# Creative Approach to Teaching Project Management
# Service Learning

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## Introduction

A project is a complex, non-routine, one-time effort limited by time, budget, resources, and performance specifications designed to meet customer needs[1]. Therefore, they require a unique approach to management and administration. A creative approach is taken in designing and teaching the graduate level Technological Project Management course offered as part of the Industrial & Manufacturing Engineering department's program at California Polytechnic State University in San Luis Obispo. The course covers the basic issues related to, and tools used for managing projects in organizations in addition to providing the opportunity for a real-world application of the tools and concepts comprising project management

The course is designed for students who want to learn how to manage a project by following the "learn by doing" philosophy. The course content follows the "project life cycle", investigating projects from start to finish. However, the best way to appreciate the complexities of managing a project and project personnel is through direct experience. For this reason, students are assigned to a project team for a house rehabilitation service project. Class efforts are focused on a home improvement project for a low income family with the mission to improve the quality of their lives.

Through this project, students engage in scheduling, supply management, project team recruiting, resource allocation, time/cost tradeoffs, risk assessment, task coordination, team-building, progress monitoring, and post project assessment. Each team plans and manages its progress using appropriate project management tools and techniques. Teams present informal status reports during the semester. Additionally students contribute their own physical labor to the project. Through an offering of this course in Spring of 2004, students spent two months meticulously planning their schedule down to the minute for two short weekends of work, splitting into smaller teams that had to stay on budget, develop contingency options and plan the remodel from top to bottom. They researched how to install drywall, laminated flooring, carpet and lay tile. We received no funding with which to perform the work for this project and depended entirely upon the generosity of businesses and individuals in the community. More than 40 donors, including local businesses and individuals provided financial support for the project. Students raised nearly $14000 in monetary and in-kind contributions and in the end, they worked a miracle.

**Clients**

The purpose of the project is to allow students an opportunity to learn project planning and management skills while at the same time make a contribution to the community. Various non profit organizations were contacted and a client who fitted the selection criteria was introduced to us by Life Step Foundation. Our selected clients, a delightful couple both in their late sixties, have been dealing with the challenges of disability for many years and whose circumstances prevent them from making many necessary changes in their home. As the victim of a violent crime twenty years ago, the husband suffered a traumatic head injury, forcing early retirement. Seven years ago, a failed knee replacement and severe infection forced his physician to fuse his right leg. A fall after coming home from the hospital required a subsequent hip replacement. He is now wheelchair bound and cannot be left alone. His wife is his primary caregiver and because their funds are limited she can afford only a few precious hours a week of outside care. Due to his disability his care requirements are very heavy and physically draining for his wife. It was our goal to improve the safety and comfort of their home and with the completion of a roll in shower, handicap accessible toilet and sink, and other household project that would otherwise go undone, bring great comfort and hope for both of them. The challenge for the students is to plan and schedule the work and resources to assure that the entire project can be completed in only four days before the school quarter ends.

**Theoretical Course Content and Objectives**

The course content is developed with the goal of exposing students to various strategies used in project planning with tools such as a work breakdown structure (WBS), Statement of Work (SOW), and Responsibility Matrix. Basic organizational structures and staffing strategies are introduced. Students learn scheduling techniques with risk assessment on project schedules, resource allocation and time/cost trade-offs. As a result their abilities for developing, planning, structuring, scheduling, and controlling projects are enhanced.

Students are made aware of various people and team roles and responsibilities essential for the effective implementation of projects. In addition they learn the appropriate use of computers in planning and controlling projects, and monitoring progress (actual vs. planned and earned value). The importance of conflict management is emphasized along with techniques to manage conflict. The course also offers students with the following personnel development opportunities:

- Analytical, Writing, and Presentation Skills - research a specific topic, analyze a problem, think creatively, suggest a solution, and prepare a written or oral presentation of the solution.

- Collaboration Skills - work effectively in a team, interact well with others, exercise leadership, sell ideas, adapt to changes, and manage a project.

