagues. Just like when faculty talk about providing undergraduate students a strong foundation in a course to build upon, the same is true of faculty needing a strong foundation for approaching the continuing professional learning required as faculty in academia.

Building on the first recommendation, faculty developers should work to continue enhancing their role as liaison between the institutional administrators and the

engineering faculty. In my view, there is a "mismatched return on investment (ROI)" situation existing between university administrators and faculty around professional development which faculty developers can play a significant role in realigning. The "mismatched ROI" refers to the chasm existing between what university administrators are funding expecting to advance the CPL of its faculty, while faculty view many of these options as unnecessary, or unappealing, and do not participate in the various faculty development opportunities provided by the institution. The faculty perspective has been mentioned several times already where participants lamented how a seminar or workshop did not align with *their* needs at this time. Working to align the two sides so that valued CPL options are present is a key role for faculty developers going forward.

The faculty developer can contribute to CPL experiences by constructing meaningful professional learning opportunities that appeal to engineering faculty using the APT method proposed above. It will be a challenge to reach out to engineering faculty to participate, but working to align faculty learning options with their professional needs should attract interest and build participation. The key, as stated by participants in the study, is to provide faculty learning opportunities that assist faculty in accomplishing some valued task in a way that does not waste the limited time they perceive to have for these activities. A first step to consider is engaging incoming assistant professors with a slate of professional learning activities, designed using APT that is benchmarked against their professional development needs for tenure. This will allow for an approach where you can say to them that this is how "we" – the institution and faculty developers – are committing to help you succeed in getting tenure and having a long-term successful academic career.

5.6. Limitations of the Study

This study used stratified, purposive, criterion-based sampling of engineering faculty at a Research University conducting very high research (RU/VH) in the Midwestern United States. The sample is not representative of engineering faculty *en masse* in the United States, particularly engineering faculty at non-research intensive universities. The sample also only represents individuals willing to discuss their learning

experiences as an Assistant Professor in the College of Engineering. Despite repeated callouts, only a select few tenure-track professors responded, many through referrals from non-eligible faculty members at the institution which raises the issue of whether these participants had a reason to want to talk, or were they simply more comfortable with the process of talking to a researcher. Other participant concerns are the over-sampling of females and under-sampling of internationally born and raised tenure-track engineering faculty.

The methodological approach to this study was thematic analysis grounded in a second-ordered interview construct focused on capturing the what/how of participants' continuing professional learning experiences without consideration for their perspective of the "lived experience." Implementation of a different methodology, particularly in the design of the study, could result in the generation of different results. The four themes in this study emerged from the process experiences of the engineering faculty at this institution.

One significant limitation to this research was specifically introduced by the researcher. Originally mentioned in the methodology section, all participants' interviews were altered by replacing the gender based name of participants with androgynous names. Analysis was conducted ignoring gender, as well as race and other identifiers, in order to focus on constructing a comprehensive story of a group of junior faculty. This was prompted by considerable researcher and participant concern about the lack of anonymity for female and minority participants. This concern guided the researcher away from including demography as part of the analysis or selection of a participant's pseudonym. This means that nuances of the individual faculty experience, particularly of underrepresented groups, have been sacrificed in order to generate the collective picture of continuing professional development of junior faculty seeking tenure.

Qualitative research studies, particularly exploratory inquiries, are not designed to provide generalizable results. This study provided insight into the construction of a model that could represent the continuing professional learning experience of individual faculty members, but the small subset of participants relative to the entire population of tenure-track engineering faculty limited the generalizability to all engineering faculty.

5.7. Recommendations for Future Research

It is important to continue research into the continuing professional learning of faculty, engineering and non-engineering, at all stages of their career. This work identified a set of four themes and constructed an introductory integrated model for situating the engineering faculty's continuing professional learning process. The model could be further developed by adding to the participant pool to confirm the findings in this study. Simple repetition of the existing study with additional participants would increase the validity of the hypothesized model and provide insight into specific subgroups – gender, country origin, department, etc.… – unique variation. Studies comparing responses by gender, engineering department, or any other subgroup identifier could provide insight in the similarities and differences with the engineering faculty population. The inclusion of faculty that are not engineering faculty, or are engineering faculty at an institution with a different Carnegie classification could expand the relativity of the themes and model beyond the population focused on in this study.

5.8. Significant Considerations of Findings

This study provided a qualitative look into the continuing professional learning of tenure-track assistant professors in engineering from the perspective of a collection of engineering faculty members of various ranks at a Carnegie classified RU/VH institution of higher education in the United States. The findings for this population and the methods employed advanced the insight of the research into faculty development by providing new data to incorporate into future thinking about research studies and faculty development programming. This new data is a thematically analyzed set of qualitative interviews centered on faculty reflection and metacognition about their continuing professional learning experiences.

The results of the study indicated that there are four influencers at play impacting the faculty professional learning experience as junior faculty. The four forces are experienced uniquely by each faculty member, based upon the uniqueness of each participant's interview; yet some overlap exists. This should be interpreted as no one set of solutions exists that will succeed in addressing the needs and wants of all junior

faculty members, but some options can be construction to impact a large swath of junior faculty's continuing professional learning. This would require undertaking the task of identifying the wants and needs of the junior faculty at a specific institution (or even within any given organization) in an attempt at alignment and coordination of institutional resources to provide continuing professional learning experiences for the maximum number of faculty members.

It is clear from this research that the prevalent force in the faculty development process was the institution. Although the way the institution manifested its influence was reported differently by individual participants, it was clear that the institution's policies, particularly about tenure, and implicitly, or explicitly, communicated messages, directly and indirectly conveyed to participants as assistant professors, influenced participant's perceptions about participation in university provided faculty development opportunities. Educational institutions can address this by developing continuity between its messaging and policies regarding tenure in order to provide a clear message/direction for junior faculty about the role of continuing professional learning in the tenure conversation. The clearest example of this dialogue can be centered on the concept of collaboration. Clear policies and messaging about expectations of how collaboration would be evaluated in the tenure process, along with whether the institution valued the concept would go a long way to clearing up the conundrum of whether collaboration is a positive or negative action for the continuing professional learning of tenure-track assistant professors in engineering. Paramount to this process would be the development of improved working communication between the institution and faculty.

There are a few final direct takeaways applicable to two major stakeholders – faculty and administrators – associated with this research on continuing professional learning in a Carnegie classified RU/VH university in the United States. Assistant professors embarking upon a tenure-track appointment need to develop a strategy to support their continuing professional learning through conversation with previous colleagues and metacognition. Previous colleagues that a faculty member has worked with as a doctoral student, particularly their dissertation advisor, dissertation committee members, or other mentor(s) can provide insight in reflecting back on what situations (personal or socially

constructed) worked best in their development as a doctoral student. This should be supplemented with metacognition – what worked for me in the past, what do I need to know/be able to do in the future, and who/what within the university (or outside) can help me have that experience or opportunity to learn/grow – to prompt the faculty member to contemplate where he or she have been, where he or she are now, and where he or she wishes to be in the future at different intervals. All of this information combined should provide enough insight to develop a continuing professional learning strategy. If not, there are always career coaches who can assist faculty members in this endeavor. The above advice can be extended to all faculty members regardless of rank or appointment type, as well as to any individual in any organization contemplating a strategy for continuing professional learning.

