A Course Developed to Teach Entrepreneurship for High Technology Ventures
Marsha Wender Timmerman
La Salle University

ABSTRACT
Many entrepreneurship courses do an excellent job of teaching students the mechanics of creating their own businesses and provide them with the basics to get started. Where courses fall short is in encouraging students to be innovative, creative, and to think outside the box. The Integrated Science, Business and Technology department at La Salle University created an entrepreneurship course entitled Entrepreneurship and High Technology Business. The goal of this course is to assist students in creating technology-intensive businesses. Students select their own ideas; all concepts must be making something new or significantly modifying something that currently exists. Technology must be included in the product idea, manufacturing, and/or sales and marketing. The strength of this course is that students do become very innovative and inventive; some very creative ideas have been conceived. The weakness is that sometimes the students do not have the expertise to make their ideas a reality.

Introduction
Educating and encouraging the entrepreneurs of tomorrow are goals shared by most colleges and universities. Formal programs in entrepreneurship have increased from 104 in 1975 to over 500 in 2006 (Kauffman 2008). The most common entrepreneurship class is offered by business schools/departments. These courses focus on the business aspects of entrepreneurship such as financing, accounting, management, sales, and marketing. While these topics are all critical to the success of an entrepreneurial venture, they are highly focused toward business students; they speak the language of business and often require business courses as prerequisites. Recent studies have shown that successful entrepreneurship programs and courses must be designed to meet the target audience at each institution.

The Kauffman report, “Entrepreneurship in American Higher Education” (2008), emphasizes that “the diversity of institution types and educational missions of American colleges and universities make a single approach to entrepreneurship both unrealistic and inauthentic.” This report goes on to define entrepreneurship as “the transformation of an innovation into a sustainable enterprise that generates value.” It is clear from this definition that entrepreneurship classes must be interdisciplinary, combining knowledge on the nature of the innovation (non-business disciplines) with basic business know-how. These interdisciplinary courses are very appropriate for science and technology students. These are the student inventors and innovators who are constantly dreaming of new products and technology. These students are focused on technology creation, not the nuts and bolts of running a start-up.

The promise and the problem of these students are summarized in a statement prepared by Stanford University (n.d.) entitled “Teaching Entrepreneurship to Engineering and Science Students: Selected Quotes from Experienced
Educators at Stanford University's Stanford Technology Ventures Program (STVP).” These students need an interdisciplinary entrepreneurship class, one that speaks a language they understand, that helps them determine the best way to reduce their ideas to practice and teaches them that without business their technologies/inventions will not move beyond their laboratories/garages. There is no doubt that for a student to be a successful entrepreneur he/she will need to have a basic understanding of business; they need to know how to make good businesses decisions. The interdisciplinary course designed for these students must be a hybrid, teaching technology development as well as basic business. The emphasis, however, needs to be on the technology, as that is the factor that is most important to these soon-to-be entrepreneurs. Desai, Ding, and Fedder (2010) discuss the value of a dialectical approach as a means for creating a dynamic learning environment in which pharmacy students can exploit their professional expertise while developing competence in business planning.

The Integrated Science, Business and Technology department at La Salle University set out to design such a course. The course is entitled Entrepreneurship and High Technology Business (La Salle University n.d.). This is a 3-credit course offered within the School of Arts and Sciences. It is open to all students; there is one prerequisite, but the instructor can waive that requirement if the student is really interested in the course. The specific objectives of this course are:

- To guide a student through the process from idea recognition to reduction to practice.
- To teach students what intellectual property is and the best ways to protect it.
- To teach students basic business concepts that will enable them to make good business decisions.
- To help students understand organizational structures that will allow them to be the leaders of their ventures while surrounding themselves with individuals whose strengths complement their weaknesses.
- To provide students with a road map that enables them to start their own ventures.

Hopefully, mastering of these objectives will encourage and enable students to develop their ideas and start new ventures. This course has been taught at La Salle since 2002. It is taught on an every other year cycle; the course has so far been offered five times.

**Course Content**

Entrepreneurship and High Technology Business is a 3-credit course that meets twice per week with two 75-minute sessions. Table 1 presents the topics that are covered in this course. While this list includes some standard business course topics, the goal is to present those topics from the perspective of the technologist. For example, the financial spreadsheets need to include what it will cost to complete research, development, and manufacturing of something that has never been made before. In addition, the financial statements need to address how the company will survive for two or more years with no anticipated sales revenue. Every effort is made to have these topics
presented by entrepreneurs or other professionals who have firsthand experience with the subject matter.

