



Fostering Innovation Through Curriculum in China

Adapting American Entrepreneurship
Education (EE) pedagogy to Chinese EE,
addressing China's unique societal and
cultural characteristics

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Abstract

Recent government mandates requiring entrepreneurship classes as a college graduation requirement have created a need to critically analyze Entrepreneurship Education (EE) in China. We used interviews, curricular analysis, literature review, and a survey to characterize the U.S. and Chinese EE systems, and to inform our recommendations for adapting experiential learning to fit the unique characteristics of the Chinese classroom. Bster Sci & Tech of Hangzhou, China, seeks to use these recommendations to fulfill their mission of leading EE's development in China.

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Authorship

Kailun Liu, Eric Peterson, Jake Scheide, and Daniel Venkitachalam all contributed to the research that resulted in this report. This section outlines each group member's contribution to the authorship of this document, in order of contribution.

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Executive Summary

In 2015, the Zhejiang Provincial Government mandated that entrepreneurship courses be a graduation requirement for every student in order to meet the rapidly growing needs of an evolving economy. This mandate means that there has been a huge influx of Chinese students taking entrepreneurship classes and thus an increasing necessity to critically analyze Entrepreneurship Education (EE) in China. The newness of EE and the lack of experience in teaching it now provide for an opportunity to address ways that EE can be enhanced in China. Our team was tasked with identifying themes in effective pedagogies used when teaching entrepreneurship in the U.S. so that EE in China could be improved. Our project is timely, relevant and important to our sponsor and China because the current priorities of China's educational system require new approaches that diverge from historical teaching methods.

This project's goal was to produce recommendations about whether American EE teaching methods could be adopted in Chinese undergraduate programs. In order to achieve our goal, our team developed three main objectives:

1. Identify the best pedagogical practices in the U.S. EE system.
2. Identify the existing and prevalent pedagogical practices in the Chinese EE system.
3. Identify systemic factors inhibiting China's adoption of American best practices.

To achieve our main goal, we utilized three key methods:

1. Literature review of the U.S. and Chinese educational systems, the history of EE in each country, and EE pedagogical methods that have been used effectively.
2. Interviews with American and Chinese professors and business professionals.
3. Survey of Chinese entrepreneurship students.

After performing extensive literature research, we identified differences between the U.S. and China, such as the use of experiential learning in the U.S., as opposed to the extensive use of lectures in China and a variety of other factors that contribute to the differing pedagogical approaches. Experts highlighted the relationship between the non-predictive nature of entrepreneurship and experiential learning. Therefore, U.S. EE employs experiential teaching methods to prepare students to meet entrepreneurship's unpredictability head-on.

Our research identified the significant impact that class size has on how teaching methods are adapted to EE environments. There was an overwhelming preference among both U.S. and Chinese EE professors to have class sizes of around 30 students. Professors felt that experiential teaching methods were more adequately suited for a smaller class size, where they could provide personal mentorship and feedback. In addition, we discovered that Chinese EE professors typically lacked relevant professional, entrepreneurial experience, whereas all American EE professors we interviewed had some relevant entrepreneurial experience that aided them in teaching course material. We also identified many innovative teaching methods used in the U.S. and examined how external factors can influence how students learn entrepreneurship.

From our survey of Chinese students taking EE courses, we learned that students find experiential teaching methods highly effective, while acknowledging their lower comfort levels with those methods. This shows a desire to change, but highlights some of the fundamental challenges rooted in the systemic educational and cultural influences on EE in China.

We concluded that American EE teaching methods cannot simply be transferred directly to Chinese EE classrooms without consideration of the systemic differences between the two countries. We highlight three main points of contention:

1. Chinese students have predispositions to certain teaching methods and learning styles, due to cultural and educational background.
2. Entrepreneurship class size in China is comparatively larger than in the U.S.
3. Most EE professors in China do not have relevant industry experience to aid them in teaching entrepreneurship.

These three points proved to be the primary limiting factors when making recommendations about how to improve EE in China. Our recommendations were:

1. Implement experiential teaching methods in Chinese entrepreneurship classrooms.
2. Facilitate and encourage gradual student collaboration.
3. Develop faculty training resources for interactive teaching methods and qualitative grading.
4. Implement a mentorship structure in Chinese EE, involving Teaching Assistants and private sector coaching.

These recommendations outline ways for the Chinese system to begin to address the systemic challenges discussed above and implement U.S. EE pedagogy into the Chinese classroom. Bster, China's first business simulation software provider, consults across their vast network of Chinese universities, and presents at major Entrepreneurship Education conferences nationally. This position of influence allows Bster to catalyze change in EE from the private sector.

Over the course of this project, we came to appreciate the complex nature of entrepreneurship. Entrepreneurship is an expansive topic, and our coverage of teaching methods is just a small part of a larger picture. This expansiveness is what makes Entrepreneurship Education unique to every country, and China is no exception. We see this project not only impacting our sponsor, but China as a whole. The Chinese want what is best for their country, and they see entrepreneurship as a vehicle for greatness. We hope that we have provided an opportunity for Chinese EE graduates to be prepared and inspired to pursue excellence through innovation and entrepreneurship.

1 Introduction

In today's global economy, entrepreneurship is at the forefront of creating stable and diversified economic growth. Leading economies, such as that of the United States, have been characterized by big business and mass production since the 1970s (Cherian, 2012). More recently, these economies have evolved to contain more small and mid-sized businesses (Naude, 2011). By promoting the growth of these smaller businesses, economies have been able to diversify and no longer need to rely solely on large corporations that run major industries. Colleges and universities have played a major role in facilitating this change (Baverman, 2013). Rather than producing graduates who are content to serve the needs of pre-established businesses, universities are being challenged to create well-rounded entrepreneurs who have the confidence to take the risks necessary to grow the SME (Small and Medium Enterprise) sector within the global economy.

China has a profound interest in producing young entrepreneurs from its educational institutions, due to recent economic changes. China's private sector has only become a major component of its economy in the last 40 years, but it has experienced rapid growth (Kanamori & Zhao, 2004). From 1989 to 2003, the number of Chinese private businesses increased from roughly 90,000 to 3 million. This significant increase is just an indication of the large gap small businesses have begun to fill. Additionally, today's Chinese university graduates face one of the toughest job markets in recent years, as large businesses have dramatically reduced the number of new recruits they hire (Xinhua, 2015). The Chinese Government has since come out with new initiatives and mandates to push for Entrepreneurship Education (EE), encouraging graduates to start their own small businesses and pursue innovation. As such, the challenge is finding better ways to provide EE to university students.

The impacts of educational system background and historical development of entrepreneurship cannot be understated when analyzing the current state of entrepreneurship education in both China and the U.S. The American educational system can be characterized as flexible and student-centric, whereas the Chinese system is lecture-based and driven by standardized testing (Teach, 2017; Classbase, 2017). Historically, entrepreneurship has shaped American big business, whereas entrepreneurship did not begin to develop in China until after

Deng Xiaoping's appointment in 1978 (Cherian, 2012; Zhang & Stough, 2013). These factors affect Entrepreneurship Education teaching methods, as universities strive to provide their students with relevant ways they can develop their countries' economies.

Significant research exists on American EE teaching methods, but the EE system in the United States has been designed to meet the needs of its unique economic, societal and cultural context. In contrast, the Chinese field lacks similar analysis, and the educational system and cultural norms between the United States and China exhibit stark differences. Bster Science and Technology Co. promotes educational innovation through entrepreneurial simulations and games, but it lacks insight into the nature of the pedagogical strategies of cutting edge Entrepreneurship Education.

Our project's goal was to make recommendations to Bster about how to more effectively teach entrepreneurship in Chinese undergraduate classrooms. Our primary objectives were to identify pedagogical practices in American and Chinese Entrepreneurship Education, and determine systemic challenges impacting the feasibility of adopting U.S. teaching methods in China. We achieved our objectives by conducting interviews with university professors, reviewing existing literature, and surveying students taking entrepreneurship courses. This enabled us to make recommendations on key teaching methods that Chinese universities and professors could adapt and implement to foster innovation. Thus, improving Chinese EE will work to diversify and expand China's private sector and further the nation's economic growth.

2 Background

In China, institutions of higher learning generally seek to adopt the teaching methods and curricular design employed by prestigious American institutions in the field of entrepreneurship (Fuller, 2015). A significant amount of research has been conducted into the roots of American EE, whereas Chinese Entrepreneurship Education exhibits gaps in pedagogy, curriculum development, and comparisons with a standard such as the U.S. (Arasti, Falavarjani, & Imanipour, 2012; Zhang & Stough, 2013). In this chapter, we examine the influences of the education system on EE in both countries and introduce the principles and history of Entrepreneurship Education. We describe the development of Entrepreneurship Education curriculum and teaching methods in the U.S. and China. Finally, we identify critical gaps in existing research that will be addressed in this report.

2.1 Entrepreneurship Education

There are many different definitions of entrepreneurship, as it is a rather complex concept that is constantly evolving. One definition we found to be all encompassing was:

Entrepreneurship is the act of managing risk and assuming responsibility in transforming creativity and innovation into unique products for the purpose of providing effective and efficient solutions to consumers, while achieving long-term profitability and contributing growth to the economy as a whole (adapted from Abrugar, 2014, pg. 1).

Inherently, Entrepreneurship Education consistently evolves to match the shift in entrepreneurship's definition. Entrepreneurship Education has grown rapidly in the last 30 years, despite debate continuing as to whether entrepreneurship can be taught (Solomon, 2007). The study of EE as a subject is relatively young, and there is no standard to dictate what someone should learn to become an entrepreneur. As such, the curriculum in EE and the teaching methods implemented within that curriculum vary greatly from school to school, and especially from country to country (Lackeus, 2015). This means that there are many different teaching methods, outside resources, curricula and historical influences to consider when examining EE.

2.1.1 Historical Influences on EE in the US

Entrepreneurship Education is heavily influenced by the history and current state of entrepreneurship. EE in the U.S. exemplifies this, relying on entrepreneurship's lengthy history in its thorough development.

"The United States was founded, quite literally, by entrepreneurs" (Gordon, 2014, pg. 1). The period after the American Civil War, from 1865 to 1970, needs special mention (Cherian, 2012). The environment at the time was extremely beneficial for the growth of entrepreneurship. Due to the development of railroads, farmers moving West, and the government's promotional regulations, immense profit opportunities emerged. Entrepreneurship during this period in American history created innovators, capitalists, and prospectors. Although some of these entrepreneurs amassed great wealth, many of them had lives with only modest fortunes. Most entrepreneurs in this period fell into the middle-class and upper-middle class. While during this period there was no formal education for entrepreneurship, it highlights the spirit of entrepreneurship that developed, and the background universities could look at when developing their programs.

Once formal Entrepreneurship Education in the U.S. came about, it developed rapidly and aggressively, starting as a niche program in innovative business schools and growing into a program available at more than 1600 universities today (Zhang, 2011). This rapid growth is especially significant because of the differences that exist across U.S. institutions and thus signals the multitude of methods that have been experimented with within EE. The first entrepreneurship program was opened by Harvard Business School in 1947, and it remains at the forefront of innovative teaching and startup creation (Arasti, Falavarjani, & Imanipour, 2012). This long history has allowed them to learn and adjust their EE programs as well as develop an alumni network able to support their mission and teach the next generation of innovators.

Between 1990 and 2005 specifically, the United States saw a huge boom in entrepreneurship and small business management programs available in universities (Solomon, 2007). In the three years from 1996-1999, five top American business schools noted a 92% increase in enrollment in entrepreneurship classes. This meant that students saw educational value in these courses and were excited to learn more about the entrepreneurial mindset. This expansion once again signifies how vast EE in the U.S. has become and the influence its history has had on its current state.

2.1.2 Education system influences on EE in US

One of the biggest influences that impacts students' success in a college course is their previous educational experience. This is especially true in courses focused heavily on teaching about innovation and entrepreneurship because these topics inherently require a more hands-on learning approach (Li, 2017). Thus, when looking at how to successfully teach entrepreneurship, it is important to consider the teaching styles these students have already experienced and the pedagogical methods they are accustomed to prior to studying entrepreneurship.

The United States educational system consists of public and private schooling options. The state governments are left to mandate standardized tests and set education standards across their respective public-school systems (ISSS, 2017). Most funding for public schools comes from within the state. Private schools are run independently of the state-run public-school system and thus are free to determine unique curricula and policies. This variation among schools and among states means that the educational background of students could vary greatly among those taking entrepreneurship courses in the U.S.

American students will typically apply to colleges and universities and go through a rigorous qualification process. Colleges will usually consider the particular courses and difficulty of those courses taken by an applicant, the applicant's Grade Point Average (GPA), and standardized test scores (Princeton, 2017). There are two main standardized tests that students may take to submit to colleges: the ACT and SAT. Tests are mandated and regulated by boards that dictate the material found on the respective tests (College Board, 2017). Most colleges will also take into account a student's commitment to activities outside of school, individual essays and even personal interviews with alumni, faculty or staff (CAI, 2017). Colleges utilize selective admission in order to assess a student's suitability for university programs. Faculty at these institutions, therefore, consider the high school experiences and learning styles these students are acclimated to in designing their courses. As a result, professors design their EE curricula and adjust their teaching methods in order to fit the variety of student profiles that come from this system into their classroom.

Students entering college EE programs may have extremely disparate learning styles, by virtue of their prior educational careers (Teach, 2017). Thus, college and university professors adjust their teaching methods (as highlighted in section 2.1.5) accordingly in order to most effectively cater to their students' needs. Generally, these needs come from an educational

system that values diversity and individuals' unique perspectives. Typical EE courses attempt to mirror these values through projects and students' active involvement in their own education. This stimulates growth and interest, qualities that would otherwise be lost in a more lecture and test based, one-size-fits-all education system.

2.1.3 Historical Influences on EE in China

In China, the history of entrepreneurship is shorter and bumpier, and thus entrepreneurship education is much less developed than in countries with a deeply rooted history in innovation and private enterprises. Modern entrepreneurship in China did not emerge until the reform era beginning in the 1980s (Zhang & Stough, 2013). Table 1 presents data showing the growth of registered private businesses, including individual businesses with fewer than seven employees and private enterprises with more than seven employees. As indicated in Table 1, starting from 1979, there was a dramatic growth in individual household businesses. Political turmoil in China contributed to the economic downturn of private businesses in 1989–1992. Renewed and speedy growth occurred after Deng Xiaoping's widely acclaimed speech in 1992.

A discussion of the history of entrepreneurship in China takes us to the year 1949, when the new People's Republic of China was established (Zhang & Stough, 2013). However, the period from 1949 to 1978 had a negligible influence on entrepreneurship development. The goal of the Chinese Communist Party (CCP) during those years was to turn China into a socialist economy. Private business ownership was illegal during this period due to the central government's control over the national economy. Meanwhile, during this same timeframe, the U.S. had a very well established private sector and was beginning to implement formal entrepreneurship teaching.

Table 1: Private Sector Growth in China from 1978 to 2003 (Zhang & Stough, 2013, p.17)

Year	Individual household businesses with less than 7 employees (in millions)	Private enterprises with more than 7 employees (in millions)
1978	0.3	n/a
1983	5.9	n/a
1988	14.53	n/a
1993	17.67	0.24
1998	31.2	1.2
2003	23.53	3.01

In 1992, Deng Xiaoping, called for deepening the transition to a socialist market economy in the famous “South Tour” (Anderson et al., 2003). In his speech, political acceptance of supporting private enterprises was made clear, and this greatly stimulated the growth rate of private enterprises. However, public enterprises and State-Owned Enterprises (SOEs) were still considered the mainstay of the Chinese economy, and they enjoyed better treatment than private businesses until 1997, nearly 50 years after the first Entrepreneurship Education program was established in the U.S.

The year 2000 was the beginning of the third stage of China’s entrepreneurship development (Zhang & Stough, 2013). In this stage, the Chinese government issued many supportive and encouraging policies to eliminate all restrictive, discriminatory regulations on private business in many different aspects such as taxes, land use, imports and exports. This signaled that the Chinese government was starting to promote more equality between private and public businesses.

Today, Small and Medium-sized Enterprises (SMEs) are mostly private in China (Chen, 2007; Tsai, 2007). Laws passed in 2002 marked the start of a new era for the development of SMEs. Furthermore, China’s accession to the World Trade Organization (WTO) in November 2001 symbolized that entrepreneurship in China would be more influenced by global competition (Zhang & Stough, 2013). Overall, this period is characterized by a rapid growth of modern entrepreneurship in China. The role of entrepreneurship in promoting economic growth,

expanding employment, and stimulating technological innovation has become less constrained by the government. Due to the later development of the entrepreneurship sector in China, EE is only now beginning to become adopted across the country.

Entrepreneurship used to be considered as a job for unemployed, idle people in China (Nair, 1996). However, this opinion has changed greatly due to economic reform. Private entrepreneurs were even invited to enter the Communist Party to participate in the management of state affairs (Chen, 2007). Many laws and regulations have been created to show the citizens of China that the government's attitude toward the private sector is changing from volatile to supportive. These changes signal a shifting focus on developing entrepreneurship in China, and thus Entrepreneurship Education must develop to meet this need.

This development is especially relevant in China with university enrollment growth rates skyrocketing from 9.8% in 1998 to 24.2% in 2009. This growth is good for China; however, unemployment has crippled the post-graduate population with only 70% of 2008 graduates finding work (Zhou & Xu, 2012). In addition to the national Ministry of Education, provincial education bodies and government affiliated agencies have modified policies and provided entrepreneurship training programs to promote the idea of small business ownership to Chinese students.

Most recently, many policies have been made to promote Entrepreneurship Education in China, especially in Zhejiang Province. Since ancient times, people from Zhejiang Province have been considered excellent merchants (Yang, 2016). Therefore, Zhejiang Province is a leading area in China to experiment with Entrepreneurship Education.

In 2015, the provincial education department issued a document "Opinions of Zhejiang Provincial Department of Education on Actively Promoting the Construction of Entrepreneurship Colleges in Colleges and Universities" (ZPDE, 2015). In the document, the department mandated every university and college build their own entrepreneurship school and offer introductory entrepreneurship courses. This is in response to the new State Council's public "entrepreneurship and innovation" requirements, and is in line with the mandate from the Ministry of Education that all students must take some sort of introductory entrepreneurship course. These changes make determining how to effectively teach EE a much higher priority, as China does not have a long history in entrepreneurship to call on. Just as the historical

development of entrepreneurship has shaped the EE systems in both countries, the educational backgrounds of students similarly impact institutions' programs.

2.1.4 Education system influences on EE in China

The Chinese educational system similarly shapes how students are used to learning, and is also reflected in the way EE courses are currently taught at Chinese universities. Government involvement in education and regular standardized admission exams are key components of the Chinese educational system that influence EE.

In China, education is regulated at different levels of the government: The Ministry of Education controls curriculum requirements, provincial authorities create the plan for implementation, and individual schools organize teachers and courses to carry out the implementation plan (Zuoxu & Rongtan, 2004). As such, there is general uniformity across the country, and students taking EE courses are likely to come from similar educational backgrounds.

The Chinese Government has significant involvement in post-secondary education (Ding, 2010). The government can affect the whole educational system, including the curriculum design, teacher employment, and funding distribution. As such, universities and colleges are all under the control of the government. The government directly manages university decisions and affairs, directly intervening in actions such as the appointment of school leaders. Financial guidelines, funding, course arrangements, and enrollment are directly regulated by the government. Thus, individual universities have less flexibility to dictate the way they are fostering innovation and teaching entrepreneurship.

Students' progression through their education is also highly regulated, and differs from the U.S. educational system. Completion of junior secondary education marks the end of the 9-year compulsory education program (Classbase, 2017). Students wishing to continue their studies must pass the entrance examinations for general senior secondary schools, known as "zhongkao". At the end of their final school year, graduates of senior secondary schools seeking admission to post-secondary education are required to take the National Higher Education Entrance Examination, commonly known as "gaokao". Success on this test is the primary requirement for college admittance. This test-centric educational system requires the students to use memorization to succeed, and this approach is mirrored in much of the current EE pedagogy used in universities in China.

Students entering tertiary education in China have grown accustomed to standardized tests and memorization of information. These methods are the backbone of the Chinese education system and thus inform the teaching methods used in Chinese universities. We will review specific teaching methods utilized in Chinese EE in more detail in Section 2.1.6.

It is important to acknowledge that the Chinese education system is starkly different from the American one. As described, the American system devotes resources to innovative teaching methods, with a focus on moving away from standardized test-based evaluation and towards experiential learning, which is reflected in their EE courses. On the other hand, the Chinese system primarily still has a traditional, rigid memorization-style/examination focused structure. As such, the experiences and skillset of college students in the two systems vary. Due to this, we cannot assume teaching methods employed in American EE courses will be just as effective in Chinese universities.

2.1.5 Entrepreneurship Education Pedagogy in the United States

The United States has been at the forefront of Entrepreneurship Education for decades, and sets an example for countries across the world. Part of the U.S. dominance in Entrepreneurship Education comes with a constant evolution of teaching methods. Entrepreneurship courses strive for student-centric learning by utilizing action research, action plans, case studies and mock business creation (Tan, & Ng, 2011). Although the curriculum, professors' industry background, class involvement, and resources utilized may vary when using these methods, they all focus on getting the students involved in their own experiential learning.

In Entrepreneurship Education, action research “is a disciplined process of inquiry conducted *by* and *for* those taking the action” (Sagor, 2000, pg. 1). Students engage in action research in order to better understand how they can improve their learning. One example of action research is group review, whereby students come together in a group in order to analyze and constructively critique each other's work. Professors will typically break a class into groups and give each group the task of positively critiquing their groupmates' work. This critique could include anything from correcting basic structural or syntactical flaws in their writing to analyzing critical thinking and analysis flaws. This process aims to engage students actively in order to help them overcome existing flaws or errors. This heightens a student's sense of responsibility for his/her own work, improves the quality of the work, and gets all students more involved in their own learning.

In Entrepreneurship Education, an action plan is a detailed, action oriented plan where students create their own deadlines, timelines and necessities for their projects (MindTools, 2017). These projects range from business plan creation to interviewing prospective customers. An action plan requires that students think critically about how they approach workflows. Professors will typically have students create an action plan near the start of a course (quarter, semester, or year), in which they plan out in detail how they want to tackle a project. This ensures students are engaged in identifying tasks, delegating those tasks and understanding what they need to accomplish. As students follow through on their action plans, they should meet with their professor regularly to ensure that their action plan is being followed. This gives the students more flexibility in determining their own course of action and how they are going to go about meeting course requirements, giving them freedom to make decisions and have a hands-on learning experience.

In addition to action plans and action research, one of the most popular activities in United States business schools that professors engage students in is the creation of a business (Babson, 2017a). Encouraging students to create their own businesses as part of a class is regularly utilized by Babson College, where part of the undergraduate requirement is to take a class whereby students are required to invent, develop and launch a business (Babson, 2017b). Classes typically consist of up to 40 students and are broken up into teams of 10. Throughout the semester, two dedicated faculty members teach students about entrepreneurship, marketing, accounting, organizational behavior, information systems, and operations, while emphasizing the integrated role these functions have in a business. Different variations of this method have been adapted and incorporated into many other colleges and universities (Noer, 2017). Babson is unique in that the college loans up to \$3,000 as startup money for each business. Students own the ideas for the businesses, and they are encouraged to think about how their business meets a human need. However, at other institutions, this exercise is much less complex and simply involves students developing mock portions of a business or going through the process of identifying a need in society and presenting an idea for a solution. This kind of exercise once again causes students to take concepts they learn in class and practice applying them in a safe, experiential environment.

A case study is a presentation of realistic, complex and contextually rich situations that involve a conflict or problem that one or more of the characters in the case must negotiate

(CMU, 2015). In entrepreneurship courses, professors will typically take a real problem a business or corporation was presented with in the past, and ask students to solve that problem within the context of the story. The case will outline different roles, such as the CEO of the company, a consultant, or a head of a department. Students are then assigned these roles in the case study based on the characters described, and are asked to act as if they were in the place of their assigned character (Gonsalves, 2015). Case studies are aimed at getting students to critically and realistically apply concepts learned in class to real situations and prepare them for the uncertainties of entrepreneurship without utilizing tangible resources.

While these general methods are used across courses, the quality and direction of EE curricula vary broadly (Winkel et al., 2013). In the United States, universities are free to design their own curriculum. This means that schools can label almost any course related to business as an “entrepreneurship” course, from balance sheets to business law. This flexibility in EE means that multiple colleges in the same city teaching entrepreneurship could use totally different approaches to their curriculum design (Esmi, Marzoughi, & Torkzadeh, 2015). This is largely because entrepreneurship is a mix between a science and an art. It is a science in that a set of basic skills and baseline knowledge exist that individuals need to have in order to be a successful entrepreneur. These skills are generally more consistent across different schools’ curricula. The more difficult aspect is teaching the art of entrepreneurship. Professors and universities have to figure out the best way to inspire their students to be creative whilst simultaneously enabling them to practice this creativity in the setting of a class. The integration of the art and the science into a curriculum is what makes the selection of teaching methods, outside resources and course topics so difficult to establish for an entrepreneurship course.

A professor’s industry background is another key aspect in understanding how entrepreneurship and innovation are taught in the classroom. Professors of practice are particularly valuable from an entrepreneurial or innovative standpoint in the classroom as they have the ability to bring real-world experience into an environment where it can be difficult to gain such experience (Ly, 2015). A “professor of practice” is defined as a professor who has gained experience in a field through practical and real exposure, and now teaches based on that experience (Hollinger & Knight, 2004). Professors of practice need not have obtained an advanced formal education in their craft to be hired and are valued for their real experience over a degree in their field (AASSCB, 2007). Professors of practice can supplement the curriculum

taught by using their professional experiences. For example, a student can learn financial structure, growth management and venture capitalism in a class curriculum. Then, a professor of practice can support that student's learning with real examples, advice and potential results based on his/her experience running a business that had to utilize those concepts. Professors with industry experience have more confidence in getting away from a textbook and facilitating more hands-on learning.

A professor's involvement outside of the classroom can be just as important as his/her engagement within the classroom when it comes to entrepreneurship and innovation education. For many students, a more individualized interaction with a professor could mean the difference between sparking interest and passion for the subject or not (Reis, 2012). When it comes to innovation and Entrepreneurship Education, having professors who are accessible outside of class is extremely important when utilizing student-centric learning. The students know that they are not alone in their struggles and intellectual development.

For example, a student starting a business may be struggling with managing employees and bookkeeping. If this student has an accessible professor to go to for guidance and advice, he/she could be more inclined to keep on trying and push through adversity knowing that there is a support network to turn to (Reis, 2012). In addition, these problems could be resolved and the situation could foster a learning environment within the student's business whereby the student learns actively from experiences rather than passively through lectures or textbooks.

Additionally, university students interested in entrepreneurship and innovation have an abundance of resources available to them outside of the classroom. For example, clubs and organizations can host workshops and guest speakers, and private sector partners can sponsor entrepreneurial Research and Development projects to be completed by undergraduate students (MIT, 2017a; WPI, 2017c). These types of resources can then be integrated into the classroom by having a business professional come in to speak to the class and offer inspiration, or utilizing private sector partnerships to mentor students through class projects. Thus, EE faculty members have many choices when looking for external resources to embed into their classroom learning environment in order to provide a real-world grounding for course content.