University administrators at all levels should consider focusing on two primary actions for changing the continuing professional learning environment for incoming assistant professors on the tenure-track, although these changes would have implications for all faculty staff. The first action would be centered on alignment of tenure policies and tenure messaging, explicit and implicit, across mentors, tenure committees, department chairs, college administrators, and university officials. Using the collaboration concept again, tenure policies would tell tenure committees how to value collaborative efforts, while providing assistant professors clear rules about what would be valued collaborative efforts relative to attaining tenure. Alignment throughout the departments and colleges could then replicate the message that collaboration by faculty members is valued within the institution, or not.

The second action university administrators need to support is the development and alignment of professional development activities at the department, college and university level. Certain professional development supporting programs may reside best at different levels within the university. Determination of what professional development programs are needed and what organizational unit within the department can best support its success should help in building the relevance factor for faculty who often commented as participants in this study that existing programs did not align with their need, but seemed appropriate for other faculty.

5.9. Final Thoughts

This dissertation used tenure-track engineering faculty responses about their professional learning experiences to identify four themes that influenced faculty engagement in CPL. Two outcomes proposed from this study to help visualize the influencer interactions impacting faculty continuing professional learning are a set of metaphorical equations for thinking holistically about a tenure-track engineering faculty member's approach to CPL and a proposed framework of "lenses" that can be used in the design of faculty CPL experiences by administrators or faculty developers. This work should be considered for extension beyond faculty to influencing the design and thinking about continuing professional learning in all professional contexts.

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APPENDICES

Appendix A. Early Pilot Interview Protocol

INTERVIEW GUIDE

Interview participant: _____

Location: _____ Dates held: _____

---

[1] INTRO

- ☐ Tell me about yourself.
  - o Personality traits, interests, etc… for BIO

[2] RESEARCHER

- ☐ Tell me about your lived experiences learning to be a researcher?
  - o Chronologically (start at grad school)
  - o Did you learn about ethics in research?
  - o Tell me more…
- ☐ Check Back
  - o Is there anything else about learning to be a researcher that you want to share with me?

[3] TEACHER

- ☐ Tell me about your lived experiences learning to be a teacher?
  - o Chronologically (start at grad school)
  - o Tell me more…
- ☐ Check Back
  - o Is there anything else about learning to be a researcher that you want to share with me?

- ☐ Thank you! Next steps: send you transcripts when they are completed.

Appendix B. Early Interview Protocol

Interview Protocol

Interview participant: _____

Location: _____ Date(s) held: _____

Background Statements:

- What do you consider to be your field of work as a faculty member?
    - If participant needs prompting:
        - What discipline do you associate with?
        - What do you call yourself? Why is that?
        - Do you call yourself that when describing what you do to other people?
        - What field is your background in? What have you been trained in?
- What does the word ***professional development*** mean to you?
- I use the term ***professional development***, but is there a word or phrase you are more comfortable or familiar with that describes professional development in your field?
- How long have you been involved with professional development (insert their word choice)?
- Do you have any formal ***professional development*** (insert their word choice) training?
    - What did that involve?

Describing Experiences:

- Tell me about a ***professional development*** (insert their word choice) experience you had as an assistant professor?
    - What did you do?
    - What was your goal in participating/engaging in this experience?
    - Who
    - How did you approach the experience?
    - In what way were others, involved in your professional development?
        - How often did you interact with other?
        - What did a typical interaction with the other involve?
        - What kind of information were you trying to learn from them?
        - Why was important to have that particular information?
        - What did you do next after you met with the other?
        - Where were all of the places you met with your other?
        - What influence did other have?
    - Did you produce any tangible, or measureable, outcome from this experience?
    - How did you assimilate information from this experience into your way of working as a professional?

Other Experiences:

- Do you think you "learned" from this professional development experience? If "Yes," in what way? If "No," why not?
- Can you describe another experience you have had that involved professional development?
    - How do you think this is different from the experience(s) talked about earlier?

Summative Questions:

- Based on what we have discussed, what is professional development?
- When you think about ***doing*** professional development, what does that mean?
- As a faculty member, what things are important to think about when undergoing (?) professional development?
- Please describe any experiences that challenged your way of thinking about professional development?
- Reflecting back on your experiences, if you were to change anything related to professional development, what would it be?
    - Step through each experience.
- Exploring the different words used to describe professional development:
    - If used different words: you have used the words "X" to describe professional development. Do words have similar or different meanings to you?
    - If participant did not use different words: various words are used to describe professional development, such as faculty development or continuing professional learning. Do words have similar or different meanings to you?

Exploring Relationship to Experiences

- What experiences do you believe contributed the most to your development as a faculty member?
- Anything else that you want to add about your development as a faculty member that you don't feel I have asked about already?
    - Follow-up with any aspects they did not talk about earlier.

Concluding Questions:

- Do you have any questions of me?
- Thank you for your time!!!!

Appendix C. Final Interview Protocol

Interview Protocol

Demography/Background Statements

- Are you a tenure-track faculty member? What is your rank?
- Upon graduating with your PhD, what did you do next?
  - Did you work in industry/post-doc?
  - Did you work in industry before graduate school?
- What do you consider to be your field of work as a faculty member?
  - What discipline do you associate with?
  - What field is your background in? What have you been trained in?
  - What do you call yourself professionally? Why is that?
- Why did you become a tenure-track professor?

Describing Experiences:

- What did (do) you need to do to advance from assistant to associate professor (i.e. receive tenure) and move forward with your academic career?
  - Who told you? What were those activities? How did you identify them?
  - Tell me about grants, research, teaching, graduate students. Whatever else they raise unique.

Other Experiences:

- I am an incoming assistant professor and have come to you seeking advice?
  - What do I need to do over the next 6 years to grow professionally to be successful in the short term (tenure)? But also the long term (career)? How do I do them?

Additional Questions:

- What is the most important thing you have done as an assistant professor (i.e. early in your career) that you feel has contributed to being successful in your career?
  - How did you identify it as important?
- What does the phrase *professional development* mean to you?
- Anything else that you want to add about your development as a faculty member that you don't feel I have asked about already?
  - Follow-up with any aspects they did not talk about earlier.

Concluding Questions:

- Do you have any questions of me?

Appendix D. Recruitment Email

Initial Recruitment E-mail

Subject line of email: Opportunity to Provide Your Perception of Continuing Career Development of Engineering Faculty

Professor _____:

I am recruiting engineering faculty to provide insight into the various ways you have experienced professional development in your early career. This is an opportunity for you to provide your commentary and perception about the continuing development of early career professors. The ultimate goal is to impact how administrators support the continuing development of early career faculty.

