AC 2010-745: A QUALITATIVE EXAMINATION OF FACULTY BELIEFS RELATED TO ENTREPRENEURSHIP EDUCATION

Kirsten Hochstedt, Pennsylvania State University
Kirsten Hochstedt is a Graduate Assistant at the Leonhard Center for the Enhancement of Engineering Education. She has received her Masters degree in Educational Psychology, with an emphasis in educational and psychological measurement, at Penn State and is a doctoral candidate in the same program. The primary focus of her research concerns assessing the response structure of test scores using item response theory methodology.

Sarah Zappe, Pennsylvania State University
Sarah E. Zappe, is Research Associate and Director of Assessment and Instructional Support for the Leonhard Center for the Enhancement of Engineering Education at Pennsylvania State University. In her current position, Dr. Zappe is responsible for supporting curricular assessment and developing instructional support programs for faculty and teaching assistants in the College of Engineering. Her work in engineering education focuses on assessment, faculty development, and teaching and learning issues.

Elizabeth Kisenwether, Pennsylvania State University
Elizabeth Kisenwether is Assistant Professor of Engineering Design and co-Director of the Lion Launch Pad at Penn State University. Liz holds a B.S. degree in Electrical Engineering from Penn State (1979), and M.S.E.E. degrees from Massachusetts Institute of Technology (1981) and The Johns Hopkins University (1988). She worked in industry for 11 years with a defense contractor (HRB Systems/Raytheon), and then co-founded and worked for five years with a high-tech startup (Paragon Technology), which developed digital video add-in cards/modules for laptop and rugged portable computers. Since joining Penn State in 1999, Liz has taught design courses in the Mechanical, Electrical, and Civil and Environmental Engineering Departments, and in SEDTAPP. In 2001, she became director of the Problem-Based Learning in Entrepreneurship project (underwritten by the GE Fund), and in 2002 was named Director of the Engineering Entrepreneurship Minor. She was awarded the 2005 Price Foundation Innovative Entrepreneurship Educators Award – Stanford University REE Conference (Roundtable for Entrepreneurship Education) and 2006 ASEE Kauffman Outstanding Entrepreneurship Educator Award. In January 2010, Liz stepped down as Director of the E-SHIP Minor to help define expansion plans for undergraduate entrepreneurship education across Penn State. Liz is co-Director of the Lion Launch Pad, a new student-centric on-campus business incubator. The Lion Launch Pad supports entrepreneurial teams from across Penn State, with the goal establish viable innovation companies.

Angela Shartrand, National Collegiate Inventors and Innovators Alliance
Angela Shartrand is research and evaluation manager at the National Collegiate Inventors and Innovators Alliance, a non-profit organization that supports technology entrepreneurship in U.S. colleges and universities. Her research focuses on understanding how to develop and sustain ecosystems that support innovation and entrepreneurship in higher education. She holds a Ph.D. in Applied Developmental and Educational Psychology from Boston College, an Ed.M. from Harvard University and a B.A. from Williams College.

A qualitative examination of faculty beliefs related to entrepreneurship education

Abstract

As part of a larger NSF-funded research study, this paper begins to examine faculty members' beliefs related to entrepreneurship education and how these beliefs may be translated into practice in entrepreneurship programs and courses. A total of 26 faculty members participated in a semi-structured interview to examine their beliefs related to entrepreneurship education. These faculty members came from one of three large research institutions having strong entrepreneurship programs for undergraduate students. The faculty members were from various disciplines including engineering, business, and others. The interview protocol included questions relating to faculty beliefs of entrepreneurship education focusing on the following:

1. How do faculty members define the entrepreneurial mindset, or the characteristics necessary to be entrepreneurs?
2. Do faculty members believe that the entrepreneurial mindset is something that can be developed? Or do they feel that certain characteristics necessary to be an entrepreneur are innate to the person?
3. How do faculty members teach entrepreneurship? Is there a relationship between the faculty beliefs and the way that they teach entrepreneurship?

We hypothesize that faculty members' beliefs will vary and that these beliefs are directly tied to how courses are taught, influencing both course content and the use of specific instructional strategies. We also hypothesize that beliefs are influenced by various characteristics of the individual faculty members. The qualitative data collected in this study provides a starting point into understanding faculty beliefs and serves as a launching point for the next steps in the project.

Introduction

In the past several decades, universities and colleges around the country have begun to implement programs in engineering schools dedicated to teaching students the skills, knowledge, and attitudes necessary to become entrepreneurs. In 2003, Katz estimated that more than 1600 universities had established entrepreneurship programs in business, engineering, or as an interdisciplinary program.[1] This number is continuing to grow, particularly in engineering colleges as the importance of entrepreneurial skills for engineering students is being recognized by a greater degree.

Ohland and colleagues[2], who define entrepreneurship as "the initiation of new wealth-creating activities in response to a perceived market need, despite an element of risk and absent or inadequate resources," list several reasons why engineering students need to be trained in skills relating to entrepreneurship. As the authors note, the perfect product design may not be successful if the designer is unable to use business knowledge and skills to find a "niche" in the marketplace. In addition, many graduates of engineering programs are finding work in start-up

ventures and small companies that require the entrepreneurial mindset. Companies are beginning to realize that business decisions need to include the insight and experiences that engineers possess.