These pedagogies and influences all characterize the current U.S. Entrepreneurship Education system as striving to provide student-centric learning in which students are required to think on their own and apply concepts. While lectures are often still utilized, they have moved

away from the traditional lecture and test-based teaching approaches to more comprehensive programs, which better prepare students for the volatility of entrepreneurship.

2.1.6 Entrepreneurship Education Pedagogy in China

In China, the Ministry of Education outlines all curriculum at tertiary institutions allowing for a standardized curriculum (as discussed in Section 2.1.4). However, because Entrepreneurship Education is so new and diverse, the Ministry has given universities some freedom to decide the exact content that will be taught in their entrepreneurship courses (Jeff Huang, personal communication, December 1st, 2017). Even with the ability for universities to adjust teaching methods, the “chalk and talk” approach is still the most common approach to teaching (Donnelly, 2014). In this model, the teacher remains at the front of the classroom, directing learning, controlling classroom activities and ensuring a disciplined environment. The lecturer has the complete attention of students, and thus has total control over what, when and how material is consumed. Students are consistently timed, tested and ranked against each other on a monthly (sometimes weekly) basis (Donnelly, 2014). Classrooms are organized into rows, and students generally have no control over what happens in the classroom. This lecture-style method has contributed to Chinese students’ great success in standardized tests, which is the way their education system is structured (as outlined in Section 2.1.4). However, this approach is not conducive to experiential learning and individual thinking, which are some of the key components in the success of the U.S. EE system.

While the lecture-based approach is still the norm in Chinese EE, leaders are emerging in China that have adopted the student-centric approach and are working to change that norm. Tsinghua University (2017) in particular, utilizes an entrepreneurship program that revolves around small class size and experimentation based education. Their programs feature extensive resources for students to develop and receive mentorship for innovation and entrepreneurship. Their iCenter is a private sector partnership space with an abundance of resources for students to utilize in pursuing their business ideas and engage in hands-on learning. This innovation center is over 10,000 square meters and provides students many industry-level manufacturing and electronic facilities, such as: CNC milling machines, industrial laser cutting machines, a high precision 3D printer and industrial welding robots. These extensive resources are used to foster the idea of student-centric learning that is implemented commonly in the U.S.

Tsinghua University, however, is not the norm in China. It represents a university with an abundance of resources to dedicate to entrepreneurship in order to provide hands-on learning experiences in more intimate settings (Jeff Huang, personal communication, November 3rd, 2017). The norm in China remains the lecture based approach, in which professors provide information to students and ask them to regurgitate those concepts back on a test or in a report. The students still lack the opportunity to direct their own learning and apply those concepts.

This core difference between the Chinese and U.S. Entrepreneurship Education systems reflects a gap in research that currently exists. Educators have not found the most effective way to foster innovation in the Chinese classroom. The U.S. has created a student-centric system that has proven to be very effective, while China is still generally utilizing the lecture-based model. While some Chinese universities are attempting to implement features of the U.S. system, it is not clear if the widespread use of these methods can be directly adopted, due to a variety of influences on entrepreneurship and education that dictate the effectiveness of certain pedagogy in both countries. Thus, more research needed to be done on both systems and what influences them in order to determine how U.S. EE teaching methods could be adapted to the Chinese classroom. In the next chapter, we explain how we went about determining what types of U.S. teaching methods may be feasibly introduced into Chinese EE.

3 Methodology

The goal of this project was to provide Bster Science and Technology Co. with recommendations on how to improve entrepreneurship and innovation education in undergraduate programs in China. In order to reach our goal, we completed the following objectives: determined effective entrepreneurship pedagogy techniques used in the United States, identified prevalent pedagogical practices in Chinese EE, and identified the systemic differences between EE in China and the U.S. in order to find suitable EE pedagogy for China. To achieve these objectives, we developed the following methodology for collecting and analyzing data, focusing primarily on interviews and a survey.

3.1 Determine Effective Entrepreneurship Pedagogy in the United States

To provide an effective set of recommendations for modifications to Chinese EE teaching methods, we used the world standard, the United States. We chose to focus our research on three key institutions with varying approaches to teaching EE, namely: Worcester Polytechnic Institute (WPI), Babson College, and Massachusetts Institute of Technology (MIT). WPI was selected due to its accessibility and focus on project-based learning. We looked at Babson for their highly regarded entrepreneurship program and well-known introductory business creation class. Additionally, we looked at MIT, a leader in innovative business creation and the transformation of innovation into entrepreneurial ventures. Looking at three successful institutions with different approaches allowed us to identify themes across Entrepreneurship Education more broadly in the U.S.

3.1.1 Interview entrepreneurship professors to understand themes in teaching style

By interviewing professors at each of the selected institutions, we sought to understand the teaching methods being utilized and the reasons they were effective. This gave us varying perspectives that we could compare to identify the best practices used to teach entrepreneurship in the U.S. and the influences behind them. We started by interviewing professors at WPI and utilized snowball sampling to obtain connections at the other two institutions. We interviewed Mark Rice (first Dean of WPI's Business School), Arthur Gerstenfeld (WPI business professor for 37 years), and Frank Hoy (WPI entrepreneurship professor with vast experiences in industry) to begin with and utilized their connections to access MIT and Babson faculty. From Babson, we

were able to interview Donna Kelley (teaching professor with experiences teaching in East Asia) and Heidi Neck (professor in charge of faculty training on Entrepreneurship Education). Finally, from MIT we interviewed one professor, Elaine Chen (entrepreneur in residence with experience teaching in Hong Kong), as we found their teaching methods to be impractical for application at most universities in China due to their extensive resources. In total, we interviewed six entrepreneurship faculty from the U.S. via Skype and email, with follow-up questions answered via email following our protocol outlined in Appendix B.

Throughout the interview process, these professors highlighted specific teaching methods and activities they found extremely effective in the American entrepreneurship classroom. In order to accurately visualize these methods, we created a game which walks the user through each of these activities (Appendix X). In choosing these activities, we selected methods which represented multiple characteristics of the American EE system, in order to provide a broad snapshot of its features. We used the ‘RPG Maker MV’ software to create these virtualizations of real-life teaching methods.

3.1.2 Identify course structure and syllabi

Another important way we determined how these institutions are successful in EE was to look at how the courses are organized and taught. Going beyond interviewing professors, we looked at specific course syllabi to see what is being taught when, the projects and activities they use, and how they integrate texts and other technology into the course. This allowed us to better identify the specific methods teachers and institutions are using to foster innovation and inspire students to become entrepreneurs.

We obtained these syllabi by asking the professors whom we interviewed for permission to utilize their syllabi in a curricular analysis. We also asked students who have, or are taking, entrepreneurship courses at MIT, WPI, or Babson to share the syllabi they have received with us and asked professors for permission to utilize them in our research. However, we were only able to receive permission from the WPI faculty we connected with. We obtained three syllabi from entrepreneurship courses taught at WPI, and then another four from engineering courses that utilize teaching methods that promote innovation in the classroom and are primarily project-based. This allowed us to look at how innovation is being integrated into other majors’ courses as well as the courses designed solely around entrepreneurship and innovation, giving us more specific examples of teaching methods and their integration into U.S. EE.

3.1.3 Perspective outside of academia on US EE

In addition to teaching methods at institutions, our background research revealed that one key difference in entrepreneurship in China and the United States is the influence of private sector businesses on EE, which showed that there was more involvement in the U.S. To get further information, we interviewed a business professional to discuss the skills he believes are critical in creating a good entrepreneur and his awareness of the state of EE in the U.S. We identified Rajan Venkitachalam, who works for Eagle Investment Systems and is also an angel investor as our interview subject for this portion of our methods. A Babson College graduate himself, his success in entrepreneurship demonstrates the institutional effectiveness of this program. Almost all the professors we interviewed also previously or currently have had experience in their own companies or in investing. As such, this additional interview with one person removed from academia allowed us to bring additional insight into our research (See Appendix D: Business Professional Interview Protocol, for more information on this interview).

3.2 Identify Prevalent Pedagogical Practices in Chinese EE

Along with determining the United States' approach to educating young entrepreneurs, we looked at China's strategy in fostering innovation. We utilized interviews to elaborate further on the literature research we had conducted and to gain a thorough understanding of the way entrepreneurship is currently being taught in China. Our native Chinese speaker, Kailun Liu, arranged and executed our interviews and any data we collected from them. We utilized our sponsor's connections with Chinese universities as well as professors at HDU to schedule meetings and interviews.

3.2.1 Interview entrepreneurship professors

Similar to our interviews with American professors, we hoped to gain a perspective on why Chinese entrepreneurship professors employ their specific teaching methods and the challenges they face while teaching. Of particular importance was the professors' previous experience in entrepreneurship, whether it be creating a startup company or holding an advanced degree. We also ascertained their opinions on the biggest challenges in teaching entrepreneurship and innovation in China. These interviews allowed us to identify current teaching methods being utilized to teach entrepreneurship, but also allowed us to develop a more comprehensive characterization of EE in China. These professors were chosen based on the connections we had at HDU and from our sponsor. We focused more on universities in China that lack the ability to conduct classes with only 20-30 students. These schools could thus benefit from the educational

solutions our sponsor provides. In total, we interviewed five Chinese EE professors from Hangzhou Dianzi University, Central South University, and Zhejiang University of Science and Technology. The protocol for these interviews can be found in Appendix C: Chinese Professor Protocol.

3.2.2 Perspective outside of academia on Chinese EE

We also ensured we were able to make a comparison between private sector involvement in EE in China and the U.S. We elected to interview Zhenwei Shang, CEO of Dream G-Space incubator, which is located near HDU and works with local universities, to gain this insight. This allowed us to once again gain an understanding of private sector involvement and understanding of EE from an individual outside of academia. We used the same protocol for interviewing the American business professional but used Kailun Liu to translate all questions and responses. (See Appendix D: Business Professional Interview Protocol.)

3.3 Identify Systemic Differences Between Entrepreneurship Education in China and the US

This section explains how we identified nuances in education systems and cultural norms that may impact the effectiveness of adopting U.S. EE teaching methods in China. Specifically, we identified the factors that make direct translation of U.S. EE teaching methods into the Chinese system not feasible and the roots of those difficulties. To do this, we needed to understand students' backgrounds and views on teaching methods as well as systemic differences in EE identified through our interviews with professors.

To characterize the students' background derived from the educational system that they go through, we conducted a literature review, as described in Section 2.1.2 and 2.1.4.

Through a Qualtrics survey of Chinese students, we ascertained the effectiveness of EE teaching methods as reported by the learners themselves. We distinguished between effectiveness of the teaching methods and the students' comfort levels with those teaching methods being applied to EE. This survey allowed us to identify cultural and systemic barriers that exist as well as helped us better understand the Chinese student. In total, we surveyed 220 Chinese students, primarily from HDU. We used QR codes to distribute the questionnaire to the introductory entrepreneurship class' WeChat groups as well as in person via QR to students as they were exiting the class and at an entrepreneurship club meeting at HDU (See Appendix F: Survey Protocol).

We interviewed Professor Chrysanthe Demetry, director of WPI's Teaching and Learning Center, in order to gain a similar understanding of the U.S. student. She works to promote professional development of faculty by training them on better ways to teach students at WPI. This interview allowed us to build on our previous interviews with U.S. professors and to compare the backgrounds and expectations of students with how they learn in both cultures (see Appendix E: Professor Demetry Interview Protocol).

These qualitative insights generated from background research, survey data, and interviews provided the information necessary to identify foundational problems impacting the adoption of American EE teaching methods in China. These problems were identified so that our recommendations could take into consideration systemic differences between the two countries.

The identification of systemic challenges, as well as the data collected on Entrepreneurship Education teaching methods in both countries allowed us to identify areas in which leading U.S. institutions' teaching methods may be integrated into Chinese classrooms. In the following chapter, we present, analyze and evaluate the data we obtained from using all of our research methods.

4 Results and Analysis

The goal of our project was to produce recommendations on how Chinese universities can improve how entrepreneurship is being taught in the classroom. First, we characterize the American and Chinese EE systems, outlining teaching methods, typical course structure, and the role external resources play in the classroom. We then highlight three critical challenges the Chinese EE system faces in adopting U.S. teaching methods.

4.1 Entrepreneurship Education Best Practices in the US

Entrepreneurship Education in the United States is characterized as highly experiential and project-based, in order to prepare students for the non-predictive nature of entrepreneurship. While, our analysis focused on MIT, Babson College and WPI, and therefore may not necessarily represent the characteristics of the entire country's EE system, we have used our findings to inform generalizations throughout this section. Professors in the U.S. have attempted to replicate entrepreneurship's volatility through their teaching methods and course structure. Professors are "shaping experiences that allow [students] to develop their abilities to think entrepreneurially" (Heidi Neck, Appendix O).

The success of American EE when using experiential and project-based teaching methods is evidence of their effectiveness. Experiential teaching methods engage students in practical, hands-on activities where they apply entrepreneurial concepts and guide their own learning. The implementation of experiential learning is found in teaching methods, course structure, and external resources utilized in U.S. EE classrooms. The application of entrepreneurial concepts through experiential learning allows students to actively engage in the uncertainties of entrepreneurship.

4.1.1 Teaching Methods

Our analysis of EE teaching methods in the U.S. revealed a focus on preparing students for real-world entrepreneurship, using student-centric learning and experiential methods. This approach encourages student participation and leadership, core traits of any entrepreneur. Professor Donna Kelley of Babson College quantified this claim by speaking to the proportion of class time she believes ought to be devoted to faculty lectures compared with student-oriented activities (Appendix M). Specifically, Kelley argues that professors should not lecture for more than 10 minutes at a time – valuing a variety of student-professor classroom interactions. Limited

lecture-based learning enables class time to be used for discovery through practice, centered on the student. Professor Francis Hoy of WPI mentioned this when speaking on how practice is more important than theory in EE (Appendix L).

Based on our interviews with U.S. professors, the key difference between teaching entrepreneurship and other business courses is the need to utilize interactive and experiential teaching methods. Interviewees highlighted case study analysis, situation observation and analysis, impromptu networking and collaborative presentations. These activities represent the most effective teaching methods our interviewees have utilized to teach students entrepreneurial concepts.

For Venkitachalam, case study analysis is a primary mechanism for learning entrepreneurship (Appendix S). Case studies allow students to apply concepts learned in class by immersing themselves in a situation, understanding the perspective of the subject, and acting on their behalf. This allows students to personally experiment in different situations with minimal resource expenditure and low risk, which can increase their confidence. Case studies are easy to implement, and their popularity means professors can identify the perfect case for their intended learning outcomes. As a case study does not involve resources, students aren't anxious about wasting money on risky decisions. This prior examination of the volatility of entrepreneurship instills confidence and prepares the student to take calculated risks in the real-world. Modifications to the case study approach include student presentations of their proposed solutions to the cases (Appendix J), and the incorporation of relevant entrepreneurs into the class through an interview session with the students (Appendix P). Regardless of their particular format, it is important that case studies are relevant to the class being taught, and the students' interests. "You have to use case studies that are relatable to your audience. So, if you're talking to a bunch of people from a bank, and all you can talk about is robots, that's just not going to fly." (Elaine Chen, Appendix H). By utilizing these tailored case studies, professors in the U.S. can captivate the interest of their students, making them more likely to bridge the gap between theory and practice.

Situation observation and analysis is another effective interactive method in teaching entrepreneurship (Appendix M). In one activity, students make an assumption about a topic, e.g. helmets are ubiquitous amongst bicycle users, based on their prior experience (adapted in Appendix X). As a class, students and professors go into the field to test that assumption against

reality, collecting data on how many bicycle users were, in fact, wearing helmets. This example tests the need for a product before expending resources on an idea based on inference. Once again, this method utilizes the experiential component of field research to convey concepts of an entrepreneurial ideation phase. Another activity takes students out of the classroom to analyze a common, everyday procedure, e.g. ordering a taxi (adapted in Appendix X). The students identify obstacles and challenges that affect the efficiency or ability to execute the process, with hopes of transitioning that challenge into a business idea. This teaching method is essentially a brief, real-world case study open to student interpretation. Teaching students a theory on how to generate ideas is inherently difficult – so professors instead utilize this experiential method, exposing them to a real-world situation.

Presentation-based collaboration is another widely used, effective method in American EE. One professor assigned weekly presentations on the progress of student-run businesses in his classes, and he often invited deans and business professionals to his classes to give feedback and advice to the student presenters (Appendix J). An entrepreneur must be confident when pitching an idea to investors or marketing their product to consumers, and conducting team presentations in front of knowledgeable peers and established professionals helps to build this confidence at an early stage. Thus, team presentations prepare students for real-world scenarios encountered by entrepreneurs when garnering an investment or selling a product. Team presentations also incorporate collaborative learning, which is highly valued in the U.S. EE system. Another activity encourages collaboration on the first day, where each student moves along a line of other students introducing themselves, tasked with identifying a business idea they would be happy to start together based on shared interests (Appendix L, adapted in Appendix X). After generating a different business idea with each class member, they present one by one on their favorite business idea with one of the students they just met. Students are exposed to presenting on a topic they are knowledgeable about, giving concise elevator pitches, and engaging in impromptu social interaction. This activity, as well as collaborative presentations in general, covers many facets of real-world entrepreneurship, the trademark characteristic of American EE.

In the above example, the professor plays a facilitative role in guiding students but does not explicitly solve problems for them. As Gerstenfeld said, “the most important rule that I followed is to try to get students talking and involved, acting much more as a facilitator rather than a lecturer” (Arthur Gerstenfeld, Appendix J).

From this, we can conclude that EE teaching methods in the United States are tailored around preparing students for the uncertainties of entrepreneurship, and engaging them in the uncertainty of the real world. As Professor Kelley observed, entrepreneurship's non-predictive nature is what makes starting a business so difficult (Appendix M). The U.S. system exposes students to real-world entrepreneurship through the implementation of experiential learning methods, assessed in a qualitative manner. Teaching methods in which students focus on planning and structure would result in students being unprepared for the unpredictability of the entrepreneurial ventures they hope to start. In addition to their teaching methods, professors also use their course structure as a tool to exercise concept application and experiential learning.

4.1.2 Course Structure

In the U.S., Entrepreneurship Education curricula revolve around similar concepts of experiential, real-world learning, which emphasize that there is often no correct answer to a situation. Data collected from seven American course syllabi reinforces the importance of qualitative grading (See Appendix W: Referenced Syllabi).

The lack of final exams in many entrepreneurship courses reflects the focus on learning from experiences rather than memorization. WPI's introductory entrepreneurship course has the following grading criteria: 10% case and textbook reports, 20% book review, 10% networking events, 20% elevator pitch team project, 30% commercialization plan team project, 10% class participation (Appendix W). This grading rubric heavily focuses on student involvement inside the classroom and on group projects. A primarily qualitative curriculum design such as in this course aligns itself with Donna Kelley's and Mark Rice's views that qualitative grading is difficult, but it provides more insight into student proficiency in entrepreneurial learning (Appendix M, P). Critically analyzing literature for gaps and contradictions, participating in networking opportunities, and working in groups are critical components of a successful entrepreneur, as highlighted in the previous section's analysis of teaching methods. As entrepreneurship is a non-predictive field, stated by Professors Hoy and Kelley, the students taking the courses should thus be more prepared for entrepreneurship's inherently volatile nature (Appendix L, M).

What is perhaps more interesting, however, is Professor Hoy's course structure. The above grading system is used across all courses Professor Hoy teaches, from the introductory level to more advanced courses such as Growing and Managing New Ventures (Appendix W).

This shows that at least one professor has identified a best practice for the teaching of his entrepreneurship courses, and the fact that it involves no tests is in line with American EE professors' opinions on effective curriculum design through experiential learning.

Although Hoy uses similar grading criteria across all courses he teaches, he also highlighted how teaching entrepreneurship to different student populations can be challenging and requires varying approaches (Appendix L). For example, students at the University of Texas, El Paso, were far more interested in creating small businesses such as a restaurant or a bar to support their families, whereas students at WPI aimed to use their technical backgrounds to create an innovative startup company. This variability can even happen between class cohorts. As a result, professors rarely teach the same content twice (even at the same schools). Hoy was able to teach students in Texas the value of managerial entrepreneurship and the real application of content taught in class to their jobs, but by contrast he taught WPI students how technology and innovation can be turned into entrepreneurial ventures. To conclude, professors must utilize their experience to adapt course content based on the needs of their students.

Entrepreneurship Education takes place beyond the typical entrepreneurship course. Technical classes at American colleges are increasingly incorporating entrepreneurial mindset learning into their courses, as this generates interest in the subject matter and offers a pathway to further study for interested students (Appendix W). Students in a WPI Software Engineering course work in teams of 9-12 to create a software application for a sponsor. All teams work on the same project and are in direct competition with each other to create the solution selected by the sponsor. Lectures take place four times a week, discussing the software development process and team dynamics management. At no point do the lectures cover the actual coding required for the project. Once a week, students present on their current progress, in addition to meeting with their assigned coach to receive team mentorship.

Courses such as Software Engineering are inherently entrepreneurial in nature as they have students working to create a product to solve a problem (Appendix W). This product can often be scaled up after the class is done into a fully-operational business. The lectures focus on concepts, as opposed to directly assisting students with the graded work, which was highlighted as an important aspect of EE by our interview subjects. Sixty percent of the grade is related directly to individual contributions to the software project and is not test based. This further encourages exploratory learning and incentivizes contribution to the group as opposed to

studying individually for the exam, which is only worth 15% of the final grade. This reiterates the importance of experiential learning, providing students a more in-depth understanding of concept application and prepare them for the real world.

4.1.3 Other Influences in the Classroom

In addition to course structure and classroom-based teaching methods, our research highlighted other key features that make the American EE system successful, namely: interdisciplinary perspectives of students, the professional experience of EE faculty, small class sizes, the presence of external resources and the low risk of entrepreneurship while still at a university.

American entrepreneurship students bring to the class multiple backgrounds and perspectives necessary to develop creative and innovative ideas. Venkitachalam talked about the value of EE's interdisciplinary nature, saying that having a wide variety of perspectives is extremely valuable to any entrepreneurship class (Appendix S). An engineer may have an innovative product idea, but an art major may be able to help design the product in an appealing manner for consumers, a business major can help market it, etc. These perspectives can improve the education received in class, and better represent the inherently interdisciplinary nature of entrepreneurship (Appendix L).

Another important finding from our interviews was the prevalence of professional entrepreneurial experience among our academic interview subjects. From being a board executive to a small business owner, our interviewees all had relevant experience pertaining to entrepreneurship (see Table 2 below). Our business professional also mentioned that every professor he encountered during his time at Babson College had experience as an entrepreneur or business professional before teaching (Appendix S). Professors with direct experience in entrepreneurship can draw from those experiences while teaching and more effectively explain to the students the concepts covered in class. These professors are more aware of the traits the field requires and can use experiential teaching methods to develop these traits more effectively than someone with no business background. Table 2 summarizes the extensive industry background all the American EE professors had prior to, or in conjunction with teaching entrepreneurship. These experiences better position professors to take on mentorship roles for students and act as the facilitator in class, highlighted as a critical teaching method previously.

Table 2: U.S. Entrepreneurship Professor Credentials

Interviewee	Institution	Real World Experience
Elaine Chen	MIT	Co-inventor of 22 patents, has worked in numerous start-ups, started and sold her own business.
Arthur Gerstenfeld	WPI	Started his own business which ended up employing 55 workers before he sold it to pursue his career as a professor.
Francis Hoy	WPI	Ran an advertising company, worked at AT&T, co-founder of a business, angel investor, served on the board of directors for a business.
Donna Kelley	Babson	Worked as a chemist and in entrepreneurship ventures in a variety of fields.
Heidi Neck	Babson	Worked for large chemical company in marketing, sales & business development. Consulted small businesses.
Mark Rice	WPI	Ran a technology business incubator and co-founded a solar energy company.

Mentorship also takes place from peer to peer interactions in the U.S. EE system, with Teaching Assistants (TAs), Peer Learning Assistants (PLAs) and Senior Assistants (SAs) playing roles in the feedback process for prospective student businesses (Appendix O). Generally, these positions are distinguished by the levels of education reached in the subject by each mentor. TAs are graduate-level students, PLAs are undergraduates who have taken the course they are advising for, and SAs are final-year students in the field of the course. One interviewee highlighted the importance of different kinds of mentorship in her interview, explaining,

It depends on the level of the course and what the students are doing... , it's important to have a support system in place for the students. You have student mentors, upper level students that are mentoring each of the business groups... some of our other courses where students are starting on their business or going to incubator space, then, yeah, industry mentors are very important (Heidi Neck, Appendix O).

These varying forms of mentorship all act to guide the student through their own learning.

Just as industry background assists in teaching entrepreneurship material, class size is also an important factor in executing experiential teaching methods. All professors we interviewed said that too large of a class size hinders the effectiveness of interactive activities. Professors we interviewed agreed that a class size of around 30 students was optimal in performing the interactive and exploratory activities and exercises that EE requires (Appendix L, T, U).

Professors at American universities and colleges often integrate external resources, such as online resources (i.e., blogs and online courses), guest speakers, and private sector partnerships, to educate students and provide pathways to entrepreneurial success (Appendix H). Online resources at MIT are available for free to anyone interested in learning entrepreneurship (edX, 2017). Guest speakers provide real-world context for the entrepreneurial concepts highlighted in lectures, offer mentorship, and provide feedback on how an early stage entrepreneurial venture is doing. Guest speakers may be used as case study subjects, providing feedback on proposed student solutions to the case, and sharing their own rationale behind the decisions they made. Finally, private sector partnerships with colleges in the form of incubators, internships and fundraising have matured over the development of the American EE system. Alumni networks are an important resource for prospective entrepreneurs, as they can provide mentorship and bring in real-world experience. MIT provides a Professional Advisory Network of over 200 alumni who have successfully founded entrepreneurial ventures and have volunteered to coach and mentor student groups with similar interests (Appendix H). A developed EE program such as MIT's consists of so many external resources that academics only play a small role in the education of students, as seen in the Annual Review of MIT's Entrepreneurship program. MIT Entrepreneurship regards programs, events, outreach and infrastructure all in equal importance with actual academic study. We generally found more developed entrepreneurship education programs have far more elaborate alumni networks, startup incubators, student organizations, and cross-campus partnerships.

Because entrepreneurship courses are electives in the United States, Chen found her students to be extremely motivated when taking her courses (Appendix H). In fact, one of her courses requires students to register in groups of two, with a business idea previously generated and often preliminary work completed. This removes the need for professors to facilitate the

social interaction and business ideation portion of the entrepreneurial process, which Chen says takes up to two weeks in her other courses. Because students can fail, with the safety of obtaining a degree from a prestigious institution, they are more motivated to iterate on the business creation process multiple times, and identify if entrepreneurship is a viable pathway for them later in life. Professor Gerstenfeld highlights a critical need for EE when describing how students can test their first few entrepreneurial ideas in college, with the fallback of continuing their education (Appendix J). EE is therefore a much lower-risk scenario than creating your first company after college and not having a steady stream of income. Professor Kelley reiterated this when discussing how the American EE system, and the general education system, teaches students that failure is acceptable (Appendix M). The EE system allows students to have a “cheap” failure, where students can quickly identify mistakes and build off these learning opportunities. Allowing students to make errors in their work is critical to strengthening retention of entrepreneurial concepts and reflects the nature of entrepreneurship outside of college.