Table 1. Class Discussion Topics

- Introduction to Entrepreneurship
- Confidentiality Agreements
- Entrepreneur Profiles
- Innovation
- Idea Recognition
- Feasibility of Idea
- Idea Reduction to Practice
- Product Development
- Competing Technologies
- Intellectual Property
- Corporate Entities
- Business Plans
- Marketing of New Products
- Competition
- The Team
- Financing the Startup Venture
- Cash Flow Statements
- Profit and Loss Statements
- Balance Sheets
- Ethics
- Operations
- Government Regulations
- Managing Growth

Introduction to Entrepreneurship

This discussion focuses on many of the highly successful, well known technology companies that students will recognize. The history of each company is briefly presented and discussion about its founder is encouraged. Every effort is made to show the diversity of companies and founders that exist in the world today. In order to balance the discussion, a few early stage companies are also discussed, as well as companies that did not succeed.

Being an entrepreneur is a life-changing event. Entrepreneurs willingly make a lot of sacrifices in order to get their businesses to succeed. The sacrifices include money, time, family, and lifestyle. Most entrepreneurs think these sacrifices are necessary in order to meet the many challenges they face; they will do whatever is in their power to make the venture succeed.

Confidentiality Agreements

Confidentiality is a difficult thing to address in this class. Each student believes that their ideas are worth billions and that the mere mention of them
in class will enable everyone to steal them. At the beginning of each semester, the instructor makes several presentations regarding what can be protected and what cannot. The instructor emphasizes that what is valuable is what you do to make the idea a reality; a good idea that has not been reduced to practice does not have much value.

The instructor explains to the class that they will be asked to sign a confidentiality agreement between themselves as individuals and as a class. The agreement states that anything said in the classroom belongs to the person who said it. No one is allowed to repeat any ideas or to pursue any ideas not suggested by them, unless they get permission from the person who presented the idea. This agreement binds the instructor as well as the students. To date, no one has refused to sign the agreement.

A standard two-page confidentiality agreement is used. Line by line review of the agreement ensures that everyone knows what they are signing. This review introduces students to confidentiality agreement use, content, and enforceability. Students are told that they will be signing many such agreements as their businesses grow.

**Entrepreneur Profiles**

Students have a real curiosity about what it takes to be an entrepreneur. The issue of born versus educated entrepreneurs is discussed at length. The instructor promotes the concept that anyone who has the desire, willpower, and tenacity to see a project through can be an entrepreneur. However, to increase the chances of success, the entrepreneur should have extensive experience in the technology/industry in which the new business will operate. Audia and Rider (2005) assert that the successful entrepreneur is a social being. Prior experience in related businesses gives the entrepreneur the confidence, network, know-how, and insights to better understand their operations, marketing, and business climate (Audia and Rider 2005).

During this section, students make oral presentations describing entrepreneurs. They are told to present one well-known entrepreneur and one from their family and/or community. It is important that the student be able to personally identify with an entrepreneur. At this time, a few early-stage entrepreneurs make presentations to the class, describing their businesses, prior experience, trials and tribulations, and successes and failures.

**Innovation**

Innovation requires being willing to take a new look at the world around and envisage how it could be different. Students are told to be creative and think outside the box. Different ways to brainstorm and exercises to encourage effective idea exchange are discussed and practiced. Everyone is reminded that there are no bad ideas and that many successful ventures started with ideas that were dismissed by many. They are also reminded to keep their ideas and solutions simple; the more complicated the solution is, the greater the chance of failure.

**Idea Recognition**

Idea recognition is the heart of the high technology enterprise and the basis for what will be produced and sold. The idea is what starts the process. The class discusses how to recognize ideas, where to look for ideas, and how to
prevent ideas from getting lost. Many ideas are the direct result of problem-solving. Students are told to think about things that really annoy them and what they would do to remove those annoyances. They are encouraged to speak with friends and family to find problems that those groups feel need solving. In addition, the students are also encouraged to look at populations that have difficulties (e.g., the elderly, the disabled, the disadvantaged). These groups have many unmet needs, any one of which could be the basis for a new product.

**Feasibility of Idea**
In this part of the course, the instructor reinforces the concept that an idea alone cannot make a company. The students brainstorm on the ways to technically determine the feasibility of their ideas. In addition, they are introduced to the concept of marketing and customers. These are technical students, and the role the customer plays in a business is a new concept to them. The instructor emphasizes that the platitude “build it and they will come” does not work in real-world business.

**Idea Reduction to Practice**
Having an exciting idea is only the beginning of the effort. Reducing the idea to a functional product is hard work and can follow a tortuous path. Students are taught that reduction to practice is where the real value lies. The students study several products and determine what needed to be done in order to get that product to market.

