COMMUNICATION IN ENGINEERING: DEVELOPING A TARGETED COURSE

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Abstract
In many technical undergraduate programs, specifically engineering, focus is placed on developing the technical abilities of students. Little emphasis is placed on communication, to include verbal, written, and presentation skills. In a dynamic corporate world, technical students can be put at a disadvantage if they are not taught the importance of being able to communicate with a variety of demographics in varying contexts. Companies are looking for engineering graduates who have strengths in both arenas. To address this issue, a semester-long communication course for engineering majors has been developed. The foundation is in current research on communication apprehension, the communication across the curriculum (CXC) movement, and the indicated growing need for communication skills in technical fields. The course incorporates many different genres of communication and presents the material in a way that addresses the unique scenarios faced by engineers. The overall goal is to make engineering students more comfortable in their level of communication ability, thus making them more marketable and competitive in the industry.
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Chapter 1: Introduction

According to the National Center for Education Statistics (2012), over 93,000 undergraduate degrees in engineering and engineering technology were awarded in 2010-2011; this represents a 14.4 percent increase over the previous five years. With many of these students entering directly into the workforce post-graduation, it is important to ascertain if these students are prepared with the skills they need to be successful employees. Historically, most engineering programs place the most emphasis on developing technical abilities, which to a certain extent is imperative due to the nature of the field. However, many employers have indicated that this focus needs to be complemented with other real-world skills. Some employers are finding that they must spend time and resources on developing strong communication ability once the employees already onboard. If students enter the corporate world already possessing these attributes, they may be much more marketable and desired by potential employers. Colleges and universities need to place more emphasis on the development of communication skills, as the world outside of academia is becoming increasingly dynamic and globalized. Engineers must understand how to communicate in a variety of contexts, as they will have a broad range of audiences throughout their professional tenure. Having engineers possess an ability to communicate and understand multiple other stakeholders in a business can ultimately benefit a company and make their overall business functions more efficient and productive.

Statement of Purpose

Based upon existing research (subsequently discussed), there is a deficiency in the development of communication skills in many undergraduate engineering programs. Because engineers tend to be technically-driven, they can benefit from a communication course geared specifically toward their unique needs. A new course will be designed in the project that will
focus on the most pertinent forms of communication that engineers will utilize, and will address the professional concerns and issues that can be distinctive to engineers. Engineering students need to develop this particular skill set, or else it can be to the detriment of themselves and their future employers.

**Definitions of Terms Used**

Throughout the remaining chapters, there are many important terms that will be used. Following are some of the most pertinent:

**Engineering:** Engineering is defined as the “professional art of applying science to the optimum conversion of the resources of nature to the uses of humankind” (Merriam-Webster, 2012). Students in undergraduate (4-year Bachelor’s degree) programs in engineering are the focus of this project. The term “engineering students” and “engineering programs” encompasses all specific disciplines within the field.

**Employers:** The term “employers” is used in the context of those organizations, both for-profit and not-for-profit, that hire recent undergraduate engineering students.

**Genres:** The term “genre” is used as a subset or type of communication medium, to include writing, public speaking, interpersonal interactions, presentations, etc. More specifically, genres are “dynamic actions that entail much more than form alone” (Devitt, 1996, p. 606)

**Hard Skills:** Hard skills are technical abilities possessed by a person. In the context of this project, hard skills could include computer programming, soldering, solving equations, working with chemicals, etc.

**Soft Skills:** According to Bancino and Zevalkink (2007), soft skills are “the cluster of personality traits, social graces, facility with language, personal habits, friendliness, and
optimism that mark people to varying degrees” (p. 20). The underlying theme of this type of skill set is the overall ability to communication across many different genres and scenarios. This term is used by many professionals in the career development realm, but it can be argued that the term itself does not accurately allude to the importance of these skills. Because this term is industry-standard, it will be used throughout this project to refer to a specific type of skill set and is in no way indicative of the level of importance.

**Organization of Remaining Chapters**

The remaining chapters are organized into the following sections: a review of existing literature, the scope and methodology of the project, a proposed communication course curriculum, and summaries and conclusions. Chapter 2, the literature review, will form the basis for the argument that a communication course specifically designed for engineering students should be a requirement in any undergraduate engineering curriculum. Chapter 3, the scope and methodology, discusses the use of this existing research, paired with employer feedback, to determine the content of the proposed course. The proposed course curriculum is introduced in Chapter 4, with the basic curriculum for instructor(s) and the full syllabus for the course included in the Appendix. Lastly, Chapter 5 discusses the limitations of the study, recommendations for further research, and pertinent conclusions.
Chapter 2: Literature Review

Philosophical Assumptions and Theoretical Basis

Students in engineering undergraduate programs are historically conditioned to believe that strong technical skills are the most important abilities developed in the post-secondary classroom. In the course of their studies, it is often stressed that “soft skills”—written and verbal communication, presentation skills, interpersonal interactions, teamwork, etc.—are not as important as a student’s growth in the technical realm. Anecdotally, the organizations that students eventually go to work for after graduation spend months, or even years, developing this second set of skills in order for their technical workers to become efficient and successful contributors in a dynamic work environment. It is often assumed by engineering students at the undergraduate level that their only role in a company would be to make technical contributions, but sometimes do not consider all the ways in which they will need to communicate amongst their peers, with customers, and with other stakeholders both inside and outside of the company.

While there are many unique pedagogies and philosophies on teaching, especially at the undergraduate level, there is much evidence to suggest that the teaching of non-technical skills is an important, if not necessary, element to include in an engineering curriculum. The reinforcement of soft skills, or the traits necessary to be an efficient communicator, team player, and effective all-around employee, is imperative in any post-secondary program, but especially those programs in which it is not traditionally a main focus. Faculty and administrators have a duty to assist in helping students to reach their full potential. By not incorporating all skill sets that will be a necessity in the workplace, students are not being served in a way that best meets their needs and/or expectations.

Perhaps one of the most pertinent learning theories in this type of course development is constructivism, further described by von Glasersfeld (1989):
(Constructivism) asserts two main principles whose application has far-reaching consequences for the study of cognitive development and learning as well as for the practice of teaching, psychotherapy, and interpersonal management in general. The two principles are: 1) knowledge is not passively received but actively built up by the cognizing subject; 2) the function of cognition is adaptive and serves the organization of the experiential world, not the discovery of ontological reality (p. 162).

An important tenet of constructivism is the theory of experiential learning, or learning from experience. Kolb (1984) is recognized for developing the contemporary approach to this method of learning and expands on the variation between traditional and progressive pedagogies, positing that there is a need “for educational methods that can translate the abstract ideas of academia into the concrete practical realities of these people’s lives” (p.6). Important to note is Kolb’s (1984) idea of “abstract ideas of academia” (p.6). Engineering is comparatively unique to liberal arts in that much of the material is not abstract. This is precisely the reason why some engineering students struggle with traditional communications courses. Technical students need a better understanding of how to translate what they may see as an “abstract” philosophy into a practical skill set. Simply put, engineering students need to experience how communication fits into an engineering role.

Ballentine (2008) offers a creative pedagogical approach that incorporates an understanding of the importance of developing professional communication abilities in engineering students and a course philosophy centered on meeting the students’ unique needs. It is suggested that “engineering students will be expected to thrive in the midst of societal progress…and it is our responsibility as instructors to continually update courses essential to
student success, such as professional and technical communication” (Ballentine, 2008, p.328).

Ballentine (2008) goes on to describe a proposed course model in more detail:

The course philosophy allows and even encourages students to engage with each theme in a manner specific to their individual pursuits and not prescribed by the instructor. For example, a student will not be required to write or research a paper on “ethics and computer engineering” when he or she desires to explore this theme by way of chemical engineering. Thus, establishing a learning environment that bolsters an engineering student’s intrinsic motivation for the materials forms the pedagogical grounding for the course (p.328).

