FACTORS RELATING TO FACULTY ENGAGEMENT IN COOPERATIVE ENGINEERING EDUCATION

by

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ABSTRACT

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The purpose of this study was to explore the factors that may relate to engineering faculty engagement in Cooperative Education (Co-op). My intent was to identify specific personal attributes and environmental conditions that relate to faculty engagement in cooperative education. I compared the engagement level of engineering faculty from programs with similar characteristics. A web-based instrument was used to survey faculty from ten universities. Follow-up interviews were completed with select faculty survey respondents. The selection process guaranteed a blend of faculty representing two institutions, one high in faculty engagement, and one low in faculty engagement. The faculty from each institution represented both high and low levels of engagement.

Findings from this study indicated some significant factors that relate to faculty engagement in co-op. The statistical analysis showed a positive relationship between the faculty co-op engagement score and the respondents' engineering (industry-related, outside of higher education) work experience. The other personal attributes or experiences examined, major/engineering discipline, academic rank, or years of teaching had no statistically significant relationship to level of co-op engagement.

The analysis indicated a positive relationship between level of engagement and the perceived level of environmental support for co-op from the department, college, and the institution. The research did indicate that faculty who feel that they are adequately

compensated for engaging in co-op are actually less likely to be involved, and as the faculty level of engagement increases, faculty are more likely to perceive that compensation is not adequate. Overall, co-op is valued by the survey respondents. A majority of the faculty surveyed indicated that: (1) students benefit from cooperative education; (2) co-op enhances the quality of the interaction between students and faculty; (3) classroom learning is enhanced by cooperative education; and (4) co-op helps students to understand engineering concepts. However, the findings show that valuing co-op does not necessarily translate into faculty engaging in co-op activities. Finally, the research tells us that faculty engagement in co-op is not an indicator of student participation in co-op.

College and university administrators need to evaluate their orientation procedures and promotion and tenure practices in relation to their support of cooperative education activities. Co-op program administrators also have opportunities to enhance faculty engagement in cooperative education through several additional actions. One strategy for increasing faculty engagement in co-op is through educating faculty regarding their co-op program, student experiences in co-op, and benefits to students, the college, and the faculty.

There has not been any published research related to the visibility of the co-op program within the colleges and the influence that may have on student participation. We may also need to consider the reputation of the co-op program among students and employers and the availability of co-op positions within the region, just to name a few of the factors that may contribute to strong student participation in co-op, with or without strong faculty engagement in cooperative education activities.

DEDICATION

To my family, for all their love and support during this endeavor.

To my Mom, she provided all I needed to succeed in life.

To my sister, Johanna, who just kept planning my graduation.

To my brother, Chris, who was always there, even if I didn't always need you.

To Bret and Lauren, the answer is YES! I am finally done with "that paper"!

In memory of my father, Charles, and my brother, Bill
who provided a strong dose of basic training.

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"Some give up their designs when they have almost reached the goal; while others, on the contrary, obtain a victory by exerting, at the last moment, more vigorous efforts than ever before." Herodotus

I do not feel that I could have exerted "more vigorous efforts than ever before" and completed this task without the motivation, enthusiasm, patience, and guidance from the people whom I am about to recognize and many others who I can not even begin to name. Each one gave me at least one thing to keep me going and I will be forever grateful.

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Introduction

Statement of the Problem

Cooperative Education, an idea created by Herman Schneider at the University of Cincinnati in 1906, is defined by the National Commission for Cooperative Education as:

…a structured educational strategy integrating classroom studies with learning through productive work experiences in a field related to a student's academic or career goals. It provides progressive experiences in integrating theory and practice. Co-op is a partnership among students, educational institutions and employers, with specified responsibilities for each party ("The Cooperative Education Model", 2008).

According the Cates and Jones (1999) cooperative education is the ultimate learning strategy. "Talk to anyone connected to the process— students, employers and educators— and you will likely receive glowing recommendations and strong endorsements of cooperative education as the most comprehensive methodology for educating students in both the theory of their profession and the practice of today's marketplace." Cooperative Education has over a one hundred year history of enhancing a students' engineering education. The benefits are well established and well documented in published research on cooperative education (Blair & Millea, 2004; Braunstein & Stull, 2001; Metzger, 2004; Nasr, Pennington & Andres, 2004; Somers, 2995; Van Gyn, Loken & Ricks, 1997; Worley, 2010).

As an educational strategy, Cooperative Education programs provide benefits to all three participating constituencies, the employer, the student, and the educational institution (Blair & Millea, 2004; Hadara & Skanes, 2007; Kerka, 1989; Van Gyn, Cutt, Loken & Ricks, 1997). For students, benefits include a combination of technical, communication, time management, and team work skills, as well as the ability to define and refine career goals. For the employer, benefits include a practical and effective recruitment strategy; increased retention of new hires due to extensive period of observations, sometimes as much as one year prior to offering a full-time position; increased access to underrepresented candidates; and enhanced relations with the educational institution and the faculty. For the educational institution, benefits include a practical testing site for theoretical classroom learning, increased student retention by connecting students to career options earlier in their curriculum, and enhanced relationships with industry for research and funding opportunities. Chapman (2009) reports an outcome of cooperative education that ultimately benefits the student, the employer, and the educational institution. This is a significant increase in the employability of the student, with 95% of co-op students reporting acceptance of career-related positions upon graduation.

Purpose of the Study

This study focused on the factors that relate to faculty engagement in Cooperative Education programs. By comparing the engagement of faculty from programs with similar characteristics, and considering the impact of faculty personal attributes and the environmental conditions of departments and colleges, my intent was to identify specific factors that relate to faculty engagement in cooperative education.

In the past 100 hundred years, Cooperative Education (Co-op) has seen a tremendous amount of growth with over 150 engineering educational institutions nationally operating cooperative education programs. A typical cooperative education program has the following characteristics:

1. It is recognized by the institution as a formal academic program and is documented as such in the student's academic record.
2. Work experiences can be parallel or full-time rotational:
    a. Parallel - part time (20 hours per week) work with a part-time class schedule
    b. Full-time – off campus working 40 hours a week for an academic term
3. Evaluations are completed by the student, faculty, and employer.

In addition, all ABET accredited schools with co-op programs adhere to certain attributes of cooperative education as developed by the American Society of Engineering Education (ASEE). These attributes are described on the American Society of Engineering Education, Cooperative Education Divisions website (2009) and are available in Appendix A. The general definition from ASEE reads:

> Cooperative Education is a structured educational strategy which integrates classroom study with learning in productive work experiences in a field related to a student's academic and/or career goals. Cooperative Education is a partnership among education institutions, employers and students.

However, there is a great disparity of student participation in cooperative education among colleges with similar program characteristics. The 2008 biannual report from the Cooperative Education Division (CED) of the American Society of Engineering

Educators (ASEE) provides us with the participation rates of the ABET accredited engineering cooperative education programs. Student participation in these ABET accredited engineering cooperative education programs range from 30% to 80% (Mathews, 2008). The cooperative education literature indicates that strong faculty engagement plays a significant role in student participation (Contomanolis, 2002; Hartley & Smith 2000; McKinnis, McNamara et al., 2001; McNutt 1980; Plachta, 1969; Schall, 1966; Stull & deAyora, 1984; Tener 1999; Wilson 1987; Zydney, Bennett et al., 2002). The purpose of this study was to explore and identify the personal attributes and experiences and the environmental conditions that may be related to the engagement of faculty in cooperative engineering education programs among select ABET accredited engineering colleges.

In two of the three most recent surveys of both instructional faculty and co-op professionals, Pratt (1974) and Stull and deAyora (1984) tell us that faculty engagement in cooperative education is difficult to develop. Pratt (1974) compared faculty from engineering and liberal arts fields at a mandatory co-op school to identify differences and similarities in levels of engagement. Pratt's research indicated that the majority of engineering faculty recognize that there is significant value in cooperative education, but many of these faculty do not support awarding academic credit for cooperative education. Stull and deAyora's (1984) objective was to identify, quantify, and analyze the faculty benefits of engagement in cooperative education. Their research concluded that faculty recognized the benefits of cooperative education when it comes to "facilitation and improvement of the classroom learning environment and the personal growth of faculty" (p. 24), but found little or no benefit in enhancing the tenure and promotion process or

faculty professional development. Contomanolis (2002) reported that engineering faculty generally have a "positive view of the academic value of cooperative education" (p.84). He has given us insight into some of the influences on engineering faculty engagement and how engagement played out in the integration of cooperative education in the classroom. He also helps to illuminate the personal characteristics of faculty who are engaged in cooperative education. Contomanolis' research and insight will be further discussed in the literature review.

In an effort to better understand why faculty are engaged in cooperative education it is also important to look at environmental conditions that may relate to faculty engagement. Colbeck and Wharton-Michael (2006) introduced the idea of environmental influences on faculty engagement with the suggestion of a model for identifying individual and organizational characteristics that influence motivation of faculty in relation to Public Scholarship. This model is addressed more thoroughly in Chapter Two.

As cooperative education enters its second century of providing benefits to students, industries, and educational institutions, it is important to understand the factors that are related to faculty participation in cooperative education. McNutt (1989) addressed how in the 1980's the cooperative education strategy transitioned from an academic endeavor to a student development program and this had an impact on the role of faculty. As co-op was separated from the more traditional forms of experiential education like internships, practicums, and clinicals, where faculty remained part of the process of developing placements, establishing objectives, and evaluating the students,

there was an undesirable consequence; faculty no longer had the same investment in a co-op program that was managed by student services or non-tenure track professionals.

I would be remiss to not take into account the very nature of faculty work in higher education, including an understanding of a professional bureaucracy and the demands placed on faculty. In addition I address the recent changes in higher education which affect the context in which faculty find themselves (Gappa, Austin & Trice, 2007; Schuster & Finklestein, 2006). What are the demands on faculty; how are those demands changing; and what role may these demands play on faculty involvement in co-curricular programs such as cooperative education? This is examined in the literature review.By analyzing the role that personal attributes and experiences and environmental factors play in faculty engagement in cooperative education at ABET accredited engineering schools, this project provides insight into conditions that are related to faculty engagement. The data collected may assist both mature and newly emerging programs to establish policies and procedures that will encourage and enhance faculty engagement in cooperative education.

Research Questions

This study was designed to answer the following questions:

1. What are the factors that are related to faculty engagement in cooperative education?
   a. What personal attributes and experiences relate to faculty engagement in cooperative education?
   b. What environmental conditions relate to faculty engagement in cooperative education?

2. Is there a relationship between faculty members' assessment of the value of cooperative education and their level of engagement in cooperative engineering education programs?

3. Is there a relationship between faculty engagement in Cooperative Engineering Education programs and student participations rates in their college's cooperative engineering education program?

Definitions for the Purpose of this Study

Cooperative Education (Co-op). Cooperative Education is a structured educational strategy which integrates classroom study with learning in productive work experiences in a field related to a student's academic and/or career goals. Cooperative Education is a partnership among education institutions, employers and student ("General Information", 2009). All of the schools chosen for this study are ABET accredited and adhere to the attributes set forth by the Cooperative Education Division of the American Society of Engineering Education. (For a complete description of these attributes please see Appendix A.)

Faculty includes only those discipline specific teaching and research faculty whose primary responsibility is not cooperative education program administration. While many programs have tenured faculty who manage and supervise co-op student placements, this study did not survey at those faculty.

Engagement, or to be engaged in is defined as the act of involving oneself or becoming occupied; participating; the act of sharing in the activities of a group.

For the purpose of this study, engagement is defined as faculty taking a positive, active role in cooperative education. Specifically, I measured faculty activities including, but not limited to, meeting with current or potential employer partners in cooperative education, making site visits to review students' co-op activities, evaluating student work product, and reviewing co-op position descriptions.

Personal attributes includes both demographic, professional, and personal characteristics of the individual faculty member. This includes tenure status, engineering discipline, gender, previous co-op experience, and current interactions with industry.

Environmental conditions for the purpose of this study are defined as the formal policies and procedures that govern faculty, including the promotion and tenure process, course assignments, release time, incentive pay, and stated missions of the college housing the cooperative education program.

Environmental factors also include the unwritten or unofficial integration of cooperative education into the culture. Unofficial environmental factors include the inclusion or exclusion of cooperative education materials in faculty orientation programs. Environmental factors may include the regular dissemination to faculty of information regarding cooperative education students and their experiences. They may also include the visible support of cooperative education students and cooperative education activities of other faculty within the department. Finally, environmental factors may include how college and departmental administration address the issue of cooperative education in faculty meetings, public forums, and college or departmental literature.

Summary

The following four chapters in this study explore the literature relevant to this study, the methodology used to collect and analyze the data, findings from the study, and interpretations, discussion and implications of the data. Chapter two reviews the literature that is related to cooperative education, faculty engagement, faculty roles in cooperative education, the psychology of motivation, and faculty motivation in higher education. Chapter three lays out the methods used to collect and analyze the data and the rationale for using these methods. Chapter four presents both the quantitative findings from the online survey and the qualitative findings from the personal interviews with select faculty. The final chapter discusses the major interpretations of the findings. This chapter also addresses the limitations of the study and implications for higher education.

Chapter Two

Critical Review of the Literature

Introduction

Herman Schneider (Park, 1943), the founder of Cooperative Education tells us, "…if a college is what it should be, its faculty will be possessed of a passion to make its learning a vitalizing, ameliorating, constructive force in every form of human behavior" (p. 68). Mc Nutt (1980) and Wilson (1987) reinforce this statement as they demonstrate how the success of a co-op program is dependent on faculty acceptance and support. Tom Akins, Director of Professional Practice from the Georgia Institute of Technology, tells us that "[You] have to build relationships with faculty members so that they don't think that you are trying to do something that's outside of the norm" (Weighart, 2009).

To lay a foundation for this research, the author reviewed research on the history of cooperative education, the role of faculty in cooperative education, the psychology of motivation, and faculty motivation in higher education. Each of these topics is reviewed here. In addition, background information is presented on the theoretical and conceptual frameworks used in this study.

Overview of Cooperative Education

A History of Cooperative Education

After observing that his most successful and well prepared engineering students were those who worked in an engineering capacity, either part-time, during breaks, or over the summer term, Herman Schneider wanted to devise a way to expose more of his

students to hands on training opportunities. In 1906, Professor Schneider presented his idea to the Board of Trustees at the University of Cincinnati. He proposed that students would increase their learning by alternating periods of work with periods of classroom study. The Board of Trustees agreed in a five to four vote to allow Schneider to proceed with his experiment, on a one year trial basis (Houshmand & Papadakis, 2006). In 2005, just one-year short of cooperative education's 100th anniversary there were "more than 1,500 universities in 43 countries" (p.15) with cooperative education programs.

As cooperative education expanded to a wide variety of institutions it became apparent to the National Commission for Cooperative Education that various models were being adapted to fit the nature of the institution. Although all programs generally exhibited many of the same characteristics, formal academic structure to the program, increasingly responsible work experiences, and a strong relationship between the classroom and the cooperative education program, there were also some significant differences between the programs of different institutions. These differences included how the school actually formally recognized the co-op experience. Some schools offered credit, while others made notations on the transcript. There were also differences in how the progressive terms were structured. Some schools allowed consecutive terms of co-op assignments, while others required the student to alternate work terms with school terms. Finally, depending on the institution the actual relationship between student, employer, and faculty represented a diverse array of involvement, accountability and responsibility parameters (Houshmand & Papadakis, 2006).

It was in 1994 that the National Commission for Cooperative Education addressed the idea of multiple models of cooperative education. They identified and recognized

five models of cooperative education. These models include the flexible four-year model, the community college model, the non-traditional student model, the articulated co-op model, and the Accreditation Board for Engineering (ABET) model. The flexible four-year model generally refers to non-mandatory co-op programs that allow for flexibility in the sequencing of the co-op rotations and the number of rotations expected, with a minimum of two rotations being standard. The community college model takes into account that most programs are two years and therefore, flexibility in timing and number of rotations is expected. The non-traditional student model can be at two- or four-year institutions and takes into account the concurrent work experiences and possibly past work experiences of students as part of the co-op requirements. The articulated co-op model recognizes and accepts high school and/or community college co-op program experience in a subsequent four year institution. The ABET model requires a minimum of one year work experience, is a traditional alternating work semester - school semester pattern and has a formal role for the employer in the co-op process (”The Co-op Model”, 2009).

Faculty Participation in Cooperative Education

There are two distinct areas of cooperative education research related to faculty: research on faculty roles and responsibilities and faculty attitude. Faculty roles and responsibilities, as addressed in the literature, refers to both the day-to-day duties of faculty in relation to cooperative education and the more intangible responsibility of providing students with guidance and counsel regarding curricula development, career choices, and research opportunities. Faculty attitudes refers to how faculty view cooperative education, their level of involvement in cooperative education activities, and

how they collaborate with cooperative education professionals and staff. Overall, the research related to faculty and cooperative education is limited and sporadic. This section reviews this literature as it relates to the research questions.