Although the number of entrepreneurship programs in engineering has grown exponentially in the past decade, little research has been done to systematically examine program models or faculty beliefs and teaching practices. Most of the research in entrepreneurship education in engineering has centered on descriptions or assessment of individual entrepreneurship programs, courses, or other individual program components.[i.e. 2,3,4] The purpose of this study, as part of a larger National Science Foundation funded project, is to begin to examine faculty beliefs and teaching practices regarding entrepreneurship education in engineering. Specifically, three research questions will be addressed:

1. How do faculty members define the entrepreneurial mindset, or the characteristics necessary to be entrepreneurs?

2. Do faculty members believe that the entrepreneurial mindset is something that can be developed? Or do they feel that certain characteristics necessary to be an entrepreneur are innate to the person?

3. How do faculty members teach entrepreneurship? Is there a relationship between the faculty beliefs and the way that they teach entrepreneurship?

Each of these questions is discussed further below.

1. How do faculty members define the entrepreneurial mindset?

What do faculty members in engineering entrepreneurship programs believe are the necessary skills to become entrepreneurs? This question has not yet been addressed in the literature. Several articles found in business and engineering education have listed what they believe to be necessary. For example, Hisrich and Peters (1998) categorize the skills required by entrepreneurs: technical skills (i.e. written and oral communication), business management skills (i.e. planning, accounting, financials), and personal entrepreneurial skills (inner control, innovation, risk taking).[5] Bilen, Kisenwether, Rzasa, and Wise (2005) discuss an engineering entrepreneurship program that is intended to enhance risk taking, motivation, leadership, innovation, customer orientation, communication skills, teamwork, and business skills.[3] While many programs have been developed around hypothetical characteristics necessary to be an entrepreneur, no studies have systematically gathered information regarding faculty beliefs about the entrepreneurial mindset.

We hypothesize that although most faculty members will define the entrepreneurial mindset in a similar manner, there will be some individual differences based on personal experiences and professional background. For example faculty members who are from an engineering background may have slightly different visions of what it takes to be an entrepreneur as compared to someone who may have come from a business background. Additionally, faculty

members who describe themselves as being entrepreneurs may have a different perspective than those who did not perceive themselves as entrepreneurs.

2. *Do faculty members believe that the entrepreneurial mindset is something that can be developed?*

Throughout entrepreneurship education literature, there has been much debate on whether the entrepreneurial mindset is something that can be taught. Henry, Hill, and Leitch (2005) provide a detailed review of this question of whether entrepreneurship can be taught. [6,7] Based on their extensive review, the authors conclude, "While there has been much debate in the literature as to whether entrepreneurship can be taught, most commentators believe that at least some elements associated with the subject can be developed and enhanced via education and training" (p. 165). Although, some researchers believe that entrepreneurs cannot be created, [i.e. 8] the consensus appears to be that at least some aspects of entrepreneurship can be taught. As Kuratko (2005) states, "…the question of whether entrepreneurship can be taught is *obsolete*…[T]he more relevant question regarding entrepreneurial education [is] what should be taught and how should it be taught?" [9]

Once again, no systematic study of faculty beliefs has been found that addresses whether the entrepreneurial mindset is innate or can be learned. We hypothesize that the majority of faculty will believe that certain aspects of entrepreneurship can be taught, as to think otherwise would not likely have resulted in the career paths of these faculty members. However, faculty members will likely differ on what characteristics of the entrepreneur would tend to be more innate to the individual.

3. *How do faculty members teach entrepreneurship?*

Henry, Hill, and Leitch (2005) note that the methods used in entrepreneurship education vary tremendously (from lectures, presentations, to video and case-based learning). [6,7] They see the need to model entrepreneurship education to what true entrepreneurs would likely experience: an unstructured, real-life situation, active learning. Speaking from the business realm, Hanke (2009) discussed the reasons why problem-based learning (PBL) lends itself appropriately to the teaching of entrepreneurship. [10] He stated that the focus on student-centered learning and the use of rich problems are appropriate for teaching entrepreneurship. In addition, dealing with ambiguous problems and working in interdisciplinary teams in the PBL approach can help to increase motivation, interest, teamwork, and communication skills, which are necessary characteristics for individuals to become entrepreneurs. Okudan and Rzasa (2005) believe that the structure of entrepreneurship courses should operate in an environment of affective socialization, in which students can experience a simulated environment associated with the values and attitudes of being an entrepreneur. [11] In addition, environments should be structured in a way that students can actively experiment with what it is like to be an entrepreneur while addressing key entrepreneurial processes such as autonomy, innovativeness, risk-taking, and competition.

