Cross College Courses: Creating a Modern Day Tower of Babel

Learning Experience

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When students from accounting, business and engineering technology are combined in a project-based software engineering course, the stage is set for creating a modern day Tower of Babel. The students are exposed to a totally unfamiliar problem: an insurance company is expanding and relocating its claims adjustment office. The company needs to link the central office and the new office located across the street which will allow claims adjusters to update and submit claims information—including digital photographs—into a central repository. The result is a project in which each student must learn a foreign technology, learn to work as a team, learn how to deal with the other disciplines, develop a working business plan and deliver a working prototype to solve the problem. The results are impressive. The team figured out how to speak one another’s languages and produced an actual prototype demonstrating the synergistic combination of backgrounds and educational experiences that were taxed into creating a remarkable solution in a short period of time.

By completing the project, engineering students learned about time management and business issues. Business majors learned about the uncertainty of software development and finance majors learned about both.

This paper discuss one of the projects from this software engineering course. There were multiple projects in the course, however this paper will discuss one of the most successful—probably because none of the participants had any prior experience with the business or technologies involved. The paper will focus on the problems faced by the team members and the real skills that had to be acquired to complete the project. The course in which the project was introduced is being used as a template to bring more non-technology students into a program where all participants benefit from learning how to use their skills synergistically to solve actual problems even before they graduate.

Objectives

Software engineering courses can be fairly dry and mechanical. Yet it is still important that students learn the fundamentals of software development. Activities in the course described in this paper combined a flavor of entrepreneurial business with conventional software engineering practices. To be successful, students needed to learn how to
communicate, how to work as a cohesive unit and how to draw from previous personal and educational experiences in order to survive as a group. The model used in the course was simple: Operating as a fictitious company, students needed to meet as a team with a “customer” (the instructor) who feigned no engineering background and claimed to be merely acting as an agent charged with overseeing a project. The “customer” would often randomly change his mind about how the product and its specifications should look and work.

The students were given only nine weeks to create a company, establish project requirements and deliver a functional prototype. Holidays, personal engagements and other matters often got in the way of their schedules. At the beginning of the course, the students encountered difficulty trying to operate as a team. They discovered that it took significant effort to form a team from five individuals to achieve a common goal. Then, the team needed to create a comprehensive product design that would solve the client’s problem. The software engineering skills required to achieve this goal were taught in the class, but the real learning was based on survival and teamwork skills that they would also need in the real world. Students discovered that the most difficult part of completing their project was learning how to work effectively with every other member of the team.

The team needed to develop their communications skills because good communication skills were essential for completion of their project. Due to the small size of the team, work requirements quickly became overwhelming. The students rapidly discovered the importance of leveraging the unique skills and experience of each and every fellow team member. When the situations became tense, if communication broke down, teamwork would suffer as well. Factions within a five-person group could be very difficult to work through. The team eventually learned the benefit of being able to operate as a group through good communication skills. Professionalism and a general desire to see the project succeed often provided the only internal voice of reason that drove the team towards success.

In the classroom, the students had to be constantly reminded that it was important to meet the demands of the customer. They discovered that customers try to provide a specification of what is needed but are often unable to effectively do so. The team learned that (in this case) the customer was incapable of effective communication and was given the task of managing an outside organization composed of professionals. Nepotism may have been the only qualification for the customer to have their position.

The students were reminded that they would have to create a product based on the information received from the customer—and the customer was often unwilling or unable to supply enough detail. This required that the team research the problem, the industry and the solution space to complete the task at hand. These harsh lessons in reality were considered one of the highlights of what the student teams learned in the course.

Course Methodology
This course was taught in a significantly different manner from conventional college courses. The mix of students included engineering, business and finance majors who wanted to learn more about the development of software in a project-based setting. The class was divided into random teams and, for most students, this was the first experience that they had in working together outside of the classroom especially with students from differing disciplines.

