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A Patent on Your Résumé, or Encouraging Creativity Among Technology Students

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Abstract

In our Advanced Technical Communications class, the students are formed into teams that must invent a new object or create a significant improvement in an already existing object, write a formal business proposal to convince a company to produce the object, and make a presentation in which they summarize their proposals. Many of these objects are patentable, and so, working with an intellectual property attorney, we teach the patent process as part of the class. In this paper, we discuss the organization of the project itself and how we teach the patent process, as well as how students respond both to the project and the possibility of graduating with the words "patent pending" on their résumés.

How We Begin

The ability to work on a team is unquestionably a required skill for anyone working in industry today. Consequently, Ward College of Technology students who take English 481, Advanced Technical Communications, are required to work on a team project. The project is actually one of a series of possible capstone projects for undergraduate Technology students, but since all Ward students must take EN 481, all students will be involved in a design project. This one involves the invention of a "truly new"[1] object, one that has to be feasible. In other words, each team has to design something totally new that is possible, useful, and marketable, given existing technology. No faster-than-light ships, no molecular transporters, only useful items that can actually be made now. The teams don't have to build a working model, though some teams do; they simply have to prove possibility with block diagrams.

Once they design the object, they prepare a written proposal in which they convince the instructor, posing as the head of a midsized manufacturing company, that their product would be a profitable one for the company to produce. And, finally, they must present a summary of their proposal in front of the class and invited guests, including other, technical faculty members.

The students approach the project with some doubts about the possibility of developing truly new objects. The fact is, more than six million patents[2] have been issued in the United States so the odds of coming up with something truly novel in this class are not strong. Although the teams did and still do occasionally develop a truly new object (for instance, a tool for electricians to use in junction boxes to accommodate cabling), most often they discover that their ideas are improvements on already existing objects. By the

terms of the assignment as it was originally developed, the object had to be new; the projects weren't actually meeting the requirements of the assignment.

The projects were, however, meeting the requirements of the patent law in Title 35 of the United States Code, which states in part that anyone who "invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent."[3] Because genuinely new improvements are recognized as worthy of protection by the U.S. government, the project was redesigned to include patentable improvements. The redesign is not yet complete, but its broad outlines are in place, and information on the redesign and plans for the future are presented here.

Who Participates

All students graduating with a four-year degree from Ward College of Technology at the University of Hartford must take EN 481, Advanced Technical Communication. Generally, students may take the class when they are in the last semester of their junior year or any time in their senior year or when they have the equivalent number of credits so that they are competent in their major field of study. Because of both the required nature of the class and the technical competency of the students, the capstone project is part of the curriculum of that class. As the assignment sheet states, the hope is that "the project should demonstrate learning achieved in all . . . work here at the University."[4]

Because the class is required of all Ward students, the class may comprise students from any of six majors:

Table 1: Ward College Majors

Architectural Engineering Technology (AET)
Audio Engineering Technology (AUET)
Chemical Engineering Technology (CHET)
Computer Engineering Technology (CET)
Electronic Engineering Technology (EET)
Mechanical Engineering Technology (MET

We also occasionally have a contract major such as Biomedical Engineering Technology. The various majors offer different—often extremely different—ideas, not to mention learning styles and talents to the project.

Students are assigned to teams with a thorough a mix of majors in every group. Because audio, computer, and electronics engineering technology majors share a number of introductory courses, students from those three majors generally have the electronics know-how necessary for many of the projects, so they can be distributed throughout the teams. Depending on the numbers of each major in the class, one mechanical engineering technology student is assigned to each group, as well.

The groups each have no fewer than three and no more than four members, a size that students have found to be workable. In the past, five-member groups were formed, but students had problems, particularly getting everyone together for meetings outside of class. Only two out of five groups in the fall ’99 class reported that difficulty, and they were able to resolve the difficulty through e-mail.