**Product Development**
Students need to be taught that the potential product needs to be manufacturable. Many good ideas get lost because they cannot be manufactured at a reasonable cost or with reasonable effort. Students are introduced to the concepts of product specifications and standard operating procedures. Often it is the experience that the entrepreneur has gained in previous ventures that gives them the knowledge to find a successful way to manufacture.

**Competing Technologies**
It is imperative that the entrepreneur has a sense of what is going on in their industry. Knowing what the competition’s next breakthrough is allows an entrepreneur to anticipate and position their product to effectively compete. Understanding the technology landscape will ensure that the company’s product remains a viable option for a long time to come. Developing a product that will be obsolete shortly after its introduction is a waste of time and resources.

**Intellectual Property**
The instructor returns to the subject of intellectual property about halfway through the class, because by this time the students have their ideas fleshed out sufficiently to determine whether there is any intellectual property and what would be the best way to protect it. This session is always presented by an intellectual property attorney. Those students with ideas they want to pursue often consult this attorney for help with their intellectual property needs.

**Corporate Entities**
As a group, these students are usually completely ignorant about the concept of corporate entities. A local business attorney makes this presentation.
Meeting a corporate attorney, hearing the language they speak, and understanding when an attorney is necessary are all very valuable experiences for the students. Because this is such a new topic for them, it is necessary for the instructor to reinforce the attorney's presentation in subsequent classes.

**Business Plans**
The form and substance of the business plan is presented fairly early in the course to get the students to start writing it. A standard business plan outline is used. Emphasis is placed on the content of the business plan, not its structure. Students are required to submit a complete business plan in lieu of a final. The hope is that as each area of the business plan is discussed in class, the students will begin to draft that section. Students are advised not to write their business plan the last week of the semester.

**Marketing of New Products**
High technology students with original ideas usually believe that everyone will love their ideas and the product will fly off the shelves. Marketing is another of those concepts that is poorly understood by these students. Class time is spent talking about the marketing they are familiar with in their daily lives, and they discuss why they select what they buy. The discussion progresses to asking who the customers for their ideas are and what the best way to target those customers would be. A marketing expert is usually called in to present on the topic. In addition, students need to think about how to introduce a product that does not exist. They are reminded that if they don't about or understand the product, consumers certainly will not feel like they must purchase it. New products have the advantage of cornering the market, but they have the very uphill battle of convincing their customers that the product is necessary.

**Competition**
This is another of the concepts that must be presented at a basic level. These students think of their product ideas as new and innovative and do not see any competitive products interfering with their company's potential success. The class discusses all the components of competition and brainstorms effective ways to compete.

**The Team**
Students are shown all the different skill sets necessary for a successful venture. It is pointed out that two sets of advisors will be necessary, the technology experts and the business experts. Time is also spent discussing ways to compensate these advisors; money is usually scarce at this stage in the company. Advisors can be receptive to different types of compensation such as equity, deferred compensation, or bartering.

Students are reminded that no one, regardless of how bright they are, will be an expert in all the necessary tasks. Students are encouraged to build a team with people who have strengths that complement their weaknesses. They need to analyze themselves carefully to determine which complementary skills would be most needed to make them successful.

Students are also reminded to include team members to do those functions that the student does not enjoy. Entrepreneurs work long hours doing many things, and they are least productive when doing things they dislike. This
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course gives students the option of working alone or in teams. This is often the time when teams are formed; students with different skill sets and interests, either technical or business, join together to form effective groups.

Financing the Startup Venture
Very few startups have the funds to take their company to profitability. Most high technology companies need to go through an extensive research and development phase before they can contemplate producing and selling a product. This translates into a significant period of time with no anticipated revenue. Significant funds must be raised for the company to survive the startup period. The class discusses the different means of raising capital and the strengths and weaknesses of each method. The instructor also emphasizes the sacrifices and risk that the company founders are expected to make in order for the investors to feel that the risk is being shared equally. Students are told that most companies fail due to undercapitalization.

Cash Flow Statements, Profit and Loss Statements, and Balance Sheets
This portion of the course focuses on money and the controls that are necessary to understand how much cash is needed, how the money will be spent, and how to make the company profitable. As most of the students are non-business majors, the class focuses only on cash flow, profit and loss, and balance sheets. It takes the students a while to learn and understand these pro forma and to see the benefit they offer the entrepreneur. The instructor usually provides the students with an Excel template that feeds data into each of the pro forma, using the profit and loss as the main data entry point.

Ethics
In today's business climate, no one can teach any type of business course without including discussion of the role of ethics in business. The instructor emphasizes that in an early-stage venture, the ethics and reputation of the business are a direct reflection of the founder. The discussion includes difficult dilemmas that all entrepreneurs face; the students are asked how they would resolve the different issues.