**Project Definition Phase and Teams**

The project start-up and project definition is essential for completing a project successfully. All the stake holders and people involved in the project must have the same expectations and perception of the project and its work. The goal and scope of the project must be clearly defined and agreed upon. In addition the rules of the project must be clearly defined and agreed upon and everyone needs to understand their role. This sets a high demand on communication. Different people process the same information differently depending on past experience and culture. Constant, effective communication and feedback is important to overcome these communication barriers. Many delays and costs can be reduced or even eliminated if a good communication plan is used.

At the beginning of the quarter the class which consisted of 25 students visited our selected client's home and asked for their wish list. Based on the wish list, the initial project scope was drafted; however the final project scope would be dictated by the amount of donations gathered throughout the quarter and risk assessments of the tasks. As a result the following teams/individual roles were formed:

- Project Coordination Team
- Bathroom Team
- Flooring Team
- Painting Team
- Shelving Team
- Fundraising and Finance Team
- Electrical Team
- Safety and Quality Control Inspector
- Support Services (to deal with logistics, food and drink, etc)
- Web Page Administrator

Each team picks a leader and develops their team charter outlining the policies and procedures it will follow and their communication plan to assure its effectiveness over the course of the quarter. The instructor's evaluation of the team effectiveness is based on how well the team follows its policies and procedures. Teams also develop a clear statement of their role in the project along with their mission, vision, problem statement and objectives.

**Project Planning Phase**

In order to build the project plan each team generates a hierarchical structure list of primary work elements under its responsibility. This work breakdown structure includes

initial estimates of work effort (man hours). Accompanying the WBS submission is a description of the proposed performance standards for the key deliverables and a preliminary plan for how the proposed standards will be achieved. From the WBS each team generates a list of material and equipment that would be needed to achieve its planned work. Since the primary purpose of generating the list is for budgeting purposes, all material and equipment items need to include quantity, type, style, costs and extensions to a grand total by the team work. An initial project network is also developed by each team. A detailed responsibility matrix is developed by each team broken down to an appropriate degree to allow for assignment of responsibility to individuals.

The team project plans include the elements listed below. The magnitude of each element of the plan depends upon the nature of the team and its work scope.

- Work breakdown structure
- Plan for integration with other teams
- Time estimates
- Recruiting Plan
- Training Plan
- Assessment of needed technical assistance
- Gantt schedule
- Risk assessments and contingency plans
- Quality assurance and performance measurement plans
- Material and other resource requirements
- Safety Plan

The overall project plan is developed by the Project Coordination Team and includes the following:

- Overall team structure
- Gantt schedule for whole project
- Reporting times
- Responsibility matrix
- Project close-out plan

The project Coordination Team is also responsible for developing the Statement of Work to be presented and approved by our clients prior to beginning the work. In addition they are responsible for obtaining any permits required to do the construction and scheduling the county inspection to be completed in a timely manner.

An overall plan for standards of performance, monitoring and controlling performance, and safety policies and practices is established for the project. This plan serves as the basis for the responsibilities of the Quality Control/Safety Inspector in addition to serving as a basis for evaluating the performance of students during the work weekends.

**Project Control**

All expenditures are tracked in real time. At any point of time, the class is able to show actual expenditures against budget. This accounting plan includes policies and rules for controlling the expenditures to assure that no expenditure is undertaken without available funding. Any changes in the project plan are also communicated to all class members.

**Working the Plan**

Our client's mobility was a very special case, since one leg was fused and he was unable to use the shower and had been receiving bed baths. Therefore the main area of focus was the bathroom which required a large area of maneuverability and wheelchair access. Since our client's leg required a lot of shower area. Part of the plan was to remove a small wall in the bathroom. Demolition of the bathroom which involved removing all the sheetrock from the walls, taking out the toilet, sink and all hardware began on Friday May 14th 2004. A shower wall was removed and the plumbing had to be capped and moved. The concrete slab in the bathroom was removed for the drain to move. The drain was repositioned and concrete was poured and left to cure. The demolition project took all weekend.

