

Entrepreneurs in Action!:

A Problem-Based Learning Environment for Engineering Entrepreneurship

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Abstract

*The objective of this paper is to describe a model called **Entrepreneurs in Action!** that teaches engineering students to make the connection between their education and daily life. The model further describes a system of infusing entrepreneurship into multiple disciplines across multiple universities. Using the curricular design principles of whole-part-whole learning, just-in-time teaching and a recursive design, the program achieves its goal of encouraging students to think more like an entrepreneur, which we believe will in turn lead to more entrepreneurial ventures. The session will describe the development of on-line engineering and business related cases and the results of field testing the cases at several universities including Vanderbilt University, Tennessee Technological University, Francis Marion University, Tennessee Wesleyan College and Anderson College.*

Introduction

Many of the more aggressive colleges/universities across the country are engaging in some form of coursework and/or experiences related to entrepreneurship education. Many of these efforts can be found either in the School of Business or in the School of Engineering (McMullan & Gillin, 2001). Some schools offer one course in Entrepreneurship in order to acquaint students with the general field of entrepreneurship. Other schools may offer one or two more courses to further enhance the student's understanding of entrepreneurship. Still other colleges and universities offer a complete four-year degree program and/or masters or doctorate. Still, the vast majority of schools offer little or nothing to teach students about self-employment, creative thinking, and the process of generating new and creative ideas for opportunity development. (Clouse, R. W., 2002).

There are at least two general underlying assumptions about entrepreneurship education. Some schools assume that entrepreneurship cannot be taught. To them, it is an

inborn skill that is derived from your gene base. In these types of schools, students appear to be already either starting a company or have entrepreneurship tendencies. These schools emphasize how to develop a business venture and seek venture capitalists for funding. Corporate buy-outs are also an important feature of this approach. Generally speaking, some of these programs teach more about how to manage and develop a corporate environment than they do to seek new and different opportunities. Usually, these programs are single discipline focused. (Clouse, R. W. & Goodin, T. L., 2001).

In programs associated with schools of engineering, students are more frequently involved in innovation than they are in true entrepreneurship. The schools of engineering are usually great at teaching the technical concepts related to disciplines but frequently do not have courses that cut across technical subject areas, thus combining multiple subjects simultaneously. While there is a trend among schools of engineering to introduce entrepreneurship into the curriculum, it is usually taught as an entity within itself and does not involve cross-disciplinary activities.

Our approach involves the development of cases that are tied to either the local community or of national concern. Cases are usually written for a certain group of students at Universities that are in the *Entrepreneurs in Action!* network. Other classes and Universities are encouraged to use the cases after they have been fully developed and tested. We have developed the following cases to be used in Engineering and Business related curricular:

Featured Cases

1. Blackout in America! (Electrical Energy Case)
This case is about the great electrical energy blackout that began in the Midwest and continued to the Eastern US several months ago. This case encourages students to think about new alternatives to electrical power.
2. A Question of Power (Oil Related Case)
This case is associated with the oil industry and provides the student with the opportunity to investigate new business ventures related to other sources of energy.
3. Chasing the Dragon (Drug Related Case)
This case is about the problems associated with the increase in the number of methamphetamine labs in Tennessee. The production of such toxic illegal drugs has created a major social, political and economic problem across our country.
4. Not in My Backyard! (Recycling Case)
The United States is a “throw away society.” This case is about recycling and the many social and economic issues related to this problem.
5. Music City Blues (Music Case)
This is a case about the music business. How does one write lyrics and find a means to support himself or herself?

6. Talking to the Air (Wireless Technology Case)
This is a wireless technology case involving the opportunity to develop a wireless downtown community in a small town.
7. The Santa Fe Effect (Small Town Redevelopment)
This is a case designed around the rejuvenation of small downtown areas.
8. The Phoenix (Cyber Café Case)
This case is written to encourage students to develop a cyber café with a cross-disciplinary learning environment that could be the place where great ideas germinate and move into business ventures.
9. Long Lines, Short Tempers (Homeland Security)
This case is written for Engineering design classes interested in small device designs for homeland security and terrorist prevention.

These cases are written about issues of concern to college age students and tie into modern day living. These cases take about 4 to 6 weeks to complete and are part of on-going class instruction. Students are required to apply the contents of their class to the case, thus infusing entrepreneurship directly in to the class. In some learning environments, multiply classes are using the same case and collaborating with each other. (Clouse, R.W. & Goodin T.L., 2005) and (Clouse, R. W. & Goodin, T. L., 2001).

The second approach is centered on the general concept that all students can learn and to some extent, be creative and entrepreneurial. The focus of this approach is to be broad based, to take a cross-disciplinary approach, to be focused on seeing opportunities that others do not see and to stress self-fulfillment. The general theme is to create a job and not take a job. Much of our academic learning is based on a system of compliance and heavy structure. Thus, there is very little room for creative thinking and entrepreneurial development in this kind of structured learning environment. It is our assumption that students can be encouraged to think creatively and entrepreneurially in a cross-disciplinary, problem-based learning environment. Researchers at Vanderbilt University (VU), Tennessee Technological University (TTU), Tennessee Wesleyan College (TWC), Francis Marion University (FMU), and Anderson College (AC) are engaged in a research project to develop a cross-disciplinary, cross-university on-line learning environment to teach and encourage multiple learning across multiple subject areas. This model program will use the principles of the *Entrepreneurs in Action!* research project as its theoretical framework. (Clouse, R.W. & Goodin T.L., 2004).

