

**AC 2009-135: RECENT DEVELOPMENTS IN THE HAROLD FRANK
ENGINEERING ENTREPRENEURSHIP INSTITUTE**

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Recent Developments in the Harold Frank Engineering Entrepreneurship Institute

Abstract

The Harold Frank Endowment supports three programs. The first is the Frank Fellows program that provides undergraduate engineering and business students with the tools and experiences needed to pursue entrepreneurial ideas. The one-year program consists of a summer program (on-campus introduction to entrepreneurship, one-week in the Silicon Valley and an internship) plus a sequence of two courses during the following academic year. The Silicon Valley program includes living in the homes of entrepreneurs and interviews with financiers, founders and CEO's. During the academic year, students participate in a course taught jointly by the Colleges of Business and Engineering and work on interdisciplinary teams to prepare both prototypes and business plans for their own entrepreneurial ideas. At end of the year each team competes in the WSU Business Plan Competition. The other parts of the program are an annual entrepreneurship workshop for graduate students and an elective course entitled, "Technology Ventures."

Introduction

In December of 2003 with funding from Mr. Harold Frank, a 1948 Electrical Engineering alumnus and founder of Applied Magnetics in Santa Barbara, CA, a trial program in engineering entrepreneurship was developed and offered to students of the College of Engineering and Architecture at Washington State University (WSU). Given its successful introduction, Mr. Frank decided to endow the Harold Frank Engineering Entrepreneurship Institute. It is now operated in conjunction with faculty within the WSU College of Business Entrepreneurship Program. Additional support has been provided from the College of Business entrepreneurship endowment, the Herbert B. Jones foundation (for development of the interdisciplinary senior project course), the NCIIA for support of senior level entrepreneurial projects and by smaller endowments provided by Lewis Lee and Larry McLean.

The Institute is governed by its director and an Advisory Board that consists of 10 alumni entrepreneurs located in the Silicon Valley area. Each year, this group assesses the program and makes suggestions for changes to its programs.

The **goal** of this program is to identify students who are interested in technological entrepreneurship and to give them the tools and experiences needed to pursue their entrepreneurial goals. A related criterion is that the student experiences should be realistic enough that they understand what it is like to actually start a business. While this goal is laudable, the program is determined just as much by its **constraints** as by its goal. The most important of these constraints are that:

- funding is limited,
- WSU is not located in an area known as a "hotbed" for entrepreneurship,
- the academic burden on heavily loaded students should not be increased substantially,
- students have different levels of interest in entrepreneurship.

It is well recognized that some students want a “hands on” experience with entrepreneurship. Others simply want to enroll in a traditional course. Finally, others have time only for a brief introduction to the field so that they can study further on their own as needed. Programs for each of these groups will be discussed in order. **More information** (including a short video) about each of these programs can be found at <http://www.cea.wsu.edu/entrepreneurship>

The Frank Fellows Program

History and Influences

The Frank Fellows Program is designed for students who want an intense, hands-on experience with technology entrepreneurship. To satisfy the constraint that engineering students not be burdened with additional coursework, much of the year long program takes place in the summer following the junior year. Originally, only engineering students were admitted and included in the summer program were a six-week introduction to entrepreneurship and a six week on-campus product design experience. In the following academic year the students continued to develop their projects through the existing senior design program. As in each subsequent year, this initial program was assessed by students, faculty and the advisory board. While this assessment indicated good results for some student projects, others were not as successful and the business emphasis was judged to be weak. Based on these observations, the program for the next year was changed. Business students were added, internships in industry were added, the summer program was more focused with short courses and most of the product development was pushed into the academic year. Each year this process was repeated and the program evolved into what it is today. Additional changes have been a more focused introduction to entrepreneurship, longer summer internships, a trip to the Silicon Valley with visits to small companies while living in the homes of entrepreneurs, financial institutions and entrepreneurial service industries, participation in a rigorous year long multidisciplinary project course taught jointly by engineering and business faculty and participation in the business plan competition. New ideas for the program came from a variety of sources. Local faculty had ideas and the advisory board has always made suggestions based on their observations and experiences. The Silicon Valley trip was strongly recommended and supported by the Advisory Board because of WSU’s constraint that it is located in a rural area with significantly less entrepreneurial activity than the Silicon Valley.