In summary, American EE best practices focus on preparing students for real-world entrepreneurship, with the preface that they will never grasp the full intricacies of the many disciplines entrepreneurship covers. Presentations, case studies, networking activities, and situation analysis are specific teaching methods used to convey real-world entrepreneurial concepts. All these methods focus on students creating something, and most involve collaboration of some kind. Professors act more as facilitators rather than lecturers, providing mentorship and integrating an abundance of external resources into the classroom.

4.2 Entrepreneurship Education Current Practices in China

Chinese Entrepreneurship Education can be characterized as developing, lecture-based, and focused on individual learning. In addition to looking at these characterizations, we researched student and professor perceptions of EE teaching methods to find out if there are discrepancies between preferences and comfort levels in these current practices.

4.2.1 Teaching Methods

Lectures and reports are the most common teaching methods in Chinese entrepreneurship classes. One example from Professor Qizhi Li’s Entrepreneurial Mindset class at Zhejiang University of Science and Technology assigns students the task of identifying any problem, and generating innovative solutions to solve this problem (Appendix N). The students create a report based on their findings and are graded primarily on their effort put into researching the topic. If

the students present a realistic solution to the problem, they will obtain the highest grade in the course. For example, Professor Li described one exemplary project in which a student ‘innovatively’ solved the problem of tape sticking to itself by using a tape dispenser. Although this is a shift from the traditional exam-based grading present in the entire Chinese educational system, it still does not qualitatively assess application of the entrepreneurial mindset. Professor Xiaoling He from Zhejiang University of Science and Technology executes his entire course through lectures (Appendix K). At times, he displays the application of risk management concepts using an online U.S. stock portfolio website; however, he simply explains his reasoning to the class in a lecture setting.

Generally, Chinese EE professors have indicated to us an intent to implement experiential teaching methods in their classes. However, due to the foundational role lectures play in Chinese education, these methods have failed to become widely adopted. Professor He attempted to employ discussion-based learning in his courses but found students were reluctant to participate (Appendix K). Professors Kelley and Chen also backed up this claim, saying that in their mixed Chinese-Western class discussions in China the discussions were dominated by the foreign students (Appendix H, N).

4.2.2 Course Structure

Course structure in the Chinese entrepreneurship classroom is shifting away from test-based grading in favor of reports and presentations. Despite this, the implementation of these methods remains quantitative and does not adequately prepare their students to start their own businesses. One key challenge that relates to this is the number and length of classes that each student is enrolled in at Chinese universities.

Chinese college students take up to twelve classes at one time, severely limiting their ability to complete work outside of class. Hangzhou Dianzi University (HDU) also enforces an 11pm curfew on students, at which point all residential buildings close, and the power is switched off (Yunhong Shen, personal communication, December 1st, 2017). This high proportion of in-class time is a common theme at universities around China. Thus, Professor Yunhong Shen from HDU believes the case study method in particular would be ineffective in Chinese institutions (Appendix R). Case study analysis requires extensive reading prior to discussion and analysis, which is not an effective use of class time. Currently, the online portion of introductory courses at HDU is merely a series of video lectures which students can view

remotely (Appendix U). This serves to reduce the amount of a professor's time spent in class and the class space needed to carry out this course, which currently has 800 students in 10 sections. Chinese EE teaching methods thus must keep in mind the high proportion of time spent in class as opposed to completing work outside of class. Chinese EE courses have a high proportion of work completed in class; however, ineffective lectures take up most of this time.

Grading mechanisms in Chinese EE are generally quantitative and often do not accurately judge a student's proficiency in entrepreneurship. For instance, attendance accounts for 60% of Professor Li's Entrepreneurial Mindset grade, and his 60 students' skills are only evaluated in the remaining 40% of their grade (Appendix N). In terms of curriculum design, his course is one third theoretical study, one third project report, and one third project presentation. The theoretical study is carried out through lectures, and students use the rest of their class time writing reports and preparing for their presentation. All sixty students present during class time, one by one; another instance of time not being used to the fullest. Although this course structure represents a shift away from strictly lecture-based learning, it reveals gaps in making this transition to more interactive methods.

4.2.3 Student perception of Chinese EE teaching methods

Despite American professors highlighting low engagement from Chinese students in discussion-based classrooms, our survey of 220 Chinese EE students revealed they believe discussions are far more effective than lectures, as shown in Figure 4.2 (Appendix V). The survey also revealed, however students are 33% more likely to find discussions 'uncomfortable' rather than lectures. A discrepancy, therefore, exists between student perceptions of effective teaching methods, as opposed to the methods that they are comfortable with. This survey provides a snapshot only of HDU students' opinions.

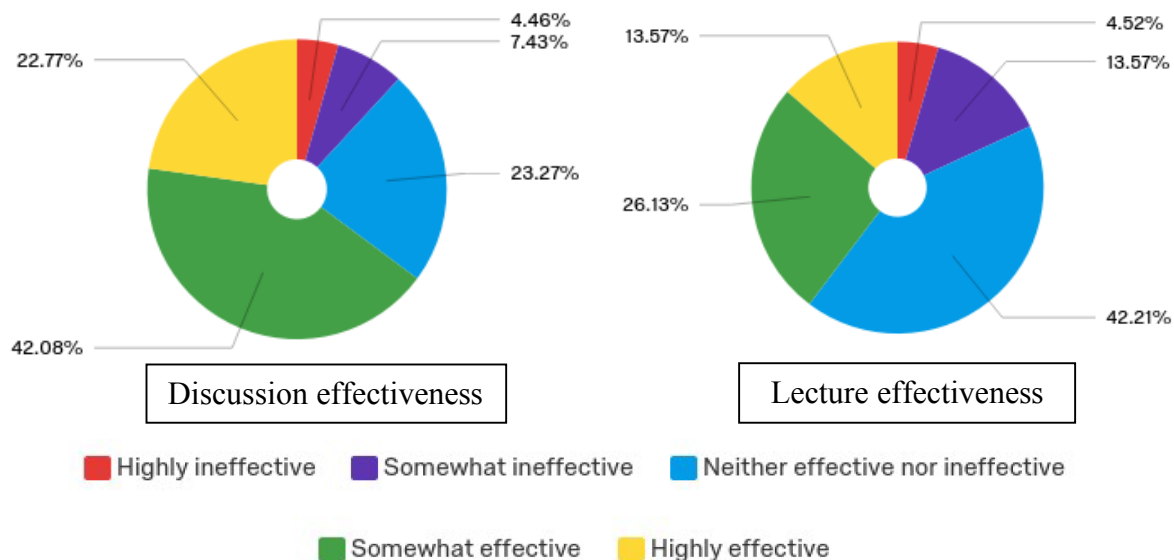


Figure 1: Effectiveness of in-class discussion vs. lectures amongst Chinese EE students

One potential factor causing this discrepancy is the atmosphere of Chinese EE, which does not yet promote cooperation and collaboration amongst students. Professor Li's Entrepreneurial Mindset course assignments are not explicitly individual – students can work in teams if they want to (Appendix N). Despite this flexibility, every student worked individually, and Professor Li was never asked for clarification on the assignment guidelines. This is most likely due to the students' expectation of standardized assessment, as highlighted in Chapter 2. Developing a collaborative atmosphere in Chinese entrepreneurship classrooms would allow students to receive feedback from peers, make experiential teaching methods more effective, and increase student comfort levels with these methods.

4.2.4 External Influences in the Classroom

Chinese EE is influenced by a variety of external influences, mentorship networks, and professor credentials. These factors impact the way professors teach and students learn in the classroom.

Mentorship networks in Chinese EE are multifaceted, primarily led by peers, the private sector, and faculty. Peer mentors are students who have completed the class being taken by another student and can aid with assignments and provide guidance. Professor Shen explained that HDU does offer a Teaching Assistant (TA) position, however this is primarily a form of financial aid, and these TAs do not hold open mentorship sessions for students to attend (Appendix R). Peer mentors do not provide significant assistance to students in Chinese EE, and

this further impacts the ability of professors to assess up to 200 students' work, the largest class size reported in our survey. Private mentors are professionals in the private sector who have industry experience in the field students are interested in, advising them on their business ideas. Zhenwei Shang, CEO of the Dream G-Space Incubator, discussed his growing partnerships with local universities (Appendix Q). Students are invited for tours of the incubator and can explore the facilities. At some universities, they have the opportunity to earn college credit whilst interning at one of the startups. In addition, the incubator also organizes guest speakers to provide information on entrepreneurship. Whilst mentors do not yet seem effectively implemented in EE, the private sector is playing an increasing role in fostering innovation and entrepreneurship in universities.

Most Chinese entrepreneurship professors do not work in industry prior to teaching entrepreneurship courses. Only one of five professors had an industry background, and that professor highlighted this as a major weakness in Chinese EE. Professors lack the experience of starting their own company or working for one, hampering the faculty mentorship process found in the U.S. EE system. Professors without business backgrounds are more likely to want to teach in a more predictive style, utilizing lectures and covering theory rather than practice and experiments. Professor Xiaoling He of Zhejiang University of Science & Technology agrees first that entrepreneurship should not be taught in a theoretical manner, and second that professors without practical industry experience can only teach theory (Appendix K). He also discussed how entrepreneurial theory gives students a false impression that creating a business is 'easy'. In his opinion, students who are only exposed to theory will be unable to handle complex situations in the real world. The strictly academic backgrounds of most Chinese EE professors are a critical reason experiential teaching methods are only sporadically used, in favor of a lecture-based education.

After identifying best practices in both the United States and China, we analyzed the cultural and social challenges U.S. EE teaching methods and curriculum have faced or will face as the Chinese EE system seeks to adopt them.

4.3 Challenges in Adopting Curriculum and Pedagogical Methods from US to China

We have characterized the U.S. EE system as experiential, project based, and student-centric, whereas the Chinese EE system is developing, lecture-based, and lacking in

collaboration. Chinese professors and students have indicated a willingness to adopt U.S. teaching methods, as shown from our interviews and survey. Despite this, we have identified three systemic problems impacting American pedagogical method adoption in Chinese EE, namely: (1) student predisposition based on the educational system and cultural norms, (2) lack of professors' industry background, and (3) large entrepreneurship class sizes.



Figure 2: Systemic Issues Applying U.S. EE Methods to Chinese EE

4.3.1 Student Predisposition

The educational systems Chinese and American students experience train them to be responsive to specific teaching methods, classroom environments, and competency evaluations, which in turn impact their preferences and comfort levels in EE. The Chinese system consists primarily of standardized tests and is inflexible due to government control over curriculum. On the other hand, the U.S. educational system values diversity due to its characterization as holistic and flexible. Cultural norms also influence student predisposition, specifically in student-teacher relationships and in the concept of “saving face”. Student predisposition impacts five core facets of U.S EE methods that will limit their adoption, as outlined in Figure 3. The following section analyzes what Chinese student predisposition is, and how it influences the adoption of U.S. EE pedagogy.

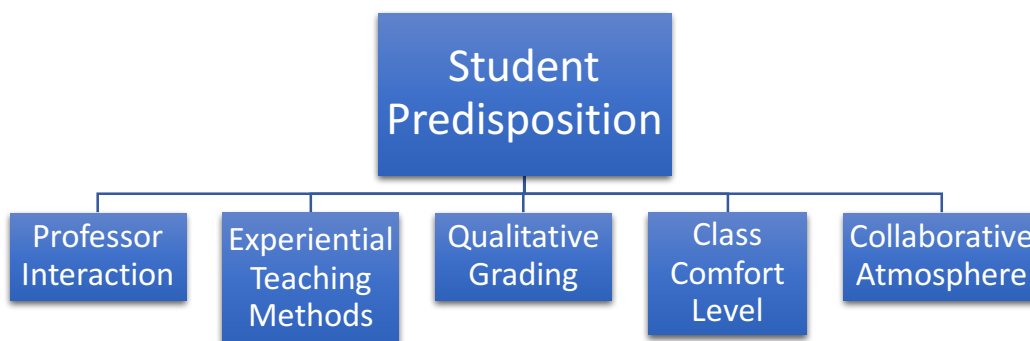


Figure 3: Impacts of Student Predisposition on EE

Standardized testing and qualitative grading are the two course evaluation mechanisms used in the Chinese and American EE systems, respectively. The Chinese educational system is rooted in examination-based learning, and students are therefore adept at memorizing information and understanding theories. Therefore, Chinese students expect they will receive good grades if they can perform the above tasks. Professor Zhang highlighted that, as Chinese EE courses have tried to move away from test taking, students have experienced confusion with identifying pathways to success (Appendix U). This makes incorporating qualitative grading into Chinese EE difficult, as students are accustomed to a system of test taking and quantitative assessment.

In our interviews, U.S. professors highlighted the need for students to apply entrepreneurial concepts, which requires qualitative grading to assess. Case study analysis and business creation are core teaching methods used in their classrooms which require entrepreneurial concept application. Standardized, quantitative grading present in the Chinese education system is not implementable when using these teaching methods. This may be one factor influencing the predominance of lecture-based learning in Chinese EE classrooms. A predisposition to this system, however, adds a layer of complexity when considering how Chinese EE professors can adapt experiential teaching methods into their courses.

The Chinese educational system focuses on individual learning, thus fostering a competitive atmosphere. This impacts the use of collaborative techniques in EE, as an interviewee explains:

I think that the first thing that is very, very different is that you can't take a U.S. style classroom approach straight up without warning of the students, because the culture prohibits them from doing the things we take for granted here. So, what I found is that you need to give them a couple days at least to warm up, and the way you have to ease them into it is to start by asking yes/no questions and get them to raise their hand. To just kind of ease them into it and get them to participate (Elaine Chen, Appendix H).

Kelley also reiterated the effectiveness of a gradual approach to encouraging collaboration, saying:

Students are not going to speak up in class and get class participation. So, what I did was more small-group breakout discussions, and when I asked them to speak afterwards it was more of them speaking on behalf of the group instead of on their own, so they were more encouraged to speak up and participate, eventually bringing them out, and students are actually more receptive to these types of methods (Donna Kelley, Appendix M).

Both of these professors identify success in warming their Chinese students up to collaborating, and saw higher class participation as a result. The success of these professors highlights the ability for shifts to be made in EE teaching methods, given the right approach.

Educational background also influences student-teacher relationship dynamics, and therefore learning. Forty-seven percent of our Chinese EE survey respondents had only one face-to-face interaction with their professor outside of the classroom over the entire semester (Appendix V). Figure 4 highlights a critical lack of face time between students and professors outside of the classroom. A student who does not question a professor out of respect will lack a depth of understanding another student has by clarifying or rebutting a concept. Faculty mentorship is a key aspect of developing entrepreneurs, highlighted in U.S. EE best practices, and this data indicates that Chinese EE does not offer the same opportunities, as a result of the student predisposition not to offer input during or outside of class.

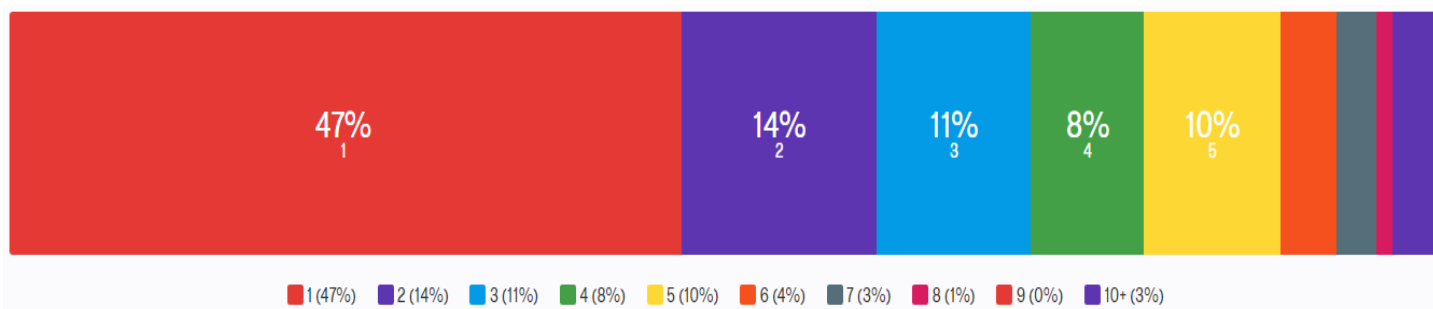


Figure 4: Number of face to face interactions between students and professors outside of class in China

Moving away from educational background, a systemic cultural norm informing student behavior is ‘saving face’. Saving face involves the preservation of a person’s dignity in social contexts, and this is especially common in Chinese culture. The impact of face saving is most prevalent in discussion-based class activity, when students fail to contribute out of the fear of

being incorrect. This action (or rather, inaction) makes implementing student-centric learning difficult in a Chinese classroom. Professor Kelley found Chinese students were more willing to speak up when doing so on the behalf of a small group, as opposed to solely representing their own views (Appendix M). This is one creative solution to this problem; however, the Chinese educational system suggests there is a lack of collaborative learning. In general, students accustomed to the cultural phenomenon of saving face are less likely to offer input in front of a group and thus may find experiential teaching methods less effective.

Another cultural norm influencing adoption of student-centric learning is the social hierarchy present in Chinese culture (Appendix I). The lecture-based system is accepted in China because Chinese culture reveres elders, especially in education. Although this is not the only reason for lectures being prevalent in education (and therefore EE), we identified the unique nature of respect for one's elders in Chinese society as a root cause of a weak student-teacher dynamic in the classroom. Professor Neck noted,

The Chinese faculty are very accustomed to standing up and lecturing. I think because respect is so important in Chinese culture, I think the fact that the Chinese students just sit and listen attentively to the lecturer is expected of them, and that the faculty member is the all-knowing professor. I think that's the culture, respecting hierarchy... and it's tough for faculty who are accustomed to lecturing to change their methods, because it's scary. And I don't think people give enough attention to the fear factor (Heidi Neck, Appendix O).

4.3.2 Professors' Industry Background

We identified the lack of industry background amongst Chinese EE professors as another core challenge when adopting U.S. EE pedagogy in China. Professor credentials impact both confidence and capacity to use experiential teaching methods, provide real-world grounding for course content, and effectively evaluate entrepreneurial concept application. As shown in Table 2, American EE professors usually have extensive entrepreneurial background, and often build on this experience in conjunction with teaching classes. Chinese EE professors generally do not have these credentials; some never leave the academic context, transitioning immediately from being a student to functioning as a professor.

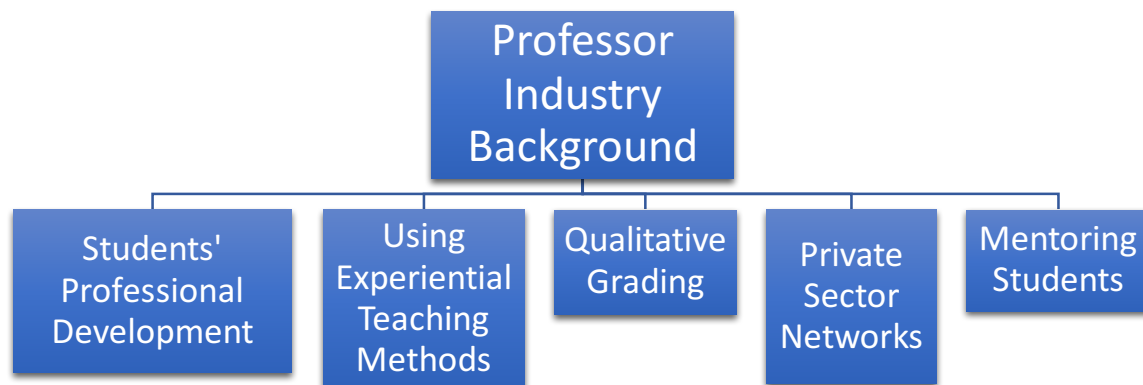


Figure 5: Impacts of Professors' Industry Background on EE

Professors with industry background can provide students with the coaching and professional networks they need to improve their business ventures. The two components of mentorship impacted by professor industry background are private sector mentorship, and student-professor coaching. The U.S. EE system features mentorship heavily, whereas the Chinese system lacks similar networks. The U.S. institutions we analyzed, most notably MIT, have resources embedded in the school where students can contact alumni with similar interests. These networks are extensive and command significant portions of developed entrepreneurship programs. In addition, the experience of professors in industry makes them valuable resources for students to get feedback on their ideas, enabling further understanding and application of course concepts.

In addition to providing mentorship and coaching, professors with industry background are more confident and capable of facilitating student-centric learning. First, experience with complex real-world situations is critical when focusing course content. Professors with business backgrounds are likely to have identified common pitfalls young entrepreneurs make, and thus they can alter their curriculum design to teach students how to circumvent them. Second, professors who have created or consulted entrepreneurial ventures are often better at evaluating the entrepreneurial concept application critically highlighted as a feature of the American EE system. They can thus implement qualitative grading mechanisms that more effectively assess students' proficiency in understanding concepts. Finally, professors in technical fields (non-entrepreneurship) can incorporate entrepreneurial learning far easier into their courses if they have experienced business creation for themselves. Professor industry background is therefore a

critical factor when considering how China, lacking in business-qualified professors, can adopt the pedagogy of the U.S, primarily consisting of faculty from entrepreneurial backgrounds.

4.3.3 *Class size*

The final systemic challenge in adapting American EE methods to China is the difference in class size. The Zhejiang Provincial Government mandated in 2015 that all undergraduate students must complete courses in EE prior to graduation. As a result, schools are still adjusting to the massive influx of students into their EE programs. Our survey revealed the average entrepreneurship class size is 79 students, far higher than the ‘optimal’ 30-60 described by Fang Yang, a leading researcher in EE at Central South University (Appendix T). These large class sizes inhibit the ability of professors to qualitatively grade many projects, maintain student focus, and adjust content to suit student interests.

Due to the recent provincial government requirement for EE, Zhejiang universities are scrambling to acquire resources to fulfill this new mandate. Professors of engineering disciplines, such as Professor Li, are now being shoehorned into teaching entrepreneurship courses despite a lack of industry experience, as highlighted above. Due to a lack of faculty members and a massive influx of students, the average class size amongst survey respondents in EE has ballooned to approximately 80 students. U.S. professors identified small, intimate classes as a key reason they can implement experiential teaching methods, qualitative grading, mentoring of students, and insightful class discussions.

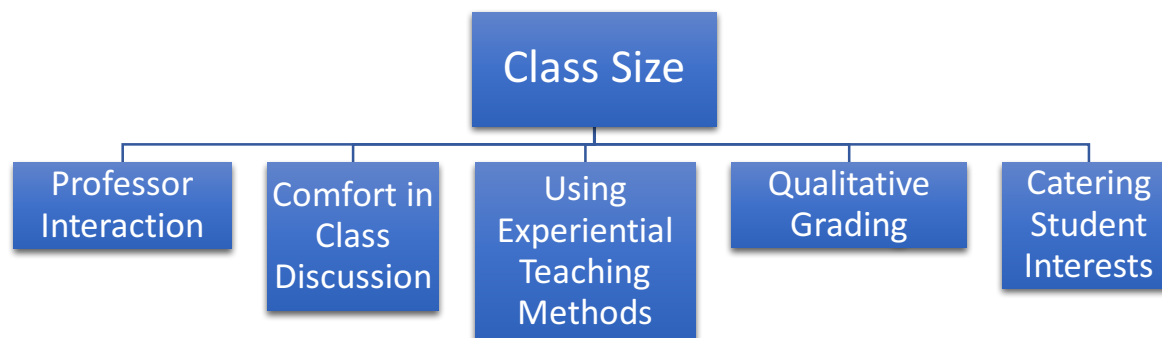


Figure 6: Advantages of Small Class Size on EE

A common theme amongst U.S. EE class activities is small class size. These activities range from ‘speed dating’ to process analysis, and all incorporated entrepreneurial concept application. These activities require small class sizes to be taught effectively and to assess progress in understanding the concepts. Taking 80+ students out into the field to test their

individual assumptions about a topic of their choosing, for instance, is a highly inefficient use of time for students and professors. Doing so with a smaller class of 10-40 students allows for the professor to understand each student's assumptions and provide individual feedback as necessary (Appendix L). Similarly, a small class size allows curriculum to focus more on student interests. As Professor Hoy discussed, different universities and even different groups of students have diverse needs and interests in the wide-reaching field of entrepreneurship. Identifying common interests among a smaller class proves far easier than with 80 students who are mandated to take entrepreneurship classes. The mandate may also impact student participation levels in these experiential activities, however more research is required in this area.

When using methods such as case study analysis or business creation, students are producing significant amounts of complex work. Grading these projects qualitatively requires time and an understanding of the individual's progress in applying entrepreneurial concepts over the duration of the course. Recalling the individual's progress over a semester-long course is difficult enough as is, let alone with 80 students to distinguish from. Similarly, professors are more likely to provide individual mentorship and coaching when they have the capacity to do so. This can be seen in the American EE system where professors often act as both teacher and mentor to student groups and projects.

In summary, when making recommendations for American EE method adoption in China, we must ensure that these recommendations consider large class sizes, lack of professors' industry background, and student predispositions. These challenges are systemic in nature and are thus unable to be remedied directly without significant time and resources. As such, our recommendations will focus on addressing these challenges to provide realistic steps to apply U.S. EE concepts in China's current system.

5 Recommendations

Based on our literature review, interviews and survey results, we have developed four recommendations designed to improve the current state of EE in China. They highlight recommended improvements within the Chinese EE system as well as how our sponsor, Bster, can help facilitate that change, while addressing the three systemic challenges in doing so (described in Section 4.3). We first recommend that Chinese EE programs continue to implement experiential teaching methods, validating the mission of Bster, along with facilitating gradual collaboration amongst students, implementing a mentorship structure, and developing faculty training programs around experiential learning and evaluation. While these recommendations are centered on how China can adopt U.S EE pedagogy, there are many other aspects such as external resources and professor confidence that affect the success of Entrepreneurship Education. Thus, we have also produced recommendations for further research on improving the EE system in China.

1. Implement experiential teaching methods in Chinese entrepreneurship classrooms.

As seen in our literature review and results, both Chinese and U.S. entrepreneurship students who identify as having exposure to experiential teaching methods find them to be most effective. American professors highlight their effectiveness in encouraging students to apply entrepreneurial concepts, learn from failure, and experience entrepreneurship first-hand.

Since out of class time is currently limited by the long schedule of 7-12 classes Chinese students take at a time, we recommend condensing lecture time to once per week. This more closely approximates the overall lecture time at US institutions we found from our interviews. Specifically, we recommend a system, highlighted by Professor Neck, in which class time is used to guide students along in projects that apply those entrepreneurial concepts covered in lectures coupled with a debriefing of the exercise. Professors can use the remaining class time to conduct feedback sessions, and perform class discussion in smaller groups. This structure will enable students to think more in-depth about entrepreneurial concepts in a more interactive setting, and thus will better prepare them for entrepreneurship in the real world.