Experiential learning and intrinsic motivation are two important learning theories that create the philosophical framework for curriculum development that complements existing research on why there is a need for a more thorough cultivation of communication proficiency. By promoting practical experience communicating through different genres, and allowing an element of free-choice in assignments and activities, students will have increased motivation for tackling an often abstract topic.

Taking into account this theoretical framework and the clear need for engineering students to become more adept communicators, the creation of a multi-disciplinary communication course for engineers is proposed. In this course, students will learn to be effective communicators, and also develop other necessary skills that will afford them the ability to successfully integrate into a multitude of different environments after graduation. There are two realms of existing research that are important in addressing this need. The first is within the field of communication apprehension. These theories explain how and why some people face communication challenges. The second body of research pertains specifically to engineering
students and the potential areas of improvement in regards to traditional curricula. The implications of this existing research will be discussed, as well as how it lays the foundation for the development of this project. Before the focus is place on *how* a communication course for engineering students should be developed, it must first be understood *why* there is a need.

**Communication Apprehension**

The first question that needs to be addressed in this analysis is why engineering students can be prone to communication challenges. The main theme behind much of this is the problem of “communication apprehension” (McCroskey, 2009). Communication apprehension, or CA, is explained as a person’s fear of communication in varying contexts, both real and anticipated (McCroskey, 2009). McCroskey’s (2009) research dates back to the 1960s, when he first posited that some college students had a very strong fear of public speaking; he has since then expanded his theory to include other types of communication. He shares an anecdotal story about inadvertently identifying an engineering student with high CA while performing research on the link between student suicides and current enrollment in public speaking courses:

In the process of looking at the lists of students in the required public speaking class, we accidentally identified a student who had enrolled for and dropped the class 12 times. He had a straight ‘A’ record in engineering, but could not graduate because he had not passed the required public speaking class (McCroskey, 2009, p. 161).

McCroskey (2009) estimates that one out of every five people suffer from high CA. Some other notable findings cited by McCroskey (2009) are Richmond’s (1977) finding that high CAs are less likely to be successful in the job applicant screening process, and Daly and McCroskey’s (1975) finding that “high CAs prefer occupations that have low oral communication demands, while low CAs prefer occupations that require high oral
communication demands” (p.167). While McCroskey’s research does not focus solely on CA in engineering students, it is valuable insight into a problem many people, including college students, face that can negatively affect post-graduation employment in their respective fields. CA research can be used as a tool for designing communication curriculum for engineering students, many of whom fit in to the high CA category.

P’Rayan and Shetty (2008), specifically relate CA to engineering students in India. In one of India’s top engineering colleges, a course entitled *Communication Skills Laboratory* is a course developed specifically for engineering and technology students, and includes components of oral presentation, group discussion, interviews, and computer-assisted English language learning (P’Rayan & Shetty, 2008). Part of the reason for the development of this course was the results of a study of 120 engineering students conducted with the objective of measuring confidence in communication. The study indicated that a majority of this group of students has high CA and around 60 percent of them lack communication skills (P’Rayan & Shetty, 2008). The findings of this study, paired with feedback from some of the top technology employers, contributed to the need for this type of course. Engineering curricula is not changing as fast as the industry itself, and employers are having a difficult time finding suitable employees that possess all the abilities they desire, to include effective communication skills (P’Rayan & Shetty, 2008). While this study provides a connection between CA and engineering students, its limitations include the fact that that culture is not addressed as a possible variable. It is possible that engineering students can have varying levels of CA based upon the constraints or characteristics of their respective cultures. Nevertheless, it provides insight as to the potential level of CA amongst engineering students.
Communication apprehension can form a theoretical basis as to why certain demographics of people, including engineering undergraduate students, face challenges with all types of communication. McCroskey’s (2009) and P’Rayan & Shetty’s (2008) research help to establish the problem that must be addressed; however, it does not specifically identify why or how communication apprehension is problematic once engineering students enter into the working world post-graduation. A second body of research exists that can better illustrate why this is a problem in the engineering field, and identify the stakeholders who are affected by underdeveloped communication skills.

*The Need for Communication in Engineering*

Bancino and Zevalkink (2007) establish the basis for why soft skills are a necessary characteristic for those going into technical roles post-graduation. They cite three reasons for why business leaders are looking for technical professionals with broader skill sets: “necessity for improvement to the bottom line, increasing competition, and globalization” (Bancino & Zevalkink, 2007, p. 20). These demands from organizations mean that these types of skills must be first developed in the classroom so they do not have to spend time and money to develop the skills after the employees are already on-board. New graduates must hit the ground running in many of these organizations, and they are expected to have skills beyond the technical set they acquire in their curriculum. Bancino and Zevalkink (2007) cite a survey of over 250 technical leaders who state that the lack of sufficient soft skills is the biggest reason for project failure in their organizations. It is suggested that students need to develop these skills prior to entering the workplace, but the challenge seems to be gaining the buy-in of the students; many technically-oriented people disengage when it comes to learning soft skills, as they see them as superfluous
and unimportant to their field (Bancino & Zevelkink, 2007). This is one point to take into account when developing a new curriculum for these types of students.

A 2008 study by Morreale and Pearson takes a look at why communication education is so important in contemporary society. In this particular study, 93 journal and newspaper articles, reports, and surveys were examined for thematic elements related to the importance of communication education; it was discovered that the majority of this literature makes a case for the centrality of communication within the U.S. education system (Morreale & Pearson, 2008). These six themes were further delineated:

1) Communication education is vital to the development of the whole person
2) Communication education helps to improve educational enterprise
3) Communication education encourages being a responsible participant in the world, socially and culturally
4) Communication helps individuals succeed in their careers and in business
5) Communication education enhances organizational processes and organizational life

Although this research identifies underlying themes as they relate to the importance of teaching communication, the authors suggest that there are some limitations, to include that it does not represent original research, nor does it address why there are some institutions that still are not placing importance on the development of multi-disciplinary instruction (Morreale & Pearson, 2008). This paves the way for additional research that can address this question.
In a 2010 study conducted by Hart Research Associates, it was discovered that employers are looking for a much broader set of skills than with what students are currently graduating. Some of the notable findings of this survey include the following percentages of employers who desired improvement in certain intellectual and practical skills of recent graduates:

- The ability to communicate effectively, orally and in writing (89%)
- Critical thinking and analytical reasoning skills (81%)
- The ability to analyze and solve complex problems (75%)
- Teamwork skills and the ability to collaborate with others in diverse group settings (71%)
- The ability to innovate and be creative (70%)
- The ability to locate, organize, and evaluate information from multiple sources (68%)
- The ability to work with numbers and understand statistics (63%) (Hart Research Associates, 2010, p. 2).

Each of these skills was identified by the majority of employers as needing improvement. This suggests that most universities are not doing enough to prepare students for employment in organizations that require a comprehensive set of skills. While the study indicates what characteristics a very broad range of employers are looking for, it does not specifically indicate desired characteristics for specific industries.

**Incorporating Communication in Engineering Curricula**

Thus far, the need for a communication course in engineering curricula has been established through the examination of existing research. While a need has been identified, it is imperative that potential solutions also be addressed. This can be accomplished through taking a
look at research focused on how communication can be integrated into a technical curriculum, which will ultimately lay the foundation for this project.