Faculty Roles and Responsibilities in Cooperative Education

According to the Canadian Association for Co-operative Education Manual (2000), faculty have specific roles in the development and sustenance of any cooperative education program. In addition to faculty substantiating the academic integrity of the cooperative education program, they may also play the role of advocate, promoting co-op as a recruitment tool and increasing the institution's visibility and reputation with industry. Finally, faculty may play specific roles and have specific responsibilities in the co-op program in a variety of ways including:

- Faculty may participate as members of the initial co-op planning committees, and subsequent committees who consider additional co-op program proposals, academic outcomes, and the evaluation process.
- Faculty may connect employer contacts and referrals with the co-op staff.
- Faculty may discuss the academic program and students' skill levels with employers.
- Faculty may visit students on their worksites, or preview worksites prior to student placement.
- Faculty may review, evaluate, and grade student work reports.
- Faculty may maintain a position as a member of co-op advisory committees and play a role in the assessment of the cooperative education program

In 1966, Thomas Schall also addressed the role of faculty in cooperative education when he addressed the co-op community at a national meeting. Schall stated that cooperative educational institutions were sitting on a "time bomb" (Schall, 1966). The dilemma he presented is this: that although the administrations of colleges and universities continue to espouse the importance of cooperative education, they have also increased the significance and need for research activities. The implication of his statements is that if universities are stressing the importance of cooperative education, but rewarding faculty for research activities, publications, and grants awarded and not recognizing cooperative education activities in the promotion and tenure process, there is a disparity in the espoused and real value of cooperative education. Although Schall was specifically addressing the situation as it currently was at Drexel University, a mandatory co-op school, he generalizes this experience to the co-op community as a whole, projecting that most if not all of the co-op programs would be experiencing a similar shift. Schall tells us, "For a cooperative education program to be effective to the fullest extent, it is essential that the faculty understand and be in general agreement with the methods and objectives of the program" (Schall, 1966, p53).

In order to have an understanding of how some faculty view their roles and responsibilities to cooperative education, I reviewed the report of a two day workshop at the American University (van der Vorm, Jones, & Ferren, 1979). The administration of the American University's cooperative education program invited faculty, students, employers, and administrative staff for a discussion on the co-op program at American University and each constituency's roles within the program. This discussion led to faculty identifying two areas where they needed to increase faculty involvement in

cooperative education: negotiating placement for students, and including the students' "career development and personal skill development"(p. 26) into the academic portion of the co-op program. In addition, the issue was raised as to how the role faculty plays in cooperative education is viewed by the university in the promotion and tenure process. As one faculty member observed "…there is little in the way of incentive for faculty to expand their activities in Co-op" (p. 26). This reinforces Schall's concerns that the demand on faculty to research and publish are limiting the time, energy and interest of faculty to take an active role in the cooperative education process.

Faculty Attitudes to Cooperative Education

Since Schall's statement in 1966, faculty attitudes towards cooperative education have been addressed extensively in the cooperative education literature (McKinnis, McNamara et al. 2001; McNutt 1980; Paske 1983; Plachta, 1969; Pratt, 1974; Schall, 1966; Stull & deAyora, 1984; Wilson, 1987, 1989). Paske (1983) informs us that humanities faculty often transmit negative attitudes of work settings outside of academia to their students. So if faculty are discouraging students to participate in cooperative education activities, or if they are downplaying their cooperative education experiences, the students are going to internalize those impressions and not seek cooperative education experiences. Faculties' appreciation and perception of cooperative education can vary greatly and if transmitted can cause confusion and misunderstanding of the cooperative education experience to students (Paske, 1983). Dawn Wilson (1987) examined liberal arts faculty and their attitude towards cooperative education. She concludes that liberal arts faculty support cooperative education in "its ability to enhance students' career and

professional development as well as for its contribution toward the students' total learning process" (p.63).

Contomanolis (2002, 2005) presents us with research that explores the engagement of engineering teaching faculty in the field of cooperative engineering education. Contomanolis surveyed 204 engineering teaching faculty at six institutions of higher education that are recognized by the cooperative education profession as being premier cooperative education schools. His results indicated that cooperative education is not fully integrated into the classroom even at exemplar institutions. He concludes that there is a disconnect between faculty values and classroom integration of cooperative education. For example, Contomanolis' research states that almost 82% of engineering faculty surveyed believed that cooperative education is a significant contributor to the students' overall academic experience and classroom performance. The research also indicates that as many as 76% believe that the classroom learning environment is enhanced by the presence of students with cooperative education work experience. However, his research also indicates that less than 20% of faculty actually perform tasks that will integrate cooperative education in the classroom. In summary, faculty indicate that the value the cooperative education experiences of students, and that the integration of these activities in the classroom add significantly to the learning experience, but they make very little effort to infuse their lectures and class discussion with details of the students' cooperative education experiences. More research needs to be done to understand the external influences on integrating cooperative education into the classroom activities.

Overview of Motivation

If the research is telling us that faculty play an integral role in the success of cooperative education programs and students participating in cooperative education programs, what are the motivating factors that relate to faculty engagement in cooperative education and the activities that support a cooperative education program? Motivation is a phenomenon of the psychology of human nature, one that comes from within an individual, but can also be influenced externally on an individual and group level. There is no evidence to prove that people are born with motivation or not, but there is substantiation that external forms of motivation can be identified and utilized to increase work output and generally make for a more efficient work system.

The Basics of Motivation

In reviewing the research on motivation there is evidence that people are motivated by a wide variety of factors or sources. To enhance my understanding of motivation I looked at Leonard's (1995) sources of motivation model. His model distinguishes that people are motivated intrinsically, instrumentally through compensation, external self concept, internal self concept, or goal identification. Intrinsic motivation is when an individual does something because they think it is fun, they enjoy doing it, or they get personal satisfaction from the activity. Instrumental motivation relates to the reward system. An individual looks forward to the reward for the activity such as pay raises, bonuses, or accolades. External self-concept relates to doing an activity for how it makes the individual look in a group, a status bearing activity. If the activity is viewed highly by one's peer group or other external agency from whom an individual seeks approval, that endorsement provides the motivation. Internal self-

concept motivation is the personal satisfaction of achieving a goal, or completing a task, and how it makes the person feel about him or her self. This is different from intrinsic motivation in that it is about one's personal self concept and not just achieving a feeling of personal satisfaction. Finally, goal internalization is when an individual takes on the goals of the organization as their own, based on their personal value system. An individual may join an organization based on a specific value they share with the organization. Once a member of the organization, the organizational goals become the goals of the individual. These internalized goals are the motivation for the individual's activities. For example, an individual may feel strongly about saving the environment and join an environmental action committee. The specific goals of this organization then become the personal goals of the individual (Leonard, 1995).

The study of motivation in humans has a long lineage, with references like Freud, McGregor, Maslow, Herzberg, Argyris, Likert, and McClelland (McClelland, 1955; Maslow, Stephens et al., 1998; Vroom, 1964; www.accel-team.com, 2007). These scholars have presented us with a diverse collection of theories of motivation including Theory X and Theory Y, Maslow's Hierarchy of Needs, the Hawthorne Effect, and Achievement Motivation, just to name a few. Maslow, in particular, discussed how humans are first concerned with meeting their basic needs and will alter behavior to meet a higher need only after the minimal needs of life are met. McClelland says that humans are motivated by three needs: achievement, affiliation, and power. Basically, all of these theorists have determined that it is something the individual needs or wants that creates a drive to behave or change behavior in a manner that will obtain that which is desired. Understanding basic motivation in humans has allowed others to focus more closely on

how workers, managers, and leaders are motivated, what makes for more effective management, and what strengthens organizational leadership. A deeper knowledge of what motivates individuals should help to clarify why faculty do or do not participate in cooperative education initiatives.

For example, Heider, Kelley, Jones, and Ross (Heider, 1958; Jones & Davis, 1965; Kelley 1967; Ross, 1977) have acknowledged attribution theory. Attribution theory is based on how people explain behavior, theirs or someone else's. Behavior can be attributed in two different ways, through things that are internal to us, such as intelligence, hard work, a specific skill, or through things that are external to us, such as forces of nature or the actions of others. The basis of the behavior is what influences individuals to be more motivated and more importantly, more likely to engage in that behavior in subsequent instances. For example, when you get an exam back and you get a low grade you may attribute that grade to the poor teacher, or the distractions in the classroom during the exam. This is an external attribution, something outside of your control. If we think we have no control over an event or series of events we may become less motivated to achieve or, in this case, less motivated to study for the next exam. If however, we admit to ourselves that maybe we did not study as hard as we should have for this exam, we will be more motivated to study harder for the next one.

Expectancy Theory, as developed by Victor Vroom in 1964, is based on the premise that individuals make choices based on what they believe will increase positive feelings and decrease or eliminate negative feelings. Specifically, the individual will expect that there is a positive relationship between action and achievement, and that the achievement will bring about a reward, one that satisfies an important need. The need

must be great enough to make the effort worthwhile. The primary factor in Vroom's theory is that an individual makes choices based on what he/she expects to happen. That behavior is one which will provide a positive outcome for the individual. According to Vroom, these choices are influenced by the individual's personal attributes such as, personality, skills, abilities and experiences (Vroom, 1964).

Additionally, efficacy theory or self-efficacy theory developed by Albert Bandura (1986) is based on the assumption that an individual's level of commitment to a task is related to their confidence in their ability to achieving a goal. Self-Efficacy is a context-specific assessment of competence to perform a specific task or a range of tasks in a given situation. It is the person's belief in their ability to achieve success. The more confident one is of achieving the task, the more effort one will be put forward to complete the task or reach the stated goal. In addition to an individual's perceived ability to achieve the goal, efficacy theory takes into account external factors or how the environment is perceived to assist the individual in achieving the goal.

Martin Ford has taken all of these previous motivation theories into account when he proposed to develop "a clear, coherent, and useful theory that could guide the efforts of scholars, professionals, and students concerned about, and interested in learning how to better address, real-world problems with strong motivational underpinnings" (1992, p. ix,). The resulting theory, Motivational Systems Theory (MST), has combined the basic premises of the previously discussed theories. This "comprehensive theory of human functioning and development" (p.ix) combines the best of these other more focused theories into a broader, more inclusive approach to the issues of motivation. The purpose of Ford's initiative was to help us understand "how motivational processes interact with

other psychological, behavioral, and environmental factors in organizing human behavior, and shows how all other theories of motivation can be understood" (p. x).

Ford (1992) defines motivation as "the organized patterning of three psychological functions that serve to direct, energize, and regulate goal-directed activity: personal goals, emotional arousal processes, and personal agency beliefs" (p. 3). Ford posits that despite all the extensive theoretical literature on motivation, there is little literature concerning the application of these theories to the problems faced by people in our society today. In addition, he tells us that "motivation provides the psychological foundation for the development of human competence in everyday life" (p. 16). Personal goals are a means for an individual to focus energies and activities towards a desired outcome. Personal agency beliefs include both capability beliefs and context beliefs. Capability beliefs are an individual's understanding of their own ability to achieve the desired goal based on experience and knowledge. Context beliefs are the individual's understanding of whether or not their environment will support them in their goal attainment. Historically, emotions have been seen as counter productive to the cognitive decision making process. However, Ford posits that emotions can be effective motivators. Emotional reactions to situations will influence behavior, even if the individual is unaware of the emotional response. For example, by creating a sense of emotional urgency with a deadline, we can increase the behavior necessary to complete the desired task (p.145).

Ford's theories help us to gain an understanding of what motivates individuals from a personal or professional perspective. We have learned that individuals are motivated by personal needs, values, goals, and/or ideals. We also know that motivation

can be internally or externally influenced. The next step is to explore the research that applies these theories to faculty in higher education. Finally, I will explore how these theories apply to engagement in co-curricular activities, including cooperative education.

Faculty Motivation in Higher Education

Understanding what motivates faculty involvement in cooperative education must begin with an understanding of what motivates faculty in general. The higher education research on faculty addresses a much broader range of categories including faculty at work, their motivation, satisfaction, expectations, reward systems, and attitudes. While there has been significant work on what motivates faculty to do research, teach, attain funding, and publish (Blackburn & Lawrence, 1995; Fairweather, 1993; Kasten, 1984; Katz, 1973; Rossman, 1976; Tuckman, 1987), there has been little significant research done regarding faculty motivation for participation in co-curricular activities.

The research of Blackburn and Lawrence (1995) gives us a comprehensive understanding of the motivation of faculty, faculty expectations and faculty satisfaction with their work. The premise of their research is "that the characteristics of individuals and their employing institutions combine and lead to variation in faculty motivation, behavior, and productivity" (p. 15).

Blackburn and Lawrence (1995) utilized a theoretical framework which incorporated both individual properties and environmental properties. Individual properties are defined as "characteristics of faculty members – for example, sociodemographic characteristics, aptitudes, and values that can affect their access to opportunities, their capacity to meet performance expectations, and their commitment to different facets of faculty roles" (p. 15). Environmental properties are defined as

"intellectual resources, institutional norms, or physical plant – that can constrain or enhance role performance" (p. 15).

Specifically, Blackburn and Lawrence (1995) have identified four individual properties that have an impact on faculty behavior. These are sociodemographic characteristics, career characteristics, self-knowledge and social knowledge. Sociodemographic characteristics are widely recognized as age, ethnicity, and gender. Career characteristics include the process of socialization during graduate studies, the nature of the particular academic discipline, and the size, culture, and type of institution where the individual works. In addition, career characteristics may also include the current academic status and length of service of the individual. Self-knowledge is the individual's awareness and insight of themselves, how they perceive their professional status, their attitudes, and their values as they relate to responsibilities of being a faculty member. Social knowledge, on the other hand, is defined as how an individual faculty member understands how they fit into the environment. This is the faculty member's understanding as to the expectations of the group for the individual's behavior. In addition, social knowledge also includes the individual's perceptions of other members within the social and professional culture.

The second factor in understanding overall faculty behavior is considering the environmental influences on participation and motivation. According to Blackburn and Lawrence (1995), these are the "objective characteristics of the work setting that exist, separate and apart from individual faculty perceptions of it" (p.17). Environmental factors are broken down into three areas, environmental conditions, environmental response, and social contingencies. Environmental conditions include basic descriptive

factors regarding the institution such as financial stability, location, size, governmental structure, and type of institution (e.g., research, liberal arts). In addition, environmental conditions also include the nature of the student body, quality of the institution's physical resources, and an affiliation to the mission of the institution by faculty.

The concept of environmental response as used by Blackburn and Lawrence (1995) is the feedback that faculty receive from external sources. Primarily, this is recognized as tenure, but also includes student responses, professional recognition, grant awards, salary increases, bonuses, and other rewards beyond personal satisfaction. The rewards given by the university in particular are representative of the mission of the organization and therefore may lead or shape faculty behavior in order to achieve personal goals through organizational reward systems.

Finally, Blackburn and Lawrence (1995) identify social contingencies as the third of the environmental factors that influence faculty behavior. Social contingencies include events from the individual's personal life that may influence or interfere with professional activities and achievements. These can include life events, such as the birth of a child, marriage, or ill-health. These social contingencies may be voluntary or involuntary and may be short-term or long-term depending on the individual situation.

Identifying what variables affect faculty behavior was only the first step in the Blackburn and Lawrence study. The second step was to identify how these variables "influence behavior and productivity" (1995, p. 18). Individuals are motivated by a multitude of variables and not all of us are motivated to do the same things in the same way. Considering this, Blackburn and Lawrence review a variety of cognitive and non-

cognitive theories of motivation. It is the cognitive theories of motivation that form the basis for their theoretical framework.

Blackburn and Lawrence consider the following categories of cognitive motivation theories for their framework: expectancy theory, attribution theory, efficacy theory, and information processing theory. Blackburn and Lawrence integrate these theories of motivation with research on faculty performance and production to develop their theoretical framework of faculty motivation. They identify several key assumptions in their theory development which are relevant to this research project.

> First, academic institutions are achievement-laden environments in which the evaluation of faculty, students, and administrator performance is ongoing. Second, faculty use assessments of themselves and their social context to make meaningful decisions about their actions. However, not all decisions require the same level of detailed situational analysis. Third, experience over time leads individuals to modify their understanding of their environments as well as their self-images. These changes can affect the subjective incentive value of different facets of work, and consequently a faculty member's level of engagement in different activities can shift. Fourth, some types of self-referent thought and perceptions of the work environments are fairly enduring, whereas others change frequently on the basis of personal feedback and vicarious experience. (Blackburn & Lawrence, 1995, p. 26)

In attempting to understand faculty engagement in cooperative education these assumptions are significant. Blackburn and Lawrence (1995) present us with two hypotheses. One, a faculty member's activities are influenced by socio-demographic

factors. Two, educational experience, institutional type, academic discipline, and other factors of career training will have an impact on self-knowledge and may counter the socio-demographic influence. For the purpose of this study one area of interest is the environmental conditions that may have an impact on faculty involvement in co-curricular activities. This may include faculty reward structures, administrative policies and procedures, and organizational culture. The second area of interest is the personal attributes or socio-demographic factors of the individual and the role they play in the potential for engagement in cooperative education. In addition to the research of Blackburn and Lawrence there has been other significant research done in relation to faculty motivation.