Bster can address experiential learning using its simulation software (Appendix A). Encouraging classes to use simulations is one way the EE system in China can conduct projects using minimal resources. Bster should therefore continue to improve their software to reflect U.S. best practices (highlighted in Section 4.1). We have created a game simulating the specific teaching methods introduced by our American EE interview subjects. The methods specifically represented are: Heidi Neck's 'Entrepreneurial Crowdsourcing', Donna Kelley's 'Methodography' and 'Process Analysis', and Francis Hoy's 'Speed Dating' (see Appendix X). Each game acts to virtualize experiential teaching methods, in a format familiar to Bster.

2. Facilitate and encourage gradual student collaboration.

A cooperative, collaborative classroom atmosphere promotes experiential learning and allows students to both provide and receive feedback on their ideas. Team projects are especially effective when students feel comfortable sharing their opinions, and when those opinions are valued.

U.S. EE revolves around student collaboration and interaction; themes students are accustomed to seeing in their prior experiences in the U.S. education system. The Chinese educational system traditionally values individual learning over collaboration and team-based learning, creating a competitive environment rather than one that fosters collaboration. As such, professors cannot expect immediate positive results from the implementation of a collaborative class environment. We recommend professors utilize a gradual approach to encourage a cooperative, discussion-based atmosphere. This can be incorporated by building up student discussion from simple yes/no feedback, to speaking on behalf of small groups and then leading to more complex class discussions as the course progresses. These more complex discussions in a team environment foster the collaboration prevalent in entrepreneurship.

Bster can implement features within their software to slowly encourage students towards collaboration and discussion (Appendix A). Examples of this include discussion forums, and a game platform in which student avatars can interact in a simulation and assist one another. This will acclimate students to discussing entrepreneurial concepts with one another in an environment they are more accustomed to with less pressure. This will act as a guide to prepare students for later in-class discussions and warm them up to a collaborative environment.

3. Implement a mentorship structure in Chinese EE.

As outlined in Section 4.1, mentorship is a key component of the American EE system. Mentorship in Chinese EE, while still developing, is largely inhibited by class size, professor's industry background, and student's educational background. Mentors from schools and the private sector incorporate their real-world experience into feedback, engaging students and rigorously testing their business ideas.

A highlight of the U.S. system's facilitation of mentorship is through peer mentors and teaching assistants. Students in these roles alleviate professors' workload and help reinforce concepts covered in lectures. These programs in Chinese universities are currently not utilized to their fullest potential as highlighted in Section 4.2. We recommend Chinese universities implement a system for students who excelled in an EE course previously to become a mentor for that course. These students would be tasked with assisting their peers through experiential learning and provide mentorship professors may not be able to give for very large classes.

Another key mentorship role in the U.S. system is that of the business professional. In the U.S., professors regularly bring in guest speakers, or discuss their own industry experience, to provide real-world grounding for course content as well as inspiration for students. The Chinese EE system is still developing in this regard, as professors lack the networks to connect their students with professionals and do not have the experience themselves. Thus, we recommend Chinese universities incorporate private sector partnerships into their classes to enrich the student learning experience. Specifically, developing relationships in which students can participate in dialogue with these business professionals and assist them in their development of EE concepts.

Bster can assist the Chinese EE system with incorporating mentorship by adding advisor features into their simulations. For example, Bster can create administrative privileges where a mentor can adjust elements of the simulation, and provide feedback to students. These features add a human element to students' experimentation with course concepts within a simulation, a point highlighted as volatile by Professor Elaine Chen (Appendix H). Professors, TAs and industry professionals are all suitable for this coaching role.

4. Develop faculty training resources for interactive teaching methods and qualitative grading.

As described in Recommendation 1, interactive teaching methods are the foundational component of EE in the U.S. Qualitative grading is one hallmark of the system, allowing professors to assess the application of entrepreneurial concepts as opposed to administering tests, which can only assess lecture-based or memorization-based learning.

Professors in the U.S. are comfortable facilitating learning as opposed to lecturing, due to their credentials as accomplished entrepreneurs in their own right. Professors in China often lack this business background and therefore prefer to lecture on theory rather than initiate practice. We recommend Chinese universities create professional development resources for both experiential teaching methods and qualitative grading. Accurately assessing concept application is just as important as encouraging it, and educating professors in parallel will therefore circumvent issues seen with recent efforts to shift from test-based learning.

Bster can develop a brand-new platform for professors to learn methods, activities and assessment criteria used in American entrepreneurship classrooms. Professors can see the benefits of simulation software from learning with it first-hand, as they simultaneously implement it in their classrooms as an experiential teaching method.

Incorporating ways for professors to learn about qualitative grading, project-based learning, and in-class discussion mechanisms would help to alleviate the impact of a faculty base with little industry experience. As such, we recommend more research be commissioned regarding the creation of a professional development structure in Chinese EE, seeking to address the systemic challenge of the lack of professors' industry background.

Additionally, our project's focus was on how Chinese institutions can adopt the best pedagogical practices of EE in the United States. A key finding our team made when completing this project was how prestigious Entrepreneurship programs such as MIT's have significant external resource networks for students to pursue in their own time. We also found that Chinese universities may lack these same resources, as EE is only starting to develop. In lieu of providing a broad snapshot of the EE systems, we instead intensively examined the impacts of teaching methods and classroom activity – briefly touching on how external resources are used inside the

class. Thus, we recommend more research be carried out into how Chinese institutions can grow their external resource base to provide students with ways to apply their entrepreneurial concepts learned in class into the real world.

Overall, we believe our recommendations can have a significant impact on shaping the Chinese EE system, improving the entrepreneurial skills of college graduates for generations to come. Bster plans on utilizing the information compiled in this report as a resource at the many conferences they attend and in their consultation of improving EE throughout China (Appendix A). Improving EE in China will help foster the developing private sector and continue China's economic growth. We hope these recommendations can provide Bster, a key player in the EE sector, clear and realistic pathways to facilitate this improvement.

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Appendix A: Sponsor Description

Founded in 2006, Hangzhou Beiteng (Bster) Technology Co. is China's first manufacturer of computer business simulation training products (Jeff Huang, personal communication, December 1st, 2017). Bster provides comprehensive simulation training solutions for universities and corporate trainings. There are other companies that provide similar services and products as Bster, but Bster is the first one using virtual simulations to teach entrepreneurship and innovation. These other companies include China Distance Education Holdings Ltd. (2017) and ETChina (2011).

Bster has more than 30 offices throughout China, including locations in Chengdu, Xian, and Beijing (Jeff Huang, personal communication, December 7th 2017). By the end of 2016, Bster's clientele exceeded 1,300 institutions teaching entrepreneurship and innovation.

Bster aims to tackle the problem of large class sizes in Chinese entrepreneurship classrooms by providing project-based and experiential teaching methods in their simulation software (Jeff Huang, personal communication, December 1st 2017). They have provided different games and software along with detailed slides for professors and teachers to utilize in their teaching. One of the games contains a virtual farm, in which students need to communicate and negotiate with others to gain different resources such as chickens, eggs and money, in order to make a profit. Another game leads students through the process of analyzing a product, coming up with a business plan, and presenting the idea in front of the "investors", which is played by other students and professors. The students are graded on how much investment they receive. A more complicated game takes a group of 3-6 students, and each student is assigned a specific role such as CEO and CTO. Throughout the game, the team will work together to make the company run smoothly. Additionally, Bster has developed more than 10 professional virtual simulation platforms for the training of professional managers, such as enterprise management and human resources management, among others.

Bster's work in entrepreneurship simulation development in universities has grown its sphere of influence to the entire Chinese EE sector. They aim to facilitate universities' development in Chinese EE through meetings, conferences, and other events (Jeff Huang, personal communication, December 7th 2017). By connecting and communicating with the universities, Bster consults on best practices of curriculum design and teaching methods in EE.

Recently, Bster attended the first annual national West Lake conference of EE, held at Zhejiang Institute of Technology.

Appendix B: US Professor Interview Protocol

Flow of events:

Introduction

Interviewer: *Good morning [subject], we are four current Juniors at WPI who are carrying out a research project on how leading colleges and universities are fostering innovation and teaching entrepreneurship so that we can determine how these methods could be applied to the current education system in place in China. We thank you for taking some time to talk to us, and we have a few questions we would like to ask.*

Interviewer: *We first wanted to ask you if we can use the results of the interview in our report? And can we use your name in the report? If not, we can keep the response anonymous. We also wanted to ask if we would be able to make an audio recording of this interview in order to transcribe it and look back on as we continue to do our research. After transcribing the interview, we will delete the audio recording. You can also consent to having your comments used with credit, in an anonymous fashion, or to be kept completely confidential. Is this okay?*

General Information:

Interviewer: *We wanted to start by getting some general background information:*

1. How long have you been a professor?
2. What courses did you teach?
3. What did you do professionally before becoming a professor?
4. What motivated you to choose business/teaching about business as a profession?

Questions:

- What do you see as the major differences between teaching most business school courses and those about entrepreneurship?
- What's the main outcome you are looking for in teaching entrepreneurship courses?
- Based on your best understanding of business education elsewhere, what are some things that you and others in the US do well in teaching innovation as compared to how it is done elsewhere?

- What do you think is more important when teaching entrepreneurship, the curriculum itself or classroom activities and interaction with the professor?
- While you have been teaching entrepreneurship, have there been certain activities or methods that made you think, “the students really enjoyed this” or, “that was really effective” or maybe a certain activity that you used originally but saw that it was not very effective, so you cut it out of the course? Please explain why this has been so.
- What kind of online learning do you integrate in the classroom, if any?
- How do you think entrepreneurship class size might affect how you teach it? (China’s class size is normally very large.)
- What sorts of resources external to the coursework do you try to implement in the classroom? (such as collaborative space, private sectors partnership, industry guest speakers)
- What do you feel is the most important aspect of teaching entrepreneurship?

Interviewer: Thank you for your time! We would like to ask again that if we can use the recording in our report? Can we use your name in the report? If not, we are prepared to keep responses anonymous.

Appendix C: Chinese Professor Interview Protocol

Flow of events:

Introduction

Interviewer: *Good morning [subject], we are four current Juniors at WPI who are carrying out a research project on how leading colleges and universities are fostering innovation and teaching entrepreneurship so that we can determine how these methods could be applied to the current education system in place in China. We thank you for taking some time to talk to us, and we have a few questions we would like to ask.*

Interviewer: *We first wanted to ask you if we can use the results of the interview in our report? And can we use your name in the report? If not, we can keep the response anonymous. We also wanted to ask if we would be able to make an audio recording of this interview in order to transcribe it and look back on as we continue to do our research. After transcribing the interview, we will delete the audio recording. You can also consent to having your comments used in an anonymous fashion, or to be kept completely confidential. Is this okay?*

General Information:

Interviewer: *We wanted to start by getting some general background information:*

- How long have you been a business school professor?
- What courses did you teach?
- What did you do professionally before becoming a professor?

Questions:

- What's your grading criteria in your courses? Why do you use this grading criteria?
- Based on your understanding on grading criteria elsewhere, what are the other grading criteria you know? Why didn't you implement those in your courses?
- What's the teaching method you use in your courses? Why do you think this is effective?
- Do you know other teaching methods that are utilized around the world? Why didn't you implement those?

- Are you open to change your current teaching method? What's the biggest difficulty on changing it?
- Are there any other mentors like TAs or business partnerships that are accessible for students? Why/why not implement those?
- Do you utilize external resources, online or business simulations in your course?
- What's the main outcome you are looking for in teaching entrepreneurship courses?

Interviewer: Thanks for your time! We would like to ask again that if we can use the recording in our report? Can we use your name in the report? If not, we are prepared to keep responses anonymous.

中国教授采访草案

流程:

自我介绍:

采访者: 您好, 我们是来自伍斯特理工大学的四名大三学生。我们在进行一个关于全球领先的大学如何培育创新、教授创业精神的研究, 来找到将这些技术或技巧应用到当前的中国教育体系中的方法。我们感谢您愿意花时间与我们交谈。我们有以下几个问题想要咨询您。

采访者: 首先我们想问一下, 我们是否可以对这次采访录音, 以便将来抄录并回顾这些内容。在用文字记录下录音的内容之后, 我们会删除录音。您觉得可以吗? 您是否同意将本次采访用于我们的研究中? 如果您不想署名, 我们可以匿名使用您的采访材料。您觉得可以吗?

基本信息:

采访者: 首先我们想询问一下一些简单的背景信息:

1. 您作为商业学教授, 教龄有多久? (如果适用)
2. 您教授什么课程
3. 在成为教授之前, 您从事什么相关工作?

问题:

- 您的课程采用何种计分方式？您为何采用这种计分方式？
- 您是否了解或者应用过其他的计分方式？您现在为何没有使用这种计分方式？
- 您在您的课程中主要使用什么样的教学方法？您为何使用这些方法？
- 您是否了解或者应用过其他的教学方法？您现在为何没有使用这种教学方法？
- 您是否愿意改变您现在的教学方法？您觉得改变它面临的最大挑战是什么？
- 除了教授之外，您的课程中还有没有其他的导师资源？比如学生助教。为什么/为什么没有应用这种导师系统？
- 您在课堂中是否使用除了大学之外的资源？比如网络课程、企业合作、商业模拟软件等？
- 您希望学生从您的课程中学到什么？
- 您是否愿意帮助学生成立他们的公司？

采访者：感谢您接受采访。在采访结束之前我们想再确认一下您是否同意我们在研究中使用您的本次采访的信息？如果您不想署名，我们也可以保持匿名，您觉得可以吗？

Appendix D: Business Professional Interview Protocol

Flow of events:

Introduction

Interviewer: *Good morning Rajan, we are four current Juniors at WPI who are working on an IQP researching how leading colleges and universities are fostering innovation and teaching entrepreneurship so that we can examine how to apply those techniques to the current education system in place in China. We thank you for taking some time to talk to us and have a few questions we would like to ask.*

Interviewer: *We would like to start by asking if you are comfortable being recorded for this interview in order to transcribe it and look back on as we continue to do our research. After transcribing the interview, we will delete the audio recording. Are these actions okay? We would also like to inform you that you have the option to remain anonymous and to have your comments remain confidential.*

General Information:

Interviewer: *We wanted to start this interview by getting some general background information about, firstly:*

1. What is your primary role at Eagle Investment Systems, and what does this role's work entail?
2. How long have you worked as a business executive?
3. What is your educational background, and how do you feel that has impacted the route you took in your professional life?
4. What did you do professionally before starting work as a business executive?
5. What drove you to choose your profession, and why did you take the path you did?

Questions:

- What did you like most about your time at Babson?
 - How did you feel Babson prepared you for your work as a business executive?
- Even though you did not go on to create your own business, how do you feel entrepreneurial thinking has played a role in how you approach your work?
- Based on your best understanding of business elsewhere, what are some things we do well in the US to teach innovation comparatively?
- What do you think is more important when learning entrepreneurship, the curriculum itself or classroom activities/professor interaction?
- While you were getting your MBA at Babson, was there a certain activity or method that you really enjoyed or found particularly effective?
 - Were there any teaching methods that you found were extremely ineffective?
- How do you think entrepreneurship class size might affect how you understood the material?
- How do you feel life experiences versus classroom curriculum helped you be successful?

- Due to your experiences in China, what do you feel the state of entrepreneurship is in China?
- As an Angel Investor, what do you look for in entrepreneurs when deciding on whether or not to invest in a company?

Below is the protocol translated and adjusted for the Chinese business professional interviewed:

商业人士采访草案

流程:

自我介绍:

采访者: 您好, 我们是来自伍斯特理工大学的四名大三学生。我们在进行一个关于全球领先的大学如何培育创新、教授创业精神的研究, 来找到将这些技术或技巧应用到当前的中国教育体系中的方法。我们感谢您愿意花时间与我们交谈。我们有以下几个问题想要咨询您。

采访者: 首先我们想问一下, 我们是否可以对这次采访录音, 以便将来抄录并回顾这些内容。在用文字记录下录音的内容之后, 我们会删除录音。您觉得可以吗? 您是否同意将本次采访用于我们的研究中? 如果您不想署名, 我们可以匿名使用您的采访材料。您觉得可以吗?

基本信息:

采访者: 首先我们想询问一下一些简单的背景信息:

1. 您在公司中的职位是什么?
2. 您能和我们分享一下您的从业经历吗?
3. 是什么趋势您选择您现在的职业?

问题:

- 您的教育背景是什么？您觉得教育背景是如何影响您的职业生涯的？
- 您觉得创业创新思维在您日常的工作中对您有怎样的影响？
- 基于您对世界其他地方的了解，您觉得中国在创新这一方面做的怎样？
- 在您的日常工作中，创业者们的哪些行为引起过您的注意？
- 您在寻找创业者时，看重他们什么样的特质？
- 在寻找创业者时，您会着重了解他们的教育背景吗？为什么/为什么不？
- 您觉得社会经验和课堂学习哪一个对您的帮助更大？
- 您觉得现在中国的创业处在一个什么阶段？中国的创业教育处在一个什么阶段？

采访者：感谢您接受采访。在采访结束之前我们想再确认一下您是否同意我们在研究中使用您的本次采访的信息？如果您不想署名，我们也可以保持匿名，您觉得可以吗？

Appendix E: Professor Demetry Interview Protocol

Flow of events:

Introduction

Interviewer: *Good morning Professor Demetry, we are four current Juniors at WPI who are working on an IQP researching how leading colleges and universities are fostering innovation and teaching entrepreneurship so that we can examine how to apply those techniques to the current education system in place in China. We thank you for taking some time to talk to us and have a few questions we would like to ask.*

Interviewer: *We first want to ask you if you would like to remain anonymous and would like your comments to be kept confidential or not. We also want to ask if you are comfortable being recorded for this interview in order to transcribe it and look back on as we continue to do our research. After transcribing the interview, we will delete the audio recording. Are these actions okay?*

General Information:

Interviewer: *We wanted to start by getting some general background information about, firstly:*

1. How long have you been a professor?
2. What motivated you to become a professor?
3. What is behind your passion for teaching and teaching methods?

Questions:

- When determining pedagogy you are going to utilize in a course, what factors do you feel are most important to consider? (the student, the course material, class size, etc.)
- What sort of factors do you take into account when understanding your students' needs?
- What teaching methods generally do you feel are most effective when teaching students in the US? (lectures, projects, discussions, etc.)
- Was there a specific activity or method that during your time teaching that your students really enjoyed or you found particularly effective?

- Were there any teaching methods that you find are extremely ineffective, what caused this ineffectiveness?
- As a professor, what do you look for in students at the end of a course? Is there a certain qualitative or quantitative outcome you look for in students in order to grade them?
- In a few words, how would you characterize US students overall?
- Do you find that using more discussion and hands-on approaches causes the student to experience discomfort? If so, how do they normally handle this discomfort? How do you handle that discomfort?
- How much of an impact do you feel a student's educational background and exposure has on their responsiveness to experiential learning?

Appendix F: Survey Protocol

Hello! This survey looks to collect information from students whom have taken entrepreneurship courses at the undergraduate level.

By completing this survey, you consent to your answers being anonymously used in an undergraduate research project. Thank you!

Initial Information

Gender

Class year

How many classes have you taken in Entrepreneurship?

Major

School

Do you have an aspiration to start your own company?

Typically, how long are your entrepreneurship classes? (Semester, quarter etc.)

In-class teaching methods

Rank these teaching methods on the following scale:

Highly effective - somewhat effective - neither - somewhat ineffective - highly ineffective - N/A

Group assignments

Projects

Case studies

Lectures

Discussions

Online learning

Seminars / panels

Outside of class communication

How accessible is your professor outside of normal course instruction? (On a scale of 1-5, where 1 is not accessible, and 5 is extremely accessible)

How often do you interact one-on-one with your professor in the course of a semester?

Comfort

How comfortable are you: (1 to 5, 1 being very uncomfortable, 5 being extremely comfortable)

Participating in class discussion

Being in a lecture environment

Asking questions of industry professionals

Talking to professors outside of class

Working with other students

(CHINESE TRANSLATION OF SURVEY)

问卷调查草案

你好！本次调查期望从知名创业学院的学生收集信息，并收集课堂中教学方法的有效性。

完成本次调查代表您同意在这个本科研究项目中匿名使用您的答案。谢谢！

基本信息

性别

年级

上过多少有关创业的课程

专业

学校

是否考虑将来创办自己的公司

通常来说，参加过的创业课程持续多长时间（半年，一季度，等）

教学方法

根据下面给出的范围对下列教学方法进行排序

非常有效 – 基本有效 – 中规中矩 – 基本无效 – 非常无效 – 不适用

- 小组作业
- 项目
- 实例研究
- 讲课
- 讨论
- 在线学习
- 研讨会/座谈会

课外交流

您的教授在正常课程之外能提供多少帮助？（1到5的程度）

在一个学期中，您和您的教授有多少一对一的互动交流？

舒适度

您是否乐于参加以下活动

范围1到5,1代表非常不乐于参加，5代表非常乐于参加

- 参与课堂讨论
- 听教授或者演讲人讲课
- 询问行业专业人士相关问题

- 在课外与教授交谈
- 和其他学生合作

Appendix G: Interview Information

Name	Institution	Date Interviewed	Members Present
Elaine Chen	Massachusetts Institute of Technology	November 16th, 2017	Eric Peterson, Jake Scheide
Chrysanthe Demetry	Worcester Polytechnic Institute	November 30th, 2017	Daniel Venkitachalam
Arthur Gerstenfeld	Worcester Polytechnic Institute	September 22nd, 2017	All
Xiaoling He	Zhejiang University of Science and Technology	November 22nd, 2017	All
Francis Hoy	Worcester Polytechnic Institute	November 6th, 2017	Kailun Liu, Eric Peterson, Jake Scheide
Donna Kelley	Babson College	November 8th, 2017	Eric Peterson
Qizhi Li	Zhejiang University of Science and Technology	November 22nd, 2017	All
Heidi Neck	Babson College	November 27th, 2017	Eric Peterson, Jake Scheide
Mark Rice	Worcester Polytechnic Institute	October 30th, 2017	N/A (email)
Zhenwei Shang	Dream G-Space Incubator	November 14th, 2017	All
Yunhong Shen	Hangzhou Dianzi University	November 21st, 2017	Kailun Liu
Rajan Venkitachalam	Eagle Investment Systems	October 28th, 2017	Daniel Venkitachalam
Fang Yang	China Central South University	October 25th, 2017	Kailun Liu, Jake Scheide
Tina Zhang	Hangzhou Dianzi University	October 25th, 2017	Eric Peterson, Daniel Venkitachalam

Appendix H: Elaine Chen Interview

Transcript

Disclaimer: This is not an exact transcript of the conducted interview. These responses were written up, after the fact, by the authors of this paper from an audio recording. The responses are, to the best of the authors' knowledge, accurate to the intent of the interview subject.

Note: Professor Chen Referenced the MIT Annual Report throughout the interview via screen sharing (MIT, 2017a).

Interview Date: November 16th, 2017

Interviewer: Eric Peterson

Interviewer: Just to start with some basic questions, how long have you been teaching?
Since 2011 or 2012, but I don't really remember. I started coaching students in 2011.

Interviewer: What motivated you to become a teacher and move away from being an entrepreneur?

Well, that's a really good question. And I can't say that it was planned. My background is mechanical engineering, I started as an engineer/product manager in 5 startups, not counting the ones that I consulted for. I started my own consulting business about 12 years ago. When I was in between my full time gigs, the problem is that I always get distracted constantly joining my clients. I had lunch with Bill Aulet, who is the managing director of the Martin Trust Center. I told him that I was starting up my consulting business again and I asked him if he had any advice for me, brand image and such. Then he said that I should start coaching students here and that it would be good for me. So I started coaching students and it was very interesting. It was great because there was constantly new stuff and I always had to keep on top of trends, it was very fun. Then, somehow, Bill got me to teach my first class.

Interviewer: When you're teaching these courses, specifically in the entrepreneurship majors, what is the main outcome you look for when teaching students?

Well, to answer that question you have to first understand what we do at MIT. We create entrepreneurs, not startups. That's really really important to get right away. That pretty much governs everything we do and how we evaluate people and ourselves. We want to give students the skills to be the best entrepreneur they can be regardless of what they end up doing later in life. Whether they are making a startup or joining a company. Or even continuing being a student. We are looking for the growth of the student. If the startup is a big success, we are proud of the student. If the startup fails and doesn't go anywhere and they end up giving up, we are still proud of the student. We would rather them do that here than out in the real world. It's a safe environment, academic environment. We don't take any financial interest from our students, it's purely academic and exercise.

Yes, and the interesting thing is that some places do take financial interest in the student's startups. I know some schools that some of my professor friends teach at where as part of the class the student will create a startup, but the advisors and sometimes professionals will take

stake in the startup. This means that now the school is financially involved in the success of that startup and students have to take that into account. That is why we are different at MIT, because we don't take financial interest in the startup and have less of a constraint on students because of that. We do not take an equity stake, we are investing in the people. So if that thing is wrong for them, and they come to that conclusion, we support their decision. We have had teams where they realized that they were not a compatible founding team, so we helped them work through that. We have had teams realize that they can't legally make this entity in the U.S. and they have to go to another country and we support that also.

Interviewer: Is there a certain teaching method that you find to be robust among all entrepreneurship courses you teach?

There are over 60 courses that MIT offers that relate in some way to entrepreneurship or innovation. Depending on who's teaching it or the teaching styles of the professor will change the pedagogy. So, I will comment on the teaching methods that I have partaken in. There's a foundational course, the New Enterprises course, it's pretty much the class we teach the entrepreneurship framework. It is highly highly action oriented, highly highly experiential. The way it works is, the students will come in as individuals, and then we spend several classes twice a week for several weeks doing ideation and team formation. They form teams, come up with an idea, and then they take that idea and do the whole 24 steps to build a startup from market segmentation all the way to having solution, getting a business model, customer acquisition, market research, how the customers are going to acquire their product. We push them hard to go out into the real world and do primary market research before they have built anything at the discovery phase and for product validation. We push them to get out there and test purchase intent, frequently by pre-selling product or by selling a concierge or MVP (minimum viable product). It's highly highly team based, project based, and they carry that project for the whole semester.

The course that I taught 7 times in a row, it's actually a follow-on course where you enter as a team, so we don't accept solo founding teams. We have to have 2 people from a team of 10. The reason is because we have found that the teams with solo founders just don't do as well. The teams enter the class as teams, and we have the following format: We sit down with them to coach them, 30 minutes for team, and that's how we start that class. Then we get back together for a facilitated discussion on a topic of interest for that week. We then meet the student's teams where they are in that class and we develop a flight of topics for the 11 or 13 times we meet, and that's a once a week class. So we develop that after we build a cohort. That's kind of a bridge to the accelerated program where we take 21 teams, one of them ended up stopping because the founders decided not to go forward with the startup. That program is the capstone program for startup teams at MIT. We totally totally meet them where they are, we don't do any teaching at all. Overall, the way we manage that summer is that we manage the cohorts, and we do goal setting every week. And we have team level accountability. We also have office hours and allow students to sign up for 30 minutes to meet with any one of the advisors. That's very high-touch, and it's not scalable, but it works. We can sit in office hours and go over any blocks that the team is having or any problems impeding progress.

Interviewer: How do you integrate outside resources into the classroom, or are those just for students that want to go above and beyond?

First off, it's important to start with the students because in design thinking and disciplined entrepreneurship, you start with the customer.

