From Technologist to Entrepreneur: Why Experiential Learning Should Work to Expand Students' Viewpoints and Communication Styles

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Abstract

As corporations require more engineers to become members of entrepreneurial teams, university engineering departments should seek to provide more opportunities for students to learn the discipline's content and communication skills needed in such roles. Students can be led to expand their professional viewpoints and roles beyond that of engineers. Expanding an undergraduate engineering student's viewpoint from technologist to entrepreneur requires him or her to internalize the entrepreneurial culture, a necessary step in gaining facility with its communications.

This paper attempts to show why experiential learning should best facilitate this necessary process. It discusses experiential learning theory and the concept of learning different genres to become members of different discourse communities. These theories underpin the described course components and other learning activities which endeavor to teach students to become members of a different disciplinary culture and discourse community--in this case, different from the university and different from their technology fields. Emphasizing the importance of entrepreneurial communications, specifically the business concept presentation and early-stage business plan, this paper follows theory with application by describing the multifaceted experiential approaches used to teach entrepreneurship to Rice University undergraduate engineering students. Much of this learning involves students actively using their own innovations to develop business plans and drawing members of the entrepreneurial community into a student-led club and the classroom. Students also participate in the business community through forums, field trips to entrepreneurial organizations' meetings, and forming an actual business.

From Technologist to Entrepreneur: Why Experiential Learning Should Work to Expand Students' Viewpoints and Communication Styles

Introduction

The late 1990s and early 2000s have seen an increase in technical entrepreneurship, whether by individuals applying for patents or by companies seeking to develop products through cross-

functional teams. In both cases engineers as entrepreneurs are called upon to communicate the market share and profit potentials of their innovations. In corporations, engineers often become leaders of product development teams, but many universities do not prepare them for the communications necessary to sell products internally or outside the company. Giving a business plan presentation demands a different viewpoint, a different focus, and knowledge of a different audience than does that of most technical presentations.

Having worked with project managers in industry and with engineering students at Rice University, I have come to theorize that selling a business concept to business people calls for becoming a participant in a different discourse community than most engineering students or many engineers are familiar with. Such familiarity can be taught through experiential learning techniques. Organizations such as the National Collegiate Inventors and Innovators Alliance (NCIIA) often describe and recommend such techniques; however, very little is usually written to explain why such techniques should work. Rhetorical communication theory and in particular genre and discourse theory can offer some likely answers.

Using Experiential Learning Techniques to Learn Different Discourses

Experiential learning places the learner "directly in touch with the realities being studied…It involves direct encounter with the phenomenon being studied rather than merely thinking about the encounter or only considering the possibility of doing something with it" [1]. The engineering student both as designer and entrepreneur can experience the realities being studied, but these are different realities. Today's engineer must often exist in both environments and therein lies the need for learning the substance and communications of both engineering and entrepreneurial practitioners.

Understanding Genres within Discourse Communities

The engineering student as designer is a member of not only a disciplinary community, but also of a community of communicators, a discourse community. Within a discourse community, practitioners understand the appropriate form, substance, and context for a communication. [2] For example, engineering students learn the form, substance, and context for a research report. In doing so, they have learned a particular genre. Understanding a genre includes "a sense of what content is appropriate to a particular purpose in a particular situation at a particular point in time," [3] according to Berkenkotter & Huckin. This understanding recognizes the redundancy of typical situations which call for routine responses and the novelty which calls for tailoring a communication to a particular audience or purpose.

How do students learn a genre? Engineering students usually learn to write lab reports through seeing examples of them and through getting feedback from professors and lab instructors. Lab reports are communications situated in the university engineering community. Students learn this genre from "insiders," as they participate in this community. However, the communication elements are usually not explicitly taught. Rather, they are picked up through practice. In looking at genre as being strongly sociocognitive in nature, Berkenkotter & Huckin assert that "enculturation into the practices of disciplinary communities is 'picked up' in the local milieu of the culture rather than being explicitly taught." [3] These authors later show how a senior

researcher learns to write an acceptable scientific article through interactions with reviewers. Through interactions with members of the entrepreneurial community and through assuming the entrepreneurial role, students can learn the discourse of that community.

Seminal Elements of Experiential Learning and Applications

Experiential learning theory provides the underpinning for a program developed over the last two years for engineering and science students at Rice University. Presently the program consists of a student-led entrepreneurial club, a business forum called the Rice Alliance for Technology and Engineering, and a course entitled "New Ventures Communication." The course focuses on an individual student or student team discovering an innovation to start a business, developing a business concept, giving a business concept presentation, and writing a short early-stage business plan. The club and course are supported by the Cain Project for Engineering and Professional Writing through a grant by Mary and Gordon Cain, a Houston entrepreneur and Rice alumnus. Thus far, the club and course have concentrated on undergraduates with some graduate students auditing.