Entrepreneurs in Action! Model

A team of researchers has been working at Vanderbilt University on a teaching strategy called *Entrepreneurs in Action!*. The overriding assumption in this research has

been that students in all disciplines can think creatively and entrepreneurially if given the opportunity to do so and if the concepts and ideas are hooked (connected) to their framework of learning. Therefore, the whole-part-whole teaching model has been researched and developed, and the program has been implemented in selected sites across the country including Schenectady, NY, Mandeville, LA, Los Lunas, NM, Hendersonville, TN, Murfreesboro, TN, and at Vanderbilt University in Nashville, TN. The approach involves identifying unique and different opportunities of interest to students in a local community and to teach students how to take that opportunity and develop it into a business venture. The process involves a cross-disciplinary approach, local and national problems of interest to students and the local community, online experts in the community, and local media support. The following description summarizes the *Entrepreneurs in Action!* process. (Clouse, R. W. & Goodin, T. L. ,2000). This early work is related to Public school learning and is supported in part by the work of DeBerg and others (DeBerg, C., & Thornton, K., 1999).

Over the years our work has been based on a set of assumptions about how people learn and how schools prepare students to live in the real world. Our assumptions have been that most of traditional schooling in America is built around systems of compliance and control. This approach tends to stifle students' creative and entrepreneurial instincts. Our research has been exploring a different approach to education, one that involves capturing the interest of the student through the use of problem- and project-based instruction delivered via the Internet. We have chosen to call our program *Entrepreneurs in Action!* This program seeks to involve students in an entrepreneurial problem at the outset and to promote learning of traditional subject areas as a part of the problem-solving activities that are undertaken. This strategy is designed to teach students to think entrepreneurially by the use of local cases and/or scenarios. Unlike many curriculum strategies that teach conformity, structured learning and unrelated learning, our strategies support creative and entrepreneurial thinking across the curriculum.

We emphasize the whole-part-whole instructional strategy that we have developed in our research. This approach involves seeing the big picture first, breaking it into parts (instructional units) and then putting it back together again into a new whole as developed from the student's own research regarding the opportunity (See Figure 1).

“Whole - Part - Whole” Teaching

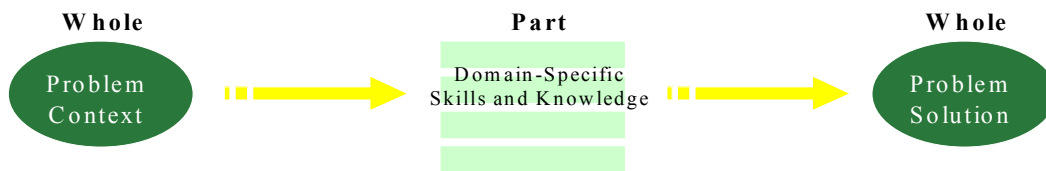
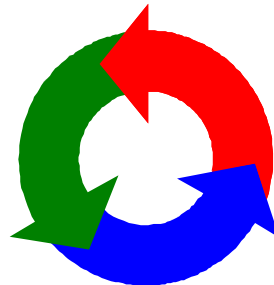


Figure 1.

This instructional design supports the Clouse theory where the concept being taught is connected (hooked) to the framework of the learner. Students learn and then apply new knowledge in situations that will reinforce their learning. Termed "recursive design," this strategy supports long-term learning of important concepts versus short-term memorization learning (See Figure 2).



Recursive Design
Learn and Apply
Figure 2.

In addition to using our whole-part-whole concept and a recursive design, we also use just-in-time learning techniques from local community entrepreneurs. By presenting curricular content just at the moment when the need for it arises, this feature addresses the issue of maintaining the relevance of the content being learned.

In general, this means that the students are given an opportunity to respond to a case developed for a local community or a national issue. Students are given the opportunity to think creatively about the entrepreneurial use of the case. When students want more information about an issue, they are able to e-mail their questions to local on-line experts. Experts and entrepreneurs are selected from the local environment to provide expert information just at the time the students need to learn such information. This is what we call "learning the parts." Once the students have the information they need, they then put together a new entrepreneurial "whole" for the case. Students are required to develop an entrepreneurial approach to the case and find ways to implement the entrepreneurial activity. The research follows somewhat the theories expressed by John Bransford and company (Bransford, J. D., Brown, A. L., & Cocking, R. R., 1999), (Clouse, R. W., 2003) and (Clouse, R. W., 2002).

The overall objective of this research project is to develop an on-line entrepreneurship curriculum that builds on the infrastructure already in use at the selected schools and investigating ways to infuse the entrepreneurship spirit into as many courses as possible. Infusing would occur through the development of *Entrepreneurs in Action!* cases.

This presentation will report on our progress during the Spring and Fall semesters of 2004 and Spring semester of 2005. The process of developing this model will be discussed as well as project outcomes to date. Topics to be discussed are as follows:

1. Connecting with the local community about local and national issues

2. Developing and implementing a Summer Entrepreneurship Institute
3. Developing and implementing EIA cases
4. Connecting with the framework of the learner
5. Evaluating performance
6. Involving multiple colleges and universities

This problem solving approach investigates the technical, social, political, and economic issues related the future of the world. Students will develop cross-discipline solutions including several engineering fields, such as marketing, entrepreneurship, human and organizational development, and business. We are testing our cases in at least five different Universities—Tennessee Technology University, Cookeville, TN, Vanderbilt University, Nashville, TN, Francis Marian University, Florence, SC, Tennessee Wesleyan College, Athens, TN and Anderson College, Anderson SC. The results from these cases and others will be discussed. We want to teach students to “make jobs rather take jobs” thus increasing the job market and reducing unemployment (Vodopivec. M., 1998).

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