Student teams were assigned a project with which they had no prior experience. They were also charged with the responsibility of developing a pseudo-company, assigning job titles and creating a company logo, structure, etc. Part of the class experience included conventional lectures, reading assignments, exams and the like, while other parts of the class time were divided into company meetings where they could meet as a group and hold meetings with their client.

Class lectures were used to describe conventional software engineering practices and real-world problems that the student teams might face including communications problems, dealing with clients and developing project specifications and schedules. The students found these topics to be simple in comparison to the actual task of completing their project. They soon realized that they were overloaded with tasks and that they would have to divide and complete tasks in parallel to function efficiently.

As the deadline approached, the team developed new ways to cope with their differences, and communicate effectively. Eventually the team rose to the occasion and completed the project successfully.

Details

Working in a real world situation with a mix of engineering, accounting and business students is a challenging prospect in the bounded world of a college course. Business and engineering, although intimately linked in the real world, are two entirely different fields on a college campus. Engineering involves a high degree of specialized problem solving tools. These tools include mathematics, logical thinking, abstract ideas, and a step-by-step approach to problem definition. Business involves an entirely different perspective and skill set such as finesse, calculated thinking and risk-taking balanced with cautiousness and, in the case of accounting, a keen attention to detail.

Logical thinking is inherently linked with abstract thinking in the world of engineering. In a similar fashion, business skills involve two seemingly opposite traits. In order to be successful in business, risks must be taken. However, at the same time, business majors are also taught to be cautious. Non-engineering students may be likely to find the solutions to engineering problems are implausible, illogical, and far-fetched. This paradox became a major issue for the team as it tried to figure out why “nothing was being accomplished.”

When examining the differences between engineering and business, it became obvious why communication between the two sides was initially a problem. From the very beginning,
the team discovered that the two sides used different languages and approaches to problem solving. As a result of these inherent language and style barriers, it was important to describe these differences through effective communications. This was achieved through several lectures and case studies presented in the classroom. Without having the teams struggling in real time with communications, the class lectures and discussions would have been purely academic. With project deadlines looming, students grabbed at the opportunity to learn new ways of dealing with their communication problems. This was one of the most important lessons in preparing students for the world after graduation where they are expected to figure out how to communicate, be productive and successful. In this course, exposing the team to a real problem allowed them to struggle and then develop techniques for solving their problem. This method seems to work and the students eventually learned to cope with their differences, communications problems and inabilities to function as a single effective unit. In the end, the project that they completed and the product that they prototyped were testimonial to that ideal.

The students learned quickly that in the real world, an organization cannot create a product that is functional, profitable and useful without the combined inputs from engineering, business and accounting functions. The students came to the realization that in a real world scenario, everyone must work together in order to create an outstanding product even if everyone is not friendly with one another. The instructor created the team maintaining diversity relative to skills, expertise and personality to insure that the team experience would mimic the real world. The team was composed of students who had never spoken before, or perhaps even had personality conflicts. A business and an accounting student added to the group insured that the business aspect of the project would remain in focus.

The entire team was forced to deal with the problem of an unresponsive customer and had to find ways of communicating effectively with him. The team soon discovered that if they did not ask specific questions and get written confirmation of the answers, the client would not and could not be held accountable for wasting valuable team time.

Throughout the class, many other aspects of the real world were introduced. Details about modeling, planning and financing the product were discussed. Learning how to provide a demonstration of the product in its initial stages was discovered to be a crucial skill. The business world and its volatility was brought into the picture as the client continually changed specifications but refused to expand the budget allotments. Unlike the engineering members of the team, the accounting and business students knew that the price of the product should not be based exclusively on salaries and direct costs. Operating costs, overhead, profit margin, expenses, and other financial details had to be included in the final price of the product and the engineering students had a difficult time learning about and coping with these new and nebulous concepts. The entire team learned that if the product was not “worth” the money to the real market, then another pricing scheme had to be assessed. Students learned how a piece of software might need to sell, for example, one hundred copies to be profitable.
This course introduced real world aspects and gave students the skills necessary to meet some of the challenges that they will face after graduation. Students realized that there are no guarantees in the technology world, and that the business world is not as forgiving as the academic one. If a company requires a specific solution, the team must work according to a fairly rigid set of specifications. What the students discovered is that many companies may not actually know what they want or may not be able to communicate the details of their particular problem to the development team. The students learned that they must extract every possible detail from the customer and then piece together what they have learned to create a reasonable specification of the product for development. Having multiple resources, including the eyes of an engineer, a businessman and an accountant allowed the groups to succeed at their tasks.