As with any academic program, the Frank Fellows program has also been influenced by interactions with programs at other academic institutions. More specifically, at least two academic programs have influenced the content and format of the Frank Fellows program. The first is the Hinman CEO’s program at the University of Maryland [1, 2]. Of specific interest was its living-learning community of entrepreneurs and the long term team based entrepreneurial projects on which the students worked. While the Frank Fellows program does not have a long term living-learning component, the students become quite close during the summer and work on the same teams for the entire academic year. The second influence was the Mayfield Fellows program of the Stanford Technology Ventures Program [3]. Of specific interest was the intense interactions between a small number of highly motivated students and both entrepreneurs and entrepreneurial service organizations. Many of these interactions have been incorporated into the Frank Fellows program.

Process and Program Content

In the Spring of their junior year, undergraduate engineering and business students are encouraged to apply for the Frank Fellows program. Applicants are judged based not only on their academic record, but also on their experience with and passion for entrepreneurship. The eight engineering students and four business students who are selected as “Frank Fellows” are given scholarship support to provide an incentive for the best students to participate.

The program begins immediately following the end of the academic year and begins with an intensive two week introduction to entrepreneurship. Topics included in this two week program are:

- “Nuts and Bolts” of starting a new company.
- Team building exercises using the WSU challenge course.
- Introduction to small company operations.
- Visit to a modern manufacturing facility.
- “Finance for Entrepreneurs” short course
- Technology transfer from research lab to private industry.
- “People Issues” seminar
- Etiquette lunch and networking event.
- Assistance from Government Agencies.
- Oral Communications “Boot Camp.”
- Interview with a patent attorney.
- Interviews with several entrepreneurs.

Following this introduction, the students are taken to the Silicon Valley. A central part of this experience is living in the homes of practicing entrepreneurs so that they can get to know them informally. Other experiences during this week in 2008 included:

- Evening reception with WSU alumni.
- Interview with Marketing VP of PlasticLogic.
- Interview with Investment Banking Executive.
- Visit to Tesla Motors and interview with its founder and CEO
- Venture Capital Discussion.
- Interview with Commercial Bankers who serve entrepreneurs.
- Visit to Proofpoint and interview with corporate attorney, CEO and engineering, sales, marketing and HR executives.
- Visit with Eleckta, North America CEO.
- Networking Barbecue.

Internship and Preparation for Academic Year

After the Following the Silicon Valley week each student participates in an internship. During the summer internship they are expected to identify ideas for products to be developed during the

academic year. At the end of this experience students are required to prepare a report that critiques the total summer experience and outlines their ideas for new products.

At the end of the summer, the students regroup on-campus during the week prior to their senior academic year. During that week they participate in a number of exercises designed to help them vet the ideas they have developed and to form teams around the ideas deemed most likely to result in successful companies.

Academic Year Program

During the following academic year, students participate in a year long course taught jointly by faculty from the Colleges of Business and Engineering. Students work on interdisciplinary teams to prepare both prototypes and business plans for their own entrepreneurial ideas. At the end of the year each team participates in the Business Plan Competition sponsored by the College of Business and judged by external referees. The first course, “Capstone Projects in Innovation and Entrepreneurship” (Entr 496) is a three credit, one semester course that can be used by engineering students as a general education course in the social sciences. Thus, it does not add to the total number of credits required for graduation. The second course, “Multidisciplinary Design” (Engr 421) is used by engineering students as a senior design course. Both courses are jointly taught by engineering and business faculty. Again, the program does not add to the number of credits required for graduation for engineering students.