The research that exists on the topic of incorporating communication into different disciplines creates an important theoretical framework. Dannels’ (2001) research emphasizes the communication across the curriculums (CXC) movement, which focuses on teaching communication skills within disciplines that are not inherently communication-related, to include engineering classrooms. This need is centered on industry demand for well-rounded graduates, which leads to a further description of the need for this type of communication curriculum:

Additionally, many disciplines are facing calls from industry to prepare students for the specific kinds of communication tasks that they will face in the workplace. Business leaders and social critics alike are recognizing the need for students to be able to present themselves effectively and to use strong communication skills in small-group settings and less formal interpersonal contexts...Workers must now be able to adjust – sometimes very rapidly – the content, persona, and level of formality, style, and format of their speaking to meet the needs of a wide range of citizens, clients or colleagues (Dannels, 2001, p. 144).

The CXC movement as it stands today first emerged when the popular media began addressing what they referred to as “mallspeak,” or otherwise inarticulate speech, amongst college students (Dannels, 2001). While some critics believe that the CXC movement does little more than address this specific problem, it is suggested that the endeavor is much more complex than that. Dannels (2001) calls for the construction of “new theoretical and practical directions” for CXC (p. 146). She suggested the development of an additional model of CXC: CID, or “communication in the disciplines”. She explains this model further:
Essentially, a CID model rests on a situated communication pedagogy, characterized by the following theoretical principles: 1) oral genres are sites for disciplinary learning, 2) oral argument is a situated practice, 3) communication competence is locally negotiated, and 4) learning to communicate is a context driven activity (Dannels, 2001, p 147).

Dannels’ (2001) argument is essentially that communication is not a skill that is separate from other fields; it is one that must be intertwined within any other discipline, including engineering. The theoretical basis of much of the argument for incorporating communication into technical curricula is founded in the theory of situated learning. Callison (1998) defines the main characteristic of situated learning: “Situated learning takes as its focus the relationship between learning and the social situation in which learning occurs” (p.36). This means that learning can be considered in terms of “certain forms of social co-participation rather than defining learning as the acquisition of propositional knowledge” (Callison, 1998, p. 38). Situated learning ultimately focuses on the idea that the most effective forms of teaching incorporate interactive activities that allow students to engage in processes that they will utilize post-graduation. Students learn to use tools actively which helps to foster an understanding of the changing dynamics they can face in regards to social interactions and negotiations; this helps students to develop life-long learning processes (Callison, 1998). An important point brought up by Callison (1998) regarding social learning is that instructors in this type of environment must “hold and model real-world skills,” meaning that they must have an awareness of the skills that are used in certain environments, as well as have experience using those skills in said environments (p. 38). This is important to take into consideration in the curriculum development process, as it must be decided what type of professor would be the best fit for teaching a certain type of course.
Artemeva, Logie, and St-Martin (1999) outline a communication course offered by a Canadian university that has been specifically developed for engineering students. They describe the rationale behind the course as being “to establish a discipline-specific context in which engineering students could acquire linguistic and rhetorical strategies that would provide an initial site of professionalism and would facilitate their transition into the workplace” (Artemeva et al., 1999, p.302). This course was developed in order for students to gain a better understanding of communicating for specific audiences (to include non-technical) and to incorporate the idea of genres into the lessons; this would include the focus on assignments that are geared toward situated learning, or the understanding of the utilization of different communication skills in different environments (Artemeva et al., 1999). The authors describe what this theoretical framework means to the design of their course: “…we as instructors need to direct our students to real, recurrent, discipline-specific situations which give them the opportunity to ‘do things with words’” (Artemeva et al., 1999, p. 305). Artemeva et al. (1999) utilize this theoretical framework to develop a communication curriculum that goes beyond traditional technical communication courses. The first piece of the curriculum requires students to select an engineering course that they’d like to use as the basis for the communication course; this helps students to identify appropriate forms of communication within their own discipline and allows them to tie everything into one course project (Artemeva et al., 1999). The ability to contextualize and gain feedback both from peers and the instructor is a valuable piece to this course, as it helps them to identify which methods of communication best fit different scenarios. Three conditions that contribute to the success of this type of curriculum are delineated by the authors:
First, communication course assignments must be connected to the subject matter courses students are taking concurrently with the communication course. This connection allows for authentic exigencies that help students explore and acquire the genres of their disciplines. Second, a dialogic environment, in which students can negotiate meaning and promote learning though this negotiation, must be created. Third, the communication course assignments should be designed and linked in such a way that they furnish students with the opportunity to build on learning experiences in the course. Under these conditions, the communication course provides a context in which students acquire rhetorical skills and strategies necessary to successfully integrate into the community of university students in a particular discipline and to facilitate their transition into the workplace (Artemeva et al., 1999, p. 313-314).

The limits of this type of curriculum can include the type of instructors involved in the course, as well as the types of students taking the course. If the instructors only have a communication background, then they may not be able to fully understand the dynamics of a technical organization and some communication challenges that may be faced by new graduates in the workplace. It would be important to bring in instructors with varying backgrounds to make the feedback more realistic; what a communication professor may see as an acceptable method of communication may not be found acceptable by someone in the engineering field. The same goes for the students in the course. It may be a good idea to include students from multiple disciplines, as they will be able to give feedback unique to their backgrounds. Engineering students will be able to understand engineering students, but a marketing student may not be able to understand the engineering student. Thus, these limitations will be taken into account in the design of this project.
McNair and Holloway-Attaway (2007) focus not just on the importance of communication, but also on the rapidly changing dynamics of the contemporary workplace, with the main focus being on the recent increase in distributed work within organizations. This means the necessity of working in teams, both local and global, where workers need to be able to efficiently communicate across a broad spectrum of contexts. This new collaborative format creates the need for workers to be able to consistently adapt to different scenarios, a skill that McNair and Holloway-Attaway (2007) feel needs to be developed in the classroom. They focus on the idea of ‘metaknowledge’: “Students do not only need a list of specific communication tasks or formats to help them succeed in globally distributed teams; they also need metaknowledge to help them understand the dynamics of such teams and the roles of communicative acts in supporting or sustaining such teams productively” (McNair & Holloway-Attaway, 2007, p. 330).

The preceding research on how and why communication and other soft skills can and should be incorporated into a technical curriculum is important in the development of this project; the rationale behind the need, as well as the multiple unique ways in which the need can be addressed create the framework for the following curriculum design.

**Rationale for Project**

Based upon three existing bodies of research, which include communication apprehension, the increased need for communication within engineering curriculum, and the ways in which communication can be incorporated into this type of curriculum using a multidisciplinary approach, a foundation for further development of a communication curriculum for undergraduate engineering students has been established. While much research exists on this issue, there is still room for the creation of a curriculum that incorporates multiple characteristics
that will ultimately combine to create a course specific to engineering students that is both practical and enjoyable. It has already been established that this type of course is needed as an important component to any engineering curriculum, but it is important to use existing research to determine the combination of course characteristics that will best suit this demographic of students and assist them in becoming active contributors to dynamic organizations after they graduate.

**Design Questions**

Based upon review of existing research, two research questions have been established that will drive the design of this project:

1) What unique challenges do engineering undergraduate students face when it comes to the development of communication skills?

2) How can these needs be addressed through the creation of a communication course specific to engineering undergraduate students?

The following sections will first discuss the scope and methodology used in this study, which subsequently will form the basis for the project. Secondly, the project itself will be discussed with the goal of outlining the design and practical application. Throughout each section, existing theory will be utilized to provide rationale for the design and to establish a thorough understanding of the development process for the final course design.
Chapter 3: Scope and Methodology

The Scope of the Study

In order to maintain a somewhat narrow focus that will create the most workable basis for this project, emphasis will be placed on examining existing research on the role of communication in engineering undergraduate programs, as well as research based on feedback from employers who hire recent graduates from 2- and 4-year post-secondary institutions. The study will not include input from the student or faculty perspective, as the definitive goal is to create a communication curriculum that promotes the outcomes that are desirable by employers. Future research could incorporate all three perspectives in order to create a more holistic understanding of an effective curriculum.