Some researchers have looked at the effectiveness of faculty reward structures and whether these methods effectively demonstrate what is truly valued by the organization and discipline. This is significant as we try to understand what motivates faculty to participate in co-curricular activities. In particular, Fairweather (1993) studied "whether administrative behavior is actually a countermeasure to the research-and-scholarship model espoused by the disciplines or whether administrative action reinforces disciplinary norms" (p. 362). Fairweather asserts that much of the previous research regarding faculty reward structures has been primarily concerned with promotion and tenure, and not the behavior and activities of faculty and administration and the way that faculty are rewarded for "the way they spend their time" (p. 361). Utilizing a national database that incorporates data from a variety of institution types, a diverse faculty population, and academic disciplines Fairweather presents us with the following observations. Despite the reported value placed on teaching in both research institutions

and comprehensive and liberal arts colleges, Fairweather's results suggest, "Research and scholarship are the most valued activities" (p.374). In fact, teaching is an overlooked aspect in pay increase consideration. In addition, Fairweather's study indicates that young faculty are socialized into the "research and scholarship model" (p.374). The process of graduate school and early initiation as an assistant professor indoctrinate individuals to focus on publications, teaching graduate students, and spending less time in the classroom with undergraduate students. This leaves little time for involvement in extra or co-curricular programs such as cooperative education.

Kasten (1984) investigated the impact of teaching and service on the awarding of tenure and pay based on merit decisions at research universities. In a broader sense, Kasten was interested in "rewards and sanctions in educational institutions" (p. 500). Specifically, Kasten surveyed and interviewed faculty to determine the value they place on research, teaching and service in the process of awarding tenure. She concluded that faculty very closely consider research activities when they award tenure. Although there is some consideration of teaching and service, there is significantly less emphasis on teaching and service in the tenure evaluation process. In many instances, cooperative education involvement is seen as a service activity to the college, and therefore not of significant consideration in the promotion and tenure process.

Serow (2000) examines faculty rewards systems through the tension that exists between the "research and teaching components of the faculty role" (p. 449). Because of changes in the mindset of college students, looking for a career and not just an education; and the impact of the economy and competition on the university system, faculty are

finding themselves involved in a broader range of activities to garner funds for research activities and other departmental requirements. The impact of this change on the profession may have multiple outcomes. Specifically, Serow found that many senior faculty chose to dedicate their primary purpose to teaching. Others have chosen to be more entrepreneurial or to work for the university and industry to enhance their research activities. We do not yet know what the impact of these changes in faculty attitudes and behaviors will have on the professoriate or the university. Will this shift in faculty attitudes and behaviors mean that more faculty will become involved in co-curricular activities like service learning, major-related student groups, cooperative education activities, or study abroad?

Boyer (1990, 1996) tells us that we cannot make changes in the university without having faculty actively engaged in the process, which includes changes in campus life or the curriculum. He indicates that we continue to expand the diversity of the student population, the programs offered, and the missions in higher education, but continue to reward faculty on primarily research and publication activity. Boyer goes on to state that we have limited criteria on how we even evaluate teaching, and in many cases, no criteria for evaluating service. Boyer does not specifically address co-curricular activities (advising, service learning, or experiential education) which may indicate there are even fewer measures for these activities of faculty members. At a minimum they are grouped with teaching responsibilities or service activities. Boyer identified four areas (domains) of scholarship which should be addressed when evaluating faculty: discovery, integration, application, and teaching. He felt that the emphasis on research in many institutions

prevented faculty from being evaluated on all of the activities related to being a faculty member. This trend in assessment criteria devalues the other activities of faculty.

In 1997, Glassick, Huber, and Maeroff attempted to bring some cohesiveness to the process of evaluating Boyer's four domains. They argue that integration, application, and teaching, can be evaluated on the same criteria as those which are used for discovery. They theorized that the faculty member should be evaluated on the following criteria "(1) stated important and achievable goals, (2) demonstrated adequate knowledge of relevant literature and skills, (3) applied appropriate methods effectively, (4) achieved goals that add to knowledge in the field, (5) presented results clearly and with integrity, and (6) critically reflected on the value of the work" for discovery, integration, application, and teaching. However, Braxton, Luckey, and Helland (2002) reported that in a survey of approximately 1500 faculty across various types of institutions, the faculty report that research/ discovery is still more highly regarded in the evaluation process and more emphasis is put on these activities.

Colbeck and Wharton-Michael (2006) examine Boyer's four domains in relation to public scholarship. They propose that faculty actually integrate the four domains regularly in their work. Colbeck's (1998, 2006) research indicates that a significant number of faculty report accomplishing research and teaching tasks concurrently. Colbeck and Wharton-Michael cite Scott (2003) who says that as members of a professional bureaucracy, faculty are complex individuals who have the ability to problem solve, be flexible, and draw on various elements of their work to fulfill their responsibilities. Faculty can draw on their teaching for research ideas and their research activities for providing clearer dissemination of theory for the classroom.

Demands on Faculty in the Workplace

Any study regarding higher education faculty must acknowledge the nature of the work setting and the demands placed on faculty. Several recent publications have addressed the changing academic environment and the demands that those changes are placing on faculty time (Gappa, Austin, & Trice, 2007; Peterson & Dill, 1997; Schuster & Finklestein, 2006). Peterson and Dill (1997) suggest that the changing nature of post-secondary education will be characterized by more external relations with government, industries and communities. These changes will influence all connected with academic institutions, including faculty, their approach to their discipline and their role within their institution.

Gappa, Austin and Trice (2007) remind us that "…it is the work of the faculty that is essential to achieving the excellence that colleges and universities envision" (p. 4). They state that the activities performed by faculty, "…teaching, research, creative endeavors, and academic decision making…"(p. 4), keep institutions moving forward. As part of a professional bureaucracy, the role of faculty is indeed that of managing and directing the organization. But for a faculty member it is the tasks of research and teaching that are the expected focus of their energies and professional growth. However research (Baldwin, 1996; Becher, 1996; Reynolds, 1996) indicates that newer faculty are more likely to place a higher value on their personal life and their activities outside of their professional roles than their older colleagues. Specifically, Schuster and Finkelstein (2006) assert that higher education has always been in a state of transition, but that "American higher education and the academic profession that serve it are on the edge of an unprecedented restructuring…" (p. 3).

Although there may be some variance in what that means by the type of institution, the discipline of the faculty member, and the career stage of the individual, most of us involved in higher education agree that faculty work in the last 50 years has been centered on teaching, research, and service. Schuster and Finkelstein (2006) tell us that across all types of institutions and disciplines, faculty work, especially the demands of research and teaching have increased dramatically in the last two decades. This is especially true in research universities, the focus of this study. Does this increase in faculty workloads have an impact on faculty engagement in cooperative education?

Summary of Motivation and Implications for Study

Having reviewed the theories of human motivation, we understand that humans are motivated from both internal and external influences. Individuals may be motivated for the material reward one receives from the activity, the emotional lift of performing a task, or the approval of the people around us. We have also learned that for faculty, much of the external reward is through the faculty promotion and tenure program. Historically, promotion and tenure systems primarily reward the research and publication activity of faculty. In contrast, much less value is placed on the other activities of faculty for example, service learning, service to the college, administrative activities, or even teaching.

We have also learned that many engineering faculty value cooperative education. Since faculty engagement in cooperative education is not usually rewarded within the promotion and tenure process, there is the suggestion that there must be some other motivation for faculty participation in cooperative education activities. The purpose of this study is to attempt to determine which factors relate to faculty engagement in

cooperative education. Is it an internal or external motivation? What are the personal attributes or environmental conditions that provide motivation to the faculty for their engagement in cooperative education?

Conceptual Framework

In an attempt to understand faculty engagement in cooperative education I looked at characteristics of the individual and the organization. This study was guided by a conceptual framework suggested by Colbeck and Wharton-Michael (2006). Colbeck and Wharton-Michael have presented "a conceptual framework for understanding influences on faculty work and for conducting research about individual, organizational, and epistemological factors that may shape faculty members' engagement in public scholarship" (p. 17). Their model consists of four parts including the characteristics of the individual, characteristics of the organization, factors of motivation, and the outcome defined as the level of public scholarship engagement. They propose that it is both the individual characteristics of the faculty member, and the characteristics of the organization in which they work, that motivate faculty members to engage in public scholarship. Their model is demonstrated in Figure One.

Colbeck and Wharton-Michael (2006) utilize Motivational Systems Theory they relate to individual goals, their belief in their own abilities, and their understanding of the expectations of their peers, and whether or not there is a relationship with their level of engagement in Cooperative Education. Anticipating there would be considerable challenge to obtain a diverse sample from the engineering faculty ranks, those demographic characteristics were not collected in this study. The framework is demonstrated in Figure Two (p. .

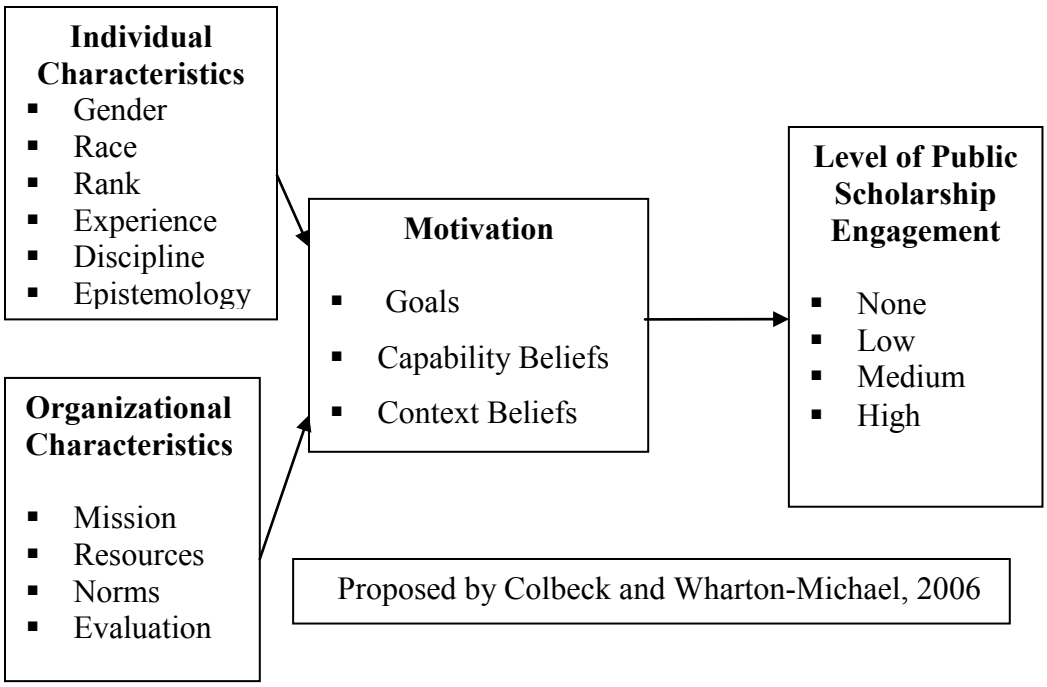

Figure 1. *Conceptual model of Influences on Faculty Engagement in Public Scholarship*

I have presented information to provide an understanding of cooperative education, the role that faculty play related to cooperative education, the psychology of motivation, faculty motivation in higher education, and the study's conceptual framework, the following chapter presents the methodology that was used to collect and analyze the data and the rationale for using these methods.

Chapter Three

Method

Introduction

The purpose of this chapter is to outline and explain the methodology that was used for this research project. The following pages will detail the research paradigm, the school selection process, the population sample, the survey instrument, and the rationale for these choices. The procedure for collecting data is described in detail, as well as the consideration of human subjects, and the processes for analyzing the data. The appendix contains copies of the survey instrument, letters of consent for participants, and the school selection criteria.

This study examined the factors that relate to faculty engagement in Cooperative Education, and how engagement is affected by personal attributes and experiences and environmental conditions. The personal attributes and experiences that were considered for their relationship to faculty engagement in cooperative education included, primary engineering discipline, tenure status, years teaching, and co-op or intern experience as an undergraduate. Specifically, I explored the environmental factors that may relate to faculty engagement in cooperative education by examining pertinent policies and practices within the college, major department, the co-op program, and the university, among the ABET accredited engineering programs studied.

This study was directed to answer the following questions:

1. What are the factors that are related to faculty engagement in cooperative education?
    a. What personal attributes and experiences relate to faculty engagement in cooperative education?

b. What environmental conditions relate to faculty engagement in cooperative education?

2. Is there a relationship between faculty members' assessment of the value of cooperative education and their level of engagement in cooperative engineering education programs?

3. Is there a relationship between faculty engagement in cooperative engineering education programs and student participations rates in their college's cooperative engineering education program?

This study was conducted from a post-positivist framework. Post-positivism allows for multiple methods of data collection, in this case a survey, document searches, and follow-up inquiry by interview(Lincoln & Guba, 2003). The post-positivist approach is based on the concept of critical realism. According to critical realism a reasonable understanding of the truth can be identified through a variety of data collection methods. The purpose of this study is to understand the relationship of environmental conditions and personal attributes and experiences on faculty engagement in cooperative education. The rationale for using a post-positivist approach rests in the understanding that each of us recognizes reality in our own context, and that although perfect objectivity can not be achieved, we can still develop a knowledge base from our observations (Creswell, 2003). By reviewing public records and documents it was my intent to identify and study faculty at institutions with specific institutional characteristics. For example, all of the institutions surveyed were research universities with very high, or high research activity as identified by the Carnegie Classification system, each had doctoral programs in the four engineering disciplines being studied: chemical, civil, electrical, and mechanical.

Further information regarding the institutional characteristics are described in greater detail on page 36. By then identifying faculty specific personal attributes, experience and environmental characteristics I hoped to develop a broader understanding of factors that are related to faculty engagement in cooperative education.

Conceptual Framework

This study was guided by a conceptual framework suggested by Colbeck and Wharton-Michael (2006). They recommend that in an effort to understand faculty engagement in public scholarship we need to look at characteristics of the individual and the organization. The theoretical basis for this framework is Ford's (1992) Motivational Systems Theory. Ford tells us that motivation for an individual is linked to personal goals, the individual's confidence in their skills to achieve the goals, the understanding that their environment will support their endeavors, and an emotional component. I proposed that by identifying the characteristics that enhance motivation to participate in cooperative education we can develop policies and practices that support faculty participation.

Figure 3 presents the conceptual framework that was adapted from the Colbeck and Wharton-Michael model (2006). The model considers both personal attributes of the individual as well as environmental factors as they relate to the motivation of the individual to participate in cooperative education.

Research Design

The research design involves surveys, interviews with co-op professionals, and faculty interviews. The first stage was a review of programs and program characteristics that was performed by the researcher using public information in order to identify the

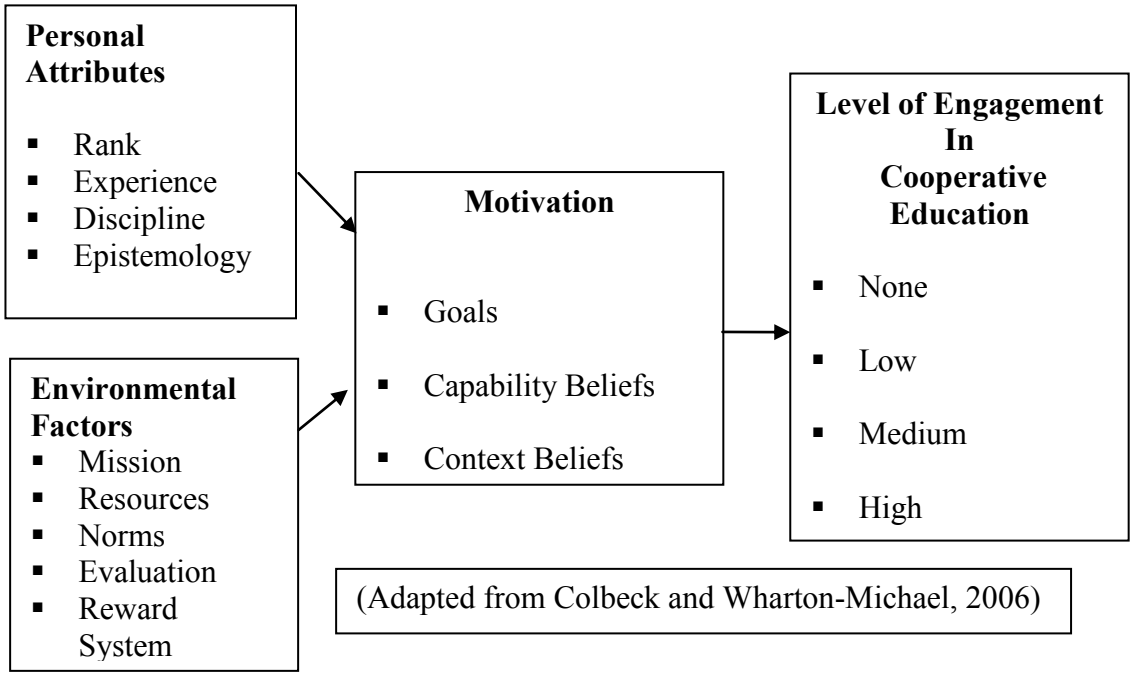

Figure 2. *Framework of Factors that Relate to Faculty Engagement in Cooperative Education*

cooperative education programs that were studied. This included a document search of national publications, university websites, national organization member lists and interviews with co-op professionals at schools that meet the initial criteria. The second stage was a web-based survey instrument completed by faculty members from the previously identified schools. The objective of surveying faculty from across engineering disciplines and from a variety of institutions was to allow for broader generalization across the cooperative education community. An effort to control confounding variables has been built into the research design, first by the pre-selection of schools and

cooperative education programs and second by limiting the survey to faculty who identify with four major engineering disciplines, mechanical, electrical, chemical and civil. A web-based survey was chosen based on a variety of factors, including ease of data collection, and the expectation that engineering faculty will have access to, familiarity with, and a level of comfort with the internet and the associated technologies.