The Rice Alliance, an alliance between the MBA program and Engineering and Natural Sciences schools, provides a forum for students, alumni, and the business community. The primary activity consists of students and alumni presenting their business plans to the Rice Alliance. Typical audiences consist of investors, mentors, faculty, potential management team members and potential employees. Certainly, the Rice Alliance provides the most real-world experience, the culminating experiential learning activity for student entrepreneurs. One goal for students in the club and course is to present to the Rice Alliance.

In helping to devise club activities and in planning the curriculum for the course, I have used specific elements of experiential learning theory discussed in Kolb's well-known book on the subject.[4] This section presents experiential learning theory followed by application examples from Rice's entrepreneurial program for engineering and science.

Theory: Learning involves transactions between person and the environment. [4]
Experiential learning involves not only the learner being changed by what he or she experiences, but the environment being changed as well. In other words, learning does not simply go on inside the person; the learner may also cause the environment to change. Such interaction and change can occur through classroom discussions, interactions with mentors, and presentations both inside the classroom and outside it. This type of learning environment often entails a partnership involving peers, professors, and the larger community of practitioners. Such an environment strongly aids in enculturation of the learner into another discourse community.

Application

Enabling students to interact with their environment depends on teaching methods and bringing together elements of an interactive environment. In the "New Ventures Communication" course, students start the semester by brainstorming problems in various industries. They are encouraged to use techniques which will allow for open discussions and synthesizing of ideas, so that mutual learning occurs between peers. (For suggested brainstorming techniques, see Tom

Kelley's *The Art of Innovation*. [5]) Later in the semester, students may work on teams with each other in developing a concept. They then discuss concepts with other members of the class and an interchange of ideas occurs. They may talk with alumni in a particular industry to test business concepts, and as a culminating activity they present their concepts to a venture capitalist to get feedback and to try to sell an expert on their products or services. In some cases such experts have gone on to aid students in developing their ideas further or in seeking funding.

The Rice Alliance forum allows for five or six entrepreneurs to give ten-minute business concept talks to an auditorium of mostly business community members. Undergraduates from the entrepreneurial club or the course have been especially successful in creating interest in their concepts. These students set as an initial goal that of creating enough interest that attendees come to their breakout sessions, which occur after that day's talks have been given. Thus far the undergraduate students have often had the most people attend their sessions and have gone on to schedule meetings with venture capitalists, even during the recent downturn.

Before a presentation, I spend substantial time individually coaching students on understanding their audiences' interests. To successfully interact with this business-oriented audience usually calls for focusing on the business concepts, not the technical aspects. The primary problem in business concept presentations for many technologists seems to be that of changing focus from technical features to business features. Less successful presentations over-emphasize technical components and become bogged down in details, often allowing the few technically-oriented members of the audience to dominate discussions. In an initial presentation, most potential investors and management teams initially want to know what the product is, what it does, and if it works. They then want to know about potential markets, prospects for profitability and growing the business, and who the competitors may be. Students who have come to understand audience expectations can facilitate transactions with their environment and influence members of the environment.

Theory: The Lewinian Learning Model presents an iterative process of reoccurring steps. [6]
A feedback model of experiential learning, Lewin's model, begins with concrete experience, followed by observing and reflecting, followed by forming abstract concepts and generalizations, and then followed by testing concept implications in new situations. The process may then begin all over again.

Application

Lewin's model fits both the laboratory and the entrepreneurial process. I use this model to structure my course content and to determine teaching methodology. The course sequence follows the entrepreneurial process:
  (1) Begins with calling on students' concrete experience as they seek problems and then solutions
  (2) Students collect data through marketing research and discussion with me, peers and mentors. They study marketing research techniques through a textbook and through hearing a marketing expert present, and then they immediately apply their knowledge to their own concepts.

(3) They formulate their business plan. Content needed and communication techniques are learned through reading, examples, and brief lectures followed by practice.

(4) They test the business plan in new situations as they move progressively from discussing it with peers to mentors to a final presentation with a venture capitalist audience. Before the presentation, I spend at least one hour rehearsing each student. Much of that time is spent on organization and logical argument, focus and emphasis, and on finding a hook for the audience. I also video tape. Watching the video tape together, we discuss delivery skills.