Michael (2007) [12] examined how entrepreneurs would most likely want to structure entrepreneurship education programs. The authors concluded, "No dominant mode of instruction

emerged" (p. 9). Faculty members in the study described a variety of instructional strategies that should be used and content that should be covered in an ideal entrepreneurship course. The authors did not examine whether the respondents' differing characteristics, such as discipline or experience as an entrepreneur, influenced their stated beliefs. In addition, the vast majority of the sample came from the business field. The beliefs of the faculty members within the sample may not generalize to the beliefs of faculty members from other disciplines or to the beliefs regarding ideal content and structure of programs within the engineering domain.

How do faculty members who are teaching entrepreneurship courses to engineers believe that entrepreneurship should be taught? Are there certain types of teaching philosophies associated with their beliefs?

In order to begin to examine the above questions, a qualitative study involving interviews with 26 faculty members who teach entrepreneurship courses was initiated. This study is a preliminary study and a precursor for a more extensive quantitative study planned for 2010.

Methods

Participants

In order to answer these research questions an in-depth qualitative investigation of established entrepreneurship programs at three large research-oriented universities was performed. The universities that participated were Penn State University, Purdue University, and North Carolina State University. All faculty members who were associated with the entrepreneurial programs, or had experience teaching entrepreneurship related courses at their respective institutions, were asked to participate in a semi-structured interview with the project researchers. The semi-structured interview format allowed the researchers to systematically gather information about specific questions. Additional follow-up questions were asked as necessary to clarify responses or to probe more deeply about the participants' beliefs on entrepreneurship education. Twenty six faculty members across these three schools agreed to take part in this study.

There were more male (86.6%) than female (15.4%) faculty members interviewed. Engineering faculty accounted for 42.3% of the participants, 19.2% of the faculty interviewed were from Entrepreneurship programs, 23.1% were from Business related departments, and 15.4% from other departments. The majority of the faculty members indicated they primarily teach undergraduate students (61.5%). The other faculty members denoted they teach graduate students (15.4%), or both graduate and undergraduate students (19.2%). The faculty members interviewed identified a range of roles including full professor (15.4%), associate professor (11.5%), assistant professor (7.7%), instructor (19.2%), lecturer (23.1%), and faculty (7.7%).

Approximately 81% of the faculty members interviewed had worked for a small start-up company and 53.8% had worked in an "innovation" segment of a large company. A little over a third of those interviewed held patents. When asked if they have any close relatives (i.e., parents, siblings, etc.) who are entrepreneurs, more than two thirds of the faculty members interviewed responded that they did. The most frequent family member listed was father (19%) followed by brother (15.2%) and uncle (11.4%); sister, son, and grandfather each represented

7.6% of entrepreneurial family members indicated. Wife, parents, and father-in-law were also mentioned.

Data Collection

The interview protocol included questions relating to faculty beliefs of entrepreneurship education focusing on the following:

- What are the critical components of entrepreneurship education?
- How do individuals develop an entrepreneurial mindset?
- Are necessary characteristics developed through experiences or are they inherent to an individual's personality?
- How can students' self-efficacy to be an entrepreneur be cultivated?
- What strategies are used in the classroom to teach entrepreneurship?

A section of questions on demographics followed these questions.

The interviewer was given the opportunity to become familiar with the interview protocol prior to conducting the faculty interviews. The study's principal investigator observed the first interview as a check of how the interview protocol functioned as well as how the interviewer performed the interview. Helpful feedback was given to the interviewer along with minor adjustments made to the interview protocol. Appropriate procedures were followed to ensure that participants gave informed consent to participate in the study and to be audio-recorded. The study was approved by Penn State's Office for Research Protections and accepted by the corresponding review boards at the other institutions.

The faculty member interviews took place during the course of an academic semester. The interviews for one of the universities took place in person (i.e., face-to-face). The interviews for the other two universities were conducted over the phone. Most of the interviews were completed in roughly one hour.

After the completion of the faculty member interviews the audio recordings from these interviews were transcribed. The individual who conducted the interviews also completed the transcriptions. The benefit of having a transcriber who was familiar with the interview data aided in the accuracy of the transcriptions.[13] The interviews were transcribed word for word with the exception of irrelevant verbal pauses (i.e., "you know," "I mean," "so," etc.).

Data Analysis

A content analysis was conducted on the interview transcripts using N-Vivo 8, a software program that facilitates the coding process.[14] Coding categories with detailed definitions were developed based on an analysis of themes that emerged from a selected faculty interview. These coding categories served as a general outline to follow for identifying key concepts and categories in the subsequent interviews. The coding scheme was altered as necessary as additional themes and categories emerged during the content analysis process. All faculty member interviews were systematically coded using the coding scheme. Upon completion of

coding the interviews, all interviews were reviewed as a check that the classification of the interview segments to the coding categories was accurate.[15]

In order to gather evidence about the reliability of the coding, we examined the reproducibility of the coding scheme. Percentage agreement served as an estimate of the degree to which the coding scheme could be replicated.[16] The percentage agreement value was calculated by comparing the coding consistency between two scorers.[16] A question from the faculty beliefs and goals interview was selected for coding ("How would you define an entrepreneurial mindset? In other words, what characteristics, features, or ideals do you envision entrepreneurs to possess?").

