Lessons Learned from Client Projects in an Undergraduate Project Management Course

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ABSTRACT

This work proposes that a subtle combination of three learning methods offering 'just in time' project management knowledge, coupled with hands-on project management experience can be particularly effective in producing project management students with employable skills. Students were required to apply formal project management knowledge to gain real-world experience managing a 12-week client project. 'Lessons Learned' reports prepared by 112 students enrolled from Fall 2009 - Fall 2011 were collected and analyzed to assess the student experience. Analysis of the 'lessons learned' data illustrates the challenges and successes students faced as project managers of a client project in seven of the nine project management knowledge areas. Finally, a number of 'teachable moments', made possible by the innovative learning environment, including the difference between conceptual learning and experiential learning with respect to integration, risk, communication and HR management and the difference between 'leading' and 'managing', demonstrate the added value of integrating hands-on skills with 'just in time' knowledge to create an authentic project management learning environment.

Keywords: Project-based Learning, Learner-centered Education, Experiential Learning and Education, Team Projects, Project Management

1. INTRODUCTION

The motivation for this paper comes from two driving forces: (1) growing industry demand for competent and qualified project managers and (2) efforts of universities to develop innovative project management courses and degrees that graduate students with a combination of project management knowledge and real-world skills that meet increasingly demanding industry needs. The purpose of this paper is to look at the subtle blending of three teaching methods – instructor-centered education, learner-centered education and project-based learning - to create a highly effective learning environment for project management students and the student experiences achieved from delivering the course over a period of several semesters.

Different forms of learning in the classroom can impact the extent and quality of the academic and practical knowledge and the depth of lessons learned by students in their individual and group classroom experiences. These different types of learning typically fall into three main categories: (1) instructor-centered education, (2) learner-centered education and (3) project-based learning. To accommodate the growing demands of employers who are increasingly seeking new university graduates with project management skills and competencies (i.e., teamwork, leadership, communication skills, ability to effect change), learning methods are evolving to place a greater emphasis on student participation and involvement during the learning process. Interest in these more active and experiential learning-centered pedagogies, has increased dramatically during the last several years (Young & Dieklemann 2002; Elam & Spotts 2004, Camarero, Rodriquez & San Jose 2010), resulting in a changing role for educators. Student learning, rather than teaching, is becoming the defining element of the instructor's role (Elam and Spotts 2004) and the educator's role in the classroom is changing from the 'Ringmaster' who is focused on maintaining order to a 'Conductor' who encourages learning (Kraft, 2010). To meet the requirements of this new role, innovative educators are introducing a broader set of learning activities into their classroom, including an increased emphasis on active and experiential learning, such as client projects (Tynjälä, Pirhonen, Vartiainen & Helle 2010; Camarero, et al. 2010; Keys 2003). Cooke and Williams (2004) propose that experiential learning offer numerous advantages over lectures and objective exams by creating opportunities for students to apply concepts and theories learned in the classroom to solve 'real world' problems.

Hard skills, such as the Project Management Book of Knowledge (PMBOK®) methodologies, processes, and project management tools/techniques are critical requirements for project management, and are best taught in an instructor-centered setting. While these hard skills are necessary capabilities for project managers, they are not

sufficient (Jewels & Ford 2004). Supporting this opinion, Petter and Randolph (2009), stress the importance of training future project managers in the art of interpersonal 'soft' skills. Jewels and Bruce (2003) go so far as to say that statistically "most projects fail because the 'soft science' portions of the project have not received enough attention – the human factor has not been adequately addressed". In the classroom, these soft skills, which include communication skills, critical thinking, leadership, collaboration and teamwork, socio-political demands, and the ability to analyze a situation and develop an effective solution, are best taught in a learner-centered environment and particularly in a real-world situation where students gain hands-on experience managing a project. It follows, therefore, that if educators rely solely on an instructor-centered education paradigm for teaching project management, their students will not gain the full set of hard and soft skills they need to compete in the job market.