I ran one section of EN 481 in the fall ’99 semester, with 19 students divided into five groups, four of four, one of three, as follows:

Table 2: Group Formation,
Fall 1999

Group A:	1 CET 2 AET 1 AUET
Group B:	2 AET 1 EET
Group C:	2 AET 1 AUET 1 EET
Group D:	1 CET 2 AET 1 AUET
Group E:	2 CET 1 AUET 1 AET

The students in these groups produced their projects and presentations on time and with no reports to me of inability to do the necessary work.

What We Require for the Project

The following is a synopsis of the project description each student received before teams were formed.

Table 3: Synopsis of Project Description

TERM PROJECT
ENGLISH 481
FALL 1999

DESCRIPTION OF ASSIGNMENT:

Students will be assigned to groups of three, preferably of varied majors. Each group must invent a truly novel object or a genuinely innovative improvement of an existing object. (An example of a previous project for this class and a genuine innovation is a Braille fax machine.)

Whether the group attempts to invent a novel object or to create a significant improvement, the requisite technology to create the object must exist. Thus, a faster-than-light spacecraft will not do—unless you can prove the existence of tachyons and demonstrate the means to harness them (or some other method of exceeding the speed of light), of course.

In addition, the object or improvement must serve a function for which there is a market and must be practical for a medium-sized company to produce and sell at a profit.

Finally, the project should demonstrate learning achieved in all your work here at the University.

On the date specified on the class syllabus, you must produce a formal proposal including the following items:

- A technical description of the object or improvement and its function
- A technical description of the methods the company will use to produce the object or improvement
- Material supporting the contention that the product is possible and cost-effective to produce
- A marketing plan supporting the contention that a market exists for the object or improvement and a strategy for promoting sales

On the date specified on the syllabus, each group must also make a formal presentation of the project to the class and various Ward College professors and other guests who choose to attend the session. The presentation should summarize your project, can run up to 20 minutes, and can include any media you choose to work with. Depending on the project you decide on, you may not have to actually produce a working model of the object or improvement. However, you will have to produce drawings and schematics in sufficient detail to demonstrate its feasibility.

The formal presentation is a group responsibility; all group members should participate unless you have a specific reason to do otherwise.

To summarize, this project involves three primary tasks:

- To develop a truly novel object or a genuinely innovative improvement to an already existing object
- To prepare a written proposal as detailed above
- To prepare and make a formal presentation as detailed above.

How We Proceed

In addition to offering several majors, Ward College serves both day students, who, if they work, work around their class schedules, and evening students, who work their class schedules around their jobs. We therefore run an evening section of EN 481 at least once a year and occasionally twice. Full-time day students often enroll in an evening section, but part-time evening students almost never enroll in a day section. To accommodate both groups of students, every other class of the day section and the second half of each evening class is given over discussions of teamwork and to team meetings. A great deal of work can be accomplished in those class meetings, but every team finds it necessary to maintain e-mail contact and, as the due date approaches, to meet outside of class to complete all the necessary work.

To guide the students, discussions of teamwork, considering items like team formation and conflict resolution, as well as instruction in brainstorming and constructive criticism, are important. Games like Desert Survival contrast individual resources with team resources and demonstrate the potential benefits that teamwork can provide. The students also read the chapter about teamwork in their textbook,[5] which I supplement with material from a book called *Write Source 2000: A Guide to Writing, Thinking, & Learning*,[6] from which the phrase "Groping . . . Griping . . . Grasping . . . Grouping"[7] comes. (The phrase means that groping to find purpose and place in the group is normal, that griping and conflict are normal and proof that people are engaged in the process.) Yet another topic of discussion is critical thinking. Critical thinking is one of the current academic buzzwords, but as Phillip C. Wankat and Frank S. Oreovicz point out in their book *Teaching Engineering*,[8] there is value in making explicit for the students the fact that they are learning new modes of thinking. Discussions of such material, while perhaps not critical to the success of the project, are certainly critical to preparing students for jobs in business.