The first scorer developed the coding scheme and subsequently coded 26 interview responses to the selected question as well as the other interview questions. Using the coding scheme, the second scorer independently coded a sample of 10 interview responses to the selected question. Each transcribed response to this interview question was several sentences in length. The percentage agreement value was derived using the following criteria: both scorers agreed on the code for a segment of text (1,1); one scorer indicated a code for a segment of text and the other scorer did not agree with this code for that text segment (0,1 or 1,0). The total number of agreed upon codes was divided by the total number of indicated codes to calculate percentage agreement for the 10 interview responses to the selected question. Percentage agreement between the two scorers was 82% for the selected question, yielding an acceptable level of agreement.

Validity evidence for the interview protocol and subsequent coding scheme was obtained by gathering expert information from a professor and director of a well-known entrepreneurship program. In addition, feedback was requested from a larger research group familiar with entrepreneurship education research and an advisory board consisting of experts in engineering education.

Results

Each of the research questions is discussed below, identifying key themes that emerged during the content analysis and providing example quotations from the faculty members who were interviewed.

1. *How do faculty members define the entrepreneurial mindset, or the characteristics necessary to be entrepreneurs?*

Faculty members generally defined the entrepreneurial mindset in terms of the characteristics that entrepreneurs should possess rather than in relation to business or technical skills. The majority of faculty members did believe that the entrepreneurial mindset exists. Interestingly, three faculty members indicated the entrepreneurial mindset does not exist or that they were unsure whether it exists. All three of these faculty members were from business-related departments. These three business faculty cited necessity, desire to start a venture, skills, knowledge base, and experiences as defining an entrepreneur. The lack of any one prerequisite trait, or set of characteristics, needed to be an entrepreneur, and the ability of individuals to learn skills necessary to be a successful entrepreneur, were the primary reasons given by these faculty

when explaining why they do not believe in the entrepreneurial mindset construct.

The characteristic that was referred to by nearly 40% of the faculty members when defining an entrepreneurial mindset was "**risk tolerance**." The faculty members defined "risk tolerance" as not being afraid to take risks as comments included:

- "I think they [entrepreneurs] are risk takers."
- "They're risk takers by nature or unafraid of risks."
- "I would consider [one of] the attributes would be risk taking."
- "I think that to be an entrepreneur in the sense of really developing a business and expanding it and growing it you [have] got to be a little bit more risk friendly."

However the ability to take risk appears to only tell half of the story as the type of risk several faculty members characterized was not just risk taking behaviors. Rather, the definition concerned moderating and managing risk or being aware of the consequences or "ramifications" when one takes risks. As one faculty member stated:

> "The next question has to do with risk and how you deal with risk. And how you understand how much risk you are taking and what is the downside [of the] risk. How much are you willing to lose if things don't work out? And what is the upside? So it is having a feel for the relationship between risk and success."

One's ability to walk this seemingly precarious line between taking educated risks and achieving success does not appear to be easily learned, however, as in response to the question, "What can an individual do or experience to facilitate entrepreneurial mindset development?" only two faculty members identified taking risk. One faculty member signified that the ability to take risks is a key intrinsic characteristic needed to be an entrepreneur: "I don't think everybody can be an entrepreneur, though. And it's just because there is some risk inherent in being an entrepreneur. And some people are very risk adverse." This would indicate that one's innate capability to engage in risk taking behaviors is a pivotal component of having an entrepreneurial mindset or not. Perhaps this quote from a faculty member best summarizes the reason for this: "The hardest thing I think to imagine teaching is the ability to take risks. I do think that there is something innate in people who are willing to take risks, and of course it's a continuum."

The concept "**drive or motivation**" was mentioned as often as risk tolerance when the faculty members were defining an entrepreneurial mindset and how one develops this mindset. The category drive was depicted by expressions such as "ambition," "self-starter," "persistence," "dogged determination," "the spark," "innate drive," "perseverance," "motivated and directed," "forcing themselves," "self-motivation," and "hardheaded hard work." Drive was often described as the most important facet of the entrepreneurial mindset. As one faculty member illustrated:

> "Someone who believes in what they are doing hard enough that they are willing to put in tremendous amounts of work and not give in to occasional disappointment. I think that is what separates the entrepreneurs, especially the successful entrepreneurs."

While it was repeatedly stressed throughout the interviews that drive is a necessary characteristic for an entrepreneur, and vital to the entrepreneurial mindset, being driven was also frequently mentioned as something an individual can do to facilitate entrepreneurial development. One faculty member offered this advice to his students:

> "I just told them this, 'Take on hard challenges. Don't avoid something because you think it's tough. Go for it and [be] single-minded. And especially if you think you are not able to do it. Because once you've done it, you'll look back and realize that the only thing limiting you is you, and that will lead you to that mindset.'"

Much like risk tolerance, though, one faculty member stressed that classroom training is not sufficient to support a student who has the drive or motivation develop an entrepreneurial mindset: "How do you actually help the student that has the spark and that does want to develop it? From an academic standpoint there is only so much we can do inside the classroom." Indeed, learning through experience, being mentored, and practice were frequent responses faculty gave when asked to consider what an individual can do facilitate the entrepreneurial mindset.