A pilot study was conducted at an institution whose co-op program exhibited the same characteristics as those who would be in the final research. The intent of the pilot was to test the ease of instruction, ease of use of the Survey Monkey application among the research subject population, and to measure the time it took to complete the survey, evaluate the clarity of the questions, and to test the overall design of the research. A small sample of faculty were interviewed to review, test, and evaluate the interview protocol. A survey response rate of 48% was achieved for the pilot study.

During the first phase of this research, public records were reviewed and co-op professionals interviewed to identify 10 programs in the United States for this comparative study. Because there are major inconsistencies in the characteristics of the large numbers of cooperative education programs that currently exist at colleges and universities in the United States, programs in this study were chosen because they exhibited the following traits:

1. The cooperative education program is administered, monitored and evaluated by the university with a prescribed role for employers in the supervision and evaluation of students.
2. There is formal recognition by the educational institution of the work experience; this may be credit or other non-credit transcript notation.
3. An integrated work and school design structure includes multiple terms of work by the students.
4. The co-op programs studied were optional in nature. This indicates that students are not required by the college to participate in cooperative education as part of the degree program.

5. The majors included Mechanical, Electrical, Civil, and Chemical Engineering (Only Faculty from these disciplines were surveyed). These major have been chosen as they are found in most universities and statistically have the largest faculties.
6. The above majors were accredited under the new ABET 2000 criteria. ABET accreditation will provide consistency among program curricula.
7. Student participation ranged from between 20% of enrolled engineering students to 80% of enrolled engineering students. This variable was important as the researcher was exploring the link between faculty engagement and student participation rates.
8. The co-op program is unique to engineering or at least is decentralized from a university careers services office. Cooperative Education has its roots in engineering. Choosing programs that are specific to engineering will limit other variables that may influence the cooperative education programs.

One hundred fifty-seven engineering programs were identified through the following resources: The American Society of Engineering Educators Cooperative Education Division membership directory, The Cooperative Education and Internship membership directory, and the ABET website.

The second phase of the research consisted of interviews with co-op professionals following the document search in order to verify information gained from the data collection. It is important to note that co-op professionals were not a part of the faculty survey.

The third component of the study was a 33 question census survey of the faculty from each of the identified schools who align themselves with one of the above mentioned engineering disciplines. This faculty survey gathered data on four areas: demographic and background information, levels of engagement, value of cooperative education and environmental factors. Demographic information was gathered to identify the institution of employment, tenure status, engineering discipline, previous or current industry experience, and experience with cooperative education as an undergraduate.

This section allowed the researcher to identify some of the personal characteristics that may relate to engagement in cooperative education as a faculty member. The questions in the second section were designed to establish a level of engagement of the faculty member by measuring participation in activities that promote and support cooperative education. The third section of the survey gathered data on the environmental factors at the individual universities. This includes university, college and departmental support of cooperative education activities, inclusion in faculty orientation programs, and compensation practices. Finally, questions were asked to capture the value that faculty place on cooperative education.

Limitations

As with any study, there are limitations that are inherent in the design of the study. In this case, faculty surveyed were limited to four specific engineering majors at ten universities that hold specific and distinct attributes. Although tempting to apply the results of this research across other engineering disciplines or to cooperative education programs as a whole, it would be presumptuous. In addition, the low return rate of 20.48 % would also limit the generalizability of the study across a broader population. I believe this research does provide insight into the faculty who are most likely to be advocates for and engage in cooperative education activities. Although not conclusive or all encompassing we have learned some specific characteristics of faculty who are more likely to be engaged in activities that support cooperative education.

Study Population

Of the 157 identified ABET Engineering Colleges with Cooperative Engineering Education Programs; ten universities were selected to be part of this study. Engineering teaching faculty at the 10 selected universities were invited to participate in the online survey. Each of the faculty was aligned with one of these 4 engineering disciplines: Chemical Engineering, Civil Engineering, Electrical Engineering, and Mechanical Engineering. These disciplines were chosen as they are represented at almost all ABET accredited engineering programs, they have fairly large faculty populations, and are strong traditional cooperative education engineering disciplines. The institutions selected are the following: Georgia Technological University, Iowa State University, Michigan State University, Purdue University, The Pennsylvania State University, The University of Pittsburgh, University of Michigan, University of Tennessee, University of Wisconsin – Madison, University of Alabama.

Survey Instrument

The survey instrument used in this study was a modified version of a survey instrument used by Emanuel Contomanolis in his research for his dissertation requirement for a Ph.D. in Educational Leadership and Policy for the State University of New York at Buffalo. Contomanolis' survey focused on the role of engineering faculty who teach at institutions with cooperative education programs; what academic value faculty place on cooperative education and in what ways faculty integrate cooperative education learning experiences into the classroom. Additional questions were added to the original survey to establish faculty time commitments to determine if other

professional obligations may have some relation to the professors' time available to participate in cooperative education activities.

The survey was distributed via the internet using a pre-packaged survey program, Survey Monkey. Each institution was given a unique survey link, but all surveys were identical. This allowed the researcher to correlate aggregate data from the schools to the faculty responses of the particular institution, and allowed for correlation of environmental factors at a given university to the level of engagement of the faculty of that organization. Given the size of the faculties within the particular majors being surveyed, there was little risk of identifying individual faculty responses. The emails of each intended participant were input into Survey Monkey. This allowed the researcher to track who had participated so that non-respondents could receive a follow up email reminder. An original email was sent out from the researcher inviting faculty participation. Three follow up emails were sent over the course of a six-week period, with the last email coming from the Cooperative Education Program Director from the individual universities to their faculty.

An overall response rate of 20.48% was achieved with a total of 267 respondents. Although this return rate is low, the overall numbers and the distribution of the respondents across institutions, majors, tenure status, previous experiential education experience, and previous post-graduation industry-related experience, enable reasonable statistical analysis. The low response rate may limit the generalizability of this study to a greater population. However, the distribution is a reasonable representation of the engineering faculty in the United States as reported by the American Society of Engineering Education (General Information on Cooperative Education, 2009). The

percentage of survey respondents was higher than the national average in Chemical and Civil Engineering, 17.6% and 27% respectively. Mechanical Engineering faculty were 25.8% of the respondents, which is below the 29% of the national average. Nevertheless, this percentage still allows for a reasonable statistical inference with an N= 69. The survey response rate from Electrical Engineering Faculty was at 29.6% which is also below the national average of 39.4%. However, the national data included computer engineering faculty in their report, and this study was designed not to include faculty who identified strictly as computer engineering as their designated discipline. In addition the Electrical Engineering had a reasonable amount of respondents for statistical analysis with an N = 79. This is reported in Table 5, page 56..

A meta-analysis of response rates by Cook, Heath, and Thompson (2000) address the issue of low response rate specifically with internet survey methods. They posit that the representative nature of the survey respondents is much more important that the response rate obtained. They cite, Krosnick (1999) who states, "But it is not necessarily true that representativeness increases monotonically with increasing response rate…recent research has shown that surveys with very low response rates can be more accurate than surveys with much higher response rates" (p. 821). Previous research (Baruch 1999; Baruch & Holtom, 2008; Dillman 2000) on paper survey response rates suggests response rates average above 50%, yet Kerlinger (1986) indicates that less than a 40% return is probably more likely, since many with lower rates are not submitted for publication, or may be submitted but not accepted for publication. Cook, Heath, and Thompson's meta-analysis indicate that the mean response rate for 56 surveys was 34.6%

(2000). Kittleson (1997) indicates that one can expect between a 25 and 30% response rate from on online survey.

Extensive measures were taken to increase the return rate in the preparation of the survey, as well as the methodology of the distribution itself as recommended by the online survey providers. For example, a pilot study was performed with engineering faculty from an ABET accredited engineering school with a return rate of 48%. The emails were personalized with each recipient's name, and included a professional return email address, and specific information on how to contact the researcher, the intent of the survey, how the data will be used, and the appropriate information regarding respondent anonymity (Response Rates, 2008).

Another factor that may have contributed to the low response rate is best demonstrated in a response email from a faculty member. He stated, "I am not involved with cooperative education. There are persons on campus in our cooperative education office who are responsible. A large percentage of our ME Students are on the co-op program. It is a definite benefit to have these students in my class." All indications are this faculty member is engaged in cooperative education, but did not clearly understand the intent of the research. This same concern was expressed by five faculty members who took the time to respond to the request and explain why they weren't completing the survey. These faculty members received an email response reiterating the purpose of the research and ultimately 3 completed the survey. It may be that others had the same concern and did not email me and therefore did not receive the same clarification.

Interviews

A purposeful sample of survey respondents was chosen for a follow up interview. Eight faculty members were chosen to interview, four each from two universities. These two universities were identified specifically because the schools had distinctly different student cooperative education participation rates; one had a 75% student participation rate, while the other had a 35% student participation rate. Upon completion of the survey each faculty member was automatically assigned a participant number. The survey responses could be reviewed and then faculty could be chosen based on their engagement score for a follow up interview. The faculty represented a cross section of high engagement, low engagement scores from each of the two universities identified above. These interviews were done in person or via the telephone. The questions attempted to elicit supplemental information to accompany the statistical analysis of the data generated by the survey. These interviews were recorded, transcribed, and coded by themes. The interview protocol is located in Appendix D. Careful consideration was given during the analysis process to remove any personal characteristics that could identify individual faculty members.

Measures of Engagement, Environment, and Value

The study attempts to determine the factors, including both personal and professional characteristics and environmental factors, which relate to faculty engagement in cooperative education. This was done by establishing levels of cooperative education engagement of the faculty member, assessing the institutional support of engagement activities and cooperative education in general, and determining the value faculty place on cooperative education.

The survey contained ten questions relating to faculty engagement in cooperative education. These questions used a six-point Likert scale which ranged from, Very frequently to Never, with which to respond. The questions explored the faculty members' participation in cooperative education activities such as mentoring or supervising co-op students, meeting with employers regarding cooperative education matters, and faculties' inclusion of cooperative education information in their coursework. These questions can be found in the survey instrument in Appendix B, and are identified as questions 1 – 10.

The seven questions used to measure the faculty member's understanding of the institution's commitment to cooperative education used a five-point Likert scale with the response range from Strongly agree to Strongly disagree. These questions asked faculty to report on their actions regarding cooperative education at the institution, college and department levels, as well as the faculties' awareness of student cooperative education participation and activities. These questions can be found in the survey, located in Appendix B and are identified as questions 11-18.

Four statements were developed to measure what value the faculty member places on cooperative education. These statements used a five-point Likert scale that ranged from strongly agree to strongly disagree. The statements asked whether students benefited from cooperative education, and if cooperative education enhanced the students' learning. These questions can be found in the survey, located in Appendix B and are identified as questions 19-22.

The study also explored the relationship of certain personal and professional characteristics of the faculty members and their relationship to engagement in

cooperative education and the value that the particular faculty member places on cooperative education. In addition, the research attempted to understand if faculty obligations affected the level of engagement in cooperative education activities. Therefore the survey respondents were asked to provide the following personal and professional information regarding their current academic status, years in higher education, their major engineering discipline, their teaching load as well as professional activities, including publications, grants received, service obligations, and professional presentations. These questions can be found in Appendix B and are identified as questions 23-33.

Faculty Follow-up Interviews

Two schools were chosen from the ten surveyed based on the rate of student participation in cooperative education. Those chosen demonstrated the highest and lowest student cooperative education participation rates based on public information provided to the American Society of Engineering Education. Eight survey respondents, four from each of these two institutions were selected to be interviewed based on their faculty rank, engineering discipline, their cooperative education engagement score and cooperative education value score that were determined from their survey responses. These scores were calculated by adding up the numerical value associated each of the survey responses with the Likert scale answer and then computing an average. The engagement "score" and value "score" are these averaged results for the individual faculty member. For example, if a faculty member indicated that they strongly agreed with **all** the survey questions relating to engagement they would have an engagement score of 5.

The information gained from these interviews was examined for additional insight into the faculty participants' perspective on faculty engagement in cooperative education. These questions focused on the faculty member's level of engagement in cooperative education, their perception of the value of cooperative education, the nature of the environment within the institution, the college, and the department regarding cooperative education. The questions asked during the interviews can be found in Appendix D.

I will report the data from the eight faculty interviews which were completed after the results of the survey were analyzed. The eight faculty represent two institutions from opposite ends of the spectrum regarding the student participation rate in cooperative education. The first institution, the University of XYZ, has a high cooperative education participation rate among students at 78%. The second institution, ABC State University, has a low cooperative education participation rate among students at 29 %.

The individual faculty were chosen to represent both a high and a low level of engagement as indicated by the initial survey. A total of four faculty from each institution were chosen, two representing a high level of engagement and two representing a low level of engagement as indicated by their survey results. Faculty were also chosen from across academic disciplines to decrease the chances of results being influenced by discipline related factors. Each school had a faculty member who aligned themselves with one of each of the four disciplines studied, Chemical, Civil, Electrical, and Mechanical engineering. Faculty respondents also varied across academic rank from a tenure track assistant professor to full professor.

The interviews were conducted in person or via telephone and consisted of a series of 10 questions. Occasionally, a follow up or clarification question was asked during the course of the interviews. The interview questions were asked of each candidate and in the same order. The interview questions were designed to provide anecdotal and personal insight into the four focus areas of the online survey. This includes the level of engagement of faculty in cooperative education, the value that faculty place on the cooperative education experience for students, the support for cooperative education among the departments, colleges, and institutions in which the faculty work, and the level of activity that faculty are currently involved in that may or may not relate to their participation rate in activities that support cooperative education initiatives. These can be identified as Engagement, Value, Environment and Activity Level.

Data Analysis

Statistical analysis of the survey data was performed using SPSS 15.0 Statistical software. First, I used descriptive statistics to summarize the demographics of the faculty survey respondents; this included demographic, personal, and professional characteristics. The descriptive statistics also provided the mean, median and standard deviations of each of the calculated engagement, environment, and value scores. Inferential statistics were used to identify patterns, correlations, and relationships among individual characteristics, level of activity within the university, environmental factors, the value faculty place on cooperative education, and faculty engagement in cooperative education. Initially, a t-test was performed that demonstrated a normal distribution of the dependent variable.

I will review each of the research questions and will discuss the statistical tools that were used to analyze the survey data.

RQ 1a: What are the factors that are related to faculty engagement in cooperative education?

a. What personal attributes and experiences relate to faculty engagement in cooperative education?

Question 1 a. was evaluated with analysis of variance (ANOVA) with the dependent variable being the calculated engagement score indicating the level of faculty engagement in cooperative education and the independent variable being the individual personal attributes and experiences of the responding faculty, this is demonstrated in Table One. ANOVA is used to evaluate mean difference between two or more populations where the dependent variable is continuous and the independent variable is categorical (Alreck & Settle, 2004; Gravetter & Wallnau, 2000).

Table 1
Analysis of Variance between Engagement and Personal Attributes

Variable	Definition
Dependent	
Engagement	Engagement is defined as faculty taking a positive, active role in cooperative education
Independent	
Personal Attributes	Personal attributes include demographic, professional, and personal characteristics of the individual faculty member. This includes tenure status, engineering discipline, gender, previous co-op experience, and current interactions with industry.

RQ 1b: *What environmental conditions relate to faculty engagement in cooperative education?*

Pearson Correlation was used for question 1.b. Pearson Correlation measures the degree and direction of a linear relationship between two continuous variables, engagement scores and environmental factors (Gravetter & Wallnau, 2000). The results are represented in Table 18 and includes the correlation of the engagement score to each of the individual environmental factors that were addressed in the survey.

RQ 2: *Is there a relationship between faculty members' assessment of the value of cooperative education and their level of engagement in cooperative engineering education programs?*

Pearson Correlation and Regression analysis was also used for Question 2. Correlation measures the degree and direction of a linear relationship between two continuous variables, engagement scores and value scores (Gravetter & Wallnau, 2000). The results are represented in Table 20 and includes the correlation of the individual value questions and the engagement score of the individual faculty members. Regression analysis identifies if there exists any predictive relationship between the independent and dependent variables (Gravetter & Wallnau, 2000). The results are reported in Table 21 for the individual value factors and the engagement score of the individual faculty members.

RQ 3: *Is there a relationship between faculty engagement in Cooperative Engineering Education programs and student participation rates in their college's cooperative engineering education program?*

Pearson Correlation was used to determine if there is a relationship between the two continuous variables of faculty engagement in Cooperative Engineering Education programs and student participation rates in their college's cooperative engineering education program. This analysis is demonstrated in Table 22.

Future Chapters

The next chapter describes the information collected in classifying and identifying the institutions to be studied, the data collected from the online survey, and the responses gathered from the personal interviews with selected faculty survey respondents. Chapter Five ties the study back to the literature from chapter two, including the conceptual framework. In addition, Chapter Five presents limitations of the study, implications for higher education policy and practice, and ideas for future research.

Chapter 4

Research Findings

Introduction

This chapter presents the findings of the research study. This includes both descriptive statistics on the survey respondents and a statistical analysis of their survey responses as they relate to the research questions. In addition, responses from the one-on-one interviews held with selected faculty are included as they related to the statistical analysis. The study's research questions are:

1. What are the factors that are related to faculty engagement in cooperative education?
    a. What personal attributes and experiences relate to faculty engagement in cooperative education?
    b. What environmental conditions relate to faculty engagement in cooperative education?
2. Is there a relationship between faculty members' assessment of the value of cooperative education and their level of engagement in cooperative engineering education programs?
3. Is there a relationship between faculty engagement in Cooperative Engineering Education programs and student participation rates in their college's cooperative engineering education program?