Perhaps the most important resource in this project is Wm. Tucker Griffith of McCormick, Paulding & Huber LLP in Hartford, Connecticut, an intellectual property attorney, who speaks to the class about patents and the patent process. (Mr. Griffith teaches Intellectual Property at Hartford College for Women, one of the member schools of the University of Hartford, in the paralegal preparatory course, and he speaks to our students and offers some consultation to them *pro bono*.) Many of the students become less nervous and more enthusiastic about the project after hearing Mr. Griffith, because he clarifies many of the issues surrounding patents and actually simplifies the project by helping them to understand that improvements are patentable so long as they are more than merely changes in materials, shape, location of parts, and the like.[9]

Other resources the students find useful are the e-mail addresses of the Patent Office (http://www.uspto.gov), and the IBM patent site (http://www.patents.ibm.com). In addition, two of the public libraries designated as Patent and Trademark Depository Libraries (PTDL), namely the Hartford Public Library and the New Haven Free Public Library, are close enough to the University so students have those resources available to them, as well.

Another major resource is the faculty of the university, which, as at any university, represents an enormous research facility. Though the students on these teams are upperclassmen, they usually have confined their research to print and electronic sources. But in a creative project like this one in which new technology may be involved, those sources may not be enough. At the University of Hartford we have not only a school of technology but a school of engineering and physics and chemistry faculties in the College of Arts and Sciences as well. Students have to be encouraged to talk to people other than the professors they already know. For example, one of the projects created in the fall '99 class concerned a combination microwave and chiller. The team quickly and easily found information on the microwave and on various chilling methods, but not on a method that would allow for the combination. After going to the College of Engineering to talk to a professor there, they had information on possible methods *and* the reasons those methods probably wouldn't work, too.

After our discussion that opens the class, the teams break out and meet. I observe each group but do not participate in their work unless asked to do so. Generally, someone asks a procedural question relating to the assignment itself or to research possibilities. In previous classes, I have been asked to step in to resolve serious personality conflicts, but in the fall '99 semester, the only problem I was asked to handle was finding a missing team member. I record my observations in a notebook so I have record of each group's activity in addition to the progress report in memo format that each team must turn in at the end of each meeting. Each team must also inform me of their intended invention and receive a sign-off from me on their choice before they begin. Teams must be kept on track with reminders of due dates and other procedural matters, but the teams are entirely responsible for their internal procedures, including their organization and work methods.

In the fall '99 semester, I formed five teams, as described, and gave them the assignment. Each team spent approximately four team meetings, on average, discussing possible projects, researching to determine whether their projects had already been done and determining whether they had the resources to carry out the project.

By the meeting held in class on October 1, all the teams had settled on their projects as shown in the following table.

Table 4: Fall Team Projects

Team A—	Sewage tank overflow warning system
Team B—	Parking space availability indicator system
Team C—	Personal workstation adjustment system
Team D—	Combination microwave-chiller
Team E—	Voice-activated television operating system

Not all of these ideas are original. The personal workstation adjustment system is simply an obvious adaptation of current technology, and a parking space availability indicator system is already in use in some indoor parking garages, according to the teams' own research. However, Team B decided to find a solution to the problem of indicating parking availability in an outdoor lot, and Team C felt that their invention might meet the "nonobviousness"[10] test because they were providing not only seat adjustments but adjustments to other parts of the workstation as well. Since our lawyer currently doesn't get involved in determining actual patentability and that criterion doesn't count in the grading, I generally accept ideas that *I* find to be novel and nonobvious.

The documentation portion of the project poses challenges to students in any section of EN 481. The document must be a formal proposal and include marketing feasibility information and a marketing plan. Most students at Ward College do not take courses in marketing, so they have to research in an area in which they are less comfortable. Many of them are also not happy writers, so this part of the project is often put off until the last possible moment. As student B said when I announced it was time to consider writing the formal proposal as discussed earlier in the semester,[11] "The fun part is over."

Despite the difficulties, all five proposals were well written and met the requirements of the assignments. In addition, all the oral presentations were well organized and delivered. Team E had planned a Power Point presentation but suffered a disc failure the morning of the presentation; they had prepared overhead slides as a backup just in case, so no delays resulted.