Other characteristics frequently mentioned by the faculty members when defining an entrepreneurial mindset included "able to adapt or be flexible," "marketing skills," "acts on opportunities," "outgoing or self-confident," "passionate," "resourceful or not impeded by limited resources," and "comfortable with ambiguity."

Several faculty framed these entrepreneurial characteristics in relation to one's response to failure and challenges. Based on the following insights from faculty, it appears herein lies the dividing line between being a successful or an ineffectual entrepreneur:

- "Someone who believes in what they are doing, hard enough, that they are willing to put in tremendous amounts of work and not give in to occasional disappointment. I think that is what separates the entrepreneurs, especially the successful entrepreneurs."

- I think they have to have a passion about what it is they are doing and be willing to make decisions, and be willing to change those decisions 30 seconds later. You know too many people own a decision and they don't want to go back and change it. And I think somebody that really succeeds in this is willing to say, 'Okay, I made a mistake. I need to be able to adjust.'"

Mere willingness to persist despite adversity was not considered sufficient by several of the faculty. Rather, as can be gathered from the statements below, these faculty members maintained it was what the individual learns from such experiences that define an entrepreneur:

- "[F]ailure is a normal and natural part of entrepreneurship, [but] instead of when you fail saying 'That's it.' you ask the question 'What have you learned from that failure?' And that failure is really knowledge acquisition. It's the price for gaining knowledge. And basically to be successful you need to have a lot of failures. Hopefully they are all small, but that's your foundational learning. It's a very different mindset from what people normally think 'Well, I've got to avoid failure.' No. You have to be aggressive towards

failure actually."

- "But I think that entrepreneurs are sort of individual in that they look at failure as a learning experience and it's almost like a fail-to-win approach. In other words, you are taking on the challenge saying 'It didn't work out so well. What exactly did I learn? What do I need to bring into this situation to help solve this problem? Because I still have belief and I still have passion for the problem...'"

Also often cited was the concept of "**value added**." Value added was defined by the faculty members as knowing when a new product or venture adds something of value, which can be value for society or monetary value. Value added was defined in relation to an individual's marketing skills:

> "You have to first ask the following questions. I'll call it 'Where can you provide value added services or products?' That [is when] inventing something, or a new service, 'What value are you adding, and who are you adding it to?' So there are those kinds of starting questions. With any new idea or concept, what is the market, and who is willing to pay for it, and can you be rewarded for the value that you are adding?"

Value added was also defined in terms of social entrepreneurship by an engineer who considered himself to be a social entrepreneur: "I take a pretty broad view of entrepreneurship. Entrepreneurship is more about value creation; actually sustainable value creation." A faculty member from industrial design held a similar sentiment:

> "It is a deep conviction that an idea that you have is really much bigger than you are. And that that idea, with the proper guidance and channeling, can take on a life of its own and can be of benefit to may people. So it's the belief if I do the right things this idea of mine is going to take off and become a benefit to lots more people than just me."

For the most part, the faculty members' definition of the entrepreneurial mindset, with the exclusion of those who did not believe such mindset exists, was not surprising and corresponded to how the literature defines the characteristics necessary to be entrepreneurs.

2. *Do faculty members believe that the entrepreneurial mindset is something that can be developed? Or do they feel that certain characteristics necessary to be an entrepreneur are innate to the person?*

When asked whether the entrepreneurial mindset is something that can be developed or if certain characteristics necessary to be an entrepreneur are innate to the person, faculty members' interview responses were varied. Over two thirds of faculty members indicated that the entrepreneurial mindset is, or can be, both innate and developed. Four of the 26 faculty members indicated that the necessary characteristics to be an entrepreneur are developed or made only. Of the four faculty members who stated the necessary characteristics to be an entrepreneur are made, two were from business related departments and two had business backgrounds. Overall, the faculty members did agree that to a certain extent entrepreneurship can be taught.

A frequent response to the question of whether the entrepreneurial mindset is developed or innate to an individual was that the mindset can be developed; however, several faculty stated that the ease or challenge of such development depends partly on the mediating influence of individuals' innate characteristics. As one faculty member asserted:

> "I think there are some characteristics that maybe cause people to move a little easier into entrepreneurship, but I don't think the lack of those characteristics really excludes anyone from the opportunity or the ability to be successful in that [area]."

Another faculty member voiced a similar concern regarding the relationship between innate and developed characteristics: "I think that the drive and passion are things that you are born with. And I think that everybody has those to a degree and some people have to work harder to develop those [characteristics] than other do."

Representing the other end of the spectrum, several faculty members stressed the importance of cultivating an individual's entrepreneurial mindset through practice and training. As one faculty member declared, "But I think even those that are born [with the mindset], and there's probably a lot, if they never really practice this [entrepreneurship] or trained in how to use these skills, nothing happens!" Another faculty echoed this position, but was more pessimistic as he focused on the existence of prerequisite entrepreneurial characteristics:

> "Lots of potential entrepreneurs are born. Few are developed. So, you know there's a whole big pool of people who are born that could be entrepreneurs and you've got to find them, train them, and teach them. But again, people who weren't born to be entrepreneurs, no amount of academic training is going to change that."