Results

The implementation of this interdisciplinary project afforded students the opportunity to expand their knowledge and interpersonal communications skills. The cultures within any business enterprise are traditionally diverse, and dealing with this diversity is among the most important and difficult elements of real-world experience to learn. An educator’s goal is to instill knowledge, skills, and awareness within the student. However, the most valuable lessons are those that best model real-world situations and challenges. The project associated with this course provided one such opportunity for students to greatly enhance their collegiate educational experience.

Written information is easily provided to students. However this project presented a more challenging approach to learning. It became the responsibility of each student to teach and learn from one another. To accomplish this task, each student analyzed and assessed his or her own knowledge, skill sets and experiences and developed the communication necessary to be able to share information with group members. This process provided a platform from which a better understanding of one’s own wisdom was understood, thus building confidence and pride in the entire team. In addition to either establishing or enhancing the knowledge of each member, this activity required each student to learn, to some degree, the “languages” and basic concepts of finance, accounting and engineering. Bringing together students representing different mindsets demonstrated the existence, importance and interdependence of each. This realization can best be identified through the words of one student:

“I have become so accustomed to working with businesspersons that I neglected to realize that “software jockeys” actually exist and that they are typically of a different mindset than myself. Of course, I am not placing judgment, by declaring one right and the other wrong. I am just referring to the fact that our ways of thinking are very different. But truly, the one thing I valued most from this course experience is the fact that, despite these differences, we can still learn to work together to produce a quality product that is far superior to one that any of us could have produced on his or her own.”

However, it is important to note that the mere awareness of coexistence is only the
beginning of the learning process. As this student points out, the real value is added by understanding such interdependence and embracing the synergies that can develop to produce a more complete and superior product or idea.

Communication, and in effect cooperation, was the source of the majority of the difficulties encountered. Projects like this one, in the classroom and in business are where one can hone the skills and arts of communication.

In the end, a working prototype was created, modeled after the agreed specification and ultimately demonstrated effectively during a live presentation to a board of directors of the client company composed of engineering and business faculty. The delivered product was not merely an assembly of parts, but the result of collaboration from a number of minds with varying skill sets and backgrounds. This experience has given the students a chance to apply their education in a real world setting. The success is clearly visible not only in the prototype—the culmination of physical efforts—but also in the events and activities behind the results. A team has emerged from a group of individuals, and each member has taken the critical steps necessary to prepare for the world that they will face upon graduation.

Conclusion

Real world training is a required part of today’s higher education world. Students who do not receive this type of education are not properly prepared for the world that they are about to enter. Industry managers need educated graduates who understand the importance of communications, know how to work in teams and have critical thinking and analysis skills. This software engineering course forced students to develop new ways of approaching problems. There were no templates or cookbook solutions—only conventional practical software engineering methods that could help the student through the course. Students in this class learned that conventional resources may not be sufficient and that new skills needed to be developed.

The course not only clarified what skills were necessary, but also gave students the opportunity to develop these skills in a real world environment. Students needed to learn how to communicate with one another and to work effectively with other team members with whom they have little in common. Students learned that attention to detail is paramount when developing a product. Students became aware of the economic and financial side of building a product for a business. Students who participated in this class experienced first hand the internal intricacies of the software industry and its inherent problems. These students will be better equipped to compete for the best jobs and start on a path to a successful career upon graduation.

Bibliography