(5) Based on feedback from peers and the venture capitalist, a student or student team will make changes to a business plan and write an early-stage one with an executive summary. Those who continue to pursue their plans will start the process all over again with the concrete experience of presenting this plan to a new audience.

The teaching methodology consists of calling on various groups for feedback and giving students a chance to discuss their ideas, informally and formally, in a variety of settings: Rice Alliance, business community groups, the student club, and other mentors with whom they may meet. The student club provides speakers followed by discussion and a reception in which students can interact with the speakers. We also have club roundtables in which students can informally discuss their business concepts. MBA students, Rice alumni, and business community mentors may come to the club meetings.

Theory: A person may favor a particular learning style, but careers often call for adapting to other styles. Four learning styles have been identified:

- Convergent relying primarily on the dominant learning abilities of abstract conceptualization and active experimentation. The greatest strength of this approach lies in problem solving, decision making, and the practical application of ideas…. A person with this style does best where there is a single correct answer or solution….
- The divergent learning style has the opposite learning strengths from convergence, emphasizing concrete experience and reflective observation. The greatest strength …lies in imaginative ability and awareness of meaning and values….A person with this style performs better in situations that call for generation of alternative ideas….
- In assimilation, the dominant learning abilities are abstract conceptualization and reflective observation. The greatest strength…lies in inductive reasoning and ability to create theoretical models….
- The accommodative learning style has the opposite strengths from assimilation, emphasizing concrete experience and active experimentation. The greatest strength…lies in doing things, carrying out plans and tasks and getting involved in new experiences….Emphasis is on opportunity seeking, risk taking, and action. [4] (pgs. 77-78)

Using an instrument for predicting learning styles (LSI), Kolb conducted a study which showed correspondences between learning style and undergraduate majors, drawing on sample of managers or managers-to-be . He showed that both business and engineering majors on average scored high on active learning styles, but that business majors tended to be more concrete and were more often accommodators while engineering majors were more often convergers. However, career demands cause people to adapt their learning styles to accommodate the job roles and demands . Kolb cites Gypen who found that engineering education seems to "over prepare people …in symbolic and perceptual competencies but makes little contribution to the

development of affective and behavioral competencies," which were acquired in work [4] (pgs. 195-196).

Application

Based on my extensive experience with the entrepreneurial community, I theorize that entrepreneurship calls readily on three of the four learning styles: convergent, divergent, and accommodative. While engineering design may primarily call on convergent and research engineering may also demand assimilation and divergent learning, without the accommodative, it would be difficult to be an entrepreneur. Engineers wanting to be product development managers or entrepreneurs need to possess the accommodative learning style. Entrepreneurs must be willing to carry out plans and get involved readily with new opportunities. Their communications must also show their willingness to take action and risks.

The "New Ventures" course and the club have several aspects which require students to practice an accommodative learning style. While often beginning a business concept by converging on a solution to a problem, a student must then look at the market and competition. They have various opportunities to have their solutions questioned in light of market demands. They first present their ideas informally to peers through using a template called "Testing Your Business Idea." (See Appendix A.) Through this exercise and the questions and suggestions initially raised by me as the instructor and by peers, students accommodate their original plans. They then have other opportunities to present to other groups. Some class members go to the Rice Alliance sessions or other meetings of entrepreneurial groups such as the MIT Forum. As discussed previously, students informally try out their ideas in these social settings or call on mentors to give feedback. These situations sometimes mean that students abandon some business concepts after testing them or they change the concepts to fit the realities of the market.

The course and the club both encourage the affective and behavioral competencies which Gypen found engineers often acquire in work. Affective competencies mean experiencing a professional role with real consequences. Similarly, behavioral competencies call on applying knowledge to "real-life" problems. In the club, students formed a real business which they could pursue to make money for the club. They developed a service for incoming students: that of providing them with appliances and gadgets for their dormitory rooms.

This business required the communication skills and business competencies needed in a business. Students had to sell their service and organize partnerships within the university and with suppliers; set up distribution; provide cash flow; and work as a team. After developing the business concept, students first had to persuade the administration to let them pursue the business. They then had to persuade orientation advisors for the eight undergraduate dormitories to partner with them and allow them to use lists of incoming students for advertising purposes. They interviewed various suppliers and worked out deals with them. They priced their merchandise; and to reach their customers, they set up a webpage and mailed brochures. They set up accounting spreadsheets and a mechanism for receiving and recording orders. Finally, they delivered their products. Students then reviewed the process for improvements.

In addition to this real-life business, other opportunities exist for students to experience professional roles: applying for grants such as the e-team grants from the National Collegiate Inventors and Innovators Alliance;   presenting to a business group such as the Rice Alliance or presenting to venture capitalists. Three of our student undergraduate teams have presented to venture capitalists in pursuing their businesses beyond the classroom or the academic setting.