The “Technology Ventures” Elective course

For students who would like to have an introduction to entrepreneurship in the normal classroom setting, the senior elective, “Technology Ventures” is taught. The course is taught by Dr. Donald Tilton, adjunct faculty member and founder of Spraycool. In this course, leadership is first defined and then applied to the problem of identifying and innovating new products and services that fill an emerging market need. Leverage is then applied in the form of creating intellectual property protection, and other barriers to entry to protect the enterprise from competition. Finally, the best formula for operating must be applied to achieve excellence across the board, in all areas critical to the function of the business. A significant part of the course consists of student team projects. Approximately 15 – 20 students enroll in this course each year.

The Graduate Faculty Workshop

This annual event is directed at graduate students and faculty whose research may result in intellectual property that may be commercialized. Its purpose is to provide these individuals with enough background that they will know how to start the process of transferring their research into viable products in the marketplace. It is presented by WSU faculty and staff and attorneys from the firm Wilson, Sonsini, Goodrich & Rosati. In its first year, the workshop was attended by approximately 80 graduate students and faculty.

Program/Course Innovations

- The program provides activities for those with different levels of commitment to studying about entrepreneurship. These include a one day workshop, a semester long course and a year long intensive program.
- The Frank Fellows Program operates completely within the existing engineering curriculum that is quite full. No new credits are added to the student's program
 - The business aspects of the program are covered in the summer on-campus program and in a course that can be used as an elective within the engineering curriculum. They are solidified by participation in the Business Plan Competition. Engineering aspects of entrepreneurship are reinforced by participation in the summer internship and the required Capstone Senior Design course.
 - Intensive targeted short courses tailored to engineering entrepreneurs are used as an alternative to additional required courses.
 - In the Oral Communications Boot Camp, students learn communication skills and practice giving an "elevator speech" and a board room presentation. Video taping, critiques by fellow students and faculty and repetition are used to reinforce principles.
- Frank Fellows live in the homes of entrepreneurs for one week and have a chance to interact informally with them.
- Over the year, Frank Fellows will participate in interviews with approximately 15 entrepreneurs, venture capitalists and/or attorneys. The feedback from our students has consistently indicated that this part of the program makes the strongest impression on them.
- The graduate/faculty workshop is designed for busy faculty and graduate students who do not have time to enroll in a course on entrepreneurship, but are willing to invest one day to be introduced to enough information to allow them to ask the right questions and know who to contact about commercializing their ideas.

Program Assessment

Frank Fellows Program

There are several legitimate methods by which an academic engineering entrepreneurship program such as the Harold Frank Engineering Entrepreneurship Program can be assessed. Relevant questions include:

- Are the needs of the participants being met (i.e., are they satisfied with the program)?
- Are there measurable program outputs and have these improved over time?
- Does an external body of experts believe that the program is working well?
- Have changes been made to the program based on assessments?

- Can the impact of improvements be measured using successive assessments (i.e., closing the loop?)

All of these are, of course, related. To the extent possible, each will be discussed separately in the following paragraphs, but they will necessarily be some mixed of the topics.

The 2008-2009 Frank Fellows rated each activity during the summer program and gave average grades of between 6.4/10.0 to 9.7/10.0. In addition, they provided specific comments on each activity. Activities that are ranked low are scrutinized carefully and written comments examined. For example, it was discovered that the activity “an introduction to small business operations,” was longer than necessary and contained information that was difficult for non-specialists to understand. This activity was shortened and some of the more technical material eliminated. Another early activity was a summer session marketing class taught by the business school. This was eliminated (and replaced with targeted marketing experiences) because the course was oriented toward large established businesses rather than start-up companies. Likewise, activities that were highly rated were retained. One example is the interview with an engineering alumnus who is now a patent attorney. This has consistently been rated high by participants. Many other examples could be given. As mentioned earlier, of more value than the rating numbers are the written comments about different parts of the program. These data together with discussions between Harold Frank staff and the Advisory Board were used to either eliminate portions of the program or to modify them extensively. Thus, the program is being continuously evaluated and improved.