The characteristics the faculty members listed as innate, developed, or both innate and developed were diverse, but some patterns emerged. The most commonly mentioned categories that faculty mentioned when asked if there were certain characteristics that individuals can develop were "business skills," "communication skills," and "technical skills." Not surprisingly, skills, rather than characteristics, were most frequently mentioned as being able to be developed. "Acts on opportunity," "interpersonal skills," and "having vision" (i.e., can visualize a "future state") were most often denoted as being innate characteristics or skills. "Outgoing or self-confident" was the most frequently referred to innate characteristic as over 40% of faculty members cited it. There was also a degree of overlap between innate and developed characteristics or skills with "drive or motivation," "outgoing or self-confident," "risk tolerant," and "communication skills" referred to repeatedly as being innate and easily developed.

3. *How do faculty members teach entrepreneurship? Is there a relationship between the faculty beliefs and the way that they teach entrepreneurship?*

The most common approaches the faculty members reported using when teaching entrepreneurship were experiential learning (i.e. "hands-on" learning), case studies, active learning, and PBL. Acting as a mentor, facilitator or "coach" to the entrepreneurial students was also often mentioned. If given the opportunity to "design an e-ship program from scratch" the faculty members most often said they would include experiential learning. As one faculty

member affirmed:

> "First of all I would make it 100% hands-on. Completely. That would be the number one thing I would do. Entrepreneurship really is a contact sport. You have to get your hands dirty and you have to really do it. You have to play the game."

Tellingly, when the faculty were asked how they would change the program at their respective institutions to best help student develop an entrepreneurial mindset, nearly a third said they would like to see the students provided the opportunity to have real life and hands-on business experience through a university program or course. While several faculty members stated that the program at the institution where they currently teach is designed to allow for real life experiences, or is currently being reorganized to allow for these experiences, some faculty expressed that there could always be more opportunities. As one faculty member stated: "It would be nice if we had an incubator type capstone program that would allow you to actually operate a business."

Several faculty members also acknowledged that there were limitations involved when trying to provide their students experiential learning opportunities. One faculty member indicated many undergraduate students lack the skill sets necessary to work on actual projects. Other faculty members cited lack of financial resources in the form of small amounts of seed money as an impediment to the students being able to actually make mock-ups, launch websites, and start ventures. Another faculty member stated he has funded student teams with his own money.

In addition to having more experiential learning in a newly designed entrepreneurship program, other faculty members mentioned ideas such as having the program be interdisciplinary with other programs or disciplines and the utilization of case studies. Faculty members also stressed the importance of having the student develop communication skills through such activities as "elevator pitches," student presentations, working in teams, and talking to customers. Nearly 40% of the faculty members interviewed said they would include a course on basic business skills that covered such topics as management and financial statements. Other potential course topics mentioned included developing a business plan, teaching global competitiveness, leadership training, and requiring an internship or practicum.

Since the sample for this study is comprised of a large percentage of faculty from engineering departments, the unique perspectives and beliefs of these engineering faculty within the context of teaching entrepreneurship is worth closer analysis. Several engineering faculty were concerned with developing the communication skills required of entrepreneurs in their engineering students. As one engineering faculty member told his students,

> "Get what you need done knowing that engineering is only a quarter of the battle. There is so much involved putting something forward whether you are in a small company or you are in a large company. Essentially you have to go out. You have to talk to people. You have to be motivated and directed everyday."

Another engineering faculty member said he offers the entrepreneurship course he developed in his department for engineering students due to the observations he has had with respect to

engineers:

> "A lot of them, though, have to be clued in as to what might be possible because some, engineering students in particular, are so naive and introverted that they don't even know what is possible for them…I guess the main reason I am interested in this is to wakeup engineers. I want to let them know of opportunities they have of climbing the corporate ladder, and also entrepreneurship."

One business faculty member who taught in a program that was cross-disciplinary with engineering was concerned with this perceived disparity between engineering students and students with a business background. He made the following recommendations to bolster the engineering students' communication skills: "One weakness I see in the technical people is that they are very poor presenters…The engineering students just don't do it enough. [They] don't present enough, in my opinion."

When asked if their teaching style is impacted by their vision of how individuals develop an entrepreneurial mindset, approximately 70% of the faculty members interviewed responded that their teaching style had been affected by their beliefs. Roughly half of the faculty members interviewed stated that their career and entrepreneurial experiences influenced the way they teach entrepreneurship. Less common responses included the influences of their own interests, personal learning style, and personal characteristics or personality. Over 70% of the faculty members had also faced challenges teaching entrepreneurship. The most commonly cited challenges, in descending order, were related to aspects of the students (e.g. students' prior knowledge), the greater amount and different type of workload involved with teaching entrepreneurship, the institution's policy, how other colleges within the institution define or teach entrepreneurship, and designing the entrepreneurial curriculum.