It is imperative to take a standards-based approach to developing a communication curriculum for undergraduate engineering students, as most programs are regulated by an accrediting body. The Accreditation Board for Engineering and Technology (ABET) is one of the largest accrediting bodies in the United States for these types of programs, so some of the project design will take into account the outcomes required by ABET, which will be further delineated in the analysis and results section. This could create certain requirements that may not otherwise be incorporated in the design.

Methodology of the Study

Due to the nature of this project, it was decided that original research would not be necessary. It is important, however, that the basis for the project be founded in a critical examination of prior research, as well as qualitative feedback from the most pertinent stakeholders – future employers of engineering students. The methodology will also include an examination of best practices in teaching and curriculum design.
The methodical approach taken to this project is two-pronged. The first deals with the gathering of information that supports the need for a communication course geared specifically toward engineering students. The second deals with analyzing and utilizing prior curriculum design research, which will be an important step in the project development stage. A descriptive research method was employed, as it is important to identify and describe the state of recent engineering graduates from a skill-level perspective, and subsequently identify the conditions underlying the lack of a certain skill set (Rubin, Rubin, & Piele, 2005). Further delineation of each of these vital facets will be further described.

Firstly, information gathered in the literature review portion will be used as evidence supporting the creation of this curriculum. The main focus will be on a 2010 survey conducted by Hart Research Associates, Inc. in which 302 employers were interviewed, with the following items taken into consideration:

1) Interviews were conducted between October 27, 2009 and November 17, 2009.

2) The company has at least 25 employees.

3) 25% or more of the company’s new hires hold either an associate’s degree from a two-year college or a bachelor’s degree from a four-year college.

4) Respondents are executives at their companies. (Hart Research Associates, 2010, p. 1)

This particular survey forms the basis for understanding the types of skills employers are looking for in recent graduates. Especially noteworthy are the numerous skills employers feel recent graduates are lacking. It is this finding that is the driving force behind the course development portion of this paper. The intent in utilizing this survey is not to generate comprehensive, quantitative results, but rather to gain a better understanding of the skills desired by employers. In addition to these findings, additional existing research will be analyzed and discussed as it
relates to the importance of incorporating a communications-based course within technical curricula.

The second facet of the study method included reviewing material pertaining to communication curriculum design. A textual analysis was performed on three different types of curriculum designs (see Chapter 4) in order to create a framework for the design of the project. A critical approach was taken to identify the elements of each curriculum that could be beneficial to the design, as well as determine which parts should be eliminated based upon the overall goal.

In addition to analyzing basic formats of course design, the syllabi of three existing communication courses were also studied in order to identify best practices. These courses include *Communications for Engineering Majors 3350* from Cornell University, *WRIT 340: Advanced Writing and Communication for Engineers* from the University of Southern California, and *ENC 3246: Communication for Engineers* from the University of South Florida. The courses were identified via a search of university websites, thus would be considered a convenience sample. (Rubin et al., 2005).

This approach to project design incorporated both an understanding of the rationale behind creating an engineering communication course through both new and existing research, and also promoted a critical understanding of curriculum design in general. Chapter 4 will incorporate the existing literature on the importance of teaching communication skills to engineering students, and the best practices of course design to present a unique syllabus for a communication course for engineering majors.
Chapter 4: The Curriculum

Project Description

It is apparent based on prior research and real-world feedback from employers that there is a need for traditional engineering programs to incorporate a communication course geared specifically toward technical students. In an attempt to meet this need, a semester-long (16-week) curriculum was developed, taking into account the expressed needs of employers, as well as existing research that highlights the historical challenges faced by engineering students as they relate to communication skills. The curriculum will be broken down into eight two-week modules that will incorporate readings, class activities, multi-disciplinary group projects, and homework assignments. There will also be an online discussion board component to the course. As described in Chapter 3 – Scope & Methodology, three currently existing courses will be used as models for the development of this course. In addition to outcomes identified through existing research and through employer feedback, ABET criteria will also be taken into consideration in the development of this course. The course will be entitled “Communication for Engineers” and should be taken in a student’s third year of undergraduate study as a requirement for graduation. The modules will be broken down in the following way:

Module 1: Introduction to Communication

Module 2: Communicating as an Engineer

Module 3: Collaborating with Other Disciplines

Module 4: Identifying and Understanding Your Audience

Module 5: Business Communication

Module 6: Proposals and Presentations
Module 7: Starting Your Career in Engineering

Module 8: Ethics in Engineering

This course will introduce the topics and skills necessary for being an effective contributor to an organization in an engineering capacity. The combination of modules will be designed to meet the following specific Accreditation Board for Engineering and Technology (ABET) criteria as delineated in Criterion 3: Program Outcomes:

1. an ability to function on multi-disciplinary teams;
2. an understanding of professional and ethical responsibility;
3. an ability to communicate effectively;
4. the broad education to necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context; and
5. a recognition of the need for, and an ability to engage in life-long learning. (ABET, 2009).

The curriculum for instructors and full syllabus for the designed course can be found in Appendices A and B.

Discussion of Project

The modules outlined above are designed to incorporate a broad range of communication skills that will be important for new engineers. Based upon research on the role of communication in technical fields, employer surveys, and an overall understanding of communication apprehension, certain learning objectives were identified. Chak (2011) identifies the core competencies required of engineering students:
Among the most important attributes required of an engineer graduate are the ability to think critically, creativity, flexibility, assertiveness, pro-activeness, team playing, networking skills, leadership, ambitious, presentation skills, professional skills, tolerance, ability to predict, reliability, risk taking attitude, openness to new technologies, competitive spirit and knowledge (p. 62).

Similarly, Brinkman and van der Geest (2003) identify four layers of communication literacy, all of which should be taken into consideration in engineering programs: text craftsmanship, genre competence, strategic communication competence, and feedback competence. While it is not realistic to develop all of these competencies in one semester-long course, it is important that students gain an understanding and appreciation of these skills. The goal is for colleges and universities to produce well-rounded graduates that are prepared for the demands of the contemporary workplace.

The major parts of each of the modules are as follows (see Appendix for a more detailed description):

Module 1 will offer a basic introduction to communication. Basic communication theories will be introduced; however, the focus of the module will not be a comprehensive theoretical understanding, but rather on practical applications. Students will learn the importance of communication competence and will take inventory of their current communication skill set.

In Module 2, students will be introduced to the unique communication challenges faced by engineers. Because there is often little emphasis placed on communication within core engineering courses, the goal is for students to begin to understand what will be expected and required of them as they enter into their first careers. A requirement of this module will be to have a discussion with an industry professional who is 5 or more years removed their
undergraduate studies; the goal is to gain an understanding of how the working world differs from the academic world.

Module 3 focuses on collaborating with other disciplines. One of the most important outcomes of this course is for engineering students to understand contemporary dynamics of the workplace. They will be required to work on diverse teams where members can have varying degrees of technical knowledge. Gaining exposure to this type of working environment is imperative, as each team member contributes a very different perspective. The key is for an engineer to understand their role and how to relay their ideas in order to maximize group productivity.

Module 4 focuses on helping students to identify and understand their audience. There are many contexts in which engineers are required to communicate, so they must have the ability to alter their delivery to accommodate their audience. Engineers must understand that they will not always be communicating with other engineers; they will interact with line workers, executive-level managers, marketing professionals, accountants, human resource representatives, etc. Dannels (2010) quotes a handout given to students in an engineering capstone course:

The key role of the engineer is to take verbally expressed needs and turn them into something you can measure – numbers – for your audience of engineers but you can’t stop at the numbers because you have an audience waiting to hear words in simple terms. When you speak, you must translate your engineer jargon into simple terms (p. 260).