We would like to say that we are the center of the universe, but we aren't. Our students are.

We've got a co-working space where any startup working on their startup can come here and work. It's really a material resource because people can come here and use this as a home base. There are phone booths where you can call international places for free. Also, it's a very dynamic environment where they get a lot of peer support because everyone is doing similar things. We also have a large network we rely on. Right now, we have 7 in-residence entrepreneurs, and even among the 7 we have a large network of people. Between us and all the people we know, we have about 100-200 people in the system that are ready and eager to help the students. So we draw on that professional advisory network when students have an industry specific question. So for example, if a student has a question about clinical trial pathways, we have someone who has connections to that industry. We also draw on that network to put together mock board meetings, we put together 120 people to serve on 20 boards. The network is enormously important, that we are able to rely on the system to come in and help students build their enterprises.

And we have a lot of pop-up programs as well. For example, I personally lead a 2 week startup program in Hong Kong where we take some MIT students, bring them to Hong Kong and I recruit some Hong Kong students and we mix them up and the learning or entrepreneurship start in another country. So that's an example of a pop-up program. And then we've got the accelerator programs. We have speakers, series and events and things like that, a lot of different things as extra-curricular.

Interviewer: Do you have any suggestions on how to bring project based learning to large, lecture sized entrepreneurship classes?

I hear you, and I am from Hong Kong originally, so I understand the culture and I am the director of this thing where I take MIT and Hong Kong students in China and I mix them together. There was a lot of learning the first time I ran this. I go to Hong Kong, and we start the program and instantly I ran into the following problem. In America, we do small group examples, and you ask a question, and everyone is fighting to answer it. Less so in engineering schools but in the business school definitely, everyone is talking over everyone. In the mixed classroom, only the MIT students were answering any questions and the Chinese students were keeping their heads down trying not to make eye contact with you, so you just didn't call on them. We had an open-mic session where they had to make an elevator pitch, and I made the mistake of making it voluntary, and the first 7 pitches were all MIT students. And I'm there thinking "oh my gosh this isn't going too well".

I think that the first thing that is very very different is that you can't take a U.S. style classroom approach straight up without warning of the students, because the culture prohibits them from doing the things we take for granted here. So what I found is that you need to give them a couple days at least to warm up, and the way you have to ease them into it is to start by asking yes/no questions and get them to raise their hand. To just kind of ease them into it and get them to participate. There's a lot more "talk back" than "talk to", so they are very not used to facilitating their own learning. So at the end of my program we got really really good reviews, 92/94 reviews average. On the side we got comments like "This is not how we teach in the Chinese culture, but it was very refreshing". It was very much a project based approach. My students form teams and in 2 weeks have to build a product and business plan and they compete

in the end. It's very team based, very experiential, and I expect them to get up and talk about their project, every single one of them. And it's not just done that way in general, so I think that first of all, you are going from a lecture style, broadcast style education paradigm to participatory, workshop-like format. That really cannot be done in a large classroom format. So how do you do that?

So if I am teaching a large, 700 person lecture, I try to get them to participate by getting them to raise their hand or vote. Sometimes I do simulations where I ask them to pair up with the person next to them and do an activity, then I ask them safe questions at the end. So format-wise you have to understand the culture and that you are teaching in a large class. But that experiential project based learning really only happens in small class sizes. One way to handle that if you have a really large enrollment is TA sessions. So when you're meeting and planning the framework, you have to meet together and it's like hundreds of people in the classroom. But if you have TA breakout sessions with either TA's or additional instructions is good. Now that takes budget.

Interviewer: *Explains what Bster does*

The thing is that the platform can facilitate the content, but you still need to design the content and the pedagogy. I think that this happens all the time, you see a startup come along that says "We can facilitate x with our new software", but who's making the content? You still have to define how they interact, and then the platform can support that. At the end of the day, the team still needs a coach of some sort, so they can use a collaborative platform to share things but you can't just have an AI engine come in and facilitate the team especially when everything the student is doing is so new and most of the time on the fly. Doing something, responding, then asking probing questions and answering quickly. That's a human skill.

Appendix I: Chrysanthe Demetry Interview Transcript

Disclaimer: This is not an exact transcript of the conducted interview. These responses were written up, after the fact, by the authors of this paper from an audio recording. The responses are, to the best of the authors' knowledge, accurate to the intent of the interview subject.

Interview Date: November 30th, 2017

Interviewer: Daniel Venkitachalam

Interviewer: Great! So we first want to get some background information and understand where your passion for teaching comes from. How long have you been teaching, and what motivated you to become a professor?

I've been a professor for about 25 years, from about 1993. The reason I wanted to be a professor was because my father was a professor at WPI and I grew up around this particular university. I came to campus a lot and higher education seemed very interesting to me. New discoveries were being made, people were learning, while also having a lot of fun socially.

Interviewer: So you feel that contributes to your passion for teaching?

Yes, and also I love to be around imaginative people. It is a very transformative time, and being able to impact people's lives and being around that atmosphere and trying to influence that as part of my career is really motivating to me.

Interviewer: When you're determining specific pedagogy for your courses, what do you feel are some of the most important factors to consider? For example stuff like class size and student background.

For my work and work with other faculty, we try to use particular design models...course design models to aide us, it's called backwards design or engineering design where you start with the end in mind. But also in the context of situational factors like who your students are, what the class size, the nature of the content, what the students have learned before and will come after. There are so many situational factors to consider, some more important than others. It all depends on the situation and the professor. But we keep those in minds, and the backwards design in mind by thinking about the specific goals and objectives and what you want students to remember a few years later. And then we try to express that in measureable terms, typically not just content but also student behaviors and attitudes and abilities you want students to have. Then you also have assessments and teaching activities that will help students do well on those assessments.

Interviewer: How do you feel class size affects how you design pedagogy?

Yes, it definitely affects it, but I don't feel that a large class size should be an excuse to not try different pedagogical methods. In my small courses, between 10-20 students, it would not be too difficult to foster discussion. In a class of 100, it's hard to facilitate the discussion of 100 students. But how you do that is break them up into small groups and discuss those things in

their small groups, then have them report out at the end. There are strategies you can sue regardless of the class size. I think the most important thing is that students are given the opportunity to apply what they have learnt in class and practice in class and get immediate feedback on how well they are understanding it. And that can be done in either a small or large class.

Interviewer: How do you deal with the potential discomfort that students may have with these new, experiential learning approaches?

Yea, I'm sure I could probably do better there. It's important to let students know that it's normal to feel some discomfort at first and to be stretch outside of their comfort zone. The hardest part is giving time to the students to get to know each other and accept each other's strengths and weaknesses and perspectives in the course. Giving time to students to give each other feedback along the way and giving everyone an opportunity to participate so they really get the benefit of being together is good. I also try to share with students the research that shows that this type of peer assisted or collaborative learning has been shown time and time again to increase learning and material gain, not just among introverts but among everybody if done well. Those are a variety of ways to help students give this a try, even if it seems different or uncomfortable.

Interviewer: Was there any specific activity that you found particularly effective or ineffective?

The activities that I've found consistently effective, in material science courses, to ask students to predict the results of something. Predict and experiment when a variable changes. They think about that individually then a group. It is really good, but it is hard to develop consistently good questions that really elicit different answers and elicit misconceptions that can then be clarified. It's really really fun, and students really get into it when 60% of the class thinks one thing and 40% of the class thinks the other and they can really debate it. They get really excited if they get the answer right and are really curios if they didn't get the answer right and want to know why. So it's really an art to develop compelling questions that will engage student's interests. If you can think of something that students are naturally curious about or that will generate some disagreement, which can often be really effective.

Interviewer: How do you feel foreign students compare to US students in their responsiveness to these experiential teaching methods?

My understanding is that students from Asia and from other parts of the world have been brought up in systems that are pretty hierarchical where teachers are held in very high esteem. I'm not saying that they aren't here, but there's more of an egalitarian system here. I always tell students that I have as much to learn from you as you have to learn from me. That probably sounds very very strange to students from China and other parts of the world where professors are really, sort of on a pedestal where you may never really question the professor or speak up because the professor is the person with all the knowledge and is the one who should do all the speaking. It might be impolite or rude to question a professor or ask for clarification on something. It's why I think it may be sometimes difficult for US students to adjust to these methods, it must be even more difficult for international students perhaps. It's a little difficult on a campus like WPI, but I try to put international students in mixed groups to try and get them assistance from students who might be more comfortable in situations and teaching methods like this. I think they can better

understand each other's talents. It's a hard question, I try to come up with very heterogeneous groups that all bring a unique perspective.

Interviewer: How do you feel student's educational backgrounds impacts their responsiveness to these teaching methods?

I'm not sure I can make any generalizations about that. I have had students from many different background say that they love what I am doing and they thought that what I did in class was very effective. The one thing I worry about is the students who think that my methods are ineffective don't speak up and give me feedback. I don't know if they disproportionately come from different backgrounds. It may be that international students really value this type of teaching where their previous experiences might have been in international schools and been introduced to these methods before and are more comfortable. So the switch to WPI might seem a little less sudden, but I don't really know that all just speculation.

Interviewer: What do you look for students at the end of a course? Is there a qualitative or quantitative

I've tried a lot of things over the years regarding how to determine grades in a fair way that aligns well with what I hope students will learn. My latest experiment was to try to align very directly the stated learning outcomes with the group. This is called an outcomes based or specifications based grading approach where students have multiple opportunities to show achievement of learning outcomes. There may be some that may be related to course content, maybe some for teamwork, some related to entrepreneurial mindset. There are portions of the grade that are directly lined with those that I hope are very clear for students to see, that they can allocate their effort in ways that result in learning in a good course grade.

Interviewer: In a few words, who would you characterize US students?

Well, I do faculty orientation every year, and I always select students for the undergraduate panel to speak with new faculty about what they value about good teaching. What I hear over and over again is that students really value theory and practice, with emphasis on the "and practice". They really love applying what they learn in class to real problems. Obviously most students come to WPI with the project based curriculum in mind and that they are excited about. So that is another thing that students are generally really passionate about. Not for just knowledge sake, but for making a difference. They really like applying their knowledge to make it real.

Appendix J: Arthur Gerstenfeld Interview Transcript

Disclaimer: This is not an exact transcript of the conducted interview. These responses were written up, after the fact, by the authors of this paper from an audio recording. The responses are, to the best of the authors' knowledge, accurate to the intent of the interview subject.

Interview Date: September 22nd, 2017

Interviewer: Eric Peterson

Interviewer: So we wanted to start by asking you some questions to get a background of your experiences. How long have you been a business professor for?

How long was I at WPI? Is that the question?

Interviewer: Yes. In general how long how long did you teach entrepreneurship?

I was at WPI for thirty seven years. I started the entrepreneurship teaching... Gosh I forget how many years ago but I was doing it when most people didn't know what the term meant.

Interviewer: So within the kind of entrepreneurship programs that you taught, were there specific courses that you taught over your time that really stood out to you or that you felt more invested in?

The course that I think of the most was just called "Entrepreneurship". It was an interdisciplinary course and my appointment was with the business school and with the Department of Industrial Engineering . So I've always had that joint appointment. But we wanted it to be interdisciplinary so we had students from all of the same disciplines that you're in: computer science, mechanical engineering and some management majors.

Interviewer: Teaching in an interdisciplinary sense, did you see any differences between the majors that take the class and their participation and motivation, or did you feel like it was something that no matter what it was across disciplines everyone seemed interested in it and invested in it all?

Well of course it was a voluntary course not a required course, an elective course and so people were motivated. Most of them, I don't think there was any difference between a CS major or a mechanical engineer. So they are pretty much across the board. And generally the students were very highly motivated. Also the whole concept of starting your own business seems to excite them.

Interviewer: So before coming a Professor what did you do professionally? Did you get your degrees and start teaching right away or did you have any time in industry?

Yes I did. I first graduated as an industrial engineer and then worked in a small company for a while. And then for some years then worked for the space agency NASA for a while. And most of my entrepreneurship work was internal, not forming a company. But then later on when I joined WPI I decided I had an idea for a new company. And that was probably my biggest entrepreneurial venture. I took a leave of absence from WPI and formed my own company for a

few years and made a few dollars and had great fun. I already had tenure and was full professor so I faced with the choice whether to stay with the business or to come back to WPI. But I love teaching and I like working with students. So I ended up selling my interest to some of my partners and I came back to WPI.

Interviewer: How long was that leave of absence where you were following your entrepreneurial passion?

I think it started off just for a one year leave of absence to sort of pop up proof of concept to see if my idea made sense and then I got funding from the FAA. And that covered and then I asked for a second year and got that and then I asked them when it looked like the concept was still getting bigger I went for a third year, it was when I went for a fourth year that the president of WPI said.

I had to make up my mind at that point. They couldn't keep the position open any longer which I understood. It made sense. And that was a point of time when I sold my interest and decided to come back to WPI instead of being an entrepreneur and then I started teaching entrepreneurship.

Interviewer: So getting into some more Entrepreneurship specific questions, we want to get a sense from you of what you saw as maybe some of the major differences between teaching say a business course and an entrepreneurship course like where did you draw the line from a basic business course to the teachings of an entrepreneurial Course?

The Entrepreneurial course yes. Was really a series of case studies. So and you know I used things like Harvard Business School case study. Other case studies that are available. And I also had the students doing a entrepreneurial project where they broke into teams and each had to, they don't have to invent a new project because they only had seven week of course. But they have to come up with a new idea and walk through all the steps of first conceiving the idea and then funding and marketing and then finally building a company as if it was real and then they came in and presented. I remember correctly and during the last week we had a presentation where they had to describe their new venture and some of them were quite well quite good.

Interviewer: In particular in that entrepreneurship project you were talking about was that more exercise based in that they were creating documents for assignments submission or they actually trying to find customers and executing a real business.

Yeah. More the second. They didn't have to turn in weekly assignments. The first week or so they spent brainstorming and coming up. Coming up with different ideas. And then once they solidified it that by the third week they had to talk about how they were going to fund it. Were they going to try to raise money from banks or from private investors and private equity investment and so forth. Then once they get the funding then they do a few weeks that would try they would go out and talk to people. As if it was a real project. And then once they had the funding part they went into the marketing and all the rest of the steps and the production plan and then finally a going business.

Interviewer: I don't know if you have any examples of maybe students that had taken your entrepreneurship Course. Or students you've heard from WPI that have taken these courses and then gone on to start their own their own businesses after graduation.

I think that's an interesting question and a hard one to answer. There is a professor at WPI by the name of Mark Rice. OK. And you might talk to Mark Rice because he's pretty much in touch with outside people and I think and he told me that several of them credit my course with their success which I specifically talked about but that sounds like such an ego trip. I'll say one of them came in to see me saying it wasn't for your course I wouldn't have done: X. Yeah but I think if we want to be more specific you might want to talk to Mark. He's in closer touch and it's been some time since I've had that happen.

Interviewer: So we wanted to get a sense of maybe based on your best understanding of business globally. Do you have any things or methods that stand out to you on how we teach innovation and entrepreneurship in the United States compared to other developing countries or even established countries?

I think in the states innovation and entrepreneurship teaching is growing a lot. When I started, it was just in its infancy. But now almost every school I visit this and I have kids in school and we talk a lot. I keep in touch with other students. I think it's taught in many places so I think there's a real effort because the United States has been seen as entrepreneurial for so many years. But I think for example in Namibia where I worked closely with the Polytechnic there they weren't doing any teaching in entrepreneurship but rather they figured, well you can't teach you, you just have to do it. But I think they might have changed their mind. I'm not sure if they are teaching it. I wouldn't be surprised if they aren't teaching it now but the last time I talked to them and that was a project that I was closest to in Africa. I don't think they were teaching any courses. And I don't know about China at this point.

Interviewer: So I wanted to get a sense you had any insights on why entrepreneurship education might be growing.

Oh I see you've got a thoughtful question that's interesting. I see. I think, I think I'll talk about the United States which is the closest. I think in the United States that there is this strong feeling that it's absolutely essential, it's critical that we encourage entrepreneurship even more than we have in the past because of large companies like Microsoft and so on. Whom employ hundreds of thousands and all started with some entrepreneurs. If we're going to grow those sort of business you know whether it's Facebook or Uber or what have you. It's all an entrepreneur it's always surprising how big they can grow, become very wealthy and some may stay even if the medium sized businesses, the business that I started was one person to now maybe 40, 35-40 people. And still running and making a nice living for the people working there and so on. So they don't all become Microsoft's or Ubers. But a lot of them are such small or medium sized companies which are just fine and that's backbone of our country.

Interviewer: So you kind of described the curriculum course that you taught in terms of what exactly you did in class but was there any teaching methods, so pedagogy, that you felt was especially beneficial to teaching that subject?

One thing that I'd say doesn't accomplish a lot is to cite all sort of all sorts of principles, a lot of rules about what makes an entrepreneur successful and blah blah blah. That's quite boring to students and not very helpful because every case is different. What I think is the most important rule that I followed is to try to get students talking and involved, acting much more as a facilitator rather than a lecturer. So that if I was advising this company in regard to these courses it would be to have someone who could work with the students and have them doing

projects like the one I've described. It'd be great if they could do it over six months and actually come up with a plan. Now they may not they may not ever do it when they graduate but on the other hand they've had that whole experience that how nice they can do it and not lose any money! Now I would I would encourage them to use a lot of case studies. And after a while you start finding out by discussing various cases or what various people have tried you start to see what works and what doesn't. And there's no rules. You get it more by the cases.

Interviewer: What do you think is more important when teaching entrepreneurship. Is it more the curriculum itself or is the classroom activities and the professor interaction the thing that's more important.

You need to try to get the students deeply involved to try to just teach them a set of rules like an entrepreneur works hard and an entrepreneur does this. That's not going to accomplish very much. But if you get the students talking and thinking and particularly doing it sort of really start to form a company just do it, come up. You'd be surprised if you get three students together and start to brainstorm and saying OK let's just think of a product or service that doesn't have to be a product let's come up with a product or service. I've never had a group that didn't come up with something. And I did it term after term. Also I think the interdisciplinary is good and it's good because you get ideas from different. Different ways of thinking it's not just the mechanical or electrical or chemical or what have you.

Interviewer So while you were teaching, was there one particular activity that you did with the students that made you think, "Wow the students really like this is really effective". Or maybe that at the beginning of teaching the course there were certain methods that you used that were actually not very effective that you looked back on and the students didn't enjoy?

I think probably the most valuable part of the course is when the students had to do their own preparation on presentation. And I'd usually call outside people in like the Dean and um a few other professors. So there was a pretty high pressure group, there was a class, plus a dean, plus maybe an outside business person listening to them. And so a lot of work goes into the presentation. And they would be up late the night before working on it night and they had to try to anticipate all the questions that might be asked. And I think that was probably the best learning experience for students.

Interviewer: That's fantastic. And then was there a certain learning experience maybe at the beginning of your time teaching the course that you that you used it and when you evolved the course you decided to cut that out. Maybe it wasn't as effective?

I think probably if there was anything I cut out it was some parts of the textbook and I think the textbook stuff is not so helpful. I don't know may be some new textbooks out now that you've discovered. Yeah. That would be helpful but I never found a very good text. And after a while you know I said close the text, lets do: X. We covered a lot of ground. So maybe what you want to do, and you also got me to do a lot of thinking. I'll think about it more and you can think about it more. So if we want to talk again next week or something like that you can shoot me an e-mail or try to set up another date.

Appendix K: Xiaoling He Interview Transcript

Disclaimer: This is not an exact transcript of the conducted interview. This interview was conducted in Chinese and the responses written up are translations, after the fact, by the authors of this paper from audio recording. The responses are, to the best of the authors' knowledge, accurate to the intent of the interview subject. Also note this interview was not translated in its entirety and only represents points brought up in the report.

Interview Date: November 22nd, 2017

Interviewer: Kailun Liu

Interviewer: Can you walk us through a typical curriculum design of your courses?

Normally in the first 1/3 of the course, I teach students theories and concepts of finance and management. And the rest 2/3, I will teach students how to deal with failure.

Interviewer: How do you think professor credential might influence how they teach the course?

Professors without business backgrounds can only follow the theories and concepts they learnt from books, which is definitely not good for teaching entrepreneurship. Starting up a company means you need to face an extremely complicated situation which cannot be solved without mere theories.

Interviewer: What kind of teaching method do you implement in your courses?

I register an account in the US stock market and show the process and result of buying and selling stocks. I also encouraged students to participate class discussion, but most of the students are reluctant to interact with others. I have an interesting method that I show students a poker game and let student calculate the risk of the gambit.

Appendix L: Francis Hoy Interview Transcript

Disclaimer: This is not an exact transcript of the conducted interview. These responses were written up, after the fact, by the authors of this paper from an audio recording. The responses are, to the best of the authors' knowledge, accurate to the intent of the interview subject.

Interview Date: November 6th, 2017

Interviewer: Eric Peterson

Interviewer: We first wanted to get an idea of how long you have been a business professor here in the school of business.

I have been a business professor at WPI for 8 years.

Interviewer: What did you do before that?

I was at the University of Texas El Paso before coming to WPI.

Interviewer: What did you do professionally before becoming a professor?

Before becoming a professor, I did tour duty in the navy, and then became an accounting office supervisor at AT&T. Then, I ran an advertising company outside of El Paso, Texas on the U.S. – Mexican border. As an academic I have been involved in many startups from being a co-founder to angel investor and serving on board of directors.

Interviewer: What were some of the major differences you see in teaching a normal business course and an entrepreneurship course?

An entrepreneurship course by nature is interdisciplinary. If I were teaching marketing research or corporate finance or operations management they'd be very focused courses with material to give you a skillset in those different areas. With entrepreneurship, if you're talking about starting a business on your own or entrepreneurship within an existing corporation, you're talking about marketing, finance, operations, accounting, human resources, supply chain, information technology. You're cutting across all areas. You're talking about psychology, sociology, and economics. One of the key ideas is trying to maintain a focus. What do you want students to leave with? What do you want them to not learn? Because one of the biggest mistakes you can make is leaving your students with the feeling that they know everything about running a business and then them going out and starting a business and making colossal mistakes.

Interviewer: What's the main outcome you want with your students? What are you evaluating them on?

Well, there isn't just one course with one outcome anymore like in the past. It depends on the focus of the course. A course may have a focus on lending and how to convince people to invest in your company. Another entrepreneurship course may focus on the business plan, and how to execute different steps in order to create a business plan. Maybe how you make pitches to Angel Investors, in this you would figure out how much money you need, what you need the money for and the presentation to the investor. You just have to figure out what kind of course it

is and what the outcome may be because there are many different types of entrepreneurship courses.

Interviewer: Based on your best understanding of business education elsewhere, what are some things that the U.S. does very well?

Well, yes and no. I don't want to stereotype any one thing. If you look at business education in the U.S. there is a lot of variance between schools. At WPI we have an emphasis on technology. I was a consultant to a state university in the south a couple years ago. The students there aren't thinking about creating the next billion dollar company. They are thinking about how to create a bar or restaurant. The kind of things that you don't need a degree to do. There's no one approach here in the U.S. to make a legitimate comparison between what's going on. But I do think we take teaching innovation seriously here in the U.S. compared to other countries. I think China is going to be interesting because they definitely want to have more innovators in their country. They have made the decision that simply stealing someone else's idea, essentially reverse engineering someone's patent and making it themselves is not going to be a good long term strategy. They are going to have to be a knowledge based economy like North America and Europe. I'm getting the sense that innovation is becoming more and more important in China.

Interviewer: What teaching methods when teaching entrepreneurship do you feel are most important?

Well now we do get some cultural distinctions. The lecture method still predominant in U.S. higher education despite all the talk on flipped classrooms and experiential learning. In China however the lecture method is the norm. Students are expected to come to class, listen and take notes, then take an exam. In the U.S. we have documented the lecture mode is one of the least effective methods of teaching which is why we have pushed for different methods. You do still see a lot of lecture but this notion of the experiential education and electronic media shows how we are working hard to make the classroom environment more involved over having students just sitting down and listening. I particularly think that entrepreneurship needs some sort of activity. Our motto at WPI is theory and practice, and although I would love for all my students to create a business before the end of a term, I'm not quite there yet, but what are the proxies that we can use in class short of requiring that they start a business. Incidentally there are some entrepreneurship courses across the country that require that students start a business or at least pitch an idea to investors. And if the investors turn you down you don't pass the course. Their efforts to try and find some way to have students feel as if they are practicing it without having to pull money and investment and employing people. There are just countless ways of approaching right now on how to get students actively involved in what entrepreneurship is about before they finish the course.

Interviewer: Were there any methods you found while teaching that were particularly effective or ineffective?

All the time! Entrepreneurship is disruptive by nature, and I have never taught the same entrepreneurship course the same twice. There is always something new happening in the world, some cultural issue, social change or some technological advancement that changes the way entrepreneurship is approached. Whatever I did in the fall might not be relevant in the spring. And the things I experiment with in the spring may be really good or be really bad.

Interviewer: Was there anything specifically?

Well, in the very first class, if the class size is small, I will ask them to start introducing themselves. They will ask questions of each other like what their major is, what their interests are and what they have done. This is in order to get them to ask them question of what kind of business could we create together. Just interacting, they have to come up with a business idea. If there are 10-40 students I will allow around 40 minutes for this exercise. Then, they return to their seats and I make them stand up. Then I make them pick a student out of the class that they met and introduce them to the rest of the class. Then I ask them to describe the business that they would create together. When that's all done, I point out to them that they have just developed a couple of entrepreneurship skills like networking. Entrepreneurs network all the time, whether it be at a big event or a coffee shop. Even if they don't know something, they may know someone that knows what they don't. Networking is a critical skill, and they also essentially did an elevator pitch by saying "this is the business we are doing together." Just to show them how to get a message across in a concise way.

Interviewer: Do you integrate any online learning or online resources into your classes?

Yeah, and again it's always different. 2 weeks from tomorrow I will be bringing in an entrepreneur from New York. He created business around simulation software games for entrepreneurship. I invited him to our keynote here at WPI, and he will be able to get feedback on his startup from the other professors. I will be testing his product in my classes' C term. I also always try to give blogs and online links for students to view during whatever course I teach. Sometimes we may Skype in a speaker from some other part of the world. There are a variety of things we try.

Appendix M: Donna Kelley Interview Transcript

Disclaimer: This is not an exact transcript of the conducted interview. These responses were written up, after the fact, by the authors of this paper from an audio recording. The responses are, to the best of the authors' knowledge, accurate to the intent of the interview subject.

Interview Date: November 8th, 2017

Interviewer: Eric Peterson

Interviewer: *Explained Project and some of our findings thus far*

Professors often use case response, it's almost like storytelling and telling a story about the case. Then the professor will ask the students a question about the case, but I've been in many small group discussions. Then the students are asked to present and it becomes about trying to get the answer right and trying to impress the teacher. That's a lot of the Chinese culture, it's a test taking culture. You are getting the right answers, hierarchical, you're trying to impress your professor to get a good grade. We always have to consider the culture, and a lot of the students coming into these classes and that are coming from classes in China and at home, understand the culture is very key. When I was teaching at Tsinghua, I realized that students are not going to speak up in class and get class participation. So what I did was more small-group breakout discussions and when I asked them to speak afterwards it was more of them speaking on behalf of the group instead of on their own. So they were more encouraged to speak up and participate. Eventually bringing them out, and students are actually more receptive to these types of methods than professors because the professors have been through more of the traditional school that the students.