The big weekend May 21-24 arrived and our clients were relocated to a hotel that had been arranged by the Logistics Team. The entire furniture was removed from the house and students started working their plans. The following lists a summary of what each team was able to accomplish, (for more detail and complete before and after photos please visit the project website at **http://www.polyhouse.org**):

- **Bathroom Team**: Completely remodeled the bathroom to include a handicap accessible sink and toilet and roll-in shower. Students also tiled the walls and laid flat tile on the floors and added new fixtures.

- **Flooring Team:** Laid laminated flooring that had the appearance of hardwood floor in the living room and hallway. Installed new carpet for the two bedrooms.

- **Painting Team:** Painted the entire indoors of the house, including the ceilings with colors selected by our clients.

- **Electrical Team:** Installed a ceiling fan with remote in the master bedroom and new ceiling fans for the remaining rooms. Added new lighting in bedrooms which required rewiring the electricity in the home.

- **Shelving Team:** Added easy accessible shelves in the garage and closets

- **Support services:** Disposed all trash during the work weekends, returned all the client's belongings back into the house once the work was completed, and made sure there was sufficient food and drinks available for everyone.

## Project Challenges

One of the major challenges the students faced in the project was planning a project with a variable scope. They needed to implement techniques for identifying, justifying, selecting, and prioritizing the various parts of the planned work. Through this process they were faced with detecting problems, resolving conflicts, and overcoming barriers to implementation. Another challenge was planning and implementing a project that was time constrained with limited flexibility in resources.

## Project Benefits

The class project and assignments provides students with an opportunity to apply decision tools, frameworks and past experiences to analyze real problems and risks, in a systematic manner. They also have opportunities to examine their own personal communication styles and to assess their capabilities in numerous one-on-one and team situations. The project requires participants to display good listening skills, empathy, tact, and persuasiveness to accomplish team goals through people. Through the implementation of the project, students become aware of a variety of motivational, authority and influence techniques used in project management

Every student is part of at least one team and is provided the opportunity to work through challenges and triumphs associated with team activity. Several students also play leadership roles in various aspects of the project. These leaders are chosen and evaluated by their peers. Through hands-on involvement in a real project, students test their abilities to take action when needed, to make mid-course adjustments on plans, and to recover from unexpected problems. The house project provided a rare educational platform that went beyond the classroom setting into the actual implementation. Working closely with others provides students with opportunities to think about their values, how they operate in team environments, and what they want to achieve in the future. In addition it allows students to learn about and experience some of the problems faced by other people. Interacting closely with our client helped students become sensitive to the needs of others.

## Conclusion

The professional conduct and attitude among all the different team members was commendable. The project was carried out successfully on time and within budget and received broad media coverage by press (Central Coast newspaper: The Tribune Front

Page lead article) & regional TV stations for three days in every news segment. The course and project was a true example where "learn-by-doing" made a real difference to a disabled and disadvantaged family in the central coast and the entire San Luis Obispo community was made fully aware of Cal Poly student outreach. The effort that students put into this project deserves honorable mention.

The project terminates with a post-project assessment, personal paper reflecting on the project experience, and the hands-off of the rehabilitated structure to the client. Letters of appreciation are also sent to all donors of in-kind items, cash donors and all volunteers. There are several lessons which students learned from this project. The first is that you can never underestimate the importance of the planning phase of the project. A more well thought out plan would have highlighted potential issues in the risk assessment. Another lesson learned from this project is the importance of communication. To be an effective manager you must communicate effectively and coordinate the relationships and correspondence between the team members. The project helped students understand the qualities of success and importance of showing initiative and integrity. Finally they learned the value of a committed team and gained real life experience in managing a project. Equally important was very rare personal satisfaction that comes from helping others.

## Acknowledgments

## References

[1] Gray, C., Larson, E., Project Management, The managerial Approach, 2$^{nd}$ Edition 2003, McGraw-Hill Irwin.
[2] Verzuh, E., The Fast Forward MBA in Project Management, 1999, John Wiley & Sons.
[3] http://www.polyhouse.org course website.

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