I will report the results on faculty engagement in cooperative education and how the level of participation varies with the value faculty place on cooperative education, and

with the institution's environment as it relates to cooperative education. In addition to the quantitative data from the survey, a select pool of faculty, based on their survey responses, their academic rank, and their engineering discipline, were invited to interview with the researcher. Relevant information gained from these interviews is included where appropriate to enrich and clarify the survey findings.

Results of Statistical Analysis

Selection and Classification of Schools

This section explains the demographics of the 10 institutions that were selected to have their faculty surveyed for this project. Each institution was given an identification number from one to ten and is identified throughout the results and summary section by that number. Each institution is an ABET (Accreditation Board of Engineering and Technology) accredited engineering program, with a cooperative education program that was administered by the College of Engineering. Each institution offered the four disciplines of Chemical, Civil, Electrical and Mechanical Engineering. The undergraduate enrollment for the Colleges of Engineering in this study ranged from 2,116 to just over 11,000. The percentage of students who participate in cooperative education ranged from a low of 15% to a high of 78%.

Each school's cooperative education program was evaluated based on the school's faculty and staff participation in the cooperative education community outside of their institution. This includes participation in state, regional, national, and international cooperative education conferences and the number of journal articles published and grants awarded relating to cooperative education research or cooperative education activities. The schools' participation rates were categorized as high, medium, or low.

High indicates an extensive presence and participation in the cooperative education community; medium indicates some participation in the cooperative education community; and low indicates little or no presence in cooperative education activities at the state, regional, national or international cooperative education community. I looked at the level of visibility of engineering faculty in three main areas; published research in cooperative education both in the Journal of Cooperative Education and discipline related journals, presence at and participation in state, national and international cooperative education conferences, including, Cooperative Education and Internship Association (CEIA) National Conference, Conference for Industry and Education (CIEC), and the World Association for Cooperative Education (WACE) Conference, and finally participation in individual state or regional cooperative education activities. This information was gathered during a document search and from interviews with the cooperative education professionals at each of the institutions studied. Table 2 presents the data on enrollment, student participation in cooperative education, and the categorization for each of the institutions participating in this research project.

Demographic Description of Faculty Respondents

This section describes the demographic, personal and professional characteristics of the faculty who responded to the survey instrument. Of the 157 identified ABET engineering colleges with cooperative engineering education programs; ten universities were selected to be part of this study. Engineering teaching faculty at the 10 selected universities were invited to participate in the online survey, each of the faculty was aligned with one of four disciplines: Chemical Engineering, Civil Engineering, Electrical

Engineering, and Mechanical Engineering. These disciplines were chosen as they are represented at almost all ABET accredited engineering programs; they have fairly large

Table 2
Institution Characteristics and Categorization

Characteristics	Undergraduate Enrollment in Engineering	% of Graduates who Co-op	Categorization of the School's Participation in Cooperative Education Activities at the State, Regional, and National Level
Institution #			
1	6891	42	low
2	2584	47	med
3	2504	78	high
4	17610	34	low
5	2116	51	high
6	11058	65	high
7	5292	45	med
8	7556	15	low
9	4593	45	med
10	3250	29	low

faculty populations; and they are strong traditional cooperative education engineering disciplines. The institutions selected are: Georgia Technological University, Iowa State University, Michigan State University, Purdue University, Pennsylvania State University, University of Pittsburgh, University of Michigan, University of Tennessee, University of Wisconsin – Madison, and the University of Alabama.

Demographic data regarding faculty respondents' tenure status, academic rank, engineering discipline, work load, and previous engineering experience were gathered via the survey to ensure the sample adequately represented all four engineering disciplines, and to explore any relationship to cooperative education engagement. The current tenure status of the faculty respondents is summarized in Table Three. Just over 71% of the

survey respondents are tenured, 15% are pre-tenure, and fewer than 7% are in non-tenure track positions.

Table 3
Tenure Track Status of Survey Respondents

	Frequency	Percentage
Tenured	190	71.2
Tenure Track	40	15.0
Adjunct/Non-tenure track	18	6.7
Other	8	3.0
No response	11	4.1
Total	267	100.0

The faculty ranks of the survey respondents are summarized in Table Four. Almost 50% of the respondents have reached the status of full professor, and only 16.1% are assistant professors.

Table 4
Academic Rank of Survey Participants

	Frequency	Percent
Prof	126	47.2
Assoc Prof	77	28.8
Asst Prof	43	16.1
Instructor	3	1.1
Lecturer	7	2.6
Other	2	.7
no response	9	3.4
Total	267	100.0

Table Five summarizes the engineering discipline distribution of the faculty respondents and the national distribution of faculty within Chemical, Civil, Electrical and Mechanical Engineering. This distribution is a reasonable representation of the

engineering faculty in the United States as reported by the American Society of Engineering Educators (General Information on Cooperative Education, 2009). As the table demonstrates the percentage of survey respondents was higher than the national average in Chemical (17.6%) and Civil (27.0%) Engineering, Mechanical Engineering (25.8%) is slightly below the 29% of the national average, but still allows for a reasonable statistical inference with an N= 69. The survey response rate from Electrical Engineering Faculty (29.6%) in the sample is also below the national average of 39.4% However, the national data included computer engineering faculty in the electrical engineering data. Since this research attempted to exclude faculty who identified strictly as computer engineering as their designated discipline, we can reasonably assume that this sample size is reflective of the national average. In addition, Electrical Engineering had a sufficient number of respondents for statistical analysis with an N = 79.

Table 5

Faculty Respondents by Engineering Discipline/Major

Major	Frequency	% of Survey respondents	National Frequency	% of National Faculty
Chemical	47	17.6	1814	12.5
Civil	72	27.0	2747	19.1
Electrical	79	29.6	5694*	39.4*
Mechanical	69	25.8	4196	29
Total	267	100	14451	100

*Includes Computer Engineering Faculty, not included in the faculty invited to participate in the survey.

Table Six describes the extent of higher education teaching experience of the respondents. Almost 40% of the respondents have been teaching in higher education for 21 or more years, while 33% have worked in higher education for less than 10 years. This sample provides a cross section of faculty with a variety of levels of years of teaching in

higher education. This allows us to evaluate if length of service in higher education has a relationship to level of engagement in cooperative education.

Table 6

Number of years survey participants have worked in Higher Education

Years Teaching	Frequency	Percent
0-5	37	13.9
6-10	51	19.1
11-15	28	10.5
16-20	33	12.4
21 or more	106	39.7
No response	12	4.5
Total	267	100.0

Faculty Characteristics Related to Time

The teaching load of faculty was considered to be a potential inhibitor to cooperative education engagement. This study looked at the graduate and undergraduate teaching loads of the faculty completing the survey. The findings related to teaching load are represented in Table Seven. Fifty-five percent of the faculty respondents indicated that they teach an average of 2-3 classes (graduate and undergraduate) per academic year. From a graduate course perspective, the survey indicated that 53% of faculty teach fewer than two graduate courses during the academic year; 26% teach two or three graduate courses during the academic year, and over 5% teach four or more graduate courses per year. From an undergraduate perspective, over 53% of the faculty respondents teach one or two undergraduate courses per academic year, while almost 19% teach three or four undergraduate courses. Only 11% teach five or more undergraduate classes during the

academic year. These data tell us that a substantial percentage of faculty respondents interact on a regular basis with undergraduate students indicating that opportunity would exist for faculty to discuss cooperative education opportunities and experiences with undergraduate students.

Table 7
Average number of graduate and undergraduate courses that the individual survey respondents teach each academic year

Number of Courses	*Grad Courses*			
Undergrad Courses				
	Frequency	Percent	Frequency	Percent
0	35	13.1	8	3
1	106	39.7	71	26.6
2	33	12.4	72	27.0
3	36	13.5	35	13.1
4	7	2.6	15	5.6
5 or more	12	4.5	31	11.6
no response	38	14.2	35	13.1
TOTALS	267	100	267	100

When evaluating the time constraints of faculty members, it is also important to look at hours of service to the department, college, and university. Table Eight provides us with a summary of the number of faculty service hours to the institution per week. Almost 34% percent of the faculty respondents report more than nine hours of service weekly for the institution, 36% report from 5 – 8 hours of service weekly, while nearly 26% provide less than four hours per week in service to their institution. It is important to note that 70% of faculty provide a minimum of five hours of service per week to their college or university.

Does this service participation have an impact on faculty engagement in cooperative education? According to the faculty who were interviewed, they did not feel

that time was a factor in their level of engagement in cooperative education. This is reflected in the interview comments to the question, "Can you identify barriers to faculty that would inhibit their participation in cooperative education activities?" All ten of the faculty members interviewed indicated that time commitments do not inhibit their involvement in cooperative education. Most indicated that so little time was involved in the co-op activities that it would not really prevent them from participating in activities related to cooperative education.

Table 8
Total hours of department, college, and university service provided each week

Hours	Frequency	Percent
0-2	23	8.6
3-4	46	17.2
5-6	57	21.3
7-8	40	15.0
9-10	25	9.4
More than 10	65	24.3
No response	11	4.1
Total	267	100.0

Table Nine provides us with information related to the faculty respondents' responses to a request for information pertaining to their professional activities, including publications, grants received, and professional presentations. We can see from Tables Seven through Nine that faculty have many responsibilities and professional commitments that may limit their participation in activities that relate to cooperative education, especially activities such as visiting employer sites, meeting with employers, or evaluating student work experiences.

Table 9

Faculty Activities and Professional Obligations over the Past Two Years

	Patents	Presentations	Books	Book Reviews	Articles Non-Refereed Journals	Articles Refereed Journals
Mean	1.68	5.76	1.27	1.91	2.51	5.13
Std. Deviation	1.34	2.39	.921	1.22	2.76	2.38

Table Ten reports the summary results from the regression analysis regarding productivity variables and their ability to predict engagement score. Two productivity variables that are significant predictors of engagement score are 1) faculty who have completed the most patents, and 2) faculty who teach more graduate classes are the most likely to have a high cooperative education engagement score. These findings are significant at the 0.05 level. It is important to note that those faculty who teach more undergraduate classes are marginally predictive of a negative relationship with a p value of .053. This is significant; as this is the population of faculty who cooperative education professionals would want engaged in the cooperative education process. It is these faculty who by the nature of their work assignments are more likely to interact with undergraduate students and therefore have the most influence on the undergraduate population.

Faculty Industry Experiences

Faculty were also asked to report their non-academic engineering-related work or consulting experience after they received their Ph.D. These data are presented in Table Eleven. Almost 50% of the faculty surveyed have worked as a consultant or in a practicing engineering capacity for over 20 years. This indicates that many of the faculty

Table 10
Summary of regression analysis for productivity variables predicting engagement score

Variable	B	SE B	Ĩ	P value
On average how many patents have you completed in the past two years?	.168	.086	.185*	.004
Presentations?	-.002	.040	-.004	.962
Books?	.094	.069	-.110	.173
Book Reviews?	-.168	.231	-.057	-.726
Articles – Non-Referred Journals?	-.057	.049	-.129	.239
Articles – Referred Journals?	.012	.080	.012	.885
On average how many undergraduate courses you teach per academic year?	-.218	.068	-.287	.053
On average how many graduate courses you teach per academic year?	.168	.086	.185*	.000
On average, how many total hours of service to your department, college, and university do you provide each week?	-.079	.050	-.121	.117

R^2 = 1.72, *p < .05, B = Unstandardized Coefficients Beta, SE B, = Standard Error of unstandarized coefficients, ĨĨStandardized Coefficients.

in the sample have engineering work experience outside of higher education. This is important to note as I inquire as to whether or not industry-related experience has an

impact on how engineering faculty value cooperative education or on their level of engagement in cooperative education.

Table 11
Number of years survey participants worked in an engineering capacity outside of higher education?

Years of Engineering work	Frequency	Percent
0-5	79	29.6
6-10	20	7.5
11-15	12	4.5
16-20	10	3.7
20 or more	130	48.7
no response	16	6.0
Total	267	100.0

During the interview process, faculty members indicated that working in industry gave them an experience they did not get in the engineering classroom. One specifically talked about how she learned team work while working in industry. She states, "The first thing to teach the students in industry is to be a team member. I learned this while working in industry. If you go the extra mile they will be impressed and it will enhance your career. From day one, decide what your goals are, and what your tasks are, and don't wait until the last day of your assignment to try and achieve your goals. Do what you need to do now to achieve them."

Another shares the value he placed on co-op students as a method of identifying talent early. He stated, "While I was in industry I looked to universities to provide co-ops and interns as a method of work force development. Students who go through the program and keep the same company on all assignments are great. This way

there is ample opportunity for evaluating talent and for the student to determine if this meets their career goals."

Faculty were asked if they participated in any form of experiential education while an undergraduate student. It is interesting to note that nearly 50% participated in some kind of experiential education as undergraduates. Table Twelve provides us with information on the type of experiential education experience the faculty participated in while undergraduate students. This includes cooperative education, internships, undergraduate research, and volunteer experiences. It is revealing that only 11% participated in cooperative education, while 30% participated in an internship, and 28.8%, participated in an undergraduate research opportunity.

One faculty member who did not participate in any form of experiential education as an undergraduate student discussed in the interview process his experience of the positive effect that he sees co-op can have on students. He states, "…I did not do a co-op program and first worked between my BS and MS as a summer intern. A great experience that really helped me to understand my focus. I realized if you started earlier in your academic career how even more helpful that would be."

An analysis of variance shows that there is not a significant difference across types of experiential education (p value = .955). This indicates that whether or not a faculty member participated in either cooperative education experience, an internship, or an undergraduate research position has no relationship to their level of engagement in cooperative education as a faculty member.

Table 12
Engineering Faculty Respondents undergraduate Experiential Education Experience by Type

Type of Experience	Frequency	Percent
Co-op	31	11.6
Intern	80	30.0
Research	77	28.8
Volunteer	3	1.1
Other	35	13.1
No response	41	15.4
Total	267	100.0

Analysis of Variance of types of experiential education resulted in p = .955, not statistically significant.

Data Related to Research Questions

The following section reports the results as they relate to the specific research questions. The questions are:

1. What are the factors that are related to faculty engagement in cooperative education?

a. What personal attributes and experiences relate to faculty engagement in cooperative education?

b. What environmental conditions relate to faculty engagement in cooperative education?

2. Is there a relationship between faculty members' assessment of the value of cooperative education and their level of engagement in cooperative engineering education programs?

3. Is there a relationship between faculty engagement in Cooperative Engineering Education programs and student participation rates in their college's cooperative engineering education program?

The statistical analysis relevant to each of the research questions is reported in the following pages.

Engagement, Environment, and Value Scores

Besides demographic data, faculty were asked to provide information related to their engagement in cooperative education. Survey questions concerned their level of engagement in cooperative education, their work environment as it relates to support of cooperative education, and the value the individual faculty place on cooperative education. For statistical purposes each faculty member's survey responses to the questions regarding (1)engagement in cooperative education, (2) the nature of the environment at their institution regarding cooperative education, and (3) the value the faculty member attributes to cooperative education were calculated to create a separate score for each of the three topics; engagement, environment, and value. Each of these scores is explained in the following paragraphs and the mean group scores are reported in Table Thirteen.

Engagement Score

The responses from the ten engagement questions were averaged to create an engagement score ranging from 1 – 6 for each survey respondent. A score of six indicates the highest level of engagement and one indicates the lowest level of engagement. The mean engagement score was 2.75, with a standard deviation of .99 indicating a relatively low overall rate of engagement among the faculty respondents.

Environment Score

The responses from the seven questions on environment were averaged to create an environment support score for each survey respondent ranging from 1 – 5. One indicated a perceived low level of support for cooperative education activities in the academic environment, while five indicated a perceived high level of support for cooperative education activities in the academic environment. The mean environment score was 3.00, with a standard deviation of .78, indicating that on average the faculty felt that support for cooperative education was neutral.

Value Score

The responses from the four value questions were averaged to create a value score for each survey respondent with a range from 1 – 5. One indicated a low value placed on cooperative education while five indicated a high value placed on cooperative education. The mean value score was 3.95, with a standard deviation of .64, indicating that, on average, faculty do agree that there is value in cooperative education.

According to the information in Table Thirteen we see that faculty reported a moderately low level of engagement in cooperative education, indicating that they do not participate in many activities that support cooperative education within their college. They report a neutral environment for cooperative education. This indicates that they neither agree nor disagree that their institution's environment supports cooperative education. In contrast, the faculty express a moderately high value of cooperative education. The majority of faculty indicated that they agree or strongly agree that cooperative education has value with regard to student learning.

Table 13

Descriptive Statistics of Engagement, Environment, and Value Scores

Statistic	*Engagement Scores*	*Environmental Scores*	*Value Scores*
Mean	2.75	3.00	3.95
Standard Deviation	0.99	0.78	0.6

Using Pearson Correlation I related the faculty engagement score to the co-op value score and the environmental score, to identify any relationship of these scores to faculty engagement. The results are reported in Table Fourteen. There is a significant correlation at the 0.01 level between the engagement score and the environment score, .477; between the engagement score and the value score, .464; and the environment score and the value score, .339. These data tell us that there is a strong positive relationship among faculty level of engagement, the nature of the work environment, and the value that faculty place on cooperative education. In other words, faculty who are engaged in cooperative education also believe in the value of cooperative education. Faculty who are engaged in cooperative education also perceive an environment that supports cooperative education. In addition, there is also a positive correlation between the work environment and the extent to which faculty value cooperative education. These relationships are further explored in the following paragraphs as I report on the statistical analysis as it relates to the specific research questions.