This study will capture the various early career experiences of tenure-track engineering faculty members. If you take part in this study, you will participate in a 75-minute semi-structured interview about your early professional development experiences.

If you are interested in participation or have any questions about the study, please email James Cawthorne, doctoral candidate, at jcawthor@purdue.edu.

Thank you for considering participation in this research study.

Dr. Ruth Streveler

Associate Professor, School of Engineering Education

Purdue University, West Lafayette, IN 47907

streveler@purdue.edu

Appendix E. Referral Recruitment Email

Recruitment E-mail – Referral Participant

Subject line of email: Opportunity to Provide Your Perception of Continuing Career Development of Engineering Faculty

Professor _____:

A colleague of yours has recommended you to me as a potential insightful participant about career development of faculty early in their career. This is an opportunity for you to provide your commentary and perception about the continuing development of early career professors. The ultimate goal is to impact how administrators support the continuing development of early career faculty.

This study will capture the various early career experiences of tenure-track engineering faculty members. If you take part in this study, you will participate in a 75 minute semi-structured interview about your early professional development experiences.

If you are interested in participation or have any questions about the study, please email James Cawthorne, doctoral candidate, at jcawthor@purdue.edu.

Thank you for considering participation in this research study.

Dr. Ruth Streveler

Associate Professor, School of Engineering Education

Purdue University, West Lafayette, IN 47907

streveler@purdue.edu

Appendix F. IRB Approval

PURDUE UNIVERSITY

HUMAN RESEARCH PROTECTION PROGRAM
INSTITUTIONAL REVIEW BOARDS

To:	STREVELER, RUTH A
From:	DICLEMENTI, JEANNIE D, Chair Social Science IRB
Date:	11 / 30 / 2012
Committee Action:	Amended Exemption Granted
Action Date:	11 / 29 / 2012
Protocol Number:	1209012729
Study Title:	EARLY CAREER CONTINUING PROFESSIONAL LEARNING OF ENGINEERII FACULTY

The Institutional Review Board (IRB) has reviewed the above-referenced amended project and has determined that it remains exempt.

If you wish to make changes to this study, please refer to our guidance"**Minor Changes Not Requiring Review**" located on our website at http://www.irb/purdue.edu/policies.php. For changes requiring IRB review, please submit an **Amendment to Approved Study** form or **Personnel Amendment to Study** form, whichever is applicable, located on the forms pages of our website www.irb.purdue.edu/forms.php. Please contact our office if you have any questions.

Below is a list of best practices that we request you use when conducting your research. The list contains both general items as well as those specific to the different exemption categories.

General

- To recruit from Purdue University classrooms, the instructor and all others associated with conduct of the course (e.g., teaching assistants) must not be present during announcement of the research opportunity or any recruitment activity. This may be accomplished by announcing, in advance, that class will either start later than usual or end earlier than usual so this activity may occur. It should be emphasized that attendance at the announcement and recruitment are voluntary and the student's attendance and enrollment decision will not be shared with those administering the course.
- If students earn extra credit towards their course grade through participation in a research project conducted by someone other than the course instructor(s), such as in the example above, the students participation should only be shared with the course instructor(s) at the end of the semester. Additionally, instructors who allow extra credit to be earned through participation in research must also provide an opportunity for students to earn comparable extra credit through a non-research activity requiring an amount of time and effort comparable to the research option.

Appendix G. Demographic Codebook

This codebook provides the code, category (super code), and theme for the participant responses applicable to demographic information. The codebook is ordered alphabetically within groupings from smaller (codes) to larger (themes) conceptual thinking. Not all codes were combined into categories (super codes) since the code may have only provided a factual piece of information and not a block of knowledge that need constructing into a category. The codebook will be presented using the following format:

CODE – Abbreviated name of the code.
FULL CODE – Full name of the code. May be same as CODE.
Definition – Definition for applying the code.
Example – A quote from the participant responses that served as representative of the type of statements this code was applied to in the analysis process. Will be italicized.
Other Codes – Codes used to construct category or theme. Will exist in lieu of an example with categories or themes. Will be italicized.

Codes

AA ENGR
AERONAUTICS AND ASTRONAUTICS ENGINEERING
Faculty participant identifies as being a member of the Agricultural and Biological Engineering Department.
Aero Engineering. ~Single participant

AG BIO ENGR
AGRCULTURAL AND BIOLOGICAL ENGINEERING
Faculty participant identifies as being a member of the Agricultural and Biological Engineering Department.
Ag. and Bio. Engineering. ~Multiple participants

ASSOC PROF
ASSOCIATE PROFESSOR
Faculty participant identifies as being a tenure-track engineering faculty member holding the rank of associate professor.
Associate professor. ~Multiple participants

ASST PROF
ASSISTANT PROFESSOR
Faculty participant identifies as being a tenure-track engineering faculty member holding the rank of assistant professor.
Assistant professor. ~Multiple participants

CHEM ENGR
CHEMICAL ENGINEERING
Faculty participant identifies as being a member of the Chemical Engineering Department.
Chemical engineering. ~Multiple participants

E & C ENGR
ELECTRICAL AND COMPUTER ENGINEERING
Faculty participant identifies as being a member of the Electrical and Computer Engineering Department.
Electrical and computer engineering. ~Single participant

ENGR DISC RES
ENGINEERING DISCIPLINE RESEARCH
Faculty participant identifies conducting research firmly within the boundaries of their specific engineering discipline.
No code provided because information may identify participant.

ENGR INTER RES
ENGINEERING INTERSECTION RESEARCH
Faculty participant identifies conducting research at the intersection of multiple engineering disciplines, of engineering and science, or engineering and social sciences.
No code provided because information may identify participant.

FULL PROF
FULL PROFESSOR
Faculty participant identifies as being a tenure-track engineering faculty member holding the rank of full professor.
A full-professor. ~Multiple participants

GS LEARN RES
GRADUATE SCHOOL LEARNED RESEARCH
Faculty participant identified learning the research process as a graduate student. The research process comprises the design, conducting, and dissemination of research in a manner appropriate to their specific discipline. It does not include grant writing or managing other people.
It taught me how to learn and how to do research… It's not like the research I did, particularly my Master's on, I'm doing anything in that field now. But in terms of all the skill sets I learned and I'm using all the same processes and backgrounds. ~Kelly

GS TEACH
GRADUATE SCHOOL TEACHING
Faculty participant identified having an engaged teaching learning experience. This is represented by the responsibility of being an instructor for a course or engaging in doctoral program sponsored teaching preparation experiences.
I also was an instructor for the Research Methods class a number of times.
In my doctoral program we had a kind of a unique part of our curriculum. We had a required year-long seminar on the teaching of [discipline]. *… Discussing pedagogy, and teaching methods, and you know, how to do exams, and how to pick textbooks, and all that stuff.* [Later] *we had responsibility for co-teaching the Introductory to* [discipline] *course. So, in that sense, I did have a specific course sequence on academic teaching. ~Jesse*