You know they call it "sage on the stage", they are just more comfortable standing up there and giving lectures. The students really like that interaction though. When I was teaching at Zhejiang University there were classes where 1/3 of the students were Chinese, and every time the professor got up to lecture, the students from other parts of the world would be raising their hands and engaging while the Chinese students would all be on their phones and computers and not listening at all. It's strange because the class discussion is not comfortable for the Chinese students and the lecture method is just not optimal. The one thing for the colleges, bringing the students along because they are receptive to different methods and participation. Oftentimes the smaller groups can get them more comfortable to do this. At Babson, we recognize that the lecture method is not effective. The important thing to recognize is that entrepreneurs don't plan everything out at launch. But the point of a business plan is to plan everything out and have that strong guide. It is valuable in that you can have a roadmap, but you can't expect everything to go exactly according to plan.

The hazard then is that students will not talk to anyone and have this idea in their heads, and they get online research to back up, and they are ready to launch plan A and get 5 million dollars, but they haven't had the chance to actually flesh out their ideas and test out and learn. This is important. Chinese students feel very uncomfortable sharing their ideas, it's like they are exposing themselves to the world, and then they are afraid that someone will steal their idea. The thing they don't realize is that their idea sucks right now, everyone else has thought of it. What

other haven't done is get others to test their ideas and help them make it more appealing for the market. You have to understand that plan A has been thought of by at least a 100 people and it is not the most viable idea. It hasn't been fleshed out, the only way you can flesh it out is by testing it out and enrolling others. In fact, I just had a Japanese student approach me the other day and he asked me if he could work on his idea on his own. He didn't give me a reason why, but I knew that it was either he didn't want anyone to steal his idea or that he didn't want to be challenged or criticized. That is a major fault that most people run into, you don't want to be criticized or challenged, and you just want to do your own thing because you know it's right. Sometimes the Asian culture, the fear of failure is very difficult, not much in China as it is in China as much in Japan or Korea. The challenge is devising ways to get students out and challenging their ideas and how to test those uncertainties inexpensively. Evaluating the viability of the idea and being able to articulate that idea is very important.

Interviewer: What major differences do you see in teaching a business class and an entrepreneurship course?

Yeah well at Babson we really try to do the experiential learning and integrate across all disciplines. The main thing to remember about entrepreneurship is that it's not predictive. For example, if you teach accounting, there are standard ways to go about business and ways to handle things. You have information that's pretty reliable, like critical risk analysis. There's two things in entrepreneurship. If you have information it's not necessary reliable because you can't say "if I do this I will get this outcome". Entrepreneurship doesn't have a predictive style.

Say in a finance course, when you are trying to predict finances, you can look at the past and apply that today and adjust upward or downward, that sort of thing. Whereas in entrepreneurship you really don't have a past to go on and it's difficult to predict. You get an idea of what your business is and forge ahead, taking a step, bringing others along and getting help and embracing failure, and being able to change course and do something different. The key is getting students to do that. The business plan is a good tool but it needs to keep up with other more interactive methods. That's why we don't have business plan competitions anymore. Those competitions got so popular all over the world where everybody creates these elaborate plans and it's really well done, but the idea is actually pretty done. And pretty much every class and student group I've coached, the original business plan almost never goes according to plan. It can be an exercise to create the business plan, but if we can coach the students to develop the concept so it's more viable, it's a more useful exercise.

So we have this thing called the Beta Competition, and we have alumni talk about what they have accomplished, and their next steps. So this isn't to have them say this is what I'm going to do, give me the money and I'm going to do it tomorrow sort of thing. Really this is, here's what I'm doing, here's what I'm going to do next. It's like an in-process check. An investor might now instead look at what they have accomplished and how much money it takes to go to the next step, to know more about the opportunity. Now we can test the uncertainties and it won't cost a lot of money. It may just also be someone's time or borrowing equipment at that point.

Interviewer: How do you effectively judge the outcome of the course?

I'll have a rubric, and we are really developing skills. So I will really be judging them on the skills. It's not if they have a more viable opportunity, it's more if they can articulate it in one

minute. It had clear value. It's more on what they can demonstrate over saying "oh you have a really big market and you have this unique competitive edge." It's all about the skills.

Interviewer: Based on your understanding of business elsewhere, what do you feel the U.S. does well?

I think that the U.S. does a good job of teaching that failure is ok, and that you should get there quickly and inexpensively. So, you're not always completely successful because you can always get students that are early in the learning curve who feel that if they don't succeed they must do something different. I think the teaching of that is really important, especially in regards to the culture in Asia. The fact that failure is good and you want to get there quick and inexpensively, and an opportunity is a work in progress. You want to say "this is what I'm currently thinking" to the extent where you can back up and see the problem you are trying to solve. The way you are envisioning might not be the correct way in the beginning.

Interviewer: What do you feel is the most important aspect of teaching entrepreneurship?

What professors should understand is that they should be lecturing for more than 10 minutes at a time. There's so many different types of interaction, student to professor, student to student, and student to group. Professors should look to incorporate those different types of interactions and resist the urge to lecture and feeding them concepts that they must regurgitate on a test. They should instead be focusing on getting students to apply those concepts and how to they work with each other. Thinking about different teaching modes in class and how do you get those different interactions in class.

Interviewer: Was there any teaching method you used in class that you found particularly effective or ineffective?

When I taught entrepreneurship in China, one thing that was really effective was getting them out on the street and observing. That exercise, we call it a "Methodography" exercise. They start with an assumption, like bicycle safety, or how people carry their things. For the Chinese students, they may have assumptions based on their thinking that may not be reality. They may go out and assume for example that no one wears helmets. But when they go out for this exercise and notice they may see that in certain situations, people are wearing helmets. Maybe when they have kids with them or something. This part is good because they are just observing and not talking to people. The next step of this however is to talk to people and understand what the problem is, and that's the real key to ingrain in students. Having students talk to people about what the problem is as opposed to the idea, that's the main thing. They shouldn't be telling people an idea and having people come back asking for 100 units of a product. Because that really doesn't translate into someone's willingness to buy a product. So instead of getting people to reveal their idea, we get them to talk about the problem.

So if they had an idea on for example how to decrease bicycle theft in China, they wouldn't go up to people and say "hey this is my idea what do you think?" And people may say that they would buy it and use it but that doesn't actually mean that they are going to go out and buy your product because it may not be convenient, they may not trust it whatever. So for them to talk about the actual bicycle safety and ask people if they have had their bike stolen or were there situations where they actually felt secure, or what have they already tried. Having them talk to customers without revealing the idea is a really important skill because you're understanding the behaviors and problems.

Another exercise is walking through a usage situation with someone. So say, tell me the last time you went to dinner. Start from the time you decided you wanted to, all the way through to when you got back home. Talk to me about the process and reveal some challenges or obstacles. That may reveal some challenges in that space. So that's another one. I've don't a lot with customer personas, in trying to understand who the customer is. Also, understanding the competition is good because you can borrow other things from competitions and determine where you are unique. It's not about saying, "you suck I'm better", it's about figuring out what they are doing well and matching that with the problems you're addressing with your customer and who your customer is and finding the new business model you can create. A lot of these are better understanding your market and better understanding your opportunity, and then thinking about how you are changing course. This forces students to not evaluate their current idea, but to get to that next idea based on what they are learning.

Appendix N: Qizhi Li Interview Transcript

Disclaimer: This is not an exact transcript of the conducted interview. This interview was conducted in Chinese and the responses written up are translations, after the fact, by the authors of this paper from an audio recording. The responses are, to the best of the authors' knowledge, accurate to the intent of the interview subject. Also note this interview was not translated in its entirety and only represent points brought up in the report.

Interview Date: November 22nd, 2017

Interviewer: Kailun Liu

Interviewer: Can you walk us through the typical curriculum design of the entrepreneurship course?

We divide the whole course into three parts. The first part is the concept and theories about innovative mindset such as innovative thinking, innovative skills and innovative technologies. And the second part is a big project. I don't give students any guidelines or instruction on this project, but basically students are going to identify a problem and find out how to improve the existing design. They need to do researches and write a report on this topic. The third part is students are going to present their report in class. The presentation is about their thinking process, the researches they did and the technology they use to solve the problem. This is basically three parts of my innovative mindset course.

Interviewer: Do you set up any requirement on this report?

I don't have any requirement for students to fulfill. They are doing researches on their own. Since this is the first time I teach this course, I am doing an experiment on this teaching method. The report doesn't have any requirement, not even page limit. However, when I grade these reports, I will focus on how in-depth their researches are and whether their solution is realistic or not.

Interviewer: What are you looking for when grading the report?

One thing is the depth of their researches. The other thing is whether you give a solution to the problem. Some students identified the problem but didn't manage to solve it. These students get a lower grade. Some students gave a solution but it's not realistic, which reflects that they didn't do enough research on the topic. These students get an average grade. For the students who came up with perfect solutions, they get a higher grade.

Interviewer: Can you give us an example of the report?

One student found that sticky tapes are extremely hard to peel and cut, so he designed a tape dispenser to solve this problem.

Interviewer: Can you introduce your grading criteria for us?

The attendance takes up 60 percent. The report takes up 30 percent and the presentation takes up 10 percent.

Interviewer: Is the project an individual assignment or a team assignment?

I never mentioned if the assignment is in singles or teams, but none of them came to ask me about this and none of them actually teamed up. This can probably reflect that Chinese students lack the consciousness of cooperation.

Appendix O: Heidi Neck Interview Transcript

Disclaimer: This is not an exact transcript of the conducted interview. These responses were written up, after the fact, by the authors of this paper from an audio recording. The responses are, to the best of the authors' knowledge, accurate to the intent of the interview subject.

Interview Date: November 27th, 2017

Interviewer 1: Eric Peterson

Interviewer 2: Jake Scheide

Interviewer 1: We want to get a sense of your background, so how long have you been a business professor?

I have been a business professor since 2001, so 16 years, and all of that time has been at Babson.

Interviewer 1: Before becoming a professor, did you have any industry experience? What prompted you to become a professor?

Before working on my PhD, I was working for a large chemical company in marketing and sales and business development. Once I left there I got my MBA and during my MBA I started consulting for small businesses. After that I started my PhD program, "At The Intersection of Strategy and Entrepreneurship" is what my PhD is in. Then I started at Babson, and I've had a couple of businesses on the side during my time here.

Interviewer 2: During your time at Babson, what courses have you taught and what courses do you currently teach?

I am currently teaching an MBA course called "Entrepreneurship and Opportunity" and I have taught at the undergraduate level our "Foundations of Management and Entrepreneurship" course where our students are required to create a business. And I've taught our general "Intro to Entrepreneurship" elective.

Interviewer 1: Do you have any experience with EE outside of the U.S.?

Yes, so one of my jobs here is to run a program called the Symposium for Entrepreneurship Educators, SEE is the acronym. It is where we train other educators how to teach EE the Babson way, which is highly experiential. We do programs here at Babson, but I've been around the world doing other programs as well. I've done a program in China twice and Taiwan twice.

Interviewer 1: Were there any differences you saw when training these professors in China?

I'll just focus on my experience in China, and Asia specifically as opposed to other places I've been. The Chinese faculty are very accustomed to standing up and lecturing. I think because respect is so important in Chinese culture, I think the fact that the Chinese students just sit and listen attentively to the lecturer is expected of them, and that the faculty member is the all-knowing

professor. I think that's the culture, respecting hierarchy. What I noticed is that when you present the faculty with engaging material and experiential exercises, they engage and are enthusiastic about it. But then when you ask them if they will use it in their classroom they are like "Eh probably not". Some of them do, I think the tides are changing where the students no longer tolerate sitting and listening with respect. I think across the world that generations are no longer as respectful as they used to be, and I don't mean that in a bad way. I think they want to learn, it's just they don't want to sit down and listen. I think they want to learn by doing. And it's tough for faculty who are accustomed to lecturing to change their methods, because it's scary. And I don't think people give enough attention to the fear factor.

Call disconnects

I think where I lost you is I was...the more important point I want to make from that long winded question is how scary it is for a teacher to come into a classroom with a new exercise that they have never really done before and it's experiential so they have to lose some control. And I think that can be very difficult for people to do because no one really wants to fail in front of a bunch of students. That's really hard for teachers to do. So the best way I've found to try and convince them to try something in the classroom is to teach them how to do it, have them experience it as well.

Interviewer 1: What are the main outcomes you look for at the end of a course and how do you evaluate students?

I think there's outcomes and I think there's grades, and I think those don't always align themselves. When I'm teaching, I'm thinking "I'm a required course, I don't necessarily have 100% entrepreneurs or wannabe entrepreneurs in my course" but my goal in the course is to have them thinking more entrepreneurial than when they came into the course, whether they decided to start a new business or not. Because my philosophy is not everyone in the world can be an entrepreneur but everyone can be entrepreneurial in whatever they choose to do, and it's only going to help them. So that's my overarching, what student are getting out of the course. I'm shaping experiences that allow them to develop their abilities to think entrepreneurially. Practice is really important across my course. The old way of assessing, especially at the graduate level, was...you put 30-40% on class participation and you do a lot of case studies, then you're evaluating the student's participation in those case studies. But that really isn't how I evaluate students anymore. I've taken out class participation and put in class engagement, and that's not a huge percentage. And I've created assignments along the way to do outside of class, they have to report back the outcomes of what they are doing, and I'm grading them on that. So it's a lot of assignment that come together to create the course grade. Then I also have 2 projects in my class where peer evaluation is part of the class grade, so the students are grading each other as well as me.

Interviewer 2: Are there any teaching methods you can highlight that were extremely effective or perhaps ineffective?

I think problem based learning is very broad so you can't say that there is one thing to do. I think in general in this broad category of experiential learning there's so many different ways to do that. There's problem based learning, there's project based learning, hand-on exercises or more active based learning. The basic formula I follow is very clear instructions because that's

where I feel the breakdown happens. Students are given an ambiguous task, but they are given that ambiguous task with not specific directions. So very specific directions on what is expected of them, then they go off and do it. Then the debrief of what they learned at the end. So directions, action and debrief are the three big buckets. And then a lot of people go “Well Heidi if you give them specific directions you’re taking the ambiguity out of the exercise” and I’m like “No, that’s not what I’m talking about.” A lot of faculty just say “Hey go do this”, but if you’re not really helping students figure out what they are doing, they are just flailing not for good reason. They are flailing because the professor did not give sound instructions. Where they should be flailing is in the actual activity.

Interviewer 1: So then, what would be an example of an activity like that?

One example would be a simulation or role play on interviewing customers in order to identify needs. So we would do the role play or the simulation in class, and then I would give them instructions and tell them “Now that you’ve learned this in the role play, go out and interview 20 customers. Collect that data, then from that data list the needs that came out of those interviews”. The pre-work is the simulation or role play in class, the activity is go out and use what you learned and interview 20 customers that are not your friends or family, then turn in a short report on who you interviewed and the things you learned from each interview, and then a summary of how this changed your ideas. Then we debrief the whole experience in the class.

Interviewer 1: So what is the general structure of the class?

So, this is a 1 year course. The fall semester is spent testing new ideas and planning for launch in the spring semester. Then the spring semester is their executional stage. There are two faculty teaching the course: 1 from entrepreneurship and one from organizational behavior because it’s living, learning laboratory for issues around leadership and communication and organizational structure. So learning about the team and how teams are formed is essential to the class. As much as the idea is growing and changing so is the team.

Interviewer 2: Is there any specific criteria you use to qualitatively assess students as they are going through each phase?

Yeah, there are deliverables at the end of every phase. But also, the teams are evaluating each other and that feedback is given to the faculty. So when the business is up and running in the spring semester they are constantly doing 360 performance evaluations on each other. That’s a big part of the qualitative feedback. The assessment piece is, they are doing homework and milestones they have to reach and deliverables they have to turn in. There’s also exams in that course, there’s a midterm and final in that course but it’s been a long time since I taught that class.

Interviewer 1: When you are teaching entrepreneurship, is there a certain level of mentorship you have noticed is needed in the course? (outside resources question along with TA’s)

It depends on the level of the course and what they students are doing. So if the students are actually running businesses like in that FME course I just talked about, it’s important to have a support system in place for the students. You have student mentors, upper levels students that are mentoring each of the business groups. Some of our other courses...keep in mind in that FME course they are running that business for only 14-15 weeks then we force them to shut it

down. So it really is a business project. And some of our other courses where students are starting on their business or going to incubator space, then yeah industry mentors are very important. But it all depends on the leaning objectives and what you are trying to do.

Interviewer 1: Based on your best understanding of EE elsewhere, what are some things that the US does well?

Hmm good question...well what I think you have to consider is going out to a more macro level. It is really about what the view of entrepreneurship is in that country. So, here in the US it's really cool to be an entrepreneur. It's like "Oh you had the guts to do it and look at you, and now I'm stuck in a corporation." Whereas in some other cultures, the entrepreneur is not very well perceived, so you have to get over some of those barriers as well. So that's one thing. In the classroom, I think a lot of programs outside of the US think "Hey let's just have a couple of classes in entrepreneurship and then we can have an entrepreneurship program." But that's not enough, in order to have a really robust entrepreneurship program, it's not just about the classes, it's about the entire ecosystem around entrepreneurship education. It's around what you're doing on campus outside of the classroom. The accelerators, the incubators you have or the resources you're giving to students, or access to mentors and role models and investors and clubs. It's the buzz around the campus. It's not enough to just focus on what's happening inside the classroom. And then in turn, number 3, when you get inside the classroom and the classroom only, it's really about what the best ways are to engage students in entrepreneurship. And if you're goal is to simply make students aware of entrepreneurship, then you know you can use cases and bring in guest speakers, that's fine. If you want students to develop skills around entrepreneurship, that requires a very hands on learning approach. Because you can't just learn skills by reading about them and seeing them.

Interviewer 2: What kinds of external resources do you implement in the classroom?

I'm not really not huge about guest speakers because I feel we do a really good job of doing that outside of class. I think we provide students with a lot of learning opportunities so I don't like to use a lot of precious classroom time sitting and listening to a speaker. But I will bring in entrepreneurs who have a problem or challenge, and then we use the students as a way to crowd source a solution. This gets students working on a real life problem an actual company is having, and we get students coming up with a solution in a very competitive way. So that is one way I would use external people, I would only do it in that way, not only for the sake for talking.

Most of my classroom sessions are workshops where students work in groups. Again kind of setting up the activity, doing the activity and debriefing the activity. I'm also using the....

Call disconnects

...and I use those computer and software simulations...

Interviewer 1: The call just disconnected, can you repeat what you just said about computer simulations?

Yes, so I use computer and software based simulations as well.

Interviewer 1: Yes, so what are those simulations used to highlight in class? What do those look like?

So, I've used a simulation to help students learn how to interview people, customers specifically. I've used them to show phases of design thinking. I think that's it...yea that's it. That's all I use simulations for.

Interviewer 2: What aspects of a simulation do you feel provides something that can't be provided by any other method? Any unique benefits?

I think a simulation allows you to get the full picture of a situation in a short period of time. So you are able to simulate the environment you want students to immerse themselves in. Sometimes you can't get that through a case study, you can't get that through a chapter, and you may not be able to get it from a role play. It also allows you to bring in lots of different variables at one time, especially if it's a computer simulation. And, depending on the simulation, it's more of a game so it is more interesting to the students.

Interviewer 1: Do you have anything else you want to highlight?

Yea, I think for your client with the simulations, I think a lot of people just build simulations for the students, but they don't necessarily build them for the faculty. A lot of reasons why faculty don't adopt simulations is because one they seem too burdensome from an administrative perspective. It seems like the learning curve is really high. There is a perception that the technology might break down. And they may not know how to execute or deliver the simulation properly. And you can create a really long teaching note, but that's not going to solve the problem.

Appendix P: Mark Rice Interview

Note: This was informal interview conducted via email and thus do not reflect a dialogue.

Interview Date: October 30th, 2017

Interviewer: Eric Peterson

Q: What are some of the biggest difficulties a professor faces when teaching entrepreneurship?

A: •Fear of failure among students; lack of courage to explore new ideas and to experiment in new action-learning activities.

- Being willing to adapt to the student exploratory learning process rather than following the instructor's script.

- Setting expectations with respect to grading criteria. Many students are consumed with wanting to get an A and hence want to know what is required to be perfect. Entrepreneurship challenges don't typically have a single correct answer, and so the professor is required to qualitatively judge the performance of the students.

Q: What aspect of teaching entrepreneurship do you feel is most important? (i.e. curriculum, professor experience, certain types of projects)

A: Application of the theories, models and frameworks to practice — via case discussions, interactions with guest entrepreneurs, exercises and projects.

Q: During your time involved with entrepreneurship education, was there ever a specific activity or event that yourself or another professor did in a class that you felt really helped to inspire innovation in the students or one that you or another professor used that wasn't very effective?

A: POSITIVE: Discussing really good case studies followed by engaging with the entrepreneur featured in the case study.

NEGATIVE: Usually it is not the activity that is the problem. Sometimes (not often thankfully) I don't do a great job of designing or facilitating the activity — particularly for the first time before I have gained experience, but more often the problem is that students aren't prepared or are reluctant / unwilling to engage in the activity. For example, when I teach valuation techniques, I find students sometimes are not prepared to engage with sufficient intensity in order to "solve the problem."

Appendix Q: Zhenwei Shang Interview Transcript

Disclaimer: This is not an exact transcript of the conducted interview. This interview was conducted in Chinese and the responses written up are translations, after the fact, by the authors of this paper from an audio recording. The responses are, to the best of the authors' knowledge, accurate to the intent of the interview subject. Also note this interview was not translated in its entirety and only represent points brought up in the report.

Interview Date: November 14th, 2017

Interviewer: Kailun Liu

Interviewer: Can you introduce your cooperation with the local universities for us? For example, what activity you have?

We have multiple kinds of cooperation. The first one is we invite students from entrepreneurship schools to visit our company and we organize guest speakers to give lectures in universities. The second one is we offer many internship opportunities for students. They can transfer their internship experience to credits back in their universities. And most of our activities and events are free for students to attend.

Appendix R: Yunhong Shen Interview Transcript

Disclaimer: This is not an exact transcript of the conducted interview. This interview was conducted in Chinese and the responses written up are translations, after the fact, by the authors of this paper from an audio recording. The responses are, to the best of the authors' knowledge, accurate to the intent of the interview subject. Also note this interview was not translated in its entirety and only represent points brought up in the report.

Interview Date: November 21st, 2017

Interviewer: Kailun Liu

Interviewer: What did you do professionally before becoming a professor?

I worked in a company for 10 years before I became a professor.

Interviewer: Do you know other teaching methods that are utilized around the world? Why didn't you implement those?

Actually, case study is widely used in business course but not in entrepreneurship courses. In EE courses, we mostly guide students to make, present and improve business plans. In my experience, I know case study is an effective teaching method, but I didn't implement this method because two reasons. First, Chinese students have a lot of courses going on and most of their time is distributed in classrooms. The second reason is since EE is a required course, most students do not take this course seriously. Since case study needs students to use their own time to read through the case and then discuss in classes, most Chinese students won't read it. These are the most important reasons why I didn't implement case studies in my courses.

Interviewer: Are there any other mentors like TAs that are accessible for students? Why/why not implement those?

We do have TAs in our university. I used to teach a marketing course and the class size of the course is pretty big, so I decided to implement TAs in that course. However, we have a special requirement for TAs that they must be identified as students who need financial aids. This year I was also planned to hire TAs in my entrepreneurship courses. I sent out the online request but due to some reasons, no one ever replied to me. Normally students who want a TA job are going to contact the professors directly, so they might not be confident to deal with online requests. They could be worried about that whether they will be qualified if they never contacted the professor before. That's probably why I didn't get any TAs this year, but normally for my marketing courses, I have TAs.

Appendix S: Rajan Venkitachalam Interview Transcript

Disclaimer: This is not an exact transcript of the conducted interview. These responses were written up, after the fact, by the authors of this paper from an audio recording. The responses are, to the best of the authors' knowledge, accurate to the intent of the interview subject.

Interview Date: October 28th, 2017

Interviewer: Daniel Venkitachalam

Interviewer: What is your role at Eagle Investment Systems, and what does that role's work entail?

I am the Head of Transformation. That means that I am in charge of all product development across the entire company.

Interviewer: How long have you been a business professional?

Almost 20 years now.

Interviewer: What is your educational background, and how do you feel that has impacted the route you have taken professional?

Well, I have a Bachelor of Science in Computer Information Systems from Bentley College. That helped prepare me for a career in technology. I've always worked on both the technical and business side of things, and I got my MBA from Babson. It helped prepare for taking advantage of technology in unique ways to build businesses with it.

Interviewer: What did you like most about your time at Babson when getting your MBA?

I always thought that being an entrepreneur was more about being lucky, and about taking chances. What I learnt at Babson was that while certainly luck and timing have to do with success as an entrepreneur, it is more about taking calculated risks. This means that you know how much of a risk to take and that you know what to do if something were to happen. I also found that there were tools to accomplish all of this. The technique of entrepreneurship is something I loved learning, and the tools to help you learn the technique was something I found interesting. Really good and successful entrepreneurs are good at taking calculated risks and implementing strategies to mitigate and minimize loss.

Interviewer: Based on your best understanding of business practices around the world, what do you feel America does best in entrepreneurship education?

Well, the first class that all students take at Babson is a class called Creativity, Innovation and Entrepreneurship. This is something that most other school don't teach enough of or don't teach at all. It is important to understand that creativity, innovation and entrepreneurship are like three legs of a stool. You can't have one without the other two, they are all very deeply connected. The thing about America is that there is such a huge focus on these three things and the relationship between the three. Entrepreneurship is the vehicle, creativity is the source of great ideas, and innovation is putting those ideas into action. The thing about America is that people have been

coming to America for hundreds of years for the fact that you can be the best you are and be the best entrepreneur you can.

Interviewer: While you were getting your MBA at Babson, were there any particular teaching method that you found especially effective or ineffective?

Yes, it's called the "case method". Essentially it is experiential learning where you take a case and put yourself into a situation and you pretend that you are one person and you immerse yourself, understand and apply yourself. Another aspect of the learning that I really liked was that every professor has worked in industry and had owned a business, so they could teach from experience. This is very different from most professors in other fields because they are really good at the theory and teaching the "what if". But the professors I worked with could speak from experience and what lessons they had learnt, which is what I liked.

Interviewer: Do you feel class size affects how entrepreneurship education is taught?

Well, it's not so much about the class size as it is about the discussion that is had. No one person can have every perspective, and everyone brings a different way of thinking to the classroom. I feel that 100 is too big, but 20-30 is around what my classes were. The important thing is the discussion and bringing a wide variety of perspectives to the discussion.

Interviewer: As an Angel Investor, what do you look for in entrepreneurs when making an investment decision? Does this have anything to do with their education in entrepreneurship?

Well, if you don't understand the business, you are just a speculator, not an investor. You have to make sure that you actually understand the business and that the entrepreneur conveyed their ideas to you properly. So, what you look for is a great idea that solves a problem where you can make multiple returns on your investment. It doesn't have so much to do with the education of the entrepreneur as it does with the entrepreneur themselves and the business.