Other professors usually attend the presentations and participate actively in the question and answer period that follows each one. These other professors are from the technical specialties, so they probe for technical feasibility, covering the ground that I, with my degrees in literature and English education, cannot. I take extensive notes during the presentation so I can include their comments on the grade sheet.

The presentations might pose a problem insofar as patenting any of these project inventions is concerned. Included in our patent laws is a provision that "if the invention has been described in a printed publication anywhere . . . more than one year before the date on which an application for patent is filed in this country, a patent cannot be obtained."[12] Our attorney believes that the proposal and the presentation constitute discussion with colleagues rather than publication, but we haven't researched the law to make a final determination of that point. In those cases in which students have actually applied for patents as a result of the work done for this project (a braille fax machine, the electrician's tool described above, a method of prefabricating risers for steps), the patent application process was begun during the semester in which the projects were developed, so the issue hasn't yet arisen as a matter of law.

How We Evaluate and Grade

Each team is graded on the teamwork, the written proposal and the oral presentation. Further, each team is graded as a team, and each student is graded individually. The two grades usually end any cries of unfairness that often arise as a result of team projects,

when one or two students do the major part of the work and the "coattail riders" receive the same good grade. Since I can observe only the in-class meetings of each team and have to rely on progress reports for other information about the teams unless someone actually invites me to solve a problem, I ask all the students to write evaluations of their team and individual members of their teams. Then, taking the students' evaluations into account, I write a detailed grade sheet for the team and a shorter grade sheet for each student. Each student receives a copy of the team grade sheet and his/her own grade sheet.

In order to avoid limiting students' responses to the categories provided on a form, none is provided for the student comments on their team's performance. The students are promised anonymity; their judgments of other students are not shared with any other students or teachers, and I share them here with the permission of the class in the understanding that no names will appear. The following comments are typical.

From student C: "We did not all necessarily get along enough to go out for drinks, but as far as the working relationship went, everything was relatively good." That student suggested that everyone in the team deserved an A.

Another student "would have preferred it if we could pick our own groups. When the groups were picked randomly [though I had explained the basis for team formation], I had a good idea on the amount of effort that each member was going to put into completing the report."

That same student commented on a team member who was often late to class on team meeting days as follows: "I am <u>not</u> so willing to excuse him from the times he was late or not present at in-class group meetings. . . . I also cannot give X as much credit because we actually divided the work up so he would have less work. We did this so that we could be sure that the project would be completed. . . ."

Yet another student was cheerfully willing to give credit where it was due: "Our group could not have done anything without Z. He was the one who came up with our idea and then the one who built our model, which was great for our presentation. He was also the one who wrote our technical description and our production description."

Another student commented on the assignment of teams: "I liked the fact that you assigned the groups because it was more of a life-like scenario. On the job you will not always only work with good friends."

The students are fairly straightforward about their feelings about the project and, more important, the workings of their teams, and so the grading of the projects is relatively fair. Because the students know that their contributions to the grading process do matter, they are willing to write honest evaluations. As for the overall project, they enjoy the opportunity to apply some creativity as well as their technical knowledge to a problem and working to solve problems typically encountered by people working in technical jobs.

Conclusion

The capstone project as carried out in EN 481, Advanced Technical Communication, is meant to further students' written and oral communication skills in a practical engagement with their technical knowledge. ABET criteria currently require demonstration of such skills,[13] not to mention requirements for demonstration of problem solving skills, knowledge of production methods, and practice-oriented standard design applied to work in the field.[14] Further, the various proposed revisions of the ABET criteria mention such skills as the ability to apply creativity in the design of systems, component or processes and the ability to function effectively on teams.[15] We at Ward College do not believe that such skills should be taught only in the technical classes. Hence, the location of this project in EN 481 and the plan to expand the project to emphasize the patentability of the inventions. Whether or not the students in EN 481 actually do apply for a patent, the process of solving the problem posed by this assignment fosters the development and application of multiple skills, in order to truly prepare the students to succeed in the highly competitive job market of the twenty-first century.

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