GS TEACH OPP
GRADUATE SCHOOL TEACHING OPPORTUNITY
Faculty participant identified having a simple teaching experience. This would be leading a lab or recitation section.
They also gave me an opportunity to be a teaching assistant. ~Sandy

ID ENGR
IDENTITY ENGINEER
Faculty participant identifies themselves as an engineer.
The way I tell people engineering it's an overused term for problem solving. So, what I love is seeing the problems, and getting the right pieces of information, the right team together, doing the background research. You know, and thinking about problems in the way that might be a little different than just saying, "Oh, this is the way it's always been done let's do it this way." ~Kelly

ID PROF
IDENTITY PROFESSOR
Faculty participant identifies themselves as a professor.
I'm a professor at Purdue … for me it means that I do research, teaching, and service at a Research I Institution. ~Casey

ID SCI
IDENTITY SCIENTIST
Faculty participant identifies themselves as a scientist.
I consider myself a [discipline] scientist, not necessarily an engineer but a [discipline] scientist. I think my research is more geared sometimes towards the fundamental aspects of [discipline] discovery. ~Jamie

IND ENGR
INDUSTRIAL ENGINEERING
Faculty participant identifies as being a member of the Industrial Engineering Department.
Industrial engineering. ~Multiple participants

INDUSTRY EXP
INDUSTRY EXPERIENCE
Faculty participant had an industry experience of at least one-year post-baccalaureate degree.
I: Did you have any industry experience? R: Yes. ~Multiple participants

MAT SCI ENGR
MATERIALS ENGINEERING
Faculty participant identifies as being a member of the Materials Engineering Department.
Material science and engineering. ~Multiple participants

NO IND EXP
NO INDUSTRY EXPERIENCE
Faculty participant did not have any industry experience post-baccalaureate degree.
I: Did you have any industry experience? R: No. ~Multiple participants

NO POST DOC EXP
NO POST-DOCTORAL EXPERIENCE
Faculty participant did not have a post-doctoral experience.
I: Did you have a post-doctoral experience? R: No. ~Multiple participants

POST DOC EXP
POST-DOCTORAL EXPERIENCE
Faculty participant had a post-doctoral experience lasting more than one semester.
I: Did you have a post-doctoral experience? R: Yes. ~Multiple participants

TEN OTHER INST
TENURE OTHER INSTITUTION
Faculty participant's tenure experience did not occur at the institution where this study was conducted.
I became an assistant professor at the University of [X]. *~Multiple participants in similar way*

TEN PRIM INST
TENURE PRIMARY INSTITUTION
Faculty participant's tenure experience occurred the institution where this study was conducted.
I became an assistant professor at [this institution]. *~Multiple participants in similar way*

WF ATMOS
WHY FACULTY ATMOSPHERE
Faculty participant identified atmosphere of the university as the reason for wanting to become a faculty member.
I enjoy school. I really enjoy being around students, the atmosphere. ~Cameron

WF FLEX
WHY FACULTY FLEXIBILITY
Faculty participant identified having flexibility in their decision making as the reason for wanting to become a faculty member.
I thought that it would give me the most flexibility to work on things that I thought were important. ~Taylor

WF PREP OTH
WHY FACULTY PREPARE OTHERS
Faculty participant identified wanting to participate in the preparation of others as the reason for wanting to become a faculty member.
I have fun with research. I like working with doctoral students and even undergraduate students on research problems. ~Casey

WF SELF DIR
WHY FACULTY SELF DIRECTION
Faculty participant identified ability to direct one's own activity as the reason for wanting to become a faculty member.
Liked the idea of being able to pick the things that I worked on for myself. ~Robin

WF TEACH
WHY FACULTY TEACH
Faculty participant identified opportunity to engage in teaching as the reason for wanting to become a faculty member.
I like teaching, I like students. ~Lou

Categories

GS EXP
GRADUATE SCHOOL EXPERIENCE
Faculty participant description of the research and teaching preparation experienced as a doctoral student.
GS LEARN RES, GS TEACH, GS TEACH OPP

ID
IDENTITY
Faculty participant's constructed meaning about the perceptions surrounding what they do as a profession. It is a negotiated understanding constructed through how they see themselves and believe others see them.
ID ENGR, ID PROF, ID SCI

WHY BEC FAC
WHY BECOME FACULTY
Faculty participant identified some the motivations for why they choose to faculty members.
WF ATMOS, WF FLEX, WF PREP OTH, WF SELF D, WF TEACH

Appendix H. Continuing Professional Learning Codebook

This codebook provides the code, category (super code), and theme for the participant responses applicable to answering the research question about *influencers on continuing professional learning of tenure-track engineering faculty as assistant professors*. The codebook is ordered alphabetically within groupings from smaller (codes) to larger (themes) conceptual thinking. Not all codes were combined into categories (super codes) since the code may have only provided a factual piece of information and not a block of knowledge that need constructing into a category. Themes are constructed from categories and orphan codes applicable to theme. The codebook will be presented using the following format:

CODE – Abbreviated name of the code.
FULL CODE – Full name of the code. May be same as CODE.
Definition – Definition for applying the code.
Example – A quote from the participant responses that served as representative of the type of statements this code was applied to in the analysis process. Will be italicized.
Other Codes – Codes used to construct category or theme. Will exist in lieu of an example with categories or themes. Will be italicized.

Codes:

COLLAB ENG
COLLABORATION ENGAGEMENT
Faculty participant described continuing professional learning through a highly consultative relationship, based on mutual research or teaching, with a peer or peers.
But the one I teamed up with here was he and I both had very specific interests that sort of meshed and it was a fortuitous collaboration. It was a pretty even collaboration. I did most of the experimental work and he did most of the theoretical work. ~Pat

COLLAB VIEW
COLLABORATION VIEWPOINTS
Faculty participant described their worldview about engaging in collaboration. Included concerns and perspectives about how to proceed.
Yeah, if you are collaborating with colleagues you need to make it very clear what your contribution is, what you've brought to the table, how you've led parts of, or pieces of the effort. You have to show that you on your own have research chops to bring to the table. ~Casey

DEPT COMM PROT
DEPARTMENT COMMITTEE PROTECTION
Faculty participant described the department providing relief from committee service to free time for continuing professional learning.
I think what he did try to do in the beginning and maybe now a little bit later was to protect me from administrative duties, which assistant professors really aren't supposed to be doing that much of that ~Lou

DEPT TEACH PROT
DEPARTMENT TEACHING PROTECTION
Faculty participant described the department providing limitations to teaching loads resulting in additional free time for continuing professional learning.
I taught three different classes during the five years before I went up for tenure. That was it. And I just taught them over and over and over again. And so I was protected – 'cause I had colleagues who were teaching something different every semester. ~Casey

ENGAGE NSF PM
ENGAGE NSF PROGRAM MANAGER
Faculty participant described continuing professional learning through interacting with NSF program manager and the NSF committees.
I learned from the process that I called and I talked to the program officer and I solicited their advice on how to handle some of the criticisms and the suggestions that I had gotten. And, you know, academics love to see their words put back to them and so I very strategically answered the issues. And I put some of her words back to it. And I – and so I not only wrote a better proposal the second year but I also wrote a more politic – I mean I incorporated politics into what I wrote. ~Casey

