AC 2010-2310: EMPHASIZING MULTIDISCIPLINARY TEAMWORK AND ENHANCING COMMUNICATION SKILLS THROUGH DEVELOPMENT OF A CONCEPTUAL BUSINESS PLAN

Mohamad Ahmadian, Eastern New Mexico University

Mohamad H. Ahmadian, Eastern New Mexico University Mohamad H. Ahmadian is a professor of Electronics Engineering Technology at Eastern New Mexico University. He also serves as ABET/TAC program evaluator for electronics and computer engineering technology programs. He received his B.S., M.S., and Ph.D. in Electrical Engineering from the University of Missouri-Columbia. Before starting Ph.D. work, he worked three years as a project engineer.

Tom Brown, Eastern New Mexico University

Tom Brown, Eastern New Mexico University Tom Brown is a professor of Computer Science and the chair of Mathematical Sciences Department at Eastern New Mexico University. He received his BS in Mathematics Education and MS in Mathematics with an emphasis in statistics from the Illinois State University and his Ph.D. in applied mathematics from the University of New Mexico. Prior to joining ENMU he worked as a senior scientist for Schafer Corporation and MZA Associates Corporation for a few years.

Emphasizing Multidisciplinary Teamwork and Enhancing Student's Communication Skills through Development of a Conceptual Business Plan

Abstract

As part of the NSF Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) grant the scholarship recipients at Eastern New Mexico University are required to register for a one-credit project course. The course encourages students to hone their communication skills and gain knowledge in functioning effectively on a multidisciplinary team. This article presents a conceptual business plan to assist students in understanding the components of effective teamwork and the importance of good communication skills. Students are provided with a weekly task. The first task includes choosing a company name, and providing descriptions for: the business, product or service, business location, the target market, and the business competition. The final task includes 'the first year, business survival" such as information on monitoring and evaluation, critical communication and credit, collections, product advances, market trends and summary. In addition to class meetings, students regularly meet outside the class to create a PowerPoint presentation. Students are required to demonstrate that they are making progress in understanding the issues involved in having a successful business.

Introduction

The goal of this project is to have students achieve competency in business practices equivalent to proficiency realized in engineering subject matters, and to develop leadership among students in a multidiscipline environment. Chaya and Silverman [1] discuss an alternate approach that includes integrating business concepts into ECE courses. They describe an alternative scenario that they designated the "venture capital" (VC) approach. It retains the important feature in which corporate representation is retained but requires students to initiate their own projects (as opposed to providing a request for proposals). They also suggest that the industrial and corporate roles that engineering graduates play has greatly broadened as a consequence of the emergence of the "global" character of economic activity. Accordingly, objectives for engineering design has shifted from those characterized mainly by practical consideration (e.g., component, system, or process design) to those embracing the integration of business and entrepreneurial skills coupled with technical skills. Team-oriented design, awareness of the economic, reliability, and social impact of work product are a few of the new educational prerequisites for this climate. This redirection follows from outcomes assessments, needs of the engineering industrial/corporate client community and subsequently from the Accreditation Board for Engineering and Technology (ABET). Thus, this suggestion was incorporated in the development of this course.

While teamwork is a major component of industry core requirements, the students attending higher education institution do not possess a great deal of teamwork experience. Employers, along with the ABE, expect this type of preparation in these areas to be incorporated into the engineering curriculum at the college and university level. ABET stated in EC 2000, "Criteria"

for Accrediting Programs that one program outcome and assessment measure for engineering programs is to demonstrate that their graduates have an ability to function on multi-disciplinary teams.[2]

The team members in our S-STEM project course were from undergraduate disciplines in mathematics, computer science, electronics engineering technology, biology, computer information systems, chemistry, biochemistry, and geology**.** To provide mentorship to the freshman students, teams were organized to include students from freshman to senior level and to have students from as many programs in the targeted disciplines as possible. A senior student in each team was appointed as the team leader. Each team chose a conceptual company and provided a weekly presentation for different aspects of the company as requested by the instructor.
To improve students' communication skills, all team members were required to participate in their weekly presentation of equal time. The team members must understand the components of the presentation and be very receptive to questions asked by the audience. Furthermore, each team must submit a technical report about the team's business plan at the end of the semester. Students were provided with the criteria about writing a technical report and inclusion of required materials.

Another goal of this course was to improve student's soft skills. Engineering and science curricula often focus on the technical abilities of students, neglecting the "soft skills" that will often determine success or failure for graduates when they enter the workforce. As an example, project management skills are often neglected in an engineering or science curriculum, requiring additional training for those engineers who end up in management positions. Skills such as the ability to lead and work effectively as a member of a team are frequently identified as critical to the success of an engineer, but typically are lacking in new engineering graduates. [3]

Course Topics

In this course students worked in groups. Each group included 4-5 scholars. Each group was to devise a business plan for a marketable product or service. Each student group will had a President, Financial Officer, Marketing Specialist, Planning and Analysis person, Sales Manager and so on. Below is the outline that students were to use in developing their proposals. Groups were required to give presentation on a weekly basis. The instructor and other groups used the opportunity to critique each presentation as to clarity, viability, and practicality.

Business Proposal

Cover Sheet (Title Page)
(first week)
The first page of the proposal was the cover sheet. It should contain the following items:

- Name of the Company
- Company Address, Phone-Number
- Web-address
- Name of the Preparer

Body (Narrative)
(second and third weeks)

- Description of the Business
- Description of the Product or Service
- Description of Business Location
- Description of the Target Market
- Description of Competition
- Method of Distribution
- Advertising to Your Target Market
- Timing of Market Entry
- Industry Trend
- Management Background and Strategic Plan
- Description of Personnel

Financial Section
(fourth and fifth weeks)

- Identification of Existing or Expected Funding Needs
- Capital Equipment
- Preparation of a Balance Sheet for Day one of the first Year
- Cash Flow Projection for the First Year
- Profit and Loss Statement for the First year
- Current Personnel Cost including Fringe Benefits
- Supporting Documents
  Resumes, References, Recommendations, Equipment Cost, Supplier Price List, Needs Assessment

Pre-Planning Stages
(sixth week)

- Select the Business
- Initial Research
- Acquire the Skills

Defining the Business
(seventh week)

- Feasibility Study and Business Plan
- Market Research and Plan Financial Projection
- Cash Flow Projection

Getting Ready
(eight and ninth weeks)

- Selecting a Location
- Initial Equipment and Supply
- Pricing, Sales Forecasting
- Securing the Financing

Starting --Action Plan
(tenth, eleventh and twelfth weeks)

- Review and Adjust all Plans
- Staff Selection and Training
- Independent Contractors and Sales Representatives
- Marketing Implementation
- Customer Service and Satisfaction

Ongoing Operation -- The First Year: Business Survival
(thirteen and fourteen weeks)

- Monitoring and Evaluation
- Critical Communication and Credit
- Collections
- Product Advances and Market Trends
- Summary

Effectiveness and Assessment

Adams argues that "the hypothesis of the model regarding team effectiveness is that effectiveness (E) is defined as a function of *team performance* (P), *members' behaviors* (B) and *members' attitudes* (A) and can be represented by the equation $E = f(P, B, A)$." [2] The effectiveness parameters mentioned above are measured through the final report and weekly presentations and a questionnaire. The questionnaire was specifically developed to gather information about the students' time management, work hours, social life, scholarship effect on their education, and the S-STEM project course, as well as team effectiveness and the performance, behavior, and attitude parameters.
An assessment tool was developed to assess the one-credit Business Plan, and the effectiveness of the teamwork.

Conclusion

The goal of offering this course was to create an environment where students could work in teams from multidisciplinary STEM programs and demonstrate that students can function effectively and gain valuable experience in creating a business, time management and marketing. Also, an additional goal was to enhance student's communication skills, as well as their ability to work together on team-oriented projects. The data collected implies that: [1] every team was effective in accomplishing the given task [2] every team member increased his/her teamwork skills [3] every team member had a positive attitude toward the teamwork activity and [4] team member's presentation skills were enhanced significantly. Also, there were some concerns and suggestions that included: [1] it would be more practical to group students in the same discipline [2] the project was too time consuming for one-hour credit [3] some members did not work as hard as others and [4] it would help if there was a speaker at the beginning of the course to discuss a practical business plan. Overall, students agreed that the course provided them with business and teamwork experience as well as it enhanced their communication skills.

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Bibliography

1. Chaya Henry, Silverman Gordon. "Integrating Business Concepts into ECE Design Courses: An Alternate Approach." Proceedings of the 2003 American Society for Engineering Education Annual Conference & Exposition.

2. Stephanie G. Adams, Ph.D., Laura C. Simon Vena, Bianey C. Ruiz-Ulloa and Fernando Pereira. "A Conceptual Model for the Development and Assessment of Teamwork," *Proceedings of the 2002 American Society for Engineering Education Annual Conference & Exposition.*

3. Robert S. Weissbach, Jana G. Goodrich, Ralph M. Ford. "Lessons Learned and Best Practices in Multidisciplinary Teamwork and Teaching of a Small Product Realization Course," Proceedings of the 2004 American Society for Engineering Education Annual Conference & Exposition.