Appendix T: Fang Yang Interview Transcript

Disclaimer: This is not an exact transcript of the conducted interview. This interview was conducted in Chinese and the responses written up are translations, after the fact, by the authors of this paper from an audio recording. The responses are, to the best of the authors' knowledge, accurate to the intent of the interview subject. Also note this interview was not translated in its entirety and only represent points brought up in the report.

Interview Date: October 26th, 2017

Interviewer: Kailun Liu

Interviewer: How do you think entrepreneurship class size might affect how you teach it?

I think either large classes or smaller classes have their own advantages and disadvantages. It's hard to organize in-class discussion because it's going to be loud. Considering the cost of implementing small-size classes in China, I think 30-60 students per class is probably the best class size.

Appendix U: Tina Zhang Interview Transcript

Disclaimer: This is not an exact transcript of the conducted interview. These responses were written up, after the fact, by the authors of this paper from an audio recording. The responses are, to the best of the authors' knowledge, accurate to the intent of the interview subject.

Interview Date: October 26th, 2017

Interviewers: Eric Peterson, Daniel Venkitachalam

Interviewer: So, how long have you been a business professor?

Already 10 years.

Interviewer: Is it true that you earned your PhD at Indiana University in America?

No, I actually earned my PhD in China, but I was traveling scholar for 6 months at Indiana University.

Interviewer: So, what courses do you teach here at HDU?

I teach management, project management and entrepreneurship. This is my first year teaching entrepreneurship.

Interviewer: Did the school provide you with curriculum or requirements to teach these classes?

Actually, we do have some requirements we have to meet from the school. We have an entrepreneurship school, and we have 10 classes here. That means we have around 20 teachers for entrepreneurship. We must follow the basic requirements.

Interviewer: What are some differences between teaching a business class and an entrepreneurship class?

Actually there are a lot of differences. The main difference is that entrepreneurship focuses on practice more than theory. There are only a few lectures in our entrepreneurship class. This teaches students the basics, and then they go back to their homes or dormitory and take online tests and courses. So that is the first difference. Entrepreneurship has more practice than theory.

I also think that students should meet with managers of companies. I think that they can learn some experiences from people that have already succeeded or even failed.

Third one, I think entrepreneurship students should have their own practice. For example, some universities give 100 RMB to each team and ask them to try and earn money or make a business. Even if they fail it's OK, but that have to get some experiences. I think that this real practice is important.

In our university, we don't have this sort of program. Instead we have an incubator where students can test out their ideas. It is like a half incubator. Even if they can't hold a whole company, they can at least try something. This is why it is a half. So some of our students try the incubator. They have some companies already inside.

I know at WPI they have some competitions, but here we do not. Competitions are a good idea because they allow students to get some money towards their idea.

Next question?

Interviewer: Based on your understanding of business around the world, what is being done well in China to teach innovation in the classroom?

We will join some events and make students do projects. Make a project, make a team, online involvement. For example, when I teach my classes, the first thing I do is put the students into different groups for the project. We ask them to go into groups and make sure their backgrounds are different and ask them to find a topic they are interested in. Then they make a presentation after class on that topic. The projects have heavier weight than the tests. It would be more than 50% for the final score. We have 2 times the projects per lecture.

Interviewer: Do you still have tests in class?

Yes.

Interviewer: Is that based on the theory part?

Yes, I actually just finished grading a test that my class did. But for entrepreneurship we don't have this kind of a final. Because it is not a theory class. It is a practice class. We also ask them to write notes and we grade them on their notes so that we see how they understand the material. The notes are 30% of the final grade. Attendance is the final 10%.

Interviewer: What do you see currently as the biggest challenge in teaching entrepreneurship here in China?

I feel the first is experience. We don't have a lot of human resources on campus, so we don't have a lot of connections to companies where people want to teach. Now we have to ask teachers in university to teach, but they may not necessarily have experience in business to teach. Second, the technology develops very fast. As a teacher, to know everything is very difficult. Sometimes the students even know more than the teacher. Another challenge is online courses. They can learn anything and sometimes even get certificates from those courses and universities. If we can't teach better or get better classes we won't be teachers anymore. Even companies to entrepreneurship training. They have more resources and interesting topics. That is also a challenge.

Interviewer: How do you feel the class size affects entrepreneurship teaching?

Since entrepreneurship is now a required course, the class size has increased a lot. Before this requirements, students had to choose the class. We would have around 30 students. This meant students were actually interested in the course. Since this is now a requirement, we have so many students, and not all of them are interested. It is very difficult to implement projects also. If you give 10 minutes for a group to come up with an idea in class, and give each group a chance to present, it will take 2 hours to get through everyone. It is a big challenge.

Interviewer: Do you feel 30 is the ideal size?

Yes. It allows us to focus more in detail. With a larger size, we cannot go so much into detail on a student's passion or business idea.

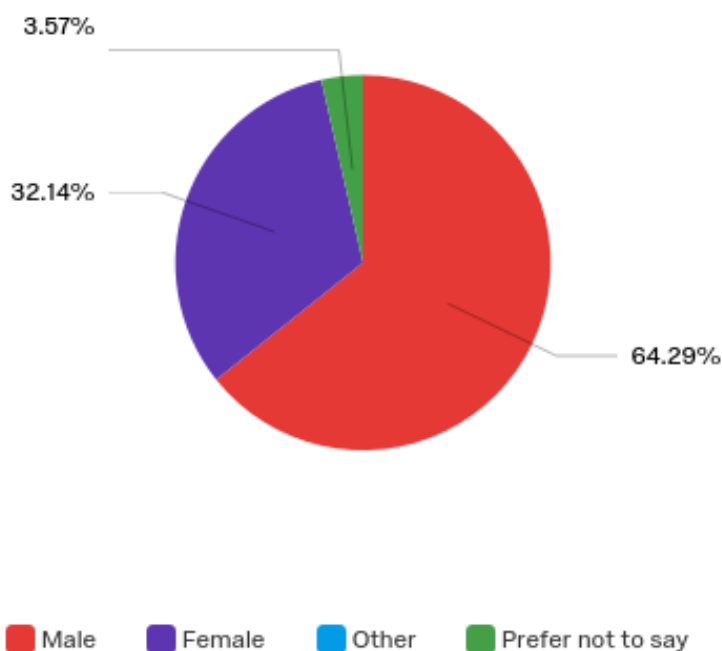
Appendix V: Survey Data

Default Report

Student Survey for Entrepreneurship Education

Q1 - Please enter your gender:

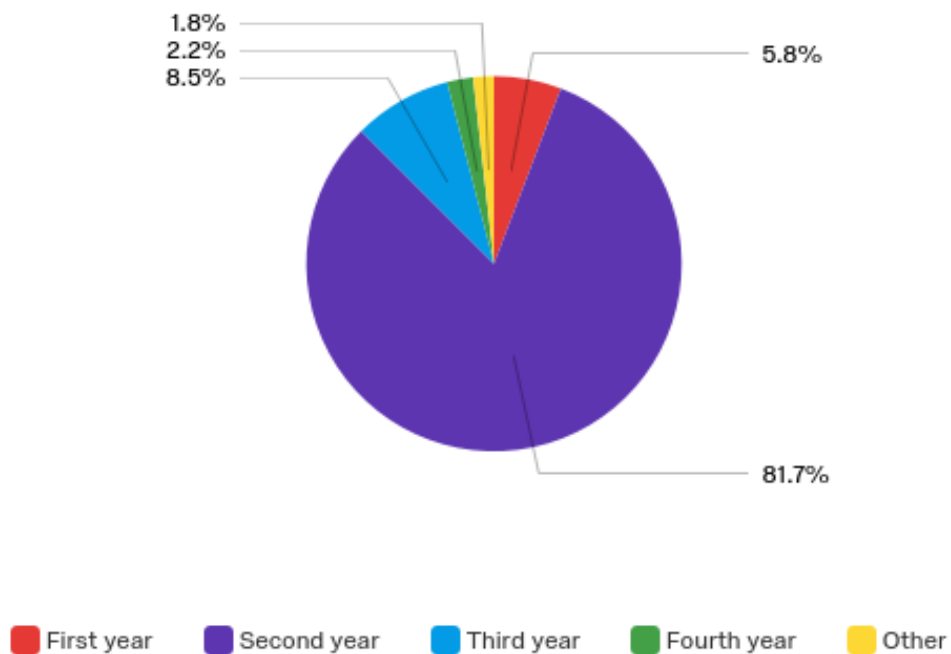
Gender Breakdown



#	Answer	%	Count
1	Male	64.29%	144
2	Female	32.14%	72
3	Other	0.00%	0
4	Prefer not to say	3.57%	8
	Total	100%	224

Q2 - Class year

Class Year

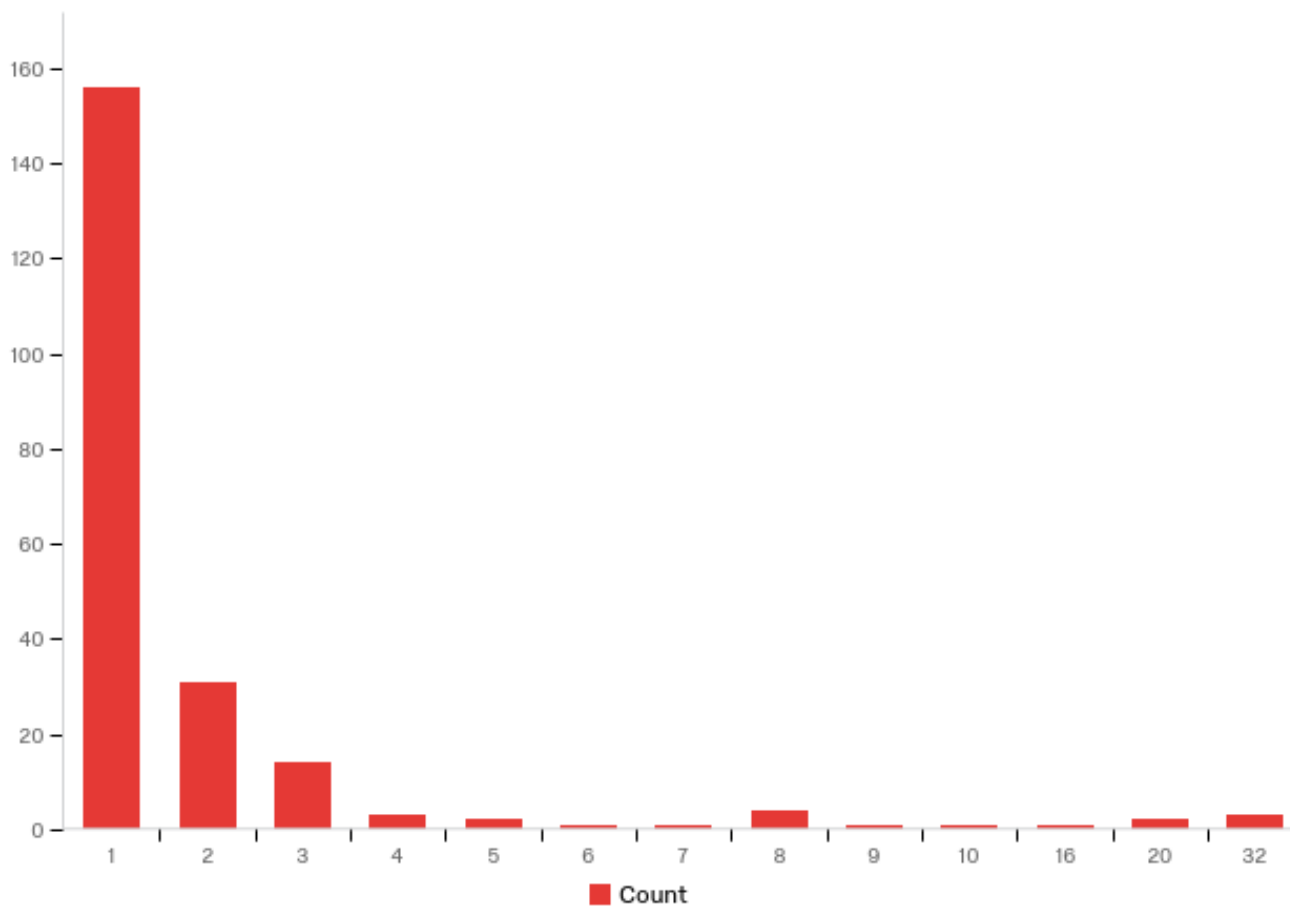


#	Answer	%	Count
1	First year	5.80%	13
2	Second year	81.70%	183
3	Third year	8.48%	19
4	Fourth year	2.23%	5
5	Other	1.79%	4
	Total	100%	224

Q3- Which school do you attend?

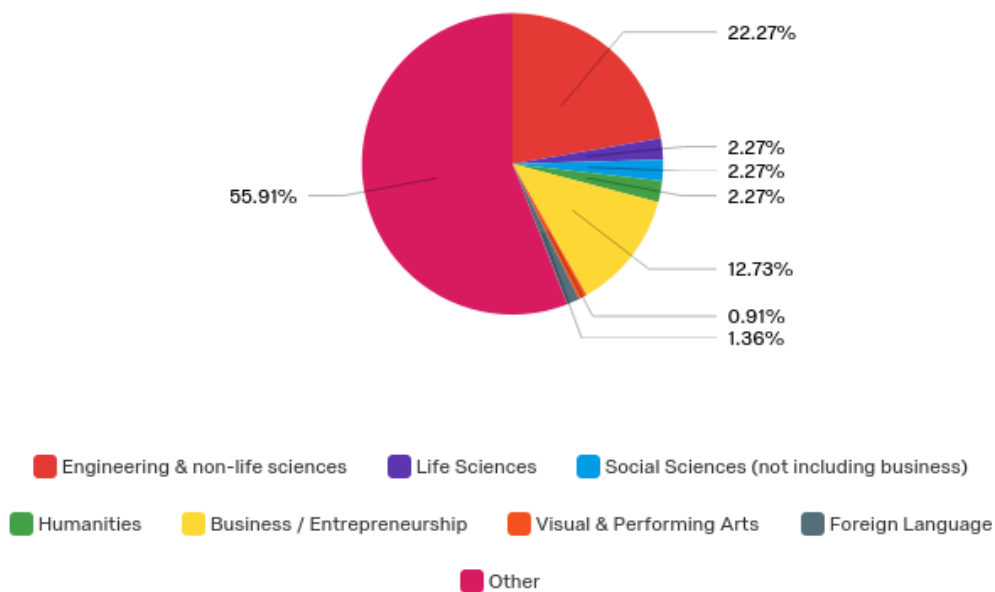


Q4- Number of entrepreneurship classes taken



Q5 - What is your major?

Major distribution

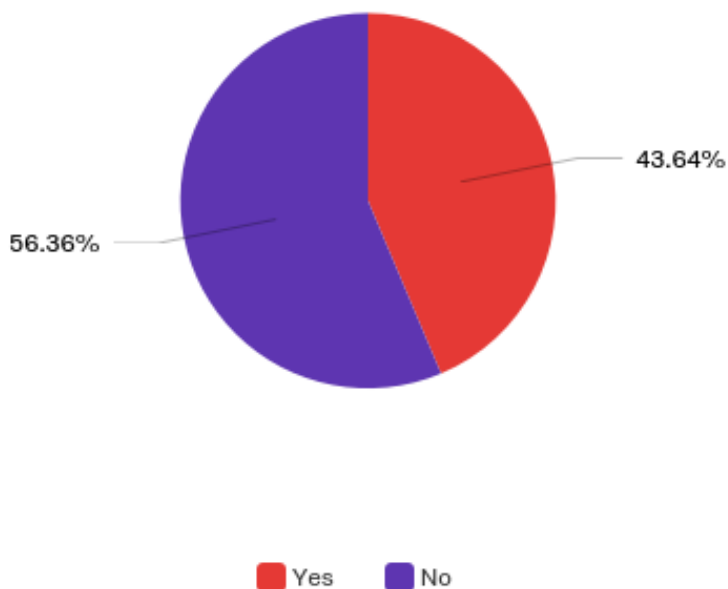


Q5 - What is your major?

#	Answer	%	Count
1	Engineering & non-life sciences	22.27%	49
2	Life Sciences	2.27%	5
3	Social Sciences (not including business)	2.27%	5
4	Humanities	2.27%	5
5	Business / Entrepreneurship	12.73%	28
6	Visual & Performing Arts	0.91%	2
7	Foreign Language	1.36%	3
8	Other	55.91%	123
	Total	100%	220

Q6 - Do you wish to start your own company one day?

Gauging student intent to start businesses



#	Answer	%	Count
1	Yes	43.64%	96
2	No	56.36%	124
	Total	100%	220

Q7 - Approximately how many students are/were in your entrepreneurship class?

#	Field	Minimum	Maximum	Mean
1	Approximately how many students are/were in your entrepreneurship class?	8.00	200.00	77.99

Q8 - Rank these teaching methods on their effectiveness based on your experience in entrepreneurship classrooms. Select 'N/A' if you never experienced this teaching in an entrepreneurship course.

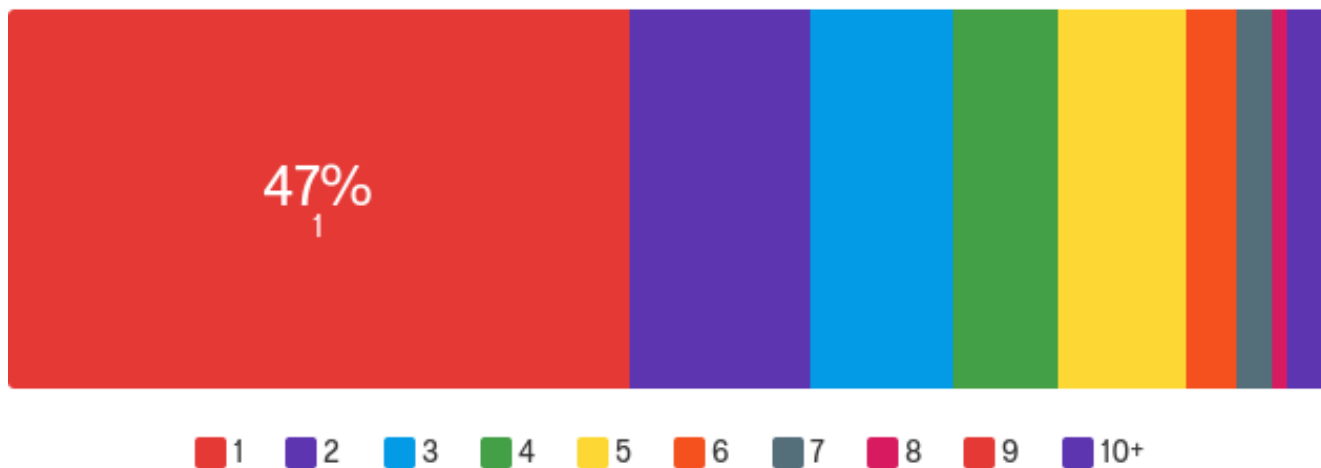
#	Question	Highly ineffective	Somewhat ineffective	Neither effective nor ineffective	Somewhat effective	Highly effective	Total
1	Group assignments	5.88% 12	8.33% 17	27.94% 57	42.16% 86	15.69% 32	204
2	Projects	5.79% 11	3.16% 6	26.84% 51	42.11% 80	22.11% 42	190
3	Case Studies	6.22% 12	2.59% 5	23.83% 46	39.90% 77	27.46% 53	193
4	Lectures	4.52% 9	13.57% 27	42.21% 84	26.13% 52	13.57% 27	199
5	Discussions	4.46% 9	7.43% 15	23.27% 47	42.08% 85	22.77% 46	202
6	Online learning	6.00% 12	17.00% 34	37.00% 74	25.50% 51	14.50% 29	200
7	Seminars / panels	3.96% 8	4.95% 10	29.70% 60	40.10% 81	21.29% 43	202
8	Textbook	5.06% 9	17.98% 32	41.57% 74	24.72% 44	10.67% 19	178

Q9 - How accessible is/was your entrepreneurship professor outside of normal course instruction? Answer on a scale of 1-5, with 1 being 'not accessible' and 5 being 'extremely accessible'

#	Field	Mean
1	Accessibility of Entrepreneurship Professor outside of class	3.21

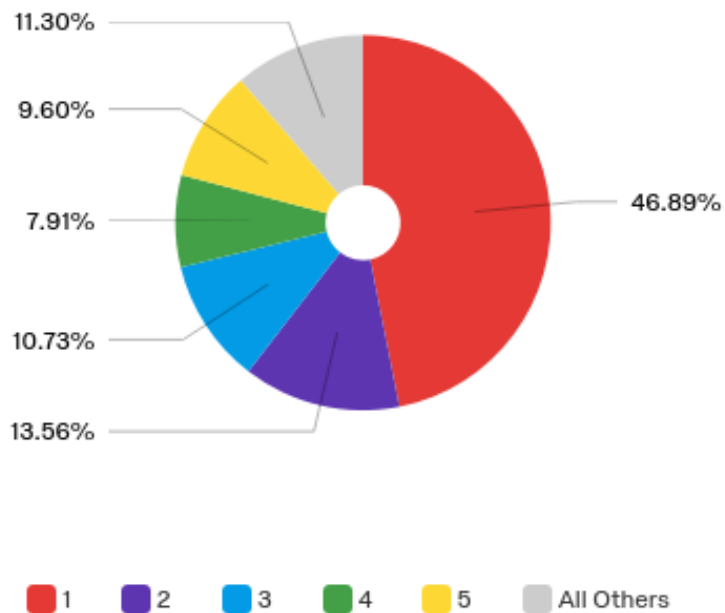
Q10 - Approximately how many in person, one-to-one interactions did you have with your professor outside of class, over the duration of the course? For multiple classes, take an average.

Number of outside of class professor-student interactions



#	Answer	%	Count
1	1	46.89%	83
2	2	13.56%	24
3	3	10.73%	19
4	4	7.91%	14
5	5	9.60%	17
6	6	3.95%	7
7	7	2.82%	5
8	8	1.13%	2
9	9	0.00%	0
10	10+	3.39%	6
	Total	100%	177

Number of face to face interactions between students and professors



#	Answer	%	Count
1	1	46.89%	83
2	2	13.56%	24
3	3	10.73%	19
4	4	7.91%	14
5	5	9.60%	17
6	6	3.95%	7
7	7	2.82%	5
8	8	1.13%	2
9	9	0.00%	0
10	10+	3.39%	6
	Total	100%	177

Q11 - Rank your comfort level doing the following things in the context of Entrepreneurship classes:

#	Question	Extremely comfortable		Moderately comfortable		Neither comfortable nor uncomfortable		Slightly uncomfortable		Extremely uncomfortable		Total
1	Participating in class discussion	17.50%	35	30.00%	60	44.50%	89	6.00%	12	2.00%	4	200
2	Being in a lecture environment	19.60%	39	30.65%	61	43.72%	87	4.02%	8	2.01%	4	199
3	Asking questions of industry professionals	22.22%	44	30.81%	61	37.88%	75	8.08%	16	1.01%	2	198
4	Talking to professors outside of class	20.81%	41	28.43%	56	45.69%	90	3.55%	7	1.52%	3	197
5	Working with other students	25.00%	50	37.50%	75	33.00%	66	2.00%	4	2.50%	5	200

Appendix W: Referenced Syllabi

CS3733 Software Engineering B17 Syllabus (Wong)

Instructor: Prof. Wilson Wong,
Department: Computer Science Department
Team Coaching: Thursdays during regular class times (mandatory attendance!)
Office Hours: See office hours spreadsheet in the Syllabus section of myWPI
TAs and SAs: See office hours spreadsheet in the Syllabus section of myWPI

We are always willing and eager to answer your questions, and would like you to master the topics covered in a timely manner. There are different venues for bringing questions outside the lecture hours:

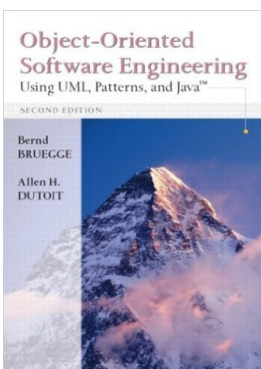
1. **Discussion boards.** Please use the discussion boards on **Canvas** as we will be monitoring those daily, plus other students could likely benefit from your questions and our answers. Other students may even be able to answer your questions
2. **Office hours.** Go to the office hours, as they are set up solely for this purpose.
3. Only when the above two methods do not work for you, then feel free to email to the staff or instructor of this course explaining your problem.
4. For personal or private matters such as illness, ADA accommodations, etcetera – email me. Please include “CS3733:” followed by the topic in the subject heading of your email message.

Recommended Background

CS2102 or CS2119

Textbook

Bruegge, Bernd and Dutoit, Allen H. Object-Oriented Software Engineering: Using UML, Patterns, Java. **Second Edition**. Prentice-Hall. ISBN: 0-13-0471100.



Used copies of the textbook may be obtained cheaply

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- [Barnes and Noble](#)
- [Biblio.com](#)
- [Half.Ebay.com](#)

You may also check out copies of this textbook on reserve in the library. There are 5 reserve copies listed under CS3733.

Supplementary Online Textbook Chapter Readings

Accessible through the [WPI Library Databases](#) readings will include a few chapters from

1. Ahmed, Ashfaque. Software Project Management: A Process-Driven Approach. In the **Books24x7** database.
2. Freeman, E. et al. Head First Design Patterns. In the **Safari** textbook database.
3. Sarcar, Vascaran. Java Design Patterns: A tour of 23 Gang of Four design patterns in Java. In the **Safari** textbook database.

Course Description

CS3733 is an undergraduate level introduction to software engineering. Students work on large teams utilizing contemporary software methodologies in the development of a real world application. The WPI catalog description for CS3733 is as follows:

“This course introduces the fundamental principles of software engineering. Modern software development techniques and life cycles are emphasized. Topics include requirements analysis and specification, analysis and design, architecture, implementation, testing and quality, configuration management, and project management. Students will be expected to complete a project that employs techniques from the topics studied. This course should be taken before any course requiring a large programming project.”

Note: Credit may NOT be earned for both this course and CS509.

Course Methodology

Lectures, demonstrations, class discussions, student presentations, readings and videos will be used to present the relevant material to the class. A series of individual assignments, team project assignments and a final exam will provide each student an opportunity to demonstrate competence in the application of software engineering concepts and tools. **Note that there will be a major time commitment of between 15 and 20 hours required outside of class in order to accommodate required readings, team meetings, homework and software application development.**

The final course grade will be based on the following components (shown with **tentative** weights):

- 25% Assignments
- 60% Team project components

Note: team members receive different grades depending on their contributions!

15% Final Exam

Each student will be asked to confidentially evaluate each team member twice, in mid-semester and at the time of delivering the final product. These evaluations are considered by the VP of Software Engineering (me) as one factor affecting each individual's team project grade together with the individual's total \$Work. For your course grade, if you do everything I ask at a satisfactory level of quality you will ensure a grade of a "B". To get a C (or worse) you would contribute poor quality work (or miss key milestones). NOTE: If you do not successfully contribute to a project team by writing Java code, you will not pass this course. To get an A you must demonstrate excellence in your project contributions, assignments and final exam.