ENTREP APP
ENTREPRENEURAL APPROACH
Faculty participant described continuing professional learning as having an enterprising face to be considered by faculty.
And one of the most useful, telling things that I heard was that every, every faculty member at a research university, particularly every science and engineering faculty member, should consider themselves as the CEO of their own startup. So that teaches you first that, yes you do have to market your brand. I mean your research area is your brand. The name of your – your lab is a brand. ~Jesse

FORM SEM
FORMAL SEMINAR
Faculty participant described impacts institution driven (i.e. formal) seminars, workshops, or other activities are experienced as contributing to the faculty member's continuing professional learning.
I went to the workshops. Just because I wanted to be a better teacher…. In fact probably if you polled the audience in those, most of the people that are dedicated to – or you know value undergraduate teaching are there, and the people that don't care about it aren't there. ~Kelly

IDR ACTIVITY
IDR ACTIVITY
Faculty participant described identifying activities to participate in to advance their continuing professional learning.
Then if you wanted to know more started to find activities such as workshops and seminars. ~Jamie

IDR MATERIAL
IDR MATERIAL
Faculty participant described identifying materials to use to advance their continuing professional learning.
*I get a book…looked for resources on the internet… when I came t*o [the institution] *I read a bunch of books about how – advice books for new faculty members, like five of them that touched on funding too. And, this was on the internet…I'm always going and reading the books…you engage in growing in that you read about it, became more familiar with it. ~Jamie*

INST CHALLENGE
INSTITUTIONAL CHALLENGES
Faculty participant described issues facing the department that impacts the continuing professional development of faculty.
We got feedback annually from the – from the full – from the full professors but that was mostly useless and anecdotal sort of stuff; it wasn't very helpful ~ Sam

INST SUPPORT
INSTITUTIONAL SUPPORT
Faculty participant described the institution playing a role in supporting continuing professional activities.
They really wanted to make a name. They really wanted to be recognized internationally and within the field. So, anything and anybody that was successfully supporting that mission was treated with care. There wasn't always agreement on how to get there and there was some disagreements that sometimes led to what you would think of as not really care. ~Morgan

MENTOR APPRENTICE
MENTOR APPRENTICESHIP
Faculty participant described working with the mentor to learn professional skills and knowledge.
Watching the way that [my mentor] *worked with the students helped me tremendously sort of understand how I needed to interact with them to help them come along. ~Taylor*

MENTOR EMP
MENTOR EMPATHY
Faculty participant described moments of the mentor acknowledging the feelings of the faculty member.
So both social/emotional support. Some support on what it was like to be other….And working in a new area. And having an interdisciplinary background there was no way for me to be standard. So other people who weren't standard helping me to feel better about not being standard instead of telling me how to be more standard, that was extremely helpful. ~Jesse

MENTOR GUIDE
MENTOR GUIDANCE
Faculty participant described receiving guidance from a mentor about how to proceed in their continuing professional learning.
Like how is your tenure package coming? Do you have any concerns with classes? How is the grant writing coming? Do you have any concerns with that? And like, you know, helping me put together my documents. ~Cameron

MENTOR IN DEPT
MENTOR IN DEPARTMENT
Faculty participant had a mentor inside their discipline specific engineering department.
I found a senior person in my academic unit. ~Taylor

MENTOR OUT DEPT
MENTOR OUTSIDE DEPARTMENT
Faculty participant had a mentor outside their discipline specific engineering department. The mentor was faculty or administrator in another engineering department, a department elsewhere in the university, or at another university.
I do have someone who has been a mentor to me. It's in a different department. ~Lou

NEG COLLAB RESP
NEGATIVE COLLABORATION RESPONSE
Faculty participant described a negative experience about collaborating as part of continuing professional learning.
So, I wrote a proposal last year with [a more senior] *faculty* [member]… *The proposal was basically all my ideas, but I needed* [them] *on the proposal because I needed to have a senior person, and there was also a chunk of the work that was very much within* [their] *field …So, immediately the assumption was that I was a junior partner in the grant….then it's like, "Oh, the baby professor needs help from the senior professor."* ***Lou***

NEG MENT EXP
NEGATIVE MENTOR EXPERIENCES
Faculty participant described a negative set of interactions regarding mentoring. This can be a negative relationship between mentee and mentor or the institution and the faculty member.
Early on there wasn't a strong mentoring component. And that was true of I think everywhere at [the institution]. *~Sam*

NO MENTOR
NO MENTOR
Faculty participant says they had no mentor.
There was never any mentoring situation here. ~Pat

PEER LEARN EXP
PEER LEARNING EXPERIENCE
Faculty participant described continuing professional learning through direct interaction with peers. This interaction is a more formalized engagement than a social function.
I participated in this [educational] *group on campus where they teach you about technology and different strategies for teaching. And from that I learned the effectiveness of … videos. So, I started putting … videos of problem solving. And that's gone over well with the students. ~Shawn*

PEER SOCIAL EXP
PEER SOCIALIZING EXPERIENCE
Faculty participant described the value and concerns associated with engaging peers socially.
You can't do it by yourself. You have to be part of the community, and part of the national community, part of the professional community, part of your departmental community. If you are not doing those things it doesn't matter how much work you do by yourself. Nobody will know and you won't be seen as a colleague that people will want to work with for the next 10-20-40 years. Those are absolutely critical. You've got to find your professional home. You've got to be seen as a colleague who will help take out the garbage and help do, you know, rake the leaves ~Jesse

PROF DEV VIEW
PROFESSIONAL DEVELPOMENT VIEWPOINTS
Faculty participant described their understanding of professional development in relation to their continuing professional learning.
I have no idea really what truly means, okay? I mean there's – it kind of depends on what your goals are what that means. Learning how to do the things to do solo… but it's kind of like a training for future administrators. ~Robin

SELF AWARE LEARN
SELF-AWARENESS OF LEARNING
Faculty participant described conscious knowledge of capability to conduct own continuing professional learning.
I started to see the patterns in what I was doing. And but again, it was pretty much self-taught ….A lot of it I had to learn on my own, but that's part of being a faculty. A lot of faculty work is on your own…I teach myself. I do what I need to do. I figure it out. ~Casey

SELF BELIEF
SELF BELIEF
Faculty participant described self-confidence own capability to engage in continuing professional learning.
I think I just always had the right idea. I – obviously it never worried – never bothered me… I just did it. It was just – it just seemed [chuckle] honestly, I never really thought about that that much. ~Robin

SPOUSE INS
SPOUSE INSIGHT
Faculty participant described continuing professional learning through interactions with their spouse.
A lot of support from my [spouse]*…my* [spouse] *says, you know, you're doing some really great things but nobody knows about them because you don't talk about them. I'm like, yeah but they should just know. He's like, you know they don't. You know you have to talk about them. ~Casey*