Government Regulations
Many of the technologies utilized in high technology companies are tightly regulated by state and local authorities. Anticipating the regulation process and preparing for it will save the entrepreneur time, money, and anxiety. As an example, the class discusses what is involved in having a product cleared through the FDA. Students are made aware that sales are not permitted until clearance is obtained. In addition, the discussion includes the ongoing surveillance required for products cleared by the FDA. Companies found to be out of compliance can be fined and, in a worst case scenario, shut down.

Operations
The class does not spend much time discussing operations, as most of the students will not be at that juncture for a significant period of time. But it is important for the students to be aware of what is ahead and the types of skill sets they will need to manage operations.
Managing Growth

The growth of the venture, while very exciting, can also be very trying. Many companies fail because they fall into the traps of growth. The class discusses the concepts presented in Crossing the Chasm (Moore 2002) and why it is difficult to predict and prepare for growth. Strategies are discussed that can allow for a company’s steady growth while giving maximum flexibility.

Course Administration

Grading

Students are primarily graded on their business plan and the strength of the business ideas they propose. To this end, they are required to turn in a completed business plan (in lieu of a final) and make a ten-minute presentation to “potential investors.” Early in the semester, students are required to present their preliminary ideas to the class. As the semester progresses, students are required to discuss how each of the concepts presented affects their specific ideas. The business plan, presentation, and class discussions are worth 65% of their grade. Students working in teams are told that the quality and quantity of their work should be in proportion to the number of people working on the team.

There is also a mid-term take home exam that assesses students’ knowledge of the concepts being presented. The midterm is worth 25% of their grade. The remaining 10% is used to assess student participation in class, as well as attendance.

Textbooks

Several different textbooks have been used for this course. No one book has been totally appropriate. The text has been used more as a reference rather than a direct instructional tool.

One semester, the instructor did not use a text but rather required that students subscribe to the Wall Street Journal and follow what was happening in the entrepreneurial world via the news media. This approach added a lot of discussion, but did not add to the overall goal of helping students learn how to start their own entities.

Results and Discussion

To date, approximately 125 students have taken the Entrepreneurship and High Technology Business course. These students fall into two groups: those who have real ideas and are seriously interested in starting a venture and those that are curious about entrepreneurship and want to learn more. All students are told that the overall purpose of this course is to plant the seeds of entrepreneurship. Students may start their ventures immediately, or in 40 years. The hope is that they will continue to consider entrepreneurship a viable option.

No formal assessment of student outcomes has been done. The course will be taught again in spring 2013. The author hopes to set up an assessment for that class and those taught in the future. The assessment will measure student knowledge, entrepreneurial plans for the future, and where students go immediately after graduation and five years hence.
The expert speakers enjoy contributing to the course. There has been no problem finding speakers. As many as one-third of the lectures are presented by outside experts. None of these people want or expect compensation and are often willing to work for pizza.

A wide variety of ideas and products have been proposed. The most popular areas have been biotechnology and healthcare and information technology hardware and software. One surprising outcome is that students choose ideas or products about which they do not have any expertise. They view the ideas as their personal property and are further reticent to bring in a partner with the appropriate expertise. They believe they can outsource the development and that the person who does the work would accept only payment for their work. This issue needs to be addressed more specifically within the context of the course.

Many students have expressed interest in filing for appropriate intellectual property protection. Some students have gone so far as to meet with the patent attorney who spoke to the class. It is not known if any students have made actual filings. Patent filings would be an indicator of taking a novel idea to the next stage of development.

To date, no one taking the course has actually started an entity to develop their ideas further. This is most likely due to the nature of the students in the course. All are young adults, most from working class families where there is a need to get a job to support themselves. Most of the students claim not to have abandoned their ideas but rather put them on hold until they are more established.

La Salle has recently established a Center for Entrepreneurship within our School of Business Administration. Students who are serious about their ideas have been referred to the center, where they are receiving additional encouragement to move ahead with their ventures.

The course remains fun to teach and requires the instructor to be able to research varied topics to help the students plan their ideas. It is extremely important to have a wide network of experts who can assist the students in obtaining the information they require. One advantage at La Salle is the large and very friendly alumni network. The alums are very interested in working with current students and appreciate the entrepreneurial spirit of these students.

While there has been no IRB-approved assessment of this course, La Salle University requires that all students complete an end of semester evaluation that assesses the course and instructor. These assessments have been good, with most students saying the course met or exceeded their needs, was helpful, and that they would recommend the course to other students. They appreciate the design of the course and especially like the guest speakers.
References


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