"Learning techniques, beyond classroom activities, have been recognized as essential ingredients to enhance learning outcomes" (Kamoun & Selim 2007, p. 81). Client projects are one form of experiential learning that is evolving as a recurring element in university courses (Tynjälä, et al. 2010; Cooke & Williams 2004; Keys 2003) and are particularly appropriate in a project management course. These projects usually consist of a group of students and a business client working together to solve a business problem. The purpose of these projects is to allow students to gain an understanding of how a typical business environment functions and provide a solid foundation for long-term, mutually beneficial partnerships. In this way, the students can integrate the knowledge gained in the classroom with that of the other group members and their real world experiences within the project to grow to expand their own personal knowledge. Researchers (Tynjälä, et al. 2010; Cooke & Williams 2004; Tucker, McCarthy, Hoxmeier, & Lenk 1998) have demonstrated that client projects improve students' critical thinking and communication skills because they require students to work through complex issues, negotiate team dynamics, and interact with working professionals. And, these client projects enlighten and challenge students in ways far beyond those provided by even the best-written case studies that typically focus on crisis situations that rarely occur in business (Dorn 1999).

Limited literature exists on the use of client projects in project management classrooms although the benefits of doing so are many (Tynjälä et al. 2010). This paper discusses one teaching model that Figure 1 – Theoretical Framework was introduced into an undergraduate project management course at a four-year University in the Southeast region of the USA that combines traditional instructor-centered learning with learner-centered education and project-based learning. In the following sections, the author discusses the literature on the three different types of learning and presents the sample population and the project. Next, to capture the student experience and their successes and failures in managing a client project, the author collected and analyzed 'lessons learned' reports to identify 'teachable moments' unique to learn-centered education and project-based learning. Then, she discusses how this self-reflection enabled students to bridge the gap between the PMBOK® knowledge learned in the classroom and their hands-on experience gained from managing a client project team and their overall attitude to this innovative teaching approach is discussed. Finally, she offers recommendations to smooth the way for others to implement this much needed hands-on approach to University-level project management education.

2. THEORETICAL FRAMEWORK

Two learning theories guide this study: (1) directed instruction and (2) cognitive learning. Advocates of directed instruction (objectivists) believe that the goal of education is to communicate or transfer knowledge to learners in the most efficient and effective way possible (Bednar, Cunningham, Duffy & Perry 1991). In contrast, those who advocate cognitive learning (constructivists) believe that for higher levels of cognition to occur, students must build their own knowledge through activities that engage them in active learning process (Tynjälä, et al. 1999). Figure 1 shows how the instructor blended one directed instruction approach (i.e., instructor-centered education) and two cognitive learning approaches (i.e., learner-centered education and project-based learning) to form a highly effective cohesive learning experience in the project management course that is the focus of this study. Each of these learning approaches is discussed in greater detail below.

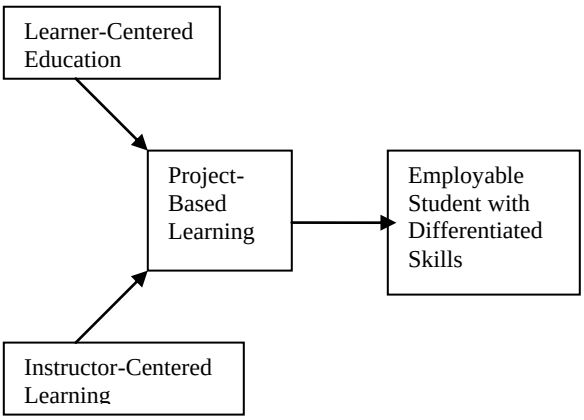

Figure 1 – Theoretical Framework

2.1 Instructor-Centered Instruction – a directed instruction approach

Instructor-centered education follows the traditional teaching methodology typically used in the classroom. This form of education uses a general lecturing method in which the focus is on the effective communication of information (Keys 2003). The teacher in this case is the transmitter of this information. The role of the student can be compared to that of a terminal of gathered information (Saulnier et al. 2008). In assessing students, the teacher will generally deliver a test that measures the extent of the knowledge that students have gained (Keys 2003). While this method is still widely used in the classroom today, assessment is primarily geared towards memory recall. In this process, the student's focus is more on remembering information for the test, rather than remembering *and* learning the information. The student does

not gain the knowledge that will assist in future application on a project in a typical business setting. While assessment is specifically geared towards testing, students' focus on the information becomes more competitive and less learning-oriented (Saulnier et al. 2008).

2.