TE GRADS
TRIAL AND ERROR GRADUATE STUDENTS
Faculty participant described learning manage graduate students through an experiential learning process.
I guess at the beginning I tried to apply like one size fits all, I tried to apply a mentoring style to everybody. And I learned through my experience that it doesn't work with everybody. I made choices as a general philosophy of course. But some people need more direction; some people need less direction; or some people don't like too much direction. And some people they want you to do a lot for them. So, identifying what type of students you're dealing with is very important. I guess it develops in time. You kind of have to adjust your course based on how you see the students react. ~Jamie

TE GRANTS
TRIAL AND ERROR GRANTS
Faculty participant described learning to write grants through an experiential learning process.
I think I developed my own way of doing it. Umm, you know, you look at other papers and okay they have these parts so I'll put these parts in, you know. And then I'd say well that doesn't make sense. ~Sandy

TE TEACH
TRIAL AND ERROR TEACHING
Faculty participant described learning to teach through an experiential learning process.
And the first thing I tried … was note cards where I'd have every student fill out a note card and then I'd step to the front of the room and when I want questions from lecture and things I'd pull a note card out to call on somebody and that did backfire 'cause that apparently established a culture of fear. So, I've tried to modify that and to have everybody involved with questions instead of just one student I called on the spot. But, it did keep them awake. But, not the right way to do it. ~Shawn

Categories:

COLLAB
COLLABORATION
Faculty participant described continuing professional learning through their formal working relationships in research and teaching with peers.
COLLAB ENG, COLLAB VIEW, NEG COLLAB RESP

COLLEGEIAL
COLLEGIALITY
Faculty participant described continuing professional learning through information exchanges with peers.
PEER LEARN EXP, PEER SOCIAL EXP

DEPT PROTECT
DEPARTMENT PROTECTION
Faculty participant
DEPT COMM PROT, DEPT TEACH PROT

ID LEARN RES
IDENTIFY LEARNING RESOURCES
Faculty participant described identifying resources to support their continuing professional learning.
IDR ACT, IDR MAT

LEARN BY DOING
LEARN BY DOING
Faculty participant described various experiential learning moments contributing to their continuing professional learning.
TE GRANTS, TE TEACH, TE GRADS

MENTOR EXIST
MENTOR EXISTENCE
Faculty participant described the existence of a mentor present in their continuing professional learning process.
MENTOR IN DEPT, MENTOR OUT DEPT, NO MENTOR

MENTOR EXP
MENTOR EXPERIENCE
Faculty participant described their experiences with mentoring in relations to their continuing professional learning.
NEG MENT EXP, MENTOR EMP, MENTOR GUIDE, MENTOR APPRENTICE

SELF APP LEARN
SELF APPROACH TO LEARNING
Faculty participant described utilizing a personalized approach to their continuing professional learning.
SELF AWARE LEARN, SELF BELIEF, ENTREP APP

Themes:

INSTITUTIONAL IMPACT ON LEARNING
DEPT PROTECT, FORM SEM, INST SUPPORT, INST CHALLENGE

MENTORED LEARNING
MENTOR EXIST, MENTOR EXP

SELF-DIRECTED LEARNING
ID LEARN RES, SELF APP LEARN, LEARN BY DOING, PROF DEV VIEW

SOCIALLY CONSTRUCTED LEARNING
COLLAB, COLLEGIAL, SPOUSE INS, ENGAGE NSF PM

VITA

VITA

James E. Cawthorne Jr.

Engineering Education, Purdue University

EDUCATION

Ph.D., Engineering Education August 2016
Purdue University**,** West Lafayette, Indiana
Dissertation: Thematic Analysis of the Continuing Professional Learning of Tenure-Track Engineering Faculty as Assistant Professors
Advisor: Dr. Ruth Streveler

Doctoral Candidate, Paper and Imaging Science **(**2000-2005)
Western Michigan University**,** Kalamazoo, Michigan
Dissertation: The Influence of Nanoparticles on Particle Packing in Coating Suspensions (*unfinished*)
Advisor: Dr. Margaret Joyce

M.S., Paper and Printing Science and Engineering December 1999
Western Michigan University**,** Kalamazoo, Michigan
Thesis: Use of a Chemically-modified Clay as a Replacement for Silica in Matte Coated Ink Jet Papers
Advisor: Dr. Margaret Joyce

B.S., Chemical Engineering December 1996
North Carolina State University**,** Raleigh, North Carolina
Passed Engineer In Training Exam for State of North Carolina – Certificate No. A-16143

B.S., Pulp and Paper Science and Technology May 1996
North Carolina State University**,** Raleigh, North Carolina
Minor: History

TEACHING EXPERIENCE

Faculty Apprentice, Content, Assessment and Pedagogy (CAP) January 2010-May 2010
School of Engineering Education, Purdue University West Lafayette, IN

Co-designed and executed the CAP (Content-Assessment-Pedagogy) class for graduate students in the School of Engineering Education. Main responsibility was the pedagogy section of the class by selecting the readings, leading the class, and developing an artifact for students to synthesize their understanding of pedagogy in their project design of their envisioned class.

Instructor of Record, Stock Preparation and Papermaking January 2001-May 2001
Department of Paper and Printing Science and Engineering Kalamazoo, MI
Western Michigan University

Re-designed introductory paper engineering course taught to sophomore students. Introduced two teaching innovations: (1) Altered course from knowledge transfer only to an approach emphasizing the application of learned knowledge in situations corresponding to an entry level process engineer. (2) Introduced project/presentation element to class to acclimate students to developing and delivering a presentation before going to their first summer internship. Managed two Teaching Assistants responsible for facilitating the laboratory portion of the course

Teaching Apprentice, Stock Preparation and Papermaking January 2001-May 2001
Department of Paper and Printing Science and Engineering Kalamazoo, MI
Western Michigan University

Teaching apprentice in the paper manufacturing course as part of teaching training within the doctoral program.

Teaching Assistant, Stock Preparation and Papermaking Spring 1998 & 1999
Teaching Assistant, Introduction to Pulp and Paper Manufacturing Fall 1997 & 1998
Department of Paper and Printing Science and Engineering Kalamazoo, MI
Western Michigan University

Developed and facilitated lab sections, graded lab reports, and led course review sessions.

Other Teaching Activities

Tutoring, High School Algebra, Benton County High School 2013-1014
Tutoring, Math, Chemistry, & Chemical Engineering, Purdue University 2008-2010
Tutoring, Math, Chemistry, & Paper Engineering, Western Michigan Univ. 1998-2004
Tutoring, Math, Chemistry, & Paper Engineering, N.C. State Univ. 1993-1997

Teaching Awards

The American Society of Engineering Education
Honorable Mention, Best Teaching Strategies Paper Award, 2013
Entrepreneurship & Innovation Division

Western Michigan University
All-University Graduate Student Teaching Effectiveness Award 2002
Department of Paper Engineering, Chemical Engineering, and Imaging Dept. Teaching Excellence Award 2001-2002
Graduate Research Ethics Education Grant, Poynter Center for the Study of Ethics, Indiana University 2000

RESEARCH EXPERIENCE

Research Assistant 2009-2012
Associate Dean of Graduate Education, College of Engineering West Lafayette, IN
Purdue University

Conducted research into identifying the professional development skills associated with engineering faculty to inform development of graduate students. This was a collaborative work with the Graduate Dean of the College of Engineering identifying desired competencies for becoming a future faculty member in engineering and what opportunities Purdue and its peer institutions provided graduate students to assist them in professional development.