Table 14

Correlations of Value, Engagement, and Environment Scores

	Engagement Score	Environment Score	Value Score
Engagement Score	1	.477**	.464**
Environment Score	.477**	1	.339**
Value Score	.464**	.339**	1

**Correlation is significant at the 0.01 level (2 tailed).

Faculty Engagement and Personal and Professional Attributes

RQ 1. What are the factors that are related to faculty engagement in cooperative education?

a. What personal attributes and experiences relate to faculty engagement in cooperative education?

The faculty cooperative education engagement score was compared to data on specific personal and professional attributes and experiences in order to answer research question 1a. The results are reported in Table Fifteen. I was attempting to determine if there was one or more specific personal attributes or experiences that relate to the cooperative education engagement activities of faculty. Analysis of Variance (ANOVA) was used to determine the relationship between an individual professor's engagement score, the dependent variable, and the independent variables of major/engineering discipline, academic rank, current status as a faculty member, years of teaching, work outside of academia, and years of consulting. The analysis of variance between major discipline and engagement score indicates there is no statistically significant difference in engagement score as related to major discipline ($F=0.854$, p value = .466). The analysis of variance measuring the relationship between academic rank (Full Professor, Associate Professor, Assistant Professor, Adjunct/Non-tenure position, or Other) and engagement score indicates that there is no statistically significant difference in engagement score as related to academic rank ($F=1.616$, p value = 0.157). The most interesting result of the ANOVA is that there is not a significant relationship between engagement score and the faculty respondents undergraduate experience in cooperative education ($F = 1.614$, p

value = .205) In contrast, the analysis of variance also indicates that there is a relationship between engagement score as it relates to current status as a faculty member (Tenured, Tenure Track, Adjunct/Non-tenure Track, Other) (F=5.672, p value = .001), and years of teaching (F=3.849, p value = .005) The analysis of variance also shows a relationship between engagement score and having worked outside of academia (F=3.723, p value = .006) and years of consulting service (F=2.423, p value=0.049). This tells us that faculty who have had some engineering work experience, whether it be prior to their work in academia or as a consultant while a professor, have a higher engagement score than those faculty members who have never worked in a traditional engineering capacity.

Table 15
ANOVA of Dependent Variable (Engagement Score) and Independent Variables (Personal Attributes)

Independent Variable	F =	P Value
Major/Engineering Discipline	0.854	0.466
Academic Rank (Full Professor, Associate Professor, Assistant Professor	1.616	0.157
Current Status as a Faculty Member (Tenured, Tenure Track, Adjunct/Non-tenure Track, Other	5.672	.001*
Years of Teaching In Higher Education	3.849	.005*
Years of Consulting	2.423*	0.049*
Undergraduate Cooperative Education Participant	1.614	.205

Table Sixteen presents the engagement score broken down by Major/Engineering discipline. There is no statistical significance between the mean engagement score and

any of the majors. This indicates that major does not have a significant impact on the level of faculty engagement in cooperative education.

Table 16
Engagement Score by Major/Engineering Discipline

Major/Engineering Discipline	**Mean Engagement Score**	**Std. Dev.**
Chemical	2.66	.979
Civil	2.80	.912
Electrical	2.61	1.14
Mechanical	2.93	.882

Table Seventeen reports the results of further exploration of the means of the engagement score by number of years consulting. This does not indicate any specific relationship between length of time consulting and level of faculty engagement in cooperative education. Apparently just working within industry either as a consultant or prior to academic service does have a positive impact on level of engagement in cooperative education as demonstrated by the analysis of variance that is reported in Table 15.

Table 17
Mean Engagement Score as it relates to outside work/consulting

Length of Service in Years Outside Work/ consulting	Mean Engagement Score	Standard Deviation
less than 5	2.59	.882
5 to 10	3.06	1.152
11 to 15	2.99	.941
16 or more	3.18	1.270
none	2.81	1.028

Faculty Engagement in Cooperative Education and Environment

RQ 1. b What environmental conditions relate to faculty engagement in cooperative education?

Table Thirteen indicates that there is a positive correlation (.477) between the faculty engagement score and environment score. Further exploration was necessary to understand the relationship between faculty engagement in cooperative education and the relationship of environmental factors. The relationship between faculty perceptions of specific environment factors and their level of engagement in cooperative education measured by their engagement score are reported in Table Eighteen. There is a significant positive correlation between engagement score and the perceived level of departmental support (.406), college support (.370), and institutional support (.312).

Table 18

Pearson Correlations of Engagement Score to Individual Environment Questions

Individual Environment Factors	Engagement Score
Received Information during Orientation	.400**
Familiar with students who participate in co-op	.453**
Strong departmental support	.406**
Strong College Support	.370**
Strong institutional support	.312**
Department faculty are actively engaged	.311**
Faculty receive adequate compensation for co-op	0.065

** Correlation is significant at the 0.01 level (2-tailed).

Additionally, there is a significant positive correlation between the engagement score and whether faculty receive information about cooperative education during their initial orientation (.400) and the engagement score and the perceived active engagement in cooperative education of other departmental faculty (.311). There is no significant

correlation between the faculty members' level of engagement and their perception of adequate compensation (.065) for engaging in activities related to cooperative education.

Table Nineteen presents the summary of the regression analysis for the individual environment factors and their ability to predict engagement score. The analysis indicates that three of the environment factors show a significant ability to predict engagement score. The first two have a positive relationship, indicating that faculty who received information about cooperative education during their orientation or were familiar with students who participated in cooperative education assignments are more likely to have a high level of engagement in cooperative education activities. However the regression analysis also indicates that there is a negative predictive relationship between level of engagement and the perception that faculty receive adequate compensation for their participation in college cooperative education activities. These findings may indicate that faculty who are aware of cooperative education information within the college or have participated in cooperative education as undergraduate students are more likely to have a high level of engagement. It also tells us that faculty who think that they are adequately compensated for their engagement in cooperative education, have a lower level of engagement than those who believe that they are not adequately compensation.

The post survey interviews provided additional insight into this topic. Faculty were asked specifically if there was support from the department, college, and/or university administration, and if that impacted faculty participation in cooperative education. For the most part, the interviewees felt that the university administration had little or no impact on the participation of faculty in cooperative education. One faculty member addressed it this way: "I think that engineering is probably the only school that

has a co-op program in particular. Other schools have intern programs. We hear more about that [from the administration], students gaining experience through interns."

Another faculty member demonstrated a similar feeling, stating, "I am not sure that co-op

Table 19
Summary of Regression Analysis for Individual Environment Factors Predicting Engagement Score

Variable	B	SE B	Ĩ	P value
I received information about the co-op program during faculty orientation or at sometime within the first year of joining the college of engineering.	.128	.046	.178*	.006
I am familiar with students who have participated in engineering cooperative education assignments.	.275	.055	.309*	.000
There is strong departmental support for faculty working with cooperative education.	.169	.091	.186	.065
There is strong college support for faculty working with cooperative education.	.061	.097	.065	.527
There is strong institutional support for faculty working with cooperative education.	-.034	.092	-.035	.714
The faculty in my department are actively engaged in cooperative education activities.	.077	.07	.080	.279
Faculty receive adequate compensation for their supervision of cooperative education students.	-.129	.063	-.122*	.043

R^2 = .326, *p < .05 B = Unstandardized Coefficients Beta, SE B, = Standard Error of unstandarized coefficients, ĨĨStandardized Coefficients.

gets any play outside of the college." And finally, a third takes it one step further, "I have no idea what the university administration says about co-op. I have never heard it discussed [by the administration]." These faculty members represent both those that are engaged in cooperative education activities and those who are not. They also represent

both types of schools, one with a high level of engagement in cooperative education and one with a low level of engagement in cooperative education.

During the interviews, I also asked two questions that pertain to the nature of the environment in the Department and/or College: 1. In your opinion, does the environment in your department or college have an impact on faculty participation in the co-op program today? 2. Would you describe your department/colleagues as supportive, neutral, or unsupportive to your college's cooperative engineering education program? Explain.

Regarding the environment of the department and college and the environment's impact on faculty participation in cooperative education, responses ranged from a perceived sense of indifference to one of total support of cooperative education. The indifference is demonstrated in this first statement, "I don't think that there is an emphasis on co-op to the point that it would impact how faculty participate. It isn't really a topic of discussion. It isn't like we discuss it at department meetings or in the hallway." This is from a faculty member with a low cooperative education engagement score from an institution with high engagement. This is in contrast to a statement of total support from a highly engaged faculty member from the same school, "The College has a very strong emphasis on cooperative education, I think 60% of our students are in the program and I would guess that two/thirds of them stay with the same employer for all three rotations. Seventy-five percent get and accept offers from their co-op companies."

The correlations presented in Table Fourteen tell us that there is a positive correlation between the perceived value of cooperative education and the support from the work environment. It is interesting to note that these two faculty members quoted

have opposite levels of engagement and yet both come from an environment that has a large percentage of students who graduate with cooperative education experience and appears to support cooperative education. It is interesting to note that two faculty members from the same school have such contradictory views of the environment that they work in. The highly engaged faculty member had extensive experience within industry before obtaining his Ph.D. and working in academia. The other faculty member, who indicated a low level of engagement, had an undergraduate research experience, but no other industry related work.

During the interview process the question, "Would you describe your department/colleagues as supportive, neutral, or unsupportive of your college's cooperative engineering education program?" generated some interesting responses. One interview participant described a somewhat ambivalent or hands off approach to cooperative education at his institution, "I guess I don't feel like it is ever a decision to be made [to participate in cooperative education activities]. I am pretty sure no one is against it, but no one really runs around promoting it." This comment is from a faculty member with a low engagement score at a high engagement institution. This faculty member was alone in his ambiguity regarding cooperative education among the colleagues interviewed at his institution.

RQ 2*: Is there a relationship between faculty members' assessment of the value of cooperative education and their level of engagement in cooperative engineering education programs?* Table Fourteen indicates that there is a positive correlation (.464) between faculty engagement and the value faculty place on cooperative education.

Table Twenty indicates the specific correlation between the individual value questions and the cooperative education engagement score. The mean score of each individual value question is compared to the overall level of engagement score using the Pearson correlation. Faculty members who indicated that students benefit from cooperative education also indicated a higher level of engagement in cooperative education. Those faculty who indicated that co-op enhances the quality of the interaction between student and faculty member were also more likely to be engaged in cooperative education. The data also tell us that faculty who believe that the students' classroom learning is enhanced by cooperative education experiences have a higher level of engagement in cooperative education. Finally, faculty who indicate that co-op helps students to better understand difficult engineering concepts are also more engaged in cooperative education. The results indicate that there is a strong positive correlation between each of the individual questions and the overall engagement score. This indicates that faculty who highly value cooperative education are more likely to have a high level of engagement in cooperative engineering education.

Table 20

Pearson Correlations of Individual Value Questions and Engagement Score

	students benefit from co-op	Co-op enhances the quality of the interaction.	Classroom learning is enhanced by co-op students.	Co-ops help students understand engineering concepts.
Engagement score	.420**	.345**	.438**	.349**

** Correlation is significant at the 0.01 level (2-tailed).

Table Twenty-one presents the summary of the regression analysis for the individual value factors and their ability to predict engagement score. The analysis

indicates that two of the value factors show a significant ability to predict engagement score. Both have a positive relationship to engagement, indicating that faculty who believe that students can benefit from participating in cooperative education and faculty who believe that the classroom learning environment is enhanced by the presence of cooperative education students are more likely to have a high level of engagement in cooperative education activities. It is also interesting to note that there is no significant ability to predict engagement score based on whether faculty believe that cooperative education provides opportunities to enhance the quality of the interaction between faculty and students, nor their belief that cooperative education experiences help students understand and learn engineering concepts and processes more quickly.

Table 21
Summary of Regression Analysis for Individual Value Factors Predicting Engagement Score

Variable	B	SE B	Ĩ	P value
I believe that students can benefit from participating in cooperative education	.319	.101	.233*	.002
Cooperative Education provides opportunities to enhance the quality of the interaction between faculty and students.	.095	.072	.092	.190
The classroom learning environment is enhanced by the presence of co-op students.	.290	.095	.288*	.002
Cooperative education experiences help students understand and learn engineering concepts and processes more quickly.	.038	.085	.033	.657

R^2 = .172, *p < .01, B = Unstandardized Coefficients Beta, SE B, = Standard Error of unstandarized coefficients, Standardized Coefficients.

The post survey interview asked faculty participants two questions addressing the value of cooperative education and how this perceived value relates to level of engagement. In response to the questions "From your perspective, does the cooperative

engineering education program enhance or inhibit student academic success? " most of the interview respondents expressed that students benefit from cooperative education and that there educational experience is most likely enhanced by their cooperative education experience. The only dissenting comments came from a faculty member from a high engagement school but who himself is not highly engaged. He stated, "I certainly don't think it hurts the student experience. I think it depends on the student. Some will get more out of it than others. Some will just see it as way to make some money. If they don't bring anything back [learning] with them it won't really help." In contrast, the most supportive comment came from a faculty member at the high engagement institution who himself is highly engaged. He stated: "[Co-op] enhances tremendously, a lot of positive experiences for the student, but those also turn into positive experiences for the faculty. When you have students who have industry knowledge, where you can engage with students that have that level of maturity; that are much more inquisitive, it makes it much more engaging and enjoyable to be in the classroom with them. You can engage with them much more as peers, especially those who are really putting forth an effort to learn what is happening in industry, to become excited about a particular area at a much earlier age than most in learning about that particular area. The students are so much more focused, mature, and disciplined."

A faculty member from the school that has a lower engagement score talked about the conflict between the value of co-op and the influence that industry may have in the classroom: "Faculty who have been in industry see the value in it [cooperative education], [I am] not sure that faculty who have not been in industry always see the connection between the co-op experience and the ability to perform in the capstone

course. In fact, some faculty may think that there might be more of an influence from industry that they don't even welcome in the classroom."

Several faculty members addressed faculty knowledge and the value of cooperative education. For example, one faculty member who has a high engagement score at a highly engaged school responded, "I think 50% of the faculty get it, maybe a little less. Some are career academics and have not worked outside of the university so they don't value the experience as much. But those who have worked in industry see the value in the co-op program. There are several who have been career academics who get it." In contrast, indifference to cooperative education is also represented with this comment from another faculty member at the same institution but who has a low level of engagement, "I guess I don't feel like it is ever a decision to be made. I am pretty sure no one is against it [cooperative education], but no one really runs around promoting it [cooperative education]"

RQ 3*: Is there a relationship between faculty engagement in Cooperative Engineering Education programs and student participation rates in their college's cooperative engineering education program?*

The cooperative education program of each university sampled reported a student participation rate between 25 and 80%. The student cooperative education participation rates from the universities studied are listed in addition to the overall faculty engagement score of the institution and presented in Table Twenty-two. Table Twenty-two also reports findings of a correlation between the mean faculty engagement score of each university and the percent of graduating students who participated in cooperative education and shows no significant relationship. This indicates that student participation

rates or the likelihood that a student will participate in cooperative education are not dependent on whether or not faculty are engaged in the cooperative education process.

Summary of Findings

In relation to personal attributes and experiences the statistical analysis showed a positive relationship between the faculty engagement score and the faculties' engineering (industry-related, outside of higher education) work experience. This work experience could have taken place prior to their faculty position or as a consultant while working in academia. The other personal attributes or experiences, major/engineering discipline, academic rank, or years of teaching had no statistically significant relationship to level of engagement.

Table 22

Institution Characteristics and Categorization

Characteristics	Undergrad Enrollment in Engineering	Mean Faculty Engagement Score of Institution	% of Grads who Co-op	Categorization
Institution #				
1	6891	2.72	42	low
2	2584	2.71	47	med
3	2504	2.83	78	high
4	17610	2.46	34	low
5	2116	3.24	51	high
6	11058	2.08	65	high
7	5292	3.24	45	med
8	7556	2.08	15	low
9	4593	2.78	45	med
10	3250	3.11	29	low

Pearson Correlation between Faculty Engagement Score and Student Participation Rates by school resulted in a -.322, this is not significant at the .05 level

From an environmental conditions perspective, the analysis indicated a positive relationship between level of engagement and the perceived level of environmental support from the department, college, and the institution. There was not however a significant correlation between faculty level of engagement and their perception of adequate compensation for engaging in activities related to cooperative education. Overall, Cooperative Education is valued by the survey respondents. A majority of the faculty surveyed indicated that students benefit from cooperative education; cooperative education enhances the quality of the interaction between student and faculty; classroom learning is enhanced by cooperative education; and co-op helps students to understand engineering concepts. Valuing cooperative education does not necessarily translate into faculty engaging in cooperative education activities. Finally, the research tells us that faculty engagement in cooperative education is not an indicator of student participation in cooperative education.

In the final chapter, the statistical and interview results are summarized and conclusions of this study are presented. Ideas are presented to assist cooperative education professionals and college administrators in influencing faculty to engage in activities that support and enhance cooperative education. This chapter also presents limitations of the study, implications for higher education policy and practice, and ideas for future research.