Given the majority of the faculty members interviewed responded that they think the entrepreneurial mindset is, or can be, both innate and developed, the teaching style reported by the subset of faculty members who believed the necessary characteristics to be an entrepreneur can only be made or developed warrants further investigation. Since skills (i.e. business skills or communication skills) were most often cited as "easily developed" in a prior question, the teaching style of this group is expected to be more skills-oriented than the faculty members who believe that aspects of the entrepreneurial mindset are innate as well as developed. Further exploration of this question will be conducted in the next phases of the study.

Of the four faculty members who indicated the entrepreneurial mindset is developed or made, one stated his teaching style was not impacted by how individuals develop an entrepreneurial mindset since the entrepreneurial mindset does not exist, and two other faculty members did not provide a direct response to the question with one citing "learning skills" as how the mindset develops and the other stating that individuals "can learn to do whatever they need to do" and "completely transcend any apparently bounds based on personality." Only one of the four faculty members clearly indicated that his teaching style was impacted by his vision of how individuals develop and entrepreneurial mindset and he tries to enhance this impact whenever his can. This particular individual stated the entrepreneurial mindset is developed, but he was not sure if it was innate or not:

"This is where I was kind of tripping over this one. I very much believe that they can be developed. Can they be developed in everybody? I don't think so. There are some people that they just don't want to be [entrepreneurs]. I believe it could be developed in anybody who truly decides that they want it. Let me put it that way."

The results of the interviews give some ideas on whether faculty members' beliefs about entrepreneurship can be tied to their teaching styles. However, in order to generalize to a larger population of faculty, quantitative data must be collected.

Discussion

Along with the other pieces of this project being funded by the National Science Foundation, this research project begins to address a significant gap in engineering education: a systematic analysis of engineering entrepreneurship program characteristics and an in-depth and comprehensive analysis of faculty beliefs about teaching entrepreneurship to engineering students. The qualitative data collected in this study provides a starting point into understanding faculty beliefs and serves as a launching point for the next steps in the project.

Not surprisingly, faculty members defined the entrepreneurial mindset in a manner consistent with definitions from the literature. The primary themes that emerged included risk tolerance, motivation or drive, learning from failure, adaptable, self-confidence, and understanding of the marketing skills, including value added of a product or venture. For the most part, the faculty members believed that there are certain aspects of being an entrepreneur that were more easily taught. The more easily taught aspects tended to focus on necessary skills, such as those relating to business skills and communication skills. Faculty members believed that personality characteristics necessary for successful entrepreneurship would be more difficult to train. This included a necessary "spark" or drive. Experiential learning was the most common type of teaching practice or philosophy. Consistent with Okudan and Rzasa (2006),[11] faculty felt that students needed to actually practice the environment of being an entrepreneur.

For the second stage of this study, a survey instrument has been developed with items measuring the themes that emerged during the faculty interviews. To date, a draft instrument has been created. In the upcoming months, pilot data and validity evidence for the scale will be collected. Once a finalized version of the scale is complete, data will be collected from a larger sample of faculty members who teach entrepreneurship courses from around the country. The faculty will be from institutions representative of the types of programs identified through the systematic analysis of the engineering entrepreneurship program characteristics.

The quantitative data gathered from the survey is pivotal for answering the research questions detailed in this paper. Although the qualitative data from the interviews has resulted in very rich and detailed information about faculty beliefs, because of the small sample size and nature of interview data, we cannot generalize to the larger population of faculty nor can research questions relating to background or disciplines of the faculty members be answered. We hope that the data collected in the second phase of the study will be extremely instrumental in further

understanding faculty beliefs about entrepreneurship education and how these translate into teaching practices.

Acknowledgement

Bibliography:

1. Katz, J. A. 2003. The chronology and intellectual trajectory of American entrepreneurship education 1876-1999. *Journal of Business Venturing,* 18(2): 283-300.
2. Ohland, M. W., Frillman, S. A., Zhang, G., & Miller, T. K. (2004). NC State's Engineering Entrepreneurship Program in the Context of US Entrepreneurship Programs. Paper presented at the annual meeting of the National Collegiate Inventors and Innovators Alliance, San Jose, CA.
3. Bilen, S. G., Kisenwether, E. C., Rzasa, S. E., & Wise, J. C. 2005. Developing and assessing students' entrepreneurial skills and mind-set. *Journal of Engineering Education.* 94(2): 233-243.
4. Damron, R. & High, K. (2009). Innovative experiences for freshman engineering entrepreneurs. Paper presented at the annual meeting of the National Collegiate Inventors and Innovators Alliance, Washington, D.C.
5. Hisrich, D. & Peters, M. P. 1998. *Entrepreneurship, 4ᵗʰ edition.* Irwin McGraw-Hill: Boston, MA.
6. Henry, C., Hill, F., & Leitch, C. 2005. Entrepreneurship education and training: can entrepreneurship be taught? Part I. *Education + Training.* 47(2):98-111.
7. Henry, C., Hill, & F., Leitch, C. 2005. Entrepreneurship education and training: can entrepreneurship be taught? Part II. *Education + Training.* 47(3):158-169.
8. Miller, A. 1987. New ventures: A fresh emphasis on entrepreneurial education. *Survey of Business.* 23(1):4-9.
9. Kuratko, D. F. 2005. The emergence of entrepreneurship education: Development, trends, and challenges. *Entrepreneurship Theory and Practice.* 29(5):577-598.
10. Hanke, R. 2009. Problem-based learning entrepreneurship education: A preliminary exploration. Paper presented at the annual conference of the United States Association for Small Business and Entrepreneurship (USASBE), Anaheim, CA. Retrieved at http://usasbe.org/knowledge/proceedings/proceedingsDocs/2009/PaperID110.pdf (Available as of January, 2010).
11. Okudan, G. E. & Rzasa, S. E. 2006. A project-based approach to entrepreneurial leadership education. *Technovation.* 26:195-210.
12. Michael, S. C. 2007. *What should we teach when we teach entrepreneurship.* Report written for the Kauffmann Foundation, Kansas City, MO.
13. Easton, K.L., McComish, J.F., & Greenberg, R. 2000. Avoiding common pitfalls in qualitative data collection and transcription. *Qualitative Health Research*, 10(5):703-707.
14. QSR International. 2008. *NVivo 8.* Retrieved from http://www.qsrinternational.com/FileResourceHandler.ashx/RelatedDocuments/DocumentFile/456/NVivo_8_brochure.pdf (Available as of January, 2010).
15. Krippendorff, K. 2004. *Content analysis: An introduction to its methodology.* Thousand Oaks, CA: Sage Publications.
16. Stemler, Steve 2001. An overview of content analysis. Practical Assessment, Research & Evaluation, 7(17). Retrieved from http://PAREonline.net/getvn.asp?v=7&n=17 (Available as of January, 2010).
17. Wood, J. M. 2007. Understanding and Computing Cohen's Kappa: A Tutorial. *WebPsychEmpiricist.* Retrieved from http://wpe.info/vault/wood07/Wood07.pdf (Available as of January, 2010).

Appendix: Faculty Interview Protocol

<u>Background</u>

 1. Tell me how you became affiliated with the entrepreneurship program at your institution.

 2. Do you consider yourself to be an entrepreneur?

<u>How individuals can develop an entrepreneurial mindset</u>

 1. How would you define an entrepreneurial mindset? In other words, what characteristics, features, or ideals do you envision entrepreneurs to possess?

 2. How do you think people develop an entrepreneurial mindset?

 3. What can an individual do or experience to facilitate this development?

<u>Whether necessary characteristics can be developed</u>

 1. Some people might debate that entrepreneurs are "born" rather than "made." Do you feel that the necessary characteristics to be an entrepreneur are inherent to a person's personality? Or do you feel these can be developed?

 2. Are there certain characteristics that are more inherent to personality? What are these? Why do you feel these are inherent?

 3. What characteristics are more easily developed and why?

<u>Critical components of entrepreneurship education</u>

 1. Many colleges and universities around the country have developed programs to teach undergraduates skills related to entrepreneurship. If you were designing an e-ship program from scratch, what would you include?

 2. What do you think are the critical components of these programs?

 3. How would you change the program at your institution to best help students develop an entrepreneurial mindset?

Individual's experience with entrepreneurship program

1. What entrepreneurship courses do you teach at your institution?

2. What is your approach to teaching this subject?

3. What aspects of your background may influence the way you teach entrepreneurship?

4. Do you feel your teaching style is impacted by your vision of how individuals develop an entrepreneurial mindset? Why or why not?

5. Have you faced challenges teaching entrepreneurship?

6. If an entrepreneurial student had a successful start-up company (or the company was showing high potential), and he/she dropped out of school to really launch the start-up, what would be your reaction?

7. What do you think would be your administration's reaction to the student dropping out?

8. Suppose you are mentoring an undergraduate student or student team in a new product or new venture. Across time, you become so interested and involved that your ideas become part of the intellectual property of the new product or new venture. Do you see this as a problem? If so, why? If not, why? Do you see any potential conflict of interest?

Follow-up demographic questions:

1. Do you have any patents?

2. Have you worked in a small start-up company?

3. Have you ever worked in an "innovation" segment of a large company?

4. Do you have any close relatives (i.e., parents, siblings, etc.) who are entrepreneurs?

5. Describe your position with the university. Are you a tenure-track faculty, instructor, etc.?

6. Do you primarily teach in the undergraduate or the graduate program at your institution?

<u>Instructions</u>: Please look at the list of characteristics below. State which characteristics are 1) most necessary to be an entrepreneur, 2) which are more inherent to personality, and 3) which can be more easily developed (or nurtured).

The list of terms follows:

- Vision
- Passion
- Optimism
- Recognizes opportunity: sees the world through the eyes of the customer
- Acts on opportunity
- Persistence
- Conventional
- Collaboration: team-oriented
- Globally aware
- Ambidextrous thinker: mixes rigor with creativity
- Tolerance for ambiguity
- Calculated risk management
- Apathetic
- Ability to clearly define problems
- Communication skills: "pitch," selling, marketing, proposals
- Basic business skills
- Unassuming
- Leadership
- Networking
- Monetarily Motivated