Research Assistant 2007-2009
School of Engineering Education West Lafayette, IN
Purdue University

Conducted research assessing the Vanderbilt-Northwestern-Texas-Harvard/MIT (VaNTH) Engineering Research Center's impact on participants. Provided feedback within research group on various other research areas – doctoral education, teaching assistant's roles/responsibilities and development of tool to assess instruction in classroom.

Research Assistant 1999-2002
Department of Paper and Printing Science and Engineering Kalamazoo, MI
Western Michigan University

Laboratory research assistant for in-house research projects based on commercial companies requests. Responsible for design of, research for, and analysis of the results from company-funded research projects studying different facets of coating formulations. Proofread and edited theses, papers, and grants.

Research Assistant 1997
Pulp and Paper Pilot Plant Operations Raleigh, NC
North Carolina State University

Responsible for designing and conducting an extensive adhesive re-pulpabilty study. Operated pilot paper machine as a teaching assistant for the senior papermaking class. Assisted in bleaching studies and pulping work in non-wood fibers.
ADMINISTRATION EXPERIENCE

Doctoral Assistant 2005-2007
College of Arts and Sciences Budget Office Kalamazoo MI
Western Michigan University

Co-managed $9.5 Million budget for graduate appointments in the College of Arts and Sciences. Responsible for other tasks within budget office relating to money transfers, spreadsheet design/implementation, grant processing and general account oversight. Reengineered graduate appointment process and trained administrative assistants in new procedures. Served on college-based committee tasked with developing workflow process to streamline graduate appointment process.

Doctoral Associate, Assistant to Dean and Associate Director 2002-2004
The Graduate College Kalamazoo MI
Western Michigan University

Designed spreadsheet for performing peer institution reviews on graduate degree requirements and student compensation and made recommendations on policy modifications to the Dean. Processed annual institutional external reports for the Council of Graduate Schools and the National Science Foundation. Assisted in designing and implementing University-wide Graduate Assistant Training for incoming students. Contributed content to manuals and led training sessions in all three Graduate Assistant appointee designations – Teaching Assistants, Research Assistants, and Service Assistants. Maintained Graduate College databases including Graduate Appointments, Graduate Awards, and Graduate Faculty.

ENGINEERING EXPERIENCE

Coating and Printing Scientist and Engineer 1999-2005
Western Michigan University Kalamazoo, MI

Outside of research activities, worked with main two advisors to execute several commercial coating and printing trials for a variety of companies. Work involved benchmarking their coating material in a series of different formulations, production of coating onto a variety of substrates on pilot coaters (small and large). Ran finishing operations (calender/supercalender), conducted coated material testing (rheology and

paper physics), printed coated material and tested for print properties. Expertise developed was in paper production, coating formulation and rheology, and print operations, particularly ink jet printing.

Process Engineering Intern Summer 1996
Georgia-Pacific Corporation Monticello, MS

Generated a computer simulation (WinGEMS) mimicking the chemical recovery. Assisted lead engineer on a variety of pulping and papermaking projects – a washing study, a refiner study, and a paper chemical trial.

Process Engineering Intern Summer 1995
Champion International Paper Sartell, MN

Designed and executed a coating thickener trial seeking a cost saving alternative to current product. Process involved initial bench trial of a series of thickeners, a machine trial, and final thickener selection. Study resulted in an estimated $500,000 per year when producing that particular coated paper. Evaluated paper machine's cleaning and screening system for efficiency.

Process Engineering Intern Summer 1994
Temple-Inland Corporation Newport, IN

Performed a series of analysis on incoming recycle paper and board materials, which served as the raw materials for the mill.

PUBLICATIONS

Articles

Daniel M. Ferguson, James E Cawthorne Jr., and Ruth A. Streveler, "Designing a Principles of Entrepreneurship Course." *The Journal of Engineering Entrepreneurship*, Volume 5, Number 1, p. 55-73, June 2014.

Daniel M. Ferguson, James E Cawthorne Jr., Benjamin Ahn and Matt Ohland, "Engineering Innovativeness." *The Journal of Engineering Entrepreneurship*, Volume 4, Number 1, p. 1-16, June 2014.

Hyun-Kook Lee, Margaret K. Joyce**,** Paul D. Fleming**,** and James E. Cawthorne, *"Influence of Silica and Alumina Oxide on Coating Structure and Print Quality of Ink Jet Papers", TAPPI Journal*, 2005.

James E. Cawthorne, Margaret Joyce and Paul D. Fleming, "Use of a Chemically Modified Clay as a Replacement for Silica in Matte Coated Ink Jet Papers", *Journal of Coating Technology*, **75**, No. 937, p. 75-81, Feb. 2003.

Professional Academic Papers (refereed)

Daniel Michael Ferguson, Wendy C. Newstetter, Eden Fisher, Paula Gangopadhyay, James Edwin Cawthorne Jr., Sridhar S. Condoor, Edward J. Coyle, Donald Wroblewski, and Cornelia Huellstrunk. “The Framework on Innovative Engineering”, 121st ASEE Annual Conference and Exposition, June 15-18, 2014, Indianapolis, IN.

Daniel M. Ferguson, James E. Cawthorne Jr., and Dr. Ruth Streveler, “Designing an Introductory Entrepreneurial Thinking Course”, 120th ASEE Annual Conference and Exposition, June 23-26, 2013, Atlanta, GA.

Daniel M. Ferguson, James E. Cawthorne Jr., Corey T Schimpf, and Monica E Cardella. “Learning Strategies and Learning Traits Critical to Practicing Engineers after College”, 120th ASEE Annual Conference & Exposition, June 23-26, 2013, Atlanta, GA

Daniel M. Ferguson, James E. Cawthorne Jr, Benjamin Ahn, and Matthew W. Ohland. “Engineering Innovativeness” 2012 ASEE Annual Conference and Exposition, June 10-13, 2012, San Antonio, TX.

Michele L. Strutz, James E. Cawthorne Jr., Daniel M. Ferguson, Mark T. Carnes, and Matthew W. Ohland. “Returning Students in Engineering Education: Making a Case for ‘Experience Capital’” 2011 ASEE Annual Conference and Exposition, June 26-29, 2011, Vancouver, B.C., Canada.

James E. Cawthorne Jr. and Monica Cox, "Assessment of the VANTH Engineering Research Center on Graduate Students”, 2009 ASEE Annual Conference and Exposition, June 14-17, 2009, Austin, TX.