Chapter Five

Discussion, Interpretation, and Implications

Introduction

This chapter presents a brief background on the impetus for completing this study, reviews the purpose of this study, summarizes, and discusses the data. It also identifies implications for policy and practice as well as makes recommendations for future research. It was my intent in this study to expand on the previous research regarding faculty and cooperative education and to explore the relationship to faculty engagement in cooperative education. I wanted to know what policies and practices can be implemented or enhanced to encourage faculty to take an active role in their college's cooperative education programs, or at least, be supportive of students who choose to participate in cooperative education.

Contomanolis (2005) explored faculty attitudes towards cooperative education and how faculty integrated cooperative education into their classrooms. He concluded that while faculty express "positive feelings about the academic value of cooperative education for students and to [co-op] students contributions to the classroom teaching

environment, faculty utilization of classroom integration activities [for example, asking students to discuss of their co-op experiences in the classroom, or using student co-op experiences to demonstrate theoretical concepts] was extremely limited" (p. 11).

Dromgoole, Nielsen and Rowe (1986) indicated that a key barrier to expanding and improving cooperative education programs was a "lack of faculty cooperation" (p. 13). They indicated that faculty were apathetic or unsupportive of cooperative education. In their study, seventeen of nineteen institutions surveyed reported that lack of faculty participation was a hindrance to the growth and development of their cooperative education programs. Additionally, DePasquale (1991) indicated "that faculty support of [a] cooperative education program is a critical component of the program's success or failure" (p. ii) Homer (1987) pondered if faculty ever actually asked students or listened to students about their cooperative education experiences. Heinemann, DeFalco and Smelkinson (1992) investigated if faculty recognize the educational and professional benefits of cooperative education. They tell us that the "indifference to cooperative education" (p 38) in higher education is due to faculty being unaware of the "learning, thinking, and general professional development" (p. 38) that can be achieved through cooperative education.

Overview of the Study

The purpose of this study was to explore the factors that relate to engineering faculty engagement in cooperative education. Engagement has been defined as the act of involving oneself or becoming occupied; participating; the act of sharing in the activities of a group (Braham, 1995). For the purpose of this study, engagement was defined as faculty taking a positive, active role in cooperative education. I gathered data on faculty

activities related to cooperative education, such as, meeting with current or potential employer partners in cooperative education, making site visits to review students' co-op activities, evaluating student work products, and reviewing co-op position descriptions. I also gathered data on the value that faculty assign to cooperative education, and the environmental support for cooperative education that faculty perceive within their department, college, and university. In addition, I gathered data on scholarly activity and faculty workload.

Faculty from four engineering majors (Chemical, Civil, Electrical, and Mechanical) were selected to participate in this study because these majors are present at most engineering colleges. Ten institutions were chosen to participate based on their size, their Carnegie classification, the nature of their cooperative education program, and their rates of student participation in cooperative education. Specifically, all of the institutions surveyed were research universities with very high or high research activity as identified by the Carnegie Classification system. Each had doctoral programs in the four engineering disciplines being studied: chemical, civil, electrical, and mechanical: each program is accredited under ABET (Accrediting Board of Engineering and Technology). The schools had a cooperative education program that was housed in the college of engineering and a student cooperative education participation rate of fifteen to seventy-eight percent during their undergraduate tenure. The undergraduate enrollment for the Colleges of Engineering in this study ranged from 2,116 to just over 11,000.

By studying schools with similar characteristics I assumed that I could identify personal and professional attributes and/or environmental factors that relate to faculty engagement in cooperative education. By studying schools with varying student

participation rates, I was hopeful that I could determine whether faculty engagement was related to student participation rates.

Summary of Findings

In investigating the factors relating to faculty engagement in cooperative education, I asked three primary research questions:

RQ 1. What are the factors that are related to faculty engagement in cooperative education?

a. What personal attributes and experiences relate to faculty engagement in cooperative education?

b. What environmental conditions relate to faculty engagement in cooperative education?

RQ 2. Is there a relationship between faculty members' assessment of the value of cooperative education and their level of engagement in cooperative engineering education programs?

RQ 3. Is there a relationship between faculty engagement in Cooperative Engineering Education programs and student participation rates in their college's cooperative engineering education program?

The following paragraphs identify the question and summarize the findings for each question.

In relation to the first research question the statistical analysis showed a positive relationship between the faculty engagement score and the faculty's engineering work experience outside of academia (Table 11). This work experience could have taken place prior to their faculty position or as a consultant while working in academia. This

experience can include prior work as an engineer in industry, work as a consultant while also serving as a faculty member, or a faculty member's own entrepreneurial endeavors outside of academia. However a faculty member's experience with cooperative education or other forms of experiential education did not have a significant relationship to the respondents' level of engagement in cooperative education. Other personal attributes or experiences including, major/engineering discipline, academic rank, or years of teaching had no statistically significant relationship to the level of faculty engagement in cooperative education (Table 15).

For the second part of the first question the statistical analysis indicates that from an environmental conditions perspective there is a positive relationship between professors' level of engagement and the level of support they perceive for cooperative education from their department, college, and institution. There was not, however, a significant correlation between level of faculty engagement and the professors' perception of adequate compensation for engaging in activities related to cooperative education (Table 18).

A regression analysis indicated that there was a negative predictive relationship between the predictor, belief in adequate compensation for faculty participation in cooperative education activities, and the dependent variable, level of engagement (Table 19). This indicates that monetary compensation is really not a motivating factor for faculty participation in cooperative education activities. The regression analysis did show a positive predictive relationship between the predictor, receiving information about co-op during faculty orientation, and being familiar with students who have participated in engineering cooperative education assignments. This indicates that faculty

awareness of cooperative education, either through orientation or direct student experience, is positively related to their participation in cooperative education activities.

In response to the second research question, survey respondents overall reported that they valued cooperative education. Most of the faculty indicated that students benefit from cooperative education; cooperative education enhances the quality of the interaction between students and faculty; classroom learning is enhanced by cooperative education; and cooperative education helps students to understand engineering concepts. Valuing cooperative education does not, however, necessarily translate into faculty engagement in cooperative education activities. There was no significant correlation between professors' cooperative education value scores and their level of engagement in cooperative education (Table 20).

A regression analysis of individual value factors and faculty engagement scores indicated that two of the value factors show a significant ability to predict a level of faculty engagement in cooperative education. These two individual faculty values are: (1) Faculty who believe that students can benefit from participating in cooperative education; and (2) Faculty who believe that the classroom learning environment is enhanced by the presence of cooperative education students (Table 21).

The most surprising outcome of this research was the answer to research question three. There was no statistically significant correlation between the level of faculty engagement in cooperative education and students' rate of participation in cooperative education. A regression analysis indicated that there was no ability to predict student participation rates in cooperative education based on the level of faculty engagement in cooperative education.

Discussion of Findings

Using the adapted Colbeck and Wharton-Michael (2006) theoretical framework, I explored whether personal attributes and experiences and environmental factors relate to faculty engagement in cooperative education activities. Colbeck and Wharton-Michael suggest that "an individual characteristic especially likely to be associated with engagement in public scholarship involves faculty members' epistemologies – their ways of knowing" (p 19-20). They suggest that the more aware or connected a faculty member is to public scholarship, i.e., the more they know how public scholarship benefits and contributes to the academic experience for both faculty and students, the more likely they are to participate in activities related to public scholarship.

Research question one attempts to determine what faculty "know" about cooperative education through their own personal attributes and experiences. The findings of this study tell us that faculty who have industry-based engineering experience are much more likely to be engaged in activities that support cooperative education. These faculty "know" the value of the experience in industry and therefore, consistent with the model proposed by Colbeck and Wharton-Michael, they are more likely to support work activities with which they are familiar.

In relation to personal attributes and experiences, the statistical analysis showed a positive relationship between the faculty engagement score and the faculty's engineering work experience. This work experience could have taken place prior to their faculty position or as a consultant while working in academia. The other personal attributes or experiences examined, major/engineering discipline, academic rank, or years of teaching

had no statistically significant relationship to level of cooperative education engagement (Tables 15-17).

Heinemann, DeFalco and Smelkinson (1992) examined faculty indifference to cooperative education. They tell us that the "indifference to cooperative education" (p 38) in higher education is due to faculty being unaware of the "learning, thinking, and general professional development" (p. 38) that can be achieved through cooperative education. I believe that my study shows that faculty who have had some professional engineering experience outside of academia do understand the value of learning that exists in the professional workplace. In addition, they recognize the positive impact that cooperative education experiences have on the learning in the engineering classroom.

From an environmental conditions perspective, the analysis indicated a positive relationship between level of faculty engagement in cooperative education and the perceived level of support for cooperative education from various levels of their institution (Table 18). This indicates that faculty who believe that there is a high level of support from the administrative powers at their institution (i.e., department, college, university), have a stronger inclination to engage in activities that support cooperative education. Fairweather and Rhoads (1995) reported that faculty socialization or the experiences of new faculty have significant influence on the expectations of faculty. They also reinforce the assumption that "administrative behavior" (p. 181) reinforces faculty attitudes towards the value of teaching, research and other scholarly activities. This suggests that it is very important to include information regarding cooperative education during the orientation process and at faculty meetings in order to create an understanding among faculty that the institution values cooperative education.

There was not, however, a significant correlation between faculty level of engagement and their perception of adequate compensation for engaging in activities related to cooperative education. Indeed, a regression analysis indicated that there was a negative predictive relationship between the predictor, belief in adequate compensation for faculty participation in cooperative education activities, and the dependent variable, level of engagement (Table 19). This tells us that faculty respondents who perceive that faculty are adequately compensated for their engagement in cooperative education, have a lower level of engagement that than those who believe faculty are not adequately compensated. In other words, faculty who are not really involved in the process of cooperative education feel that there is adequate reward. However, once a faculty member becomes engaged in the process, they develop a better understanding of what the commitment requires. These faculty feel that their efforts are not adequately recognized in the reward system.

Much research has been done on the faculty reward system and its effect on faculty participation (Fairweather 1993; Huyser 2004; O'Meara 2005). Specifically, Fairweather reports that his "results suggest that pay, which reflects, at least in part, administrative values placed on faculty behavior, does not follow the stated values placed on teaching by department chairs. Pay is instead consistent with disciplinary emphases on research and scholarship" (p. 374). Fairweather and others have indicated that faculty pay is primarily based on research and scholarship, and less on student learning, professors' teaching, or other values identified by department chairs. However, even though cooperative education maybe valued by the department and the faculty as a whole

there is no indication that the typical academic reward system provides incentive for faculty to engage in cooperative education activities.

My research indicates that faculty who are not engaged in cooperative education feel that there is adequate compensation for those faculty who are engaged. Those faculty who are actively engaged in cooperative education feel that they are not adequately compensated for their time and effort in working with cooperative education activities. This may indicate that, although there does not appear to be a compelling financial benefit for participating in cooperative education, those faculty who are involved may have an alternative motivation for their continued support of cooperative education. My research indicates that the faculty's own industry experience has given them a better understanding of the learning that takes place outside of the engineering classroom. This deeper understanding and appreciation of the benefits of cooperative education by engineering faculty with industry experience of their own is a starting point for identifying faculty champions. Once faculty are identified as having previous industry experience, the cooperative education staff can reach out to them to encourage and enhance the faculty's engagement in cooperative education activities.

Overall Cooperative Education was valued by the majority of the survey respondents. Faculty indicated that students benefit from cooperative education, cooperative education enhances the quality of the interaction between students and faculty, classroom learning is enhanced by cooperative education, and co-op experience helps students to understand engineering concepts. This perceived value of cooperative education does not, however, necessarily translate into faculty engagement in cooperative education activities (Table 20). Previous research indicates that, overall, faculty

recognize the value of cooperative education (Contomanolis 2005, DePasquale 1991, McKinnis, McNamara, Kuzcek, and Salvendy 2001, Stull and DeAyora 1984, Wilson 1987, 1989, and Lyons 1961), but that value of cooperative education does not necessarily translate into engaging in activities that support cooperative education. My study indicated that most faculty recognized and appreciated the benefits of cooperative education to the students and yet this recognition alone did not encourage faculty to participate in activities that support cooperative education (Table 21).

Contomanolis (2005), in his study on faculty attitudes towards cooperative education, reported that "a significant majority of the respondents …believed that cooperative education work experience is a significant contributor to the students' overall academic success" (p. 14), but according to his study, this belief did not translate into faculty integrating cooperative education activities into their classroom activities. As in the Contomanolis study, this research indicates that valuing cooperative education does not necessarily translate into faculty participating or engaging in activities that support cooperative education.

Finally, this research demonstrates that there is not a statistically significant relationship between faculty engagement in cooperative education and student participation in cooperative education. If that is the case, do we need to worry about faculty engagement in cooperative education at all? Is there some other attribute within the structure of the cooperative education program, student population, or external environment that influences student engagement in cooperative education? Does the reputation and visibility of the cooperative education program play a greater role in influencing student participation rates than does faculty engagement? There has not been

any published research related to the visibility of the cooperative education program within engineering colleges and the influence that may have on student participation. We may also need to consider the reputation of the cooperative education program among students and employers and the availability of co-op positions within an institution's region, just to name a few of the factors that may contribute to strong student participation in cooperative education, with or without strong faculty engagement in cooperative education activities. This is discussed further in recommendations for future research.

Evaluation of the Framework

The Model of Influences on Faculty Engagement in Public Scholarship proposed by Colbeck and Wharton-Michael (2006) served as the starting point for the design of this study. It provided a structure for understanding what motivates individuals to engage in Cooperative Education from a personal perspective. Their model also accounted for environmental influences on participation. As the literature indicates, human motivation is a complex phenomenon. The Colbeck and Wharton-Michael model assisted in guiding the research towards specific factors that may affect faculty behavior related to cooperative education. The modified model I developed excluded some personal factors used in the Colbeck and Wharton-Michael mode, most specifically, gender and race. This is not to discount the value or influence that these factors have on engagement in cooperative education. However, anticipating there would be considerable challenge to obtain a diverse sample from the engineering faculty ranks, those demographic characteristics were not examined in this study.

In evaluating the adapted Colbeck and Wharton- Michael framework, I examined the concepts of individual characteristics and organizational characteristics as they relate to my research and results. The original model suggests that "faculty members' goals for their academic work and their belief that they have the capabilities to achieve their goals may be shaped by their individual characteristics" (Colbeck and Wharton-Michael, 2006, p. 21). The results of my research indicate that the only individual characteristic that had a significant influence on faculty participation in cooperative education was the faculty's own experiences with industry outside of academia. None of the other individual characteristics studied showed a significant influence on the faculty member's engagement in cooperative education. This finding is consistent with the Colbeck and Wharton-Michael (2006) premise that it is the faculty member's way of knowing, based on their own experiences that play a role in the faculty member's engagement in cooperative education.

Organizational characteristics may also play a role in influencing faculty engagement in cooperative education. Colbeck and Wharton-Michael (2006) suggest that an individual's "personal goals, capability beliefs, and context beliefs are likely to be influenced by the department and institutional contexts" (p.22). The research presented here indicates that there is a significant relationship between the faculty members' level of engagement in cooperative education and the perceived level of organizational support for cooperative education. In contrast, rewards, at least those of a monetary nature, did not show a significant relationship to engagement. This may indicate that, depending on the nature of the organization, some organizational characteristics may have influence on

engagement in activities, while other organizational characteristics have no influence at all.

The model as adapted for this study was designed to develop an understanding of what motivates faculty engagement in cooperative education. This research suggests that there are several variables, both individual characteristics and organizational characteristics that do play a role in influencing faculty engagement in cooperative education. Hence, the model proved to be helpful in identifying factors that influence faculty involvement with this important educational method. The adapted model may be useful in designing future research on faculty participation in cooperative education. Recommendations for future research are discussed in detail later in this chapter.

Limitations

As with any study, there are limitations that are inherent in the research design... In this study, faculty surveyed were limited to four specific engineering majors at ten universities that hold specific and distinct attributes. Although tempting to apply the results of this research across other engineering disciplines or to cooperative education programs as a whole, it would be inappropriate to over generalize. In addition, the low return rate of 22% would also limit the generalizability of the study across a broader population. I believe this research does provide insight into the faculty who are most likely to be advocates for and engage in cooperative education activities. Although not conclusive or all encompassing, we have learned some specific characteristics of faculty who are more likely to be engaged in activities that support cooperative education.

Conclusions, Implications and Recommendations

The findings of this study indicate that there are specific personal attributes and experiences that are related to faculty engagement in cooperative education (Table 10). Specifically, in relation to personal attributes, we know that faculty tenure status and years of service both have a positive relationship to faculty engagement scores. Faculty who have reached full professor, and not surprisingly, those faculty who have worked in academia the longest, are more likely to engage in activities that support cooperative education We also learned in this study that faculty who have had industry engineering experience outside of academia are more likely to be engaged in cooperative education activities. In addition, we have learned that there is a positive predictive relationship between faculty who have completed more patents than their colleagues in the survey, are also more likely to participate in cooperative education activities, as well as those who teach courses at the graduate level. In contrast, this study identified a slight negative predictive relationship between faculty who teach undergraduate courses and engagement in cooperative education activities. This is significant because the majority of students who participate in cooperative education programs are undergraduate students.