Most students in the class decide they are not ready to start their own businesses. They want to learn the communications and substance needed for communicating a business plan, but they are preparing to work for corporations. However, the experiential way in which the course is taught gives them a chance to role-play through their presentations.

Role models also help to develop affective competencies. These models are presented through
- providing speakers and discussion roundtables,
- my having worked in business and therefore being able to relate my experiences in the classroom
- students visiting community business meetings to interact with entrepreneurs
- internships, which other university organizations provide.

Summary and Conclusions

Many of today's engineers may develop their own business concepts or become members of entrepreneurial teams in corporations. In fact, engineers often become the leaders of such cross-functional entrepreneurial teams. However, universities often do little to prepare engineering undergraduates to assume the roles of entrepreneurs. Such roles call on knowledge of the entrepreneurial community, its culture and communications. Based on Berkenkotter and Huckin's discussions of communication genres, I have sought to explain that the engineering student in the university learns different genres from those of the entrepreneur. A technical report has a different format, focus, content, purpose, and occurs in a different situation from that of a business plan or business concept presentation. Students learn different genres when they are exposed to the milieu of a particular culture.

Genre theory builds a strong case for two teaching practices in regard to engineering students: (1) devising a learning environment for engineering students to learn and practice entrepreneurial concepts and communications and (2) making that learning environment experiential. Such an environment allows students to assume the role of a professional. This experiential learning requires specific program components and teaching methods.

One Rice University entrepreneurial program for engineering and science students concentrates on undergraduates and takes advantage of three components: (1) course entitled "New Ventures Communication," (2) entrepreneurial club which offers students an actual business opportunity, (3) a forum called the Rice Alliance for Technology and Engineering, at which students can present to the business community. The program emphasizes active and concrete learning. Students begin the course by seeking problems and solutions based on their own experiences. They learn to accommodate their solutions through first brainstorming with peers and later seeking feedback through a progression of sources. This progression starts with peers and the instructor and then proceeds beyond the academic community to the entrepreneurial community.

Entrepreneurs are used as classroom and club speakers, mentors, and judges of students' final business presentations for the course. Through this feedback process, students learn to accommodate their plans to the perceived realities of the marketplace.

The teaching techniques call for the instructor to assume the roles of facilitator and team member. On occasion I become an expert on the subject matter or the entrepreneurial audience. Having worked as an entrepreneur and a consultant to entrepreneurs gives me some advantage. For those instructors without such experiences, I would suggest immersion in an organization which supports entrepreneurial activities—one in which they can get to know entrepreneurs and possibly serve with them on panels and boards.

As course instructor and club sponsor, I primarily provide experiences through bringing in speakers, encouraging discussions, asking students to test their concepts , and then raising questions and providing resources and examples. I lecture briefly on business plan elements and communication techniques, but most of the class time is spent in discussing students' actual business concepts. I also spend practice time with students individually before they present their business plans in class to a venture capitalist. In the club business I act as a sounding board, encourager, and sometimes team member. One challenge: preventing oneself from intervening when the students themselves need to solve problems that arise.

Instead of expecting engineering students to learn entrepreneurship and entrepreneurial communications on the job, universities can supply them with the necessary experiences. Such experiences take advantage of the entrepreneurial community and bring entrepreneurs into the classroom and the club. Students also go beyond academic walls to visit and participate in business forums and entrepreneurial groups. Experiential learning would seem to provide the way for engineering students to become members of this entrepreneurial discourse community.

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Appendix A

TESTING YOUR BUSINESS CONCEPT

Are you ready to pursue your concept? Talk through these questions with your team or your peers. Scoring: Give yourself 6 points for every well-answered question: Below 60: Keep Working on it; 60 and above - Time to Overcome Hurdles; 78 and above – Almost Ready; 84 and above - Start rounding up prospects for testing or launching your business.

The Business*
What will you do?

What is the product/service?

How will you make money (revenue sources)?

The Market*
Who will you sell to?

How large is the market?

What's the market's growth potential?

How will you sell and distribute?

Who are your competitors and what are they doing?

How are you different?

Management/talent*
What talent/experience do you have on the team?

What talent/experience do you need?

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Financials

Approximately how much money do you need to start?*

How much profit can you make per unit/ service event?*

How much of the market share might be feasible? Basis for prediction?

When will you break even?

What is your ultimate goal?
__Own and run business
__Sell business
__IPO as publicly held company
__Other: Explain

*Essential questions to be answered first.