Module 5 addresses practical elements of business communication. This module introduces students to the practical communication methods used in a business setting, which can include technical reports, email correspondence, business lunch/dinner etiquette, proposals, etc.
Students will practice their skills in a variety of these different genres through in-class activities and assignments.

Module 6 will focus on the proposals and presentations. This will incorporate prior modules, namely Modules 3 and 4, which introduced working on multi-disciplinary teams and identifying an understanding an audience. Students will learn the ways to format dynamic proposals and presentations, and will begin to use some of the common tools to create engaging designs.

Module 7 is career-oriented. It is important for students to know what to expect upon entering into the working world after graduation. This module will focus on resume building and interviewing skills. Students will learn about the job search/interview process. Preparation is important for a successful interview, so the more practice a student has, the more comfortable he or she will be when it comes time for the first real interview. The assignment for this module will require students to visit their university’s career services office to become familiar with the services offered, and they must also attend walk-in hours or a full appointment to have their resume reviewed. There will be two guest speakers within this module offering two different perspectives. The first will be a human resources representative who will familiarize students with the hiring process, as well as common missteps of college students in regards to resumes and interviewing. The second speaker will be a recent alumnus now working in an engineering capacity, who will offer his or her perspective on the corporate world and how it differs from university life. These perspectives are important for students to begin to understand the things that are expected of them, and to hear it from a first-person source will be much more effective than simply teaching the material.
The final module, Module 8, will address ethics in engineering. Ethics are not only important in the practice of engineering, but they are also important in all other facets of professional life. This module will include material to aid in the understanding of ethical behavior, and will focus on several case studies that will require an analysis of the actions taken in certain questionable situations. Students will practice their decision making skills and will be required to be able to discuss their thought processes used to determine how to handle ethical situations.

In addition to the lectures and assignments/activities of each module, students will be responsible for completing two group projects throughout the semester. The goal of the first project will be to create a presentation for a non-technical audience. A technical topic from an engineering course will be selected by the group. This topic will need to be approved by the instructor prior to beginning the project. Students will make the decision on the format of the presentation, but will want to present it in a way that is easily understood by their audience and is visually appealing and engaging. They must adhere to the following guidelines:

1. Topic can be anything engineering-related, but must be approved by instructor.

2. Required length of presentation is 10-12 minutes.

3. All four team members must speak at some point in the presentation.

4. They must have a visual aid (PowerPoint, Prezi, diagram, video, etc.)

5. They must create an easy-to-understand handout of information to distribute to audience members.
This project is intended to be the least intensive of the two projects in order for students to not feel intimidated, especially those with communication apprehension. Grading will be based upon the effective communication of ideas in an easy-to-understand format.

The second project will be a comprehensive assessment of all the skills learned throughout the semester. This project will involve collaboration with students from a Business Communication course on a multi-disciplinary team. Some of the backgrounds of the students may include business administration, marketing, economics, accounting, etc. Corporate partners who have volunteered their time and expertise will provide the students with a real-world problem for which they will have to develop a solution. They will then be responsible for developing a presentation that will outline all pertinent aspects of their problem-solving processes. Each student will be responsible for applying techniques and theories from each of their respective disciplines in order to create a comprehensive proposal of a solution. The project is intended to simulate the types of teams that engineers will work with in their future work environments. One of the main learning objectives is to learn how to interact with people who have varying levels of technical understanding. A second important objective is for students to be able to develop presentations that are easily understood and effectively “sell” their solution. Grading for this project will be based on presentation evaluations completed by a panel of employers and faculty.

Outcomes and Implications

Throughout the proposed course, each of the modules focuses on the desired outcomes outlined in the ABET criteria, and also addresses the needs identified in prior existing research. Each assignment and activity was developed using the aforementioned learning theories, to include constructivism (more specifically, experiential learning) and intrinsic motivation through
free-choice. The likelihood of communication apprehension amongst engineering students was also taken into account, thus students “ease into” communication tasks in what can perhaps be described as a form of systematic desensitization.

Each module incorporates readings and/or videos that are both contemporary and practical in nature to encourage students develop a vested interest in improving their communication skills. Including perspectives not just from the instructor, but also from industry professionals, provides a first-hand account of the working world. Jennings and Ferguson (1995) provide further support of this idea, citing Finniston’s (1980) review of the effectiveness of the engineering industry:

(There was) a call to broaden engineering education away from the purely engineering science to include more awareness of the place of the engineer in society and skills development. The engineering profession wanted less graduates who were trained only to be backroom experts and more who could interact with people outside the profession, be proactive, and take leading roles (p. 2).

The two required projects within the course incorporate the vital component of experiential learning, as students are placed in a group situation very similar to what they can expect in their post-graduation work environments. The second project in particular uses an experiential approach, as it introduces a real-world problem posed by a member of industry that requires the student group to develop a solution. This is in contrast with the more traditional methods of rote learning.

Experiential learning also inherently incorporates a career focus, which is introduced in Module 7. It was imperative to include a module centered on career topics, as this course mostly focuses on developing skills that will serve students and employers well post-graduation. During
Week 13, students are required to visit their career services office to familiarize themselves with the services offered and also to participate in an advising appointment. This encourages students to become aware of the career opportunities available to them and the requirements of particular occupations. This topic continues into Week 14, where students will be responsible for conducting a mock interview with a peer, and also arranging a mock interview through the career services office. The experience of an interview will be a more effective learning tool in contrast to only providing a lecture on interviewing techniques. An overall goal throughout each of the modules is to establish a context through lecture, then incorporate a practical activity to further develop an applied understanding.

Many of the assignments promote intrinsic motivation through free-choice. One of the challenges with teaching communication to technical students is getting them to understand both the relevance and importance. By allowing them to choose their own topics in many cases, it allows them to select something of interest, thus increasing their motivation to complete the task. For example, the Week 6 assignment involves the preparation of a five-minute speech/demonstration where the student teaches the class how to do something. By allowing the student to select the topic, it may make them more inclined to have an interest in the assignment. Also, people inherently like to talk about things they know, or can do, well. This can assist in helping students with communication apprehension to be more comfortable than they would be presenting on an unfamiliar topic. A second assignment during Week 9 allows students to select two of their favorite articles out of a set of required readings to which they will provide a reaction and a practical management application. This also allows an element of free-choice in an effort to encourage better understanding. While this is an important learning theory within the framework of this course, not all assignments include this approach. It is important for students
to understand that they will not always have a choice in their assignments once they are employed, thus some course requirements are thoroughly defined and delineated.

All of these modules were developed with core communication competencies as the main objectives. Because the course will be team-taught by one engineering professor and one communication professor, each module will offer a holistic approach to the material. The assignments were designed in a transitional working model that progressively builds on each communication experience attained through the previous module. By the end of the semester, students should feel comfortable and confident in their level of communication skills, and will ultimately be more marketable candidates upon graduation.
Chapter 5: Summaries and Conclusions

Limitations of the Study

Prior existing research was used as the basis for this project, thus the theoretical foundation was limited in that regard. One piece of research that was taken heavily into consideration was an existing survey of employers who hire new college graduates. Because this survey did not specify the types of majors each employer hires, it was not possible to determine if there were variances between those who hire engineering graduates and those who do not.

A second limitation to this study involves the limiting of feedback to only employers, and not students or faculty. The largest stakeholder taken into account were the companies who hire engineering graduates, and whether the current skills sets with which students are graduating meet their needs. It is possible that there could be varying attitudes that exists across different demographics.