The entire Frank Fellows program is submitted annually to the Advisory Board for feedback. These individuals all either are or have been active entrepreneurs and hence considered “experts.” Suggestions from them have included the establishment of the “People Issues” activity since more companies fail due to conflicts among principal employees than for any other reason. Board members also reflected on the projects selected by students and started a long discussion about what constitutes an acceptable project for entrepreneurship students. They also suggested that an activity with a corporate attorney in the Silicon Valley program be included (and they provided one for the students to interview). Finally, and perhaps somewhat surprisingly, Advisory Board members stressed the need for a discussion of ethics and pointed out how leadership can easily be compromised if company leaders do not treat their employees with respect or are less than forthcoming with data about company performance.

An alumni group of Frank Fellows has been formed and a program has begun to solicit suggestions from these people because they have been able to reexamine the Frank Fellows program in light of their real world experiences. While the data we have received are not yet systematic, a few comments about the program are appropriate here. One is, “my experience with the Frank Fellows Program allowed me to jump into the business and managerial aspect of the company much sooner than others in my first role within _____. I can talk business plans, marketing, etc. with confidence and without hesitation. The Frank Fellows Program helped make me realize that I get paid to make decisions and to speak with authority.”

One specific measurable output of the program is the number and success of companies started by students in the program. While it has always been the intention to have students start

companies, there were no successful attempts to start companies near the beginning of the program. However, as time went on the summer program improved and the structure of the academic year course was more encouraging to the development of new companies. As a result, more attempts were made to start companies and those that went beyond concept were able to succeed better than those previously tried. Several examples follow.

In 2005 – 2006, the BERZ Design Team that included two Frank Fellows developed an inexpensive, lightweight, user-controlled height-adjusting manual wheelchair. This team finished fourth of 46 teams entered into the 2006 *S.E.E.D.* Collegiate Venture Forum in Santa Barbara, CA despite the fact that they were the only team of undergraduates in the competition. A company was formed around this idea and still exists but is not active at the moment.

In 2006- 2007, two student teams that included Frank Fellows finished first and second respectively (out of 12 undergraduate teams) in the 2007 WSU Business Plan competition. One team developed an advanced backpacking system and the other developed a robotic calf for training of calf ropers. Neither team followed through and established a company.

In 2007-2008, one student team that included several Frank Fellows finished second (out of 12 undergraduate teams) in the WSU 2008 Business Plan competition. This team has now started the non-profit business “Developing World Technologies” to develop and facilitate the distribution of culturally relevant, life-changing technologies in developing countries. The group has focused on designing human-powered irrigation pumps for farmers in developing countries with the idea of increasing farming productivity. Their product, the WaterCycle, is a bicycle-powered irrigation pump that is easy-to-use, durable, affordable, and easily transported. More information can be found in [4]. This team is one of 15 teams that was invited to participate in the NCIIA/Lemelson Foundation March Madness for the Mind event held in March 2009 at the Smithsonian National Museum of American History in Washington DC.

In 2008-2009, one student team of 2008-2009 Harold Frank Engineering Internship students has already formed the business “EcoWell” to address the problem of discarded non-refillable water bottles. They propose to do this by developing a network for distributing filtered water to refillable water bottles using vending machines actuated by RFID tags and a subscription service. The intellectual property of the company is now protected and company is incorporated and has received initial funding. More information about this business (under its predecessor name “Terraware”) can be found in [5].

Overall, the trend of evaluations of the Frank Fellows Program with time is positive. It is believed that this is an indication of increasing satisfaction with the program by its participants and the advisory board.

Technology Ventures Course

The Technology Ventures course is assessed through the normal on-line course evaluation system organized by the CEA. The average of all responses was 4.5/5.0, a result that is significantly greater than the average course rating for courses in the College of engineering and Architecture (i.e., approximately 4.1/5.0). This constitutes a strong recommended by

participants. A typical written comment was, “I was amazingly pleased that this course was offered: engineering students really need to know these things, and I’d like to see further collaboration with business owners and students in the future.”

Graduate Workshop

With approximately half of its participants responding, the overall evaluation of the graduate student faculty workshop was 9.1/10.0. Based on this (and more detailed assessment of individual parts of the workshop) it was decided that the program should be repeated.

References

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