Therefore, as cooperative education professionals, we need to determine how we can increase faculty engagement in cooperative education activities by those faculty who more regularly interact with undergraduate students. Is there a method by which cooperative education staff can increase engagement of faculty who have not had the same exposure to industry as their more engaged colleagues? It is imperative that co-op professionals continue to work with faculty who have achieved the status of full professor and those who have been in higher education for longer than ten years. It might be

advantageous to employ those more experienced faculty in our efforts to educate and engage younger faculty.

Previous research (Sorcinelli & Austin, 1992; Tierney & Rhoades, 1994) tells us that faculty socialization begins within the graduate school experience. As part of this socialization process cooperative education professionals should work with those faculty engaged in cooperative education but who work more closely with graduate students to include an understanding of the importance of cooperative education. In addition, faculty should encourage those graduate students who have not had industry-based experience to seek out such opportunities so that they may understand the professional development and engineering learning that takes place outside of the classroom.

The research indicates that there are environmental factors that are related to faculty engagement in cooperative education (Table 18). Specifically, this study indicated that there is a positive correlation between level of engagement and faculty receiving information about co-op during their orientation; if faculty are familiar with students who participate in cooperative education; if there is perceived strong support for cooperative education from the department, college, and/or institution; and if it is perceived that department faculty are engaged in cooperative education. The correlation does not report any relationship between faculty engagement and the belief that faculty receive adequate compensation for engaging in cooperative education. However, a closer look at this factor, using a regression analysis indicates that there is a negative predictor relationship. This tells us that survey respondents who believe that faculty are adequately compensated for engaging in cooperative education are actually less likely to be involved, and as their

level of engagement increases they are more likely to perceive that compensation is not adequate.

This is important information for cooperative education program coordinators, department chairs, college deans, and other university administrators. It is exciting to note that in general faculty value cooperative education for its contribution to students' success and its enhancement of classroom learning. However, this is tempered by the fact that the faculty most likely to engage in cooperative education activities have had significant industry–based work experience, either as an undergraduate student, prior to working in academia, or as a consultant while pursuing their academic career. Fairweather (1993) tells us that the faculty most likely to have industry-related experience are those who have been in academia for ten or more years. Younger faculty are less likely to have worked outside of academia. Based on the result of this research, this trend in newer faculty having little or no industry experience may have a negative impact on faculty engagement in cooperative education.

The literature tells us that the demands on faculty are continuing to increase in the ever changing academic environment (Gappa, Austin, & Trice, 2007; Peterson & Dill, 1997; Schuster & Finklestein, 2006). Is it too much to expect faculty to be more actively engaged in the cooperative education process? Is there a way to get faculty support without taxing their time? Is the predominant model within cooperative education environments that uses cooperative education professionals and not teaching faculty, actually the most effective method of engaging students in the cooperative education process.

Implications for Policy and Practice

College and university administrators need to evaluate their orientation procedures and promotion and tenure practices in relation to their support of cooperative education activities. Administrators should review their orientation procedures to determine if new faculty are introduced to cooperative education during the orientation process and how much emphasis is placed on participation in cooperative education activities. Institutions that want faculty involvement in cooperative education should develop a stronger introduction to cooperative education within faculty orientations. Administrators also need to review the promotion and tenure policy processes and assess if and how engagement in cooperative education is evaluated and rewarded. Steps should be taken to recognize engagement in cooperative education through the tenure process or at the very least through an additional reward process, e.g., service awards, merit pay, course load adjustment.

Cooperative Education program administrators also have opportunities to enhance faculty engagement in cooperative education through several additional actions. One strategy for increasing faculty engagement in cooperative education is through educating faculty regarding the cooperative education program, student experiences in cooperative education, and benefits to students, the college, and the faculty. This includes having an opportunity to address faculty in department and/or faculty meetings, providing relevant information on the benefits of cooperative education to students, faculty, the college, and the university. Not only would this provide faculty with valuable information but it would also show that the college administration supports cooperative education. In addition, cooperative education program administrators should provide faculty with the

opportunity to evaluate potential placements, meet with potential or current employers, review students' final cooperative education reports, student blogs, posters, or articles regarding their cooperative education experiences. I believe that since faculty who indicated that they know of students who have participated in cooperative education activities are more likely to be engaged in cooperative education, it is important to share stories of students and their cooperative education experiences. Faculty know many students from their classes, but they may not know of the students experiences with cooperative education. If co-op administrators provide them with information that will link the students they already know to cooperative education experiences, it may have a positive effect on individual faculty and encourage engagement in cooperative education activities.

Finally, advocates for the cooperative education profession need to review cooperative education practices and determine what other resources and influences can be utilized to encourage student participation in cooperative education. Maybe increasing faculty engagement will have an impact, but maybe there are other more effective methods that may have the same or greater ability to influence student participation in cooperative education.

Recommendations for Future Research

As demonstrated in the review of the literature in Chapter Two, much of the literature on faculty and cooperative education is over twenty years old, leaving a gap in the research and understanding of the role of faculty in cooperative education. In recent years, research has focused more on the benefits of cooperative education to students and cooperative education in the liberal arts or other non-traditional cooperative education

majors. Additional studies regarding faculty engagement would expand on the findings of this study and generate discussion on the role of faculty for the future of cooperative education.

Specifically, I suggest a large national study that examines faculty engagement in cooperative education, their motivations, and their level of participation be conducted. This study might include faculty in disciplines including engineering, business, and less traditional cooperative education disciplines including the humanities and natural sciences. In addition, another more in-depth, qualitative study that identifies highly engaged faculty and explores their motivations, personal experiences, and their relationship to their institutions' cooperative education programs, and the influence these factors may have on their level of engagement would add a significant understanding to the cooperative education community. By utilizing the Colbeck/Wharton-Michael conceptual framework, a study may be conducted with a more comprehensive review of the influence of capability beliefs and context beliefs on faculty engagement in cooperative education and the influence of these beliefs on level of participation in cooperative education.

I also suggest researching to what extent the role of faculty in cooperative education is included in the faculty reward system. For example, is engagement in cooperative education recognized as service to the college, as part of the teaching process, or not at all in the promotion and tenure process? Depending on whether and how engagement in cooperative education activities is recognized by the university what effect, if any, does that reward system have on faculty engagement in cooperative education? In addition, a comprehensive study of the nature of cooperative education

programs across the United States will allow the discipline to better understand the complexity and diversity of the current programs and may suggest areas that need to be studied and evaluated.

APPENDICES

Appendix A

Program Attributes

1.) Literature of the educational institution includes a description of the mission and goals of the cooperative education program.

2.) The employer and the educational institution agree to a formalized plan of work experiences which are integrated with the academic program and related to the student's field of study and/or career goals. This formalized plan addresses the following:

- Description of the job and the opportunity for new learning, including workplace competencies.
- Sequential multiple work terms, each approximately equal in length to the institution's academic terms.
- Work experiences monitored by the educational institution and supervised by the employer.
- Registration at the educational institution in a Co-op work period course during periods of employment. During academic periods, students participating in the program are enrolled at the educational institution at least as part-time students in parallel programs and as full-time students in alternating programs.
- Recognition of the student as an employee subject to all of the employer's conditions of employment, including remuneration.
- Evaluation of the work experiences by the student, educational institution and employer.
- Provision for maintaining interaction and communication.

3.) The educational institution recognizes Co-op as a structured educational program with formal involvement of faculty in the development, administration and direction of the program.

4.) Educational institutions are responsible for admission to the program, establishing guidelines for student eligibility, and setting policies for participation.

5.) The employer and the educational institution establish procedures to maintain student records.

6.) The educational institution provides formal academic recognition of the student's participation in the program. (http://www.profpractice.gatech.edu/ced/attributes.htm, 2009)

Appendix B

Survey Instrument

Thank you for agreeing to participate in this research project.
As a reminder, this study is intended to look at and identify faculty participation activities in cooperative education. It is performed as partial fulfillment of the requirements for the researcher's Ph.D. in Higher, Adult, and Lifelong Education at Michigan State University. You have been selected to complete the survey in your role as a faculty member in an ABET accredited engineering program at a research university in the United States of America. There are no foreseeable risks with this research. The potential benefit is in contributing to the body of literature on the relationship of faculty to cooperative engineering education programs. There is no cost or payment for participating in this study. You may cease to participate at any time during the survey.

Section One: Demographic Information

1. Current Status as a Faculty Member:
   Tenured tenure track adjunct/non-tenure track ____other (explain)

2. Current Academic Rank:

Professor
Associate Professor
Assistant Professor
Instructor
Lecturer
Other Title (e.g, Adjunct, Emeritus, other)

3. How many years have you been teaching in Higher Education?

   0-5 6-10 11-15 16-20 20 or more

4. What level of courses do you most often teach? (Pick one)

   Intro/freshman lower division (fresh/soph) upper division (junior/senior) graduate other

5. On average, how many for-credit courses do you teach per academic year?
Graduate courses:
0 1 2 3 4 5 or more

Undergraduate courses:
0 1 2 3 4 5 or more

6. On average, how many of the following have you completed in the past two years?

Articles in refereed journals
0 1 2 3 4 5 6 7 or more

Articles in non-refereed journals
0 1 2 3 4 5 6 7 or more

Book reviews, chapters, creative works
0 1 2 3 4 5 6 7 or more

Books, textbooks
0 1 2 3 4 5 6 7 or more

Presentations, national or international
0 1 2 3 4 5 6 7 or more

Patents
0 1 2 3 4 5 6 7 or more

7. Which engineering discipline are you most closely aligned with as a Faculty Member?

Mechanical Engineering Civil Engineering Electrical Engineering

Chemical Engineering Other _____

8. Have you worked outside of the university setting in an engineering organization after you completed your PhD? Yes No

If yes, briefly explain the nature of this work?

8a. If yes, how many years of engineering related work or consulting experience do you have, not including your teaching and academic research.

0-5 6-10 11- 15 16-20

9. As an undergraduate student, did you participate in cooperative education or other form of experiential education (intern, research)?

Yes No

9. a. If yes, please explain the nature of your cooperative education experience:

co-op, traditional alternating placement

intern, one time only or summer experience

research, undergraduate research position

volunteer. Habitat for Humanity etc

other (Please explain)

10. On average, how many total hours of service to your department, college, and university do you provide each week?

0-2 hours 3-4 4-5 6-7 8-9 10 or more

Section Two: Engagement

1. I have mentored, supervised, or evaluated Cooperative Education student experiences?

   Very Frequently Frequently Occassionally Rarely Very Rarely Never

2. I actively encourage students to participate in Cooperative Education Programs?

   Very Frequently Frequently Occassionally Rarely Very Rarely Never

3. I meet with employers to discuss and develop co-op positions for our students?

   Very Frequently Frequently Occassionally Rarely Very Rarely Never

4. I evaluate written job descriptions for content, relationship to curriculum, and quality of experience for our cooperative education program.

   Very Frequently Frequently Occassionally Rarely Very Rarely Never

5. I visit co-op student worksites to evaluate students' experience and/or enhance relationships with employers.

   Very Frequently Frequently Occassionally Rarely Very Rarely Never

6. I share information about co-op employers and co-op opportunities in my classes.

   Very Frequently Frequently Occassionally Rarely Very Rarely Never

7. As part of my class, I ask students who have worked as a co-op student to describe where they worked and how that work may relate to the course material and content of the class.

   Very Frequently Frequently Occassionally Rarely Very Rarely Never

8. I assign class projects that provide students with the opportunity to relate their work experiences to the material being presented in class.

   Very Frequently Frequently Occassionally Rarely Very Rarely Never

9. During the course of my teaching, I ask students to relate their coop work experience to a principle or topic being discussed.
   Very Frequently Frequently Occassionally Rarely Very Rarely Never

10. During the course of my teaching, I use examples from industry or business to assist my students in understanding course material.
    Very Frequently Frequently Occassionally Rarely Very Rarely Never

Section Three: Environment

11. I received information about the co-op program during faculty orientation to the engineering college or early in my experience as a new faculty member at this institution?

    Strongly agree agree neutral disagree strongly disagree

12. I am familiar with students who have participated in engineering cooperative education assignments?

    Strongly agree agree neutral disagree strongly disagree

13. There is strong departmental support for faculty working with cooperative education.

    Strongly agree agree neutral disagree strongly disagree

14. There is strong college support for faculty working with cooperative education.

Strongly agree agree neutral disagree strongly disagree

15. There is strong institutional support for faculty working with cooperative education.

Strongly agree agree neutral disagree strongly disagree

16. The faculty in my department are actively engaged in cooperative education activities.

Strongly agree agree neutral disagree strongly disagree

17. Faculty receive adequate compensation for their supervision of cooperative education students.

Strongly agree agree neutral disagree strongly disagree

Section Four: Value

1. I believe that students can benefit from participating in cooperative education.

Strongly agree agree neutral disagree strongly disagree

2. Cooperative Education provides opportunities to enhance the quality of the interaction between faculty and students.

Strongly agree agree neutral disagree strongly disagree

3. The classroom learning environment is enhanced by the presence of co-op students.

Strongly agree agree neutral disagree strongly disagree

4. Cooperative engineering education experiences help students understand and learn engineering concepts and processes more quickly.

Strongly agree agree neutral disagree strongly disagree

Appendix C

Letter to Participants

Influences on Faculty Engagement in Cooperative Education
Bernadette J. Friedrich, PhD Candidate Education Administration
Michigan State University
1340 Engineering Building, East Lansing, MI 48824
517-355-5163, friedric@msu.edu

1. Purpose of Research:

This study is intended to identify factors related to faculty participation in cooperative education. It is performed as partial fulfillment of the requirements for the researcher's Ph.D. in Higher, Adult, and Lifelong Education at Michigan State University. You have been selected to complete the survey in your role as a faculty member in an ABET accredited engineering program at a research university in the United States of America. There are no foreseeable risks associated with this research. The research will contribute to the body of literature on the relationship of faculty to cooperative engineering education programs. You may cease to participate at any time during the survey.

2. What you will do:

- Complete an online survey using Survey Monkey.
- The time required for this study is less than 15 minutes to complete the 31 questions.
- A small percentage of survey respondents will be selected for a personal interview. This would require an additional 30 - 45 minutes for a personal interviewer with the researcher. If selected for an interview, you may agree or not agree to participate.
- The findings of this study will be available for review upon written request to the researcher.

3. Potential Benefits and Risks:

- You will not directly benefit from your participation in this study; however your participation will contribute to the body of literature on the relationship of faculty to cooperative engineering education programs.
- There are no foreseeable risks associated with participation in this study.

4. Privacy and Confidentiality:

- The data for this project will be kept confidential.
- All research data will be destroyed within five years of completion of the study.
- Until that time data will remain on a personal thumb drive and will remain locked in a file cabinet in the researcher's office when not being utilized.
- Data will be collected via a reputable online web-survey system and will remain secure via multiple layers of security, including daily third-party audits. Once all of the data has been collected it will be downloaded and deleted from the on-line vendor.

- There will be no connection between the individual and their responses.
- The results of this study may be published or presented at professional meetings, but the identities of all research participants will remain anonymous.

5. Your rights to participate, say no, or withdraw

- Your participation is entirely voluntary for both the survey, and if applicable, the personal interview.
- You may change your mind at any time and withdraw.
- You may choose not to answer specific questions or stop participating at any time.

6. Cost and Compensation for participating in this study:

- There is no cost or payment for participating in this study.

7. Contact Information for Questions and Concerns:

If you have concerns or questions about this study, such as scientific issues, how to do any part of it, or to report an injury, please contact the researcher (Bernadette Friedrich, 1340 Engineering Building, Michigan State University, East Lansing, MI 48824, 517-355-5163, friedric@msu.edu or the dissertation chair, Roger Baldwin, 429 Erickson Hall, Michigan State University, East Lansing, MI 48824, 517-355-6452, rbaldwin@msu.edu

If you have any questions or concerns about your role and rights as a research participant, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Director of MSU's Human Research Protection Program, Dr. Peter Vasilenko, at 517-355-2180, Fax 517-432-4503, or e-mail irb@msu.edu or regular mail at 202 Olds Hall, MSU, East Lansing, MI 48824.

12. **Documentation of Informed Consent.**

Your completion of this survey indicates that you voluntarily agree to participate in this research study.

You may print this form for your records.

Appendix D

Interview Questions

1. Tell me about your involvement in the College of Engineering Cooperative Education Program?
   a. Have you worked with the staff in evaluating potential cooperative education placements?
   b. Have you evaluated students' work experience at the end of the work term?

2. Have any past employment or academic experiences influenced your participation in your institution's/college's co-op program? Explain.

3. In your opinion does the environment in your department or college an impact on faculty participation in the co-op program today?

4. From your perspective, does the cooperative engineering education program enhance or inhibit student academic success? Explain.

5. Would you describe your **department/colleagues** as supportive, neutral, or unsupportive to your college's cooperative engineering education program? Explain.

6. Would you describe your **Dean** as supportive, neutral, or unsupportive to your college's cooperative engineering education program? Explain.

7. Would you describe your **Chair/Department Head** as supportive, neutral, or unsupportive to your college's cooperative engineering education program? Explain.

8. Would you describe your **Institution** as supportive, neutral, or unsupportive to your college's cooperative engineering education program? Explain.

9. From your perspective, are the benefits of cooperative engineering education worth the time required of faculty?

10. Can you identify barriers to faculty that would inhibit their participation in cooperative education activities?

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