A final identified limitation is the lack of a full analysis of colleges and universities that already offer a communication course for engineering students. Much of this project was based on an assumption that the majority of colleges and universities do not offer an engineering-specific communications course. This assumption was made based upon a brief overview of multiple college and university engineering program requirements via online resources. No comparison was made between schools that do and do not offer this type of course, and the corresponding preparation levels of students.

Recommendations for Further Study

Further studies may incorporate original research that focuses on feedback from employers who specifically hire engineering students. This will allow for better support of a proposed communication course developed strictly for engineering students, as the questions
asked of the employers can be better targeted. Included in this research could be the use of a focus group of key employers in an effort to generate discussion about what they expect of new graduates and what they suggest that colleges and universities can improve upon in regards to developing certain skill sets.

Two important audiences that were not addressed in the development of this project were engineering students and faculty members. Further research could survey engineering students to identify their current comfort level with communication skills, as well as determine whether or not they feel that they are being prepared for the corporate world. A demographic of particular interest could be engineering students who have participated in an internship or a co-op while still enrolled in college. This group of students has the unique opportunity to enter into a real-world role prior to graduation and can have an earlier grasp of whether or not they feel prepared for that role.

A second important perspective solicited in potential future research could be from faculty. It is important to determine if there is dissonance between how faculty members believe they are preparing students, and how students and employers feel about the preparation being received.

Further research can also delve deeper into identifying the colleges and universities that already offer an engineering-specific communication course in an effort to ascertain if there is a change in the level of preparedness indicated by students and employers.

**Conclusions**

A need has been identified as it relates to the preparation of engineering students for real-world roles after graduation. The contemporary work environment is very dynamic and requires students to have a much broader skill set than what was required of them in the past. Colleges
and universities have not traditionally placed a focus on developing communication skills within their technical programs; however, based upon criticism from employers, this is something that is imperative to the success of new graduates. Engineering students can be prone to communication apprehension (see McCroskey, 2009 and P’Rayan & Shetty, 2008), thus a communication course designed specifically within the context of engineering can be of great benefit.

Bancino and Zevalkink (2007) and Dannels (2010), as well as many other aforementioned scholars (see Chapter 2) call for a shift from more traditional technical programs, to ones that are more professionally-oriented. Using the theory of experiential learning as a basis for course material, students will be exposed to the practical uses of communication. Thus, the importance of communication in future work environments will become more salient, ultimately increasing both understanding and appreciation. This project can form the basis for an engineering-specific communication curriculum that will meet the unique needs of both students and employers that can open more employment opportunities to students and contribute to improved overall organizational performance for employers.
References


Shuman, M. L. (2010). *Syllabus for ENC 3246: Communication for Engineers – SEC 003*. (Available from University of South Florida College of Arts and Sciences, 4202 E. Fowler Avenue, CPR107, Tampa, FL 33620)


Appendix A

**Course: Communication for Engineers**

**Curriculum for Instructors**

**Note to Instructor(s):** This course is broken down into eight (8) two-week modules. The theme throughout all eight modules will be to help students gain an understanding of how engineers communicate within organizations, with a focus on understanding their audience, writing and public speaking skills, and working on multi-disciplinary teams. The goal by the end of the semester is to increase students’ comfort level across all formats of communication and to help them become an effective and efficient future employee upon graduation. This course will combine lecture and discussion components, as well as individual and group projects. There will also be a required online discussion component. The curriculum may be altered at the discretion of the instructor to fit the unique needs of the students.

Following is a basic outline of the goals and objectives of each module. These objectives ultimately help meet the Accreditation Board for Engineering and Technology (ABET) criteria as delineated in Criterion 3: Program Outcomes:

1. an ability to function on multi-disciplinary teams;
2. an understanding of professional and ethical responsibility;
3. an ability to communicate effectively;
4. the broad education to necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context; and
5. a recognition of the need for, and an ability to engage in life-long learning. (ABET, 2009).

**Course Assignments:** Reference syllabus for the requirements of each assignment, including group projects and online discussion board topics.

**Grading:** Each assignment can be weighted at the discretion of the instructor(s).

**Required Course Texts:**

- Other materials as listed throughout the curriculum/syllabus
Module 1: Introduction to Communication

Goal: To provide an overview of basic communication theories and their practical applications.

Student Learning Objectives:
- Gain a basic understanding of the importance of communication, as well as basic communication theories.
- Take inventory of current communication abilities.

Student Performance Outcome(s):
- Display an understanding of their current level of communication aptitude.

Required Readings:
- Syllabus
- Speight, Chapter 1 – Scientific and Engineering Writing (p. 1-15)

Module 2: Communicating as an Engineer

Goal: To assist students in understanding the unique scenarios and challenges engineers face as they relate to communication.

Student Learning Objectives:
- Understand how engineers are required to communicate within a corporate environment.
- Recognize the different forms of communication that will be important as an engineer.
- Understand why communication ability is imperative for an engineer, not just technical skills.

Student Performance Outcome(s):
- Compose a piece of writing that effectively translates a technical topic to a non-technical audience.
- Begin to identify how engineers deliver messages to others.
Required Readings:

- Review “Writing Guidelines for Engineering and Science Students” at http://www.writing.engr.psu.edu/.

Module 3: Collaborating with Other Disciplines

Goal: For students to understand dynamic work environments in which they will be required to work with others of varying backgrounds and levels of technical understanding.

Student Learning Objectives:

- Understand how to define and assign tasks within a group to maximize efficiency.
- Learn how to relay ideas to other group members in an easily understood manner.

Student Performance Outcome(s):

- Effectively work within a group and be able to successfully identify and assign tasks.

Required Readings:

- Speight, Chapter 7 – Teamwork (p. 107-121)
- Harvard Business School manual – “When it’s a group effort” (p. 35-39)

Module 4: Identifying and Understanding Your Audience

Goal: For students to be able to recognize the differences between different potential audiences and how to maximize effectiveness of their delivery based upon those differences.

Student Learning Objectives:

- Understand the contexts in which they might be required to communicate.
- Ability to identify with whom they will need to interact, at all levels from laborers to executive-level management.
- Learn how to adjust their delivery method to accommodate varying audiences.
Student Performance Outcome(s):

- Determine the most effective method of message delivery based upon different audiences.

Required Readings:

- Speight, Chapter 4 – Audience (p. 57-71)

Module 5: Business Communication

Goal: To familiarize students with the business environment and how people communicate on a day-to-day basis.

Student Learning Objectives:

- Understand the transition from college to the corporate world
- Gain exposure to practical communication methods, including email, memorandums, presentations, business letters, reports, etiquette, etc.

Student Performance Outcome(s):

- Effectively compose basic forms of business communication.
- Begin to increase comfort level with public speaking.

Required Readings:

- Watch the YouTube video “PowerPoint 2010 Crash Course” by titantechtraining (http://www.youtube.com/watch?v=OiphF2bgi-M&playnext=1&list=PL970452FA1F57CAFF) Note that this is an 8-part series.

Module 6: Proposals and Presentations

Goal: For students to become comfortable with presenting proposals and other information in front of an audience.

Student Learning Objectives:

- Learn and demonstrate best practices in regards to presentations.
- Understand the techniques that will help deliver their message to different audiences
- Learn to effectively use presentation tools in order to develop creative and dynamic proposals and presentations
- Become comfortable with public speaking.

Student Performance Outcome(s):
- Illustrate effective presentation skills with confidence and clarity.

Required Readings:
- Speight, Chapter 9 – Technical Presentations (p. 139-154)
- Harvard Business School manual (p. 15-31)

Module 7: Starting Your Career in Engineering

Goal: For students to understand the career search process.