James Cawthorne, Monica Cox, Melissa Stacer, Thomas Harris, Alene Harris, “Assessment of Effects of the VaNTH Engineering Research Center Experience on Faculty,” Biomedical Engineering and Bioengineering Society 2008 Annual Fall Meeting, October 1-4, 2008, St. Louis, MO.

Paul D. Fleming, James E. Cawthorne, Falun Mehta, Saurabh Halladale and Margaret K. Joyce, "Interpretation of Dot Area and Dot Shape of Ink Jet Dots Based on Image Analysis", Imaging Science and Technology Conference, San Diego, CA, Sept. 28, 2002.

James E. Cawthorne, Margaret Joyce and Paul D. Fleming, "Use of a Chemically-Modified Clay as a Replacement for Silica in Matte Coated Ink Jet Papers", 2001 International Coating Technology Conference, Atlanta, Georgia, November 4-7, 2002.

Publications for University Activities

James E. Cawthorne Jr., and Audeen Fenitman, eds., *Professional Development through Mentoring for Engineering Graduate Students*, Purdue University, West Lafayette, IN: 2010

James E. Cawthorne Jr., and Audeen Fenitman, eds., *Career Mentoring Tips for Faculty Guiding Engineering Graduate Students*, Purdue University, West Lafayette, IN: 2010

James E. Cawthorne, Jr., contributing author to *Research Ethics: Fifteen Cases and Commentaries*. Vol. 5. Ed. Brian Schrag, Prepared under NSF Grant No. SBR 9421897, Bloomington, IN, 2001.

James E. Cawthorne Jr., and Peter Parker, eds, *Paper Industry Process (Lab Manual for PAPR 100)*, Western Michigan University, Kalamazoo, MI: 1997

PRESENTATIONS

James E. Cawthorne Jr. “Learning Strategies and Learning Traits Critical to Practicing Engineers after College”, 120th ASEE Annual Conference & Exposition, June 23-26, 2013, Atlanta, GA

James E Cawthorne Jr. “Managing Teaching Assistant Responsibilities, Managing Learning Environments, and Academic Integrity” Invited Speaker, *Center for Instructional Excellence*, Purdue University, September 2010.

James E Cawthorne Jr. “Managing Teaching Assistant Responsibilities, Managing Learning Environments, and Academic Integrity” Invited Speaker, *Center for Instructional Excellence*, Purdue University, September 2009.

James E. Cawthorne Jr. “Assessment of the VANTH Engineering Research Center on Graduate Students”, 2009 ASEE Annual Conference and Exposition, June 14-17, 2009, Austin, TX.

James E. Cawthorne Jr. and Noemi Mendoza, “Venues for Publishing Engineering Education Research”, School of Engineering Education Seminar Series, November 6, 2008, West Lafayette, IN.

James Cawthorne, “Assessment of Effects of the VaNTH Engineering Research Center Experience on Faculty,” Biomedical Engineering and Bioengineering Society 2008 Annual Fall Meeting, October 1-4, 2008, St. Louis, MO.

James E. Cawthorne Jr., “University-wide Graduate Assistant/Doctoral Associateship Training Program – Research Assistants” Invited Speaker, The Graduate College, Western Michigan University, September, 2003.

James E. Cawthorne Jr., “Understanding Print Analysis”, Invited Speaker, TAPPI Printing and Graphics Arts Short Course, March 3-5, 2003, Kalamazoo, MI.

James E. Cawthorne Jr., “University-wide Graduate Assistant/Doctoral Associateship Training Program – Teaching Assistants” Invited Speaker, The Graduate College, Western Michigan University, September, 2002.

James E. Cawthorne Jr., “My Innovative Ideas for Teaching Introduction to Paper”, Invited Speaker, Graduate Research and Creative Awards & Graduate Student Teaching Effectiveness Awards: A Recognition of Contributions, April 4, 2002, WMU, Kalamazoo, MI.

James E. Cawthorne Jr., “Barrier Coatings: Current Issues Facing the Paper Packaging Industry”, Invited Speaker, The National Institute of Packaging Handling and Logistics Engineers Symposium, March 3-6, 2002, New Orleans, LA.

James E. Cawthorne Jr., "Use of a Chemically-Modified Clay as a Replacement for Silica in Matte Coated Ink Jet Papers", 2001 International Coating Technology Conference, November 4-7, 2001, Atlanta, GA.

James E. Cawthorne Jr., “University-wide Graduate Assistant/Doctoral Associateship Training Program – Teaching Assistants” Invited Speaker, The Graduate College, Western Michigan University, September, 2001.

Margaret Joyce, Tom Joyce, and James E. Cawthorne Jr., Invited Speaker, Papermaking and Coating Short Course for Alpena Paper Company, August 2001, Alpena, MI.

FUNDED ACTIVITIES

Graduate Dean’s Office, College of Engineering, Purdue University. 2008-2010
Graduate Student Association Start-Up Funding, $2,000 (year 1), renewable for up to 4 additional years on a decreasing scale of 20% per year.

PI: James E. Cawthorne Jr.
Title: “Funding Proposal for the Engineering Education Graduate Student Association (ENEGSA)”

Funding for two years from the College of Engineering to help establish graduate student organization the School of Engineering Education. Grant supported (1) operational expenses, (2) start-up activities to begin generating own money, and (3) professional development activities – seminars and brown bag workshops. Managed grant for 2 years including writing of end of year summary report for previous year's spending and next fiscal year's additional request. Additional requirement of PI was the writing of a constitution for the new organization. Grant successful in stimulating the development of a graduate student association in the School of Engineering Education that persists today.

AWARDS

Purdue University

Outstanding Service Scholarship, College of Engineering 2009

UNIVERSITY SERVICE

Purdue University

University Councils and Committees

School of Engineering Education Chair Search Committee	2009-2010
School of Engineering Education Recruitment Committee	2009-2010
Graduate Student Advisory Committee to the Graduate Dean of the College of Engineering	2008-2009

Student Organizations

Purdue Student Chapter of ASEE	2007-Present
President	2008-2009
Engineering Education Graduate Student Association (ENEGSA)	2008-Present
Founder and First President	2008-2009

Western Michigan University

University Councils and Committees

University Wide Graduate Assistant Training	1999-2004
Co-administrator of Training	2003-2004
University Graduate Awards and Fellowships Committee	2001-2004
Research and Technology Council	2002-2004
Graduate Curriculum Committee	1998-1999
WMU Master Planning Sub-Committee for Engineering and Business Research Park Development	1999
Faculty Senate Graduate Studies Council	1998-1999

Student Organizations

Graduate Student Advisory Committee (GSAC)	1997-2005
Chair, Financial Allocations Committee	1998-2001, 2002-2003
CommUniverCity Committee	1998-2004
GSAC ad hoc Committee on Unionization Question	2002-2004

PROFESSIONAL AFFILIATIONS

American Society for Engineering Education (ASEE)
Golden Key International Honour Society
Phi Kappa Phi (Lifetime member)
Tau Beta Pi (Engineering Honor Society)
The Professional and Organizational Development Network in Higher Education (POD)