Check your grades on Canvas for accuracy. Discrepancies have to be discussed with me **before the end of the course**. If life events are negatively affecting your ability to do course work – NOTIFY ME IMMEDIATELY. That way we may develop solutions early rather than have you appear negligent or lazy and avoid having your teammates hate you!

Business (Classroom) Etiquette

- Arrive on time.
- Do not leave while a meeting is in progress.
- If you must leave before a meeting is over, inform the chairperson in advance.
- Turn off your cell phone before the meeting begins unless your job requires it to be on at all times.
- Pay full attention to the discussion. Do not work on other tasks.
- Do not pack up your belongings until the meeting has been adjourned.

ETR 1100
ENGINEERING INNOVATION AND ENTREPRENEURSHIP
B-term 2015
Preliminary Syllabus

Instructor: Frank Hoy

Classroom: SL 105

Class Time: MR 8:00-9:50 AM

Office Hours: M 10:00-11:00, TW 4:00-5:00 PM, and by appointment

Course Description:

In the modern competitive and global world confronting today's engineers, innovation and entrepreneurship (I&E) are increasingly important perspectives for every engineering career. Individuals proficient in I&E are likely to possess unique competitive advantage over those who do not. This course develops the foundation for developing such proficiency by examining the functional roles of the business/commercial aspects of engineering disciplines as well as establishing a basis for innovative thinking. Specific cases where I&E have led to new products innovation and new enterprise development will supplement course materials.

Course Objectives:

At WPI, and many other educational institutions, students interested in innovation and entrepreneurship have an opportunity to engage these topics early in their studies. This course is designed to expose engineering students to the issues and solutions of identifying commercial issues of technology and then to develop the skills necessary to improve the probability of their success in moving the innovation solutions to the market. The centerpiece is the goal of improving a student's entrepreneurial mindset.

Entrepreneurship has a long history at WPI. The Institution has a legacy of fostering the creation of new products and enterprises. Today, WPI offers its students many opportunities to pursue interests in entrepreneurship. They include: Undergraduate Entrepreneurship Minor and Social Entrepreneurship Minor and Courses, Robert H. Grant Invention Awards, the Venture Forum, a wide variety of non-credit workshops, the Strage Innovation Award, the Kalenian Award to support and advance the ideas and innovativeness of WPI students, faculty and alumni(ae), the 3R Video Contest, the i3: Investing in Ideas with Impact Competition, and the Tech Advisors Network (TAN). These are all described in more detail on the Collaborative for Entrepreneurship & Innovation web site (www.wpi.edu/offices/cei.html).

WPI also has a legacy of educational innovations, agility, and risk taking. For example, over thirty years ago the WPI Plan introduced outcomes based education, centered on the dual emphasis of technical competency and integrative projects where students, usually working in teams, must tackle an open-ended problem. Revolutionary at the time, these concepts have now become mainstream and are, indeed, codified by ABET as minimum requirements for all engineering programs.

Countless committees, panels, and taskforces have pointed out that engineering education has to change to prepare students to work in a “flat”, global, competitive and connected world where knowledge is communal and collaborative skills are a commodity. Increasingly engineering challenges are both social and technical in their definition.

Engineering education is entering a new phase, with changes equally or more profound as those that occurred around the middle of the last century when the emphasis on the scientific foundations of engineering supplanted “hands on” practical training in a major way. This change has been referred to as the transition from educating “professional engineers” to a “scientific engineers”. The changes now imminent will lead to yet a new phase in engineering, one that we might call “entrepreneurial engineering.”

The entrepreneurial engineer must, of course, still be professional and scientific. But the entrepreneurial engineer must also be much more. The entrepreneurial engineer must understand the context of work; be able to see new needs and new opportunities; be able to sell ideas, secure resources and rally collaborative supporters, to work in a world where information is abundant and communal tools to accomplish everything are at one’s fingertips in an increasing global context.

The specific goals of the course are twofold. The first is to introduce a series of entrepreneurial skill sets in the format of a functional “tool box”. The second is to develop these concepts in a context of innovation and global competition. These two paths are inextricably linked to the probability of the success of any technological solutions and their commercial viability.

Requirements:

To survive in the highly competitive global economy, you must demonstrate a powerful work ethic. Failing to work long and hard goes hand-in-hand with failing in business. To succeed in this course requires meaningful and sustained effort. During this term, you are expected to accomplish the following:

1. Read the materials and submit reports assigned.
2. Read and review a book that can be related to innovation and entrepreneurship, subject to the approval of the instructor.
3. Participate in class discussions.
4. Attend two networking events relevant to entrepreneurship.
5. Contribute to team projects and presentations.

Half-hearted efforts on any of the above will be interpreted as an indication that you will expend half-hearted efforts in management or business ownership. Not a very good approach for success in career or life.

Textbook and Case Studies

Commercializing Innovation: Turning Technology Breakthroughs into Profits by Jerry Schaufeld, Apress, 2015.

Textbook reading assignments correspond to the case studies you will analyze. In one page, you will explain the interrelationship between the chapter from the text and the case assigned for the day.

Cases of entrepreneurial ventures that involve innovation, engineering and science are posted under Assignments on the ETR 1100 website on myWPI. As indicated in the previous paragraph, cases assigned for a particular class are intended to relate to a given chapter of the textbook. Of course, cases always encompass more than what is contained in a particular chapter. When we discuss the cases in the classroom, you can anticipate that we will assess them from a variety of angles. Entrepreneurs must grasp how everything they deal with on a daily basis relates to everything else in their adventures. Although your written assignment will focus on one chapter, you should be seeking for connections among all elements of the course, among all assignments, from the first day to the last.

Book Review:

Many books have been written about innovation and entrepreneurship. You should be thinking now and in the future of reading books that can assist in your career advancement and personal development. You are required to prepare a review of a book relevant to the subject matter of this course. You may select a book with the approval of the instructor, but each student must select a different book. The course incorporates creativity and innovativeness, so you are welcome to be creative in your selection. Fiction may be as appropriate as non-fiction. The review will be presented in writing, preferably electronically, not to exceed five pages. The review will consist of:

- A summary of the most critical elements of the book (30%); this should include the credentials of the author(s) for writing the book, and may include reports of how the book influenced others.
- An analysis of the content of the book relevant to the course material (60%). For example, how does the book compare and contrast to class lectures, to in-class exercises, to networking events, to team projects, etc.? Please take the grade percentage distribution seriously. Analysis weighs in twice as heavily as summary.
- An expression of opinion regarding the readability of the book and the contribution it makes or does not make to your learning objectives for this course (10%). Do you feel it will add to your success in business or life? Do you recommend it to others?

Networking Events and Course Materials

One of the behaviors documented to be closely associated with success in entrepreneurship is networking. Exchanging views and personal and professional information with others increases your likelihood of identifying opportunities, locating sources of financing, and recruiting and retaining talented team members. A wide range of out-of-class events can be acceptable for this assignment. These may include workshops, conferences, trade shows, etc. Although I will identify some networking activities that I feel are relevant to the course, students are encouraged to identify and propose events. Campus events are acceptable, but to qualify, event attendees/participants must include people who are not WPI students or employees.

Numerous URLs, articles, blogs, slide presentations, and other materials will be posted to the ETR 1100 website under Course Materials. Your requirement is to attend at least two networking events and to review the items posted under Course Materials that you feel offer value to you and submit a written report. The report will be a maximum of two pages. Your job is to explain how the networking event can be associated with at least two items posted under Course Materials. One class session will be canceled during D-term in exchange for your attendance at the networking events. Your report should contain:

- A brief summary of what the purpose of the event was,
- The nature of the networking you observed,
- Names and contact information for two individuals not affiliated with WPI to whom you introduced yourself, and
- How the event related to at least two Course Materials items.

Class Participation:

Effective entrepreneurs and business leaders are characterized by their skills in communication. They do not advance in their careers by passively waiting to be called upon. Classroom exchanges are useful tools for introspection by students, as well as being a means for assessing the knowledge you bring to the class by preparing ahead of time, and for determining what you are learning about the subject.

Attendance is valued in this course, just as it is in the workplace. Being absent from or late to class sends as negative a message to the instructor as it does to an employer, your customer, or your banker. You cannot make contributions to class discussions when you are not present.

Team Project:

Engineering and science innovations are occurring all across the WPI campus. You may be involved in some, perhaps creating intellectual property with faculty and other students as you work toward completing your degree. In this course, you will join a team of fellow students. They may or may not share your major. As a team, you will identify something innovative at WPI. Your assignment is to assess the commercial feasibility of the innovation and propose a strategy for taking the innovation to market.

Prospective innovations are readily accessible at WPI. There may be some research occurring that cannot be revealed in its current stage, so that must be avoided. You are likely to find innovations within the department in which you are majoring by asking faculty and staff for recommendations. WPI has an Office of Intellectual Property & Innovation. The director is Todd Keiller. Todd can provide information about patents that WPI faculty and students have obtained. You may find that there are commercial opportunities for some of those discoveries. Team reports will be presented orally and in writing at the conclusion of the term. The oral presentation will consist of an elevator pitch seeking to raise funds to launch the innovation. The pitch should be approximately five minutes long, not to exceed ten minutes. The final written report should be approximately ten pages long, not to exceed fifteen pages.

Few ventures with wealth creating potential are managed and grown by entrepreneurs acting alone. Even self-employed sole proprietors typically rely on family members, professional

advisors, alliances with customers or suppliers, or others. It would be highly unusual for members of a venture team to cooperate and agree on every aspect of introducing an innovation. Similarly, it is reasonable to expect disagreement among team members on the project. Just as with running your own firm or participating in project management, you are required to find solutions to disagreements and conflicts. A critical skill set that all WPI students should acquire as part of their educational program is how to work effectively as a member of a team. There will be peer evaluations at the end of the semester. The instructor reserves the right to raise or lower grades by a letter based on peer evaluations.

Grading Criteria:

Case and textbook reports	10%
Book review	20
Networking events and Course Materials reports	10
Team projects	
Elevator pitch	20
Commercialization plan	30
Class participation	10
Total	100%

Electronic submissions are preferred. The instructor will accept hard copies of assignments, but the turnaround of feedback will be slower. All written submissions will be typed with minimal errors in grammar and spelling. **Papers deemed unsatisfactory will be returned to students as unacceptable.**

Grades for assignments submitted late will be discounted by 10% per day.

Please refer to <http://www.wpi.edu/offices/policies.html> for institutional policies, including privacy, academic honesty, disability services, anti-harassment, grade appeal, and others. If you need course adaptations or accommodations because of a disability, or if you have medical information to share with me, please see me as soon as possible. Students with disabilities, who believe that they may need accommodations in this class, are encouraged to contact the Disability Services Office (DSO), to ensure that such accommodations are implemented in a timely fashion.

ETR 1100**ENGINEERING INNOVATION & ENTREPRENEURSHIP****B-term 2015**

Tentative Schedule

DATE	TEXT CHAPTER	CASE
10/29	Introduction to ETR 1100	
11/2	Chapters 1 & 2	Envirofit
11/5	Chapter 3	Opt-e-scrip
11/9	Chapter 4	Google
11/12	Chapter 5	Trikke Tech
11/16	Chapter 6	Proton Center
11/19	Chapter 7	Snappy Auctions
11/23	Chapter 8	WhitetracksDesign
11/30	Chapter 9	Niagara Paving
12/3	Chapter 10	Oyster Digital Media
12/7	Chapters 11 & 12	iconstruye
12/10	TBD	
12/14 & 12/17	Team Presentations	



Worcester Polytechnic Institute

School of Business

ETR 3633: Entrepreneurial Selling

Spring 2018, C Term

Monday & Thursday 2:00-3:50pm, Washburn 323

Preliminary Syllabus

Instructor: Frank Hoy

Course Description

Selling is a major part of business life, but it is especially important for those who are launching a new venture. They need to sell their business plan to potential investors. Later they need to sell their product or service to a customer. Ultimately they need to create an organization that is focused on meeting customer and other stakeholder needs through effective selling disciplines. This course will examine the elements of the sales cycle in terms of preparation, market research, prospecting, objection handling, closing, techniques for motivating the sales professional and formulation of strategy for the successful selling transaction. As part of the course students will be required to prepare individual sales presentations, one to secure investment for a new venture and one to sell a product or service to a customer. Guest speakers may be used on topics such as sales coaching, inside sales management, and to deliver sales effectiveness training.

Overview

The goal of the course is to improve the probability of the student's success in presenting a business concept (or plan) to management, investors, and stakeholders, and a product or service to customers. In addition, those students who will pursue careers in existing organizations will benefit from the processes and techniques presented in this course.

The style of the course is participatory and will include written and oral presentations designed for investors and customers. Case examples will be used and suggested models for analysis and presentation will be offered.

Learning objectives for the course include:

1. Acquiring the ability to communicate concisely in order to obtain desired action from an audience;
2. Demonstrating the skill of an active listener;
3. Developing strategies for negotiation;
4. Identifying conditions leading to win-win solutions; and

5. Grasping specific applications to entrepreneurship.

Why Take This Course?

In most business endeavors the ability to communicate ideas, project concepts, investment opportunities and customer value propositions is critically important. Equally important is to understand the dynamics of the presentation, as well as what factors influence successful outcomes. Entrepreneurial endeavors have two specific areas where the ability to communicate and understand the factors that influence successful outcomes. They include the financial presentations to investors and certainly later to customers as product and services are developed.

Access to Resources

Students are expected to have regular access to WPI e-mail and Canvas. Make sure you are reading e-mails sent to your WPI address. You are also expected to have access to all functions of Canvas, as well as to Gordon Library's online resources.

Gordon Library

Gordon Library <http://www.wpi.edu/+library/> is a valuable resource throughout your academic program. Librarians are available to help students select and locate appropriate sources, either one-on-one or in group consultations.

Writing Standards & Academic Honesty

All writing for this class is to adhere to standards expected of business professionals. While this is not normally a problem, many students violate rules for citing and referencing source material. However innocent this may be, it is still plagiarism. To report on your research you need to know the difference between a direct quotation and paraphrasing (both are appropriate but require citation), and between paraphrasing and plagiarism (the latter can lead to academic death). **A simple rule for plagiarism is not to use more than five (5) consecutive words from a source.** See the following for further explanations:

- Chicago Manual of Style <https://owl.english.purdue.edu/owl/resource/717/01/>
- Strunk & White <http://www.strunkandwhite.com>
- A Guide for Writing Research Papers <http://webster.commnet.edu/mla.htm>

WPI has an established academic honor code, described in The WPI Student Judicial Policies and Procedures. Please review the code and be aware that you are expected to abide fully by this code. To view WPI's Academic Honesty policy:

<http://www.wpi.edu/offices/policies/policy.html>

Individual assignments assume that all work submitted was prepared exclusively by you, unless explicitly stated and cited otherwise.

ETR 4930
GROWING AND MANAGING NEW VENTURES
D Term 2014
Preliminary Syllabus

Instructor: Frank Hoy

Classroom: Fuller Labs 320

Class Time: TF 2:00 – 3:50 pm

Office Hours: TF 1:00 – 1:50 pm, 4:00 – 5:00 pm and by appointment

Course Description:

One of the most troublesome aspects of entrepreneurship is running the business once it is started. This course focuses on techniques to grow the new venture and how to manage both the growth and operations. Considerable emphasis will be placed on expanding existing markets, finding new markets, anticipating the next generation of products, and managing cash flow. This course is the capstone course for both the Entrepreneurship Minor and the Management Minor.

Recommended background for this course consists of five of the following: ACC 1100, ACC 2101, BUS 1900, BUS 2950, ETR 3910, ETR 3920, MIS 3700, MKT 3600, OBC 2300, OIE 2850, OIE 3400.

Students may receive credit for only one of the following: MG 3960, MG 4930, or ETR 4930.

Course Objectives:

The purpose of a capstone course is both to add to your body of knowledge regarding holding a senior management position in your own or someone else's organization and to assess your ability to draw upon functional knowledge that you have obtained in order to make effective strategic decisions. This course places you in the role of the owner/entrepreneur or the manager/intrapreneur who is guiding a new venture into and through its growth stage. Regardless of your personal aspirations, there are certain learning objectives you should have for this course:

1. To develop strategies for the survival and growth of the new venture;
2. To identify and obtain resources to implement the strategies;
3. To hone skills for recognizing and overcoming crises and threats;
4. To prepare a venture team for opportunity identification and exploitation; and
5. To determine contingency plans for exiting the venture.

Each student's understanding of the course material and the ability to meet the learning objectives will be measured by written assignments, in-class discussions, exercises, team projects and presentations. Your learning will also be assessed by the quality of the team project and by your contributions measured by peer evaluation.

Requirements:

To survive in the highly competitive global economy, you must demonstrate a powerful work ethic. Failing to work long and hard goes hand-in-hand with failing in business. To succeed in this course requires meaningful and sustained effort. During this term, you are expected to accomplish the following:

6. Read the materials assigned.
7. Read and review a book that can be related to growing and managing a new venture, subject to the approval of the instructor.
8. Participate in class discussions.
9. Attend two networking events relevant to entrepreneurship.
10. Contribute to team projects and presentations.

Half-hearted efforts on any of the above will be interpreted as an indication that you will expend half-hearted efforts in management or business ownership. Not a very good approach for success in career or life.

Readings and Videos:

Numerous URLs, articles, blogs, slide presentations, and other materials will be posted to the course website on myWPI. You will be expected to review these materials. Five written assignments will be submitted. For each assignment, you will explain how two of the readings or videos relates to other parts of the course. The requirement is that you demonstrate how the various elements of the course are interrelated. For example, how does an article compare and contrast with comments of a guest speaker, or with a networking event you attend, or with the book you have selected to read, or with the project your team is working on, or something else from your learning experience in D-term? The written assignments should not exceed one page.

Book Review:

Many books have been written about new ventures and the men and women who create them. You should be thinking now and in the future of reading books that can assist in your career advancement and personal development. You are required to prepare a review of a book relevant to growing and managing new ventures. You may select a book with the approval of the instructor, but each student must select a different book. Growing an enterprise incorporates creativity and innovativeness, so you are welcome to be creative in your selection. Fiction may be as appropriate as non-fiction. The review will be presented in writing, preferably electronically, not to exceed five pages. The review will consist of:

- A summary of the most critical elements of the book (30%); this should include the credentials of the author(s) for writing the book, and may include reports of how the book influenced others.
- An analysis of the content of the book relevant to the course material (60%). This process parallels the criteria by which I assess your reading and video assignments. For example, how does the book compare and contrast to class lectures, to the Business Model Canvas, to in-class exercises, to business plans that you review, etc.? Please take the grade percentage distribution seriously. Analysis weighs in twice as heavily as summary.

- An expression of opinion regarding the readability of the book and the contribution it makes or does not make to your learning objectives for this course (10%). Do you feel it will add to your success in business or life? Do you recommend it to others?

Class Participation:

Effective entrepreneurs and business leaders are characterized by their skills in communication. They do not advance in their careers by passively waiting to be called upon. Classroom exchanges are useful tools for introspection by students, as well as being a means for assessing the knowledge you bring to the class by preparing ahead of time, and for determining what you are learning about the subject.

Attendance is valued in this course, just as it is in the workplace. Being absent from or late to class sends as negative a message to the instructor as it does to an employer, your customer, or your banker. You cannot make contributions to class discussions when you are not present. The instructor reserves the right to raise or lower a student's grade one letter based on the quality and quantity of the student's participation in class.

Networking Events:

One of the behaviors documented to be closely associated with success in entrepreneurship is networking. Exchanging views and personal and professional information with others increases your likelihood of identifying opportunities, locating sources of financing, and recruiting and retaining talented team members. A wide range of out-of-class events can be acceptable for this assignment. These may include workshops, conferences, trade shows, etc. Although I will identify some networking activities that I feel are relevant to the course, students are encouraged to identify and propose events. Campus events are acceptable, but to qualify, event attendees/participants must include people who are not WPI students or employees. Your requirement is to attend at least two networking events or activities for which you will submit a written report, maximum of two pages. One class session will be canceled during D-term in exchange for your attendance at the networking events. Your report should contain:

- A brief summary of what the purpose of the event was,
- The nature of the networking you observed,
- Names and contact information for two individuals not affiliated with WPI to whom you introduced yourself, and
- How the event related to ETR 4930, comparing and contrasting your observations with what you are learning through other components of the course (e.g. term project, reading assignments, classroom exercises, etc.).

Business Plan Analyses:

Many business courses taught at universities worldwide adopt the case learning method. It is likely that you have been required to read, analyze and report on case studies in other courses. For a course such as ETR 4930, business plans have been chosen as case equivalents because they represent the thinking and experiences encountered by real entrepreneurs as they wrestle with implementing their strategies in competitive environments. Business plans are available on the myWPI course website. Two business plan assignments will be prepared by collaborative efforts of your team. For one, your team will prepare a Business Model Canvas. For the other, your team will make an elevator pitch, seeking action from your audience.

Many entrepreneurs and investors contend that business plans are obsolete and have been replaced by business models. One of the most popular models is the Business Model Canvas, developed by Alexander Osterwalder and Yves Pigneur. The Canvas can be applied in visualizing the creation of a new venture, growing an existing venture, and in strategically managing ventures within larger organizations. Teams will prepare Canvases for one of the business plans posted on myWPI and for the team project. More information on the Canvas is accessible on myWPI.

Team Project:

The primary team project will involve opportunity identification, market analysis and marketing strategy. Students will form teams and work with WPI doctoral students or entrepreneurs who are developing commercially viable technologies and products. Each team will prepare business models and marketing plans. Teams will present Canvases representing their proposed business models and will submit marketing plans to the students and entrepreneurs. The marketing plans will address market entrance and growth by the proposed model.

Few ventures with wealth creating potential are managed and grown by entrepreneurs acting alone. Even self-employed sole proprietors typically rely on family members, professional advisors, alliances with customers or suppliers, or others. It would be highly unusual for members of a venture team to cooperate and agree on every aspect of managing a business. Similarly, it is reasonable to expect disagreement among team members on the project. Just as with running your own firm, you are required to find solutions to disagreements and conflicts. A critical skill set that all WPI students should acquire as part of their educational program is how to work effectively as a member of a team. There will be peer evaluations at the end of the semester. The instructor reserves the right to raise or lower grades by a letter based on peer evaluations.

Grading Criteria:

Reading and video assignments	10%
Book review	20
Networking events	10
Business plan canvas	5
Business plan elevator pitch	5
Team projects	
Canvas	15
Marketing plan	25
Class participation	10
Total	100%

Electronic submissions are preferred. The instructor will accept hard copies of assignments, but the turnaround of feedback will be slower. All written submissions will be typed with minimal errors in grammar and spelling. **Papers deemed unsatisfactory will be returned to students as unacceptable.**

Grades for assignments submitted late will be discounted by 10% per day.

Please refer to <http://www.wpi.edu/offices/policies.html> for institutional policies, including privacy, academic honesty, disability services, anti-harassment, grade appeal, and others. If you need course adaptations or accommodations because of a disability, or if you have medical

information to share with me, please see me as soon as possible. Students with disabilities, who believe that they may need accommodations in this class, are encouraged to contact the Disability Services Office (DSO), to ensure that such accommodations are implemented in a timely fashion.

**ETR 4930
GROWING AND MANAGING NEW VENTURES
D Term 2014**

Tentative Schedule

<u>Date</u>	<u>Assignment Due</u>
3/18	Course Introduction
3/21	Teams Formed Pitches by Entrepreneurs
3/25	Selection of Ventures by Teams
3/28	First Reading Assignment
4/1	Guest Speaker: David Audretsch, Indiana University
4/4	Business Plan Canvas
4/8	Second Networking Assignment
4/11	Second Reading Assignment
4/15	Guest Speaker; Third Reading Assignment
4/18	Business Plan Elevator Pitch
4/22	No class (Thursday schedule)
4/25	Fourth Reading Assignment
4/29	Book Review
5/2	Team Canvas Presentations
5/6	No class in exchange for attending networking events; Final Projects due

Appendix X: Developed Simulations

Note: *This appendix refers to the instructions for the simulations of US EE teaching methods we developed according to our research. The file for these simulations has been submitted along with the report [Attachment: FITC_Bster_IQP_Simulations]*

Specific experiential teaching methods were highlighted by U.S. EE professors as being extremely effective. Our sponsor can implement these methods in their software, as well as encourage institutions to perform similar activities in the classroom; overall improving classroom atmosphere, preparing students for real-world entrepreneurship, and developing presentation skills. We created a game simulating these methods, to better show the implementation of these methods through software.

Navigation: Use arrow key to navigate in the game. Press Z for starting the game and continuing through dialogue. Walk to talk with the professors in the garden to enter certain scenes.

Method 1: Speed Dating

Purpose:

The ‘speed dating’ teaching method is used on the first day of entrepreneurship classes as a way to facilitate introductions, foster a collaborative atmosphere, and generate business ideas.

Description:

Students move around the classroom, introducing themselves and coming up with a business they would start together based on common interests. Once each student has done this with every other student, the professor calls on a student. The called-on student goes to the front of the classroom, selecting a peer whose idea was their favorite, and pitches their prospective business. The professor continues to call on students until everyone has presented their idea with their partner.

Outcome:

Students learn impromptu networking skills in an uncomfortable environment, much like a real entrepreneur would face when pitching an idea at a conference. Moving around and talking to the entire class sets a cooperative tone to the class from the first day, making other collaborative methods more effective.

Method 2: Methodography

Purpose:

Methodography allows students to stress test an assumption about a potential business, ensuring it has a customer base and addresses a need.

Description:

Students make an assumption about something, e.g. assuming bicycle users all wear helmets, providing a consumer base for a helmet business. The professor then takes the class out into the field, where students objectively collect data, testing if that assumption is true. In the bicycle example, students may observe what percentage of users wear helmets.

Outcome:

By seeing if their assumption is true, students may conclude their business idea was based on a market that does not exist. Identifying a need and a customer are core components of a real-world entrepreneur, and this method allows students to develop these concepts.

Method 3: Process Analysis

Purpose:

Process Analysis helps students identify problems in everyday processes, and transforms them into business ideas.

Description:

In Process Analysis, students will carry out a particular task of their choice. Throughout the process of completing that task, they identify ‘hitches’ in the task that slow progress or are inefficient. The idea is that these hitches can be creatively solved through starting a business, and the more egregious the hitch, the more successful the business. It is highly likely other people have the same problems whilst completing the process, thus creating a customer base.

Outcome:

Students are given a clear path to ideating a business by finding a problem in an everyday activity. Similarly to Methodography, the ideation and identification of a customer are tackled in this teaching method. Although you cannot ‘give’ students business ideas, teaching methods like Process Analysis develop the ability for students to come up with their own.

Method 4: Entrepreneurial Crowdsourcing

Purpose:

Using Entrepreneurial Crowdsourcing as a teaching method creates a collaborative, competitive environment where students can solve a real-world problem for an established entrepreneur.

Description:

The professor brings in an actual entrepreneur with a problem they have been having with their startup. Following a short presentation from the entrepreneur, students break off into teams, brainstorming solutions and developing a plan. The entrepreneur and professor evaluate the solutions and class credit is awarded accordingly.

Outcome:

Students can see a real problem entrepreneurs face, establishing the problem as important to solve. The group aspect of this method encourages collaboration, and giving credit for the task also increases motivation to create the best solution.