Student Learning Objectives:
- Understand and utilize the services available at the career services office.
- Gain perspective from professionals in the field.
- Become comfortable with the job interview process.
- Learn resume/cover letter writing techniques.
- Gain an understanding of hiring practices

Student Performance Outcome(s):
- Actively utilize a career services office.
- Create a resume accurately and effectively displaying academic and work experience.
- Participate in a mock interview and display and understanding of appropriate response techniques.

Required Readings:
- “Common Interviewing Mistakes College Students Make” by Fox Business (http://www.foxbusiness.com/personal-finance/2011/02/09/common-interviewing-mistakes-college-students-make/)
- Watch the YouTube video “How to Answer ‘Behavior Based Interview Questions’ - Interview Tip” (http://www.youtube.com/watch?v=qKBubKO-798)

Module 8: Ethics in Engineering

Goal: For students to understand potential ethical implications within the field of engineering.

Student Learning Objectives:

- Understand both the ethical issues within engineering and also within the professional realm as a whole.
- Learn how to approach ethical issues and become comfortable and confident in making good decisions.
- Learn how to effectively describe their decision-making process.
- Become familiar with the National Society of Professional Engineers (NSPE) Code of Ethics for Engineers.

Student Performance Outcome(s):

- Identify and verbalize potential ethical issues in engineering.
- Display a thorough ethical decision making process.

Required Readings:

- National Society of Professional Engineers (NSPE) Code of Ethics for Engineers (www.nspe.org)
- Reading: Goodyer, J. J. (2012). Would you sign up to this? Engineering & Technology, 7(2), 30-33.
Appendix B

**Communication for Engineers: Course Syllabus**

This course has been specifically developed for engineering undergraduate students with the objective of developing the communication skills necessary to be successful in future work environments. It is important that this particular skill set is developed concurrently with technical knowledge, as both public and private sector employers desire new graduates who can be well-rounded employees.

In an effort to provide a comprehensive approach to the material, this course is co-taught by both engineering and communication faculty.

**Required Text:**


**Course Description:**

This course is broken down into eight (8) two-week modules. The theme throughout all eight modules will be to help you gain an understanding of how engineers communicate within organizations, with a focus on understanding your audience, writing and public speaking skills, and working on multi-disciplinary teams. The goal by the end of the semester is to increase your comfort level across all genres of communication and to help you become an effective and efficient future employee upon graduation. This course will combine lecture and discussion components, as well as individual and group projects. There will also be a required online discussion component.

**Objectives and Outcomes:**

The course objectives and outcomes are based upon ABET criteria, as well as data compiled relating to the importance of communication in technical fields.

**Course Objectives:**

1. An ability to function on multi-disciplinary teams;
2. an understanding of professional and ethical responsibility;
3. an ability to communicate effectively;
4. the broad education to necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context; and
5. a recognition of the need for, and an ability to engage in life-long learning. (ABET, 2009).

Course Outcomes:

1. Understand the role of an engineering within an organization;
2. develop the skills to be an effective and confident writer, speaker, and presenter;
3. recognize the importance of soft skills in the workplace;
4. identify and understand different genres of communication and be able to adapt; approach based upon audience;
5. be able to apply course material to real-world scenarios;
6. have an understanding of job search skills, including resume-writing, interviewing, and the hiring process; and
7. gain an ethical perspective of business and engineering.

Grading:

A ten-point grading scale is used in this course, as follows:

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<thead>
<tr>
<th>Grade</th>
<th>Range</th>
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<tbody>
<tr>
<td>A</td>
<td>90-100</td>
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<tr>
<td>B</td>
<td>80-89</td>
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<tr>
<td>C</td>
<td>70-79</td>
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<td>D</td>
<td>60-69</td>
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<td>F</td>
<td>Below 60</td>
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Course Format:

This course has two 90-minute class meetings per week. Each class will be comprised of a lecture component paired with numerous different activities (see course schedule for details). You will want to complete the reading prior to the first class of the week so you are prepared for the material. With this being a communications course, inherently there will be a lot of interactive discussion. Some of you may initially be a bit apprehensive to speak out in class, but by the end of the course the goal is to increase your communication comfort level. Conquering any communication apprehension will ultimately be to your benefit when you enter the working world after graduation.

Assignments:

Assignments will be given throughout each of the modules (see course schedule for details and due dates). You will also be responsible for completing two group projects throughout the course. The first will involve teams assigned by the instructor, which will be comprised of
members of your class. For the second group project, our class will team up with the members of a communications course in the College of Business, thus you will be working on a multi-disciplinary team. This will be considered your final project and is due at the beginning of Week 15 in order to allow time for each team to present. Grades will be based partially on evaluation forms completed by a panel of faculty from different disciplines and industry professionals.

**Mini-Speeches**

Beginning Week 3, one to two students per day will be required to give a mini-speech on a timely engineering topic. You will be required to give a 2-3 minute speech based upon a recent article of your choosing at the beginning of class. During Week 2, the instructor will present an example, and will assign each student a presentation date. This exercise is to help ease you into speaking in front of an audience.

**Projects:**

**Group Project #1 (due at the end of Module 4):** For this project, you will work in teams of four (assigned by the instructor). The goal of this project will be to create a presentation for a non-technical audience. You will first select a technical topic from one of your engineering courses. This topic will need to be approved by the instructor prior to beginning the project. You will then decide on the format of your presentation – be creative! You’ll want to present it in a way that is easily understood by your audience and is visually appealing and engaging. You must adhere to the following guidelines:

1. Topic can be anything engineering-related, but must be approved by instructor.
2. Required length of presentation is 10-12 minutes.
3. All four team members must speak at some point in the presentation.
4. You must have a visual aid (PowerPoint, Prezi, diagram, video, etc.)
5. You must create an easy-to-understand handout of your information to distribute to audience members.

**Group Project #2 (due at the beginning of Module 8):** This project will involve collaborating with students from a Business Communication course on a multi-disciplinary team. Some of the backgrounds of the students may include business administration, marketing, economics, accounting, etc. The goal of this project is to begin to understand the role of an engineer on a working team and to use the techniques learned throughout the course to effectively communicate within the team. Corporate partners who have volunteered to assist with this course will present each group with a real-world problem in their company, and the team will be tasked with developing a solution and presenting it to a panel of employers and faculty. The presentations must be between 15 and 20 minutes in length, and that is the only
requirement. Students will have full creative discretion. Presentations will take place during Weeks 15 and 16. Grades will be based partially on evaluations completed by the panel, and also an evaluation by the instructor(s).

**Online Discussion Board:**

This course contains an online discussion board component. There will be several discussion board topics assigned throughout the semester, and you will have until the 2nd class day of the module to submit your initial posting. You are then required to respond to at least 2 students by the last day of the module. The purpose of the discussion board is to give you an avenue to interact with other students about topics that may not have been thoroughly covered in class.

In addition to the assigned topics, there will be a “general” discussion board available to students to freely discuss any topic related to the course.

