

2006-1210: THE ENGINEERING ENTREPRENEURS PROGRAM (EEP) PORTAL: A NEW TOOL FOR IMPROVING ENTREPRENEURSHIP PEDAGOGY

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Dr. Walsh is a Teaching Associate Professor of ECE at North Carolina State University in Raleigh, NC. He is responsible for teaching undergraduate courses and a special section of Senior Design called the Engineering Entrepreneurs Program (www.engr.ncsu.edu/eep.) In addition, he serves as the department's distance education coordinator and is a Co-PI on an NSF grant in collaboration with the College of Education. In January of 1997, he co-founded BOPS, Inc. He served as its President and CEO for the first two years and was responsible for business planning, corporate formation, and obtained seed-round funding of \$3M with a follow-on round of \$9M. Prior to this, Dr. Walsh's technical career was with IBM where he did IC design, performed software testing, and did presales field application engineering. While at IBM, he was awarded IBM's Resident-Study scholarship and completed his MS and PhD degrees in EE at Duke University.

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Thomas K. Miller, III received the BA degree in Mathematics and Chemistry from the University of North Carolina at Chapel Hill in 1976. He received the MS degree in Biomedical Engineering and Mathematics in 1980, and the PhD in 1982, both from UNC-Chapel Hill. Since 1982 he has been with the Department of Electrical and Computer Engineering at North Carolina State University, where he holds the rank of Professor of Electrical and Computer Engineering and Associate Dean in the College of Engineering. He is currently serving as Vice Provost for Distance Education and Learning Technology Applications (DELTA). In his role as Vice Provost, Dr. Miller is responsible for strategy, deployment, and implementation of the university's learning technologies and distance education programs.

Dr. Miller has served as Principal Investigator (or co-PI) on research and educational grants totaling more than \$5M. He is the author or co-author of more than 50 technical publications in areas including engineering education, distance education technologies, medical instrumentation, computer architecture, neural networks, communications, and signal processing. He was instrumental in architecting the College of Engineering's Eos computing environment, which consists of a centrally managed network of more than 1,000 distributed workstations in academic and research labs throughout the college. Most recently, he has led the development and deployment of a "virtual classroom" model for real-time distance education over the Internet based on IP-multicast (MBone) technology. Dr. Miller teaches courses in computer architecture, microprocessor systems design, and C and C++ programming. He instituted and directs the NC State University Engineering Entrepreneurs Program. He is a member of the Academy of Outstanding Teachers at North Carolina State University, and recipient of the 1995 Joseph M. Biedenbach Outstanding Engineering Educator award from the IEEE. He also founded and served as president of X Engineering Software Systems Corporation, developer of first native X-Window spreadsheet.

Dr. Miller was recently named "Tar Heel of the Week" for his work with engineering student entrepreneurs.

The Engineering Entrepreneurs Program Portal: A New Tool for Improving Entrepreneurship Pedagogy

Abstract:

The Engineering Entrepreneurs Program Portal (EEP Portal) is a web-based tool designed for use by students who are participating in the EEP to manage their E-Teams.

For background, the EEP is an undergraduate program centered in the College of Engineering, but open to students from all academic disciplines. The program's methodology provides students a more in-depth exposure to entrepreneurship and new product development. E-Teams are lead by engineering seniors who are fulfilling their senior capstone design project requirements. They organize E-Teams comprised of undergraduates and run these teams as *virtual start-up companies*. Underclassmen serve as *virtual employees* of these E-Teams and participate for either 1-credit or 3-credits.

Topics covered in the EEP include leadership, management, project planning, marketing, sales, operations, organizational behavior, financials, corporate formation, business planning, and intellectual property. The EEP Portal provides the students a structured, yet flexible, mechanism to manage their teams and the product development process. In addition, the EEP Portal allows faculty to observe the E-Team's progress in real-time and to monitor the program's pedagogical effectiveness.

This paper discusses the impetus in developing the EEP Portal, its actual design and implementation, and provides a qualitative discussion of the results to date.

Introduction:

Why the EEP Portal? As Louis Pasteur said over 100 year ago, 'Chance favors the prepared mind.' Therefore, first and foremost, the EEP Portal forces discipline into the design and development process. This discipline is one that the students will experience in their professional careers and it is crucial to their future success to develop the skills afforded by it. Nearly all the students welcome this opportunity to hone their skills, but some still do come 'kicking and screaming' at first. However, after a few weeks of being on a team they fully understand the merit of using it in this full-immersion environment approach to new product development and entrepreneurship.

Engineering is fundamentally about creating new products that customers need or want and at prices they can afford. Therefore, before an engineer begins the process of design, development and manufacturing of a new product they must be able to articulate both the problem – the 'need' or 'want' – and their proposed solution. The skill of being able to understand and articulate the problem of a customer is generally not part of undergraduate engineering pedagogy. Yet, this skill is precisely what employers expected them to have as professionals. This skill has its roots

in the soil of communication. Without outstanding communication you run a substantial risk of building a product that solves the wrong problem. The EEP Portal plays a significant role in assisting the E-Team students in learning the art of communication.

To that end, what do they communicate about? Well, at any one point in time the members of an E-Team will be communicating about project status, schedules, budgets, technical issues, customer analysis, etc. The larger the number of team members in a given E-team the more important communication among team members becomes and, in fact, the more difficult it becomes. In addition, the larger number of E-Teams in a given semester the more important the EEP Portal becomes in faculty's communication with them.

Design, Implementation and Use:

The Engineering Entrepreneurs Program Portal was designed and implemented by Mr. Ben Sintay (Mr. Sintay is a former EEP student and is currently an MD/PhD candidate at Wake Forest University in Winston-Salem, NC) over a period of approximately six months. The functional specification was developed in conjunction with the EEP instructors. The main points of the specification included: ease-of-use, portability, archival capabilities, security measures, file management, webpage real-time updating, accessible on a per team basis within a general product design, and development environment.

Specification details are as follows:

- Graphical User Interface (GUI):
 1. Intuitive such that a tutorial is unnecessary
 2. Organized for ease of both horizontal and vertical traversals of the website with a targeted maximum depth of four web pages
 3. Multiple views depending on user classification. The classifications are as follows:
 - a) *Portal Administrator* – Faculty and website developers. This classification allows full read/write access to the EEP Portal. This includes the creation of E-Team workspace, setting of project deadlines including single and multiple deadline capabilities, along with file lockout and record capabilities if deadlines are not met
 - b) *Virtual Executives* – E-Team Senior Members. This classification allows for the creation of team user-ID's, forums, files and file classifications, and the evaluation of E-Team members
 - c) *Virtual Employees* – E-Team Members (For example see Table below). This classification is the most limited and allows for forum read and post, and use of team workspace for file sharing, and the evaluation of E-Team Senior Members

EEP Portal View by *Virtual Employees*:

Personal Options:

Group Options:

Class Options:

Group Forum
Profile
Time Reporting
EEP Evaluations

Main
Images
Users
Files
Forum
Meetings
Reported Time
Student Files

EEP Groups
EEP Files
Portal Comments
Logout
Budget

- File Management:

1. Uploading / Downloading with file locking capability
2. File creation
3. File sharing
4. Archival capabilities by semester

- Communication:

1. Creation of E-Team specific forums for communication between members. Examples include general forums for team use, hardware / software forums, marketing, etc. - Virtual Project Executives have this authority
2. Meeting minutes web tool allowing for real-time entry and dissemination
3. Instructor forms for private communications between E-Team members and the faculty
4. Faculty can monitor all E-Team communications and status reports
5. Meeting management with the following capabilities:
 - a) Schedule meetings
 - b) 'Check Box' attendee list generation
 - c) Automatic notification of meeting time/date
 - d) Automatic notification of meeting cancellation
 - e) Creation and editing of agenda and minutes

- Real time capabilities:

1. Updating to any part of the webpage is done dynamically. For instance, the addition of an up-and-coming seminar notification is immediately visible to all users. (Note this is implemented via PHP)
2. Budget approval process

- Website Editor:

1. Allows faculty to create new E-Team ID's, file space, and modify all pertinent content of the website such as 'History', 'Contacts', 'Advisory Board', etc.
2. Update all EEP Portal template files used by the E-Teams
3. Allows for the creation of announcements and seminar speaker links

4. Creation of sign up sheets for field trips with multiple time slot management capabilities for priority signup by students

Prior to the team being able to use the EEP Portal, the Portal Administrator must set up the team's ID. This is accomplished by using the 'Add Group' function to enter the new team's name, leader's name and email address, current year and semester, and the team leader's temporary password. This password is automatically sent to the team leader and they may choose to change the password at any time. The group may be classified as 'Hidden'. This classification means the team's name and webpage link do not appear on the EEP website. This classification can be changed at any time. In addition, some of the team's semester database may be made public via their EEP Portal team link if the team so desires.

Once the team ID and leader information has been entered the team leader may login to the EEP Portal and enter their team member's information. The information the team leader must enter about its team is identical to that which the Portal Administrator had to enter about them with the exception of being able to classify them as either a senior leader or virtual employee. After this, each specific team member may use the EEP Portal to administer their projects. This process is repeated for all teams.

Results To-date and Future Direction:

The EEP Portal has been in use since Fall 2003. During its first use we had a mixed bag of results with success based mainly on the senior team leaders' commitment to using it throughout their organization. As one might suspect the EEP Portal developer's (Ben Sintay) group had the most commitment to using it and their semester senior design project showed that. However, as commitment to use of the EEP Portal has grown so have the results.

Based on student input we continue to improve the portal by simplifying its GUI and by using 'best practices' in pedagogy as it relates to online learning and specifically to pedagogy improvement of engineering entrepreneurship and new product development.