**Course Schedule:**

**Module 1 (Weeks 1 & 2): Introduction to Communication**

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<td></td>
<td><strong>Assignment (due last class meeting of Week 1): IABC Communication Skills Assessment Tool</strong> Complete the communication assessment tool developed by Rich Young of the International Association of Business Communicators (IABC). This will assist you in understanding your current skill level and help you to identify areas of opportunity. Be prepared to discuss in class during Week 2.</td>
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<tr>
<td></td>
<td><strong>Online Discussion Board (due end of Week 1):</strong> Post a brief bio and include your engineering interests/career goals. Even though everyone will be interacting in class, posting a photo will help with getting to know one another.</td>
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</table>
| Week 2 | **Reading:** Speight, Chapter 1 – Scientific and Engineering Writing (p. 1-15)  

Introduce mini-speeches to commence Week 3. |

| Assignment (due last day of Week 2): Think about the role communication has played thus far in your academic career. How do you anticipate that role changing/evolving once you enter the corporate world? Or even in future academic endeavors? Please compose 2-3 paragraphs addressing this topic. |
Module 2 (Weeks 3 & 4): Communicating as an Engineer

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<td><strong>Assignment (due last day of the module):</strong> Find a friend or acquaintance who has been working in the “real world” for 5 or more years, preferably in a technical capacity, but not required. Discuss with them what their experience has been like; did they feel prepared for a dynamic work environment? What have they noticed about the communication within their place of employment? Relate your discussion to previous readings. Write a 2-3 page reflection.</td>
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**Group Project # 1 Teams will be assigned this week**

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<tr>
<th>Week 4</th>
<th>Reading: Review &quot;Writing Guidelines for Engineering and Science Students&quot; at <a href="http://www.writing.engr.psu.edu/">http://www.writing.engr.psu.edu/</a>.</th>
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<td><strong>Assignment (due last class of the module):</strong> You will be assigned a technical manual for the assembly of a product. Your task will be to convert the information from the manual into an easy-to-understand one page guide for a non-technical audience.</td>
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Module 3 (Weeks 5 & 6): Collaborating with Other Disciplines

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<tr>
<th>Week 5</th>
<th>Reading: Speight, Chapter 7 – Teamwork (p. 107-121)</th>
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<td><strong>Assignment:</strong> Work on Group Project # 1.</td>
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<th>Week 6</th>
<th>Reading: Harvard Business School manual – &quot;When it’s a group effort&quot; (p. 35-39)</th>
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<td><strong>Online Discussion Board (due end of Week 6):</strong> It can sometimes be challenging working with teammates whose cultures, personalities, or working styles are different from our own. Please discuss a time when you had difficulty working with someone else.</td>
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</table>

Module 4 (Weeks 7 & 8): Identifying and Understanding your Audience

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<tr>
<th>Week 7</th>
<th>Reading: Speight, Chapter 4 – Audience (p. 57-71)</th>
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<td><strong>Assignment (due last class of the module):</strong> <strong>Group Project # 2 Teams will be assigned this week</strong> Your assignment will be to organize a time for your group to meet outside of class. Develop a proposal for your project that you will turn in before the last class of Week 8.</td>
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**Group Project # 1 due**

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<th>Week 8</th>
<th>Reading: Harvard Business School manual – “First things first” (p. 7-15)</th>
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<td><strong>Assignment (due last class of the module):</strong> Prepare a 5 minute speech/demonstration where you teach the class how to do something. The topic can be any type of favorite activity.</td>
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# Module 5 (Weeks 9 & 10): Business Communication

| Week 9 | **Reading:** Review inc.com’s “Better Communication with Employees and Peers” guide (http://www.inc.com/guides/growth/23032.html)  
**Assignment (due last day of the module):** Select two of your favorite articles from within the “Better Communication with Employees and Peers” guide. If you were an engineering manager, how would each of these articles benefit you and your employees? Your response should be 2-3 pages. |
|---|---|
| Week 10 | **Reading:** Watch the YouTube video “PowerPoint 2010 Crash Course” by titantechtraining (http://www.youtube.com/watch?v=OiphF2bgM&playnext=1&list=PL970452FA1F57CAFF)  
Note that this is an 8-part series.  
**Assignment:** You will be assigned a timely and relevant business topic by the instructor and will create a 5-slide PowerPoint presentation to deliver to the class. |

# Module 6 (Weeks 11 & 12): Proposals and Presentations

| Week 11 | **Reading:** Speight, Chapter 9 – Technical Presentations (p. 139-154)  
**In-class Activity (during second class meeting of the week):** Impromptu speech – you will be given a topic at random and will deliver a 2-3 minute speech to the class. |
|---|---|
| Week 12 | **Reading:** Harvard Business School manual (p. 15-31)  
**Assignment (due last class of Week 12):** Your Project #2 group will be given the proposal of another group and will be tasked with evaluating it within the scope of this module. You will then have some time to meet with the group and share your feedback in a way that will benefit their final presentation. |
### Module 7 (Weeks 13 & 14): Starting your Career in Engineering

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<td><strong>Assignment (due last class of Week 14):</strong> Visit the Engineering Career Services office and register for a job search account. Attend either walk-in hours or a full advising appointment to earn credit for this assignment. Go prepared with a hard copy of your resume and have it reviewed. <strong>Guest Speakers</strong> During Week 13, we will welcome a guest speaker during each of the class meetings. The first will be a Human Resources Representative from a large manufacturing company who will discuss what employers expect of recent engineering graduates. The second guest speaker will be a recent alumnus from the University who now works in an engineering capacity. He or she will share with you his or her experience during the first year of employment.</td>
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<td>Week 14</td>
<td>Reading: “6 Things You Must Do to Get Your First Job After College” by Susan Adams (<a href="http://www.forbes.com/sites/susanadams/2012/11/12/6-things-you-must-do-to-get-your-first-job-after-college/">http://www.forbes.com/sites/susanadams/2012/11/12/6-things-you-must-do-to-get-your-first-job-after-college/</a>)</td>
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<td>“Common Interviewing Mistakes College Students Make” by Fox Business (<a href="http://www.foxbusiness.com/personal-finance/2011/02/09/common-interviewing-mistakes-college-students-make/">http://www.foxbusiness.com/personal-finance/2011/02/09/common-interviewing-mistakes-college-students-make/</a>)</td>
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<td>Watch the YouTube video “How to Answer ‘Behavior Based Interview Questions’ - Interview Tip” (<a href="http://www.youtube.com/watch?v=qKBubKO-798">http://www.youtube.com/watch?v=qKBubKO-798</a>).</td>
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<td><strong>In-class Activity (first class of Week 14):</strong> Each of you will be given a list of mock interview questions and an assessment form. Pair up with a partner and practice your interviewing skills. Use the methods learned from the readings to respond to the questions. Treat this activity as a real interview – one student will be the employer and the other will be the candidate, then switch.</td>
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<td><strong>Assignment (due last class of Week 14):</strong> Arrange for a mock interview through your career services office. You may do an in-person mock interview with an advisor, or use an online mock interview tool, such as InterviewStream (<a href="http://www.interviewstream.com/">http://www.interviewstream.com/</a>) to record yourself and submit it to an advisor for review. You must turn in the mock interview evaluation from the advisor to receive full credit.</td>
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Module 8 (Weeks 15 & 16): Ethics in Engineering

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<tr>
<th>Week 15</th>
<th>Reading: National Society of Professional Engineers (NSPE) Code of Ethics for Engineers (<a href="http://www.nspe.org">www.nspe.org</a>).</th>
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<td>Assignment (due last class meeting of Week 15): Take the NSPE Code of Ethics Examination found at <a href="http://www.nspe.org/Ethics/EthicsResources/EthicsExam/index.html">http://www.nspe.org/Ethics/EthicsResources/EthicsExam/index.html</a>. The results are for your benefit, but be prepared to discuss in class.</td>
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<td><strong>GROUP PROJECT PRESENTATIONS BEGIN WEEK 15. DATES WILL BE ASSIGNED BY THE INSTRUCTOR DURING WEEK 13</strong></td>
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<td>Week 16</td>
<td>Reading: Goodyer, J. J. (2012). Would you sign up to this? Engineering &amp; Technology, 7(2), 30-33.</td>
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<td>Assignment (due last class meeting of Week 16): Using Goodyer’s article as reference, compose a response to the idea the engineers should take a formal ethical oath. Your response should range between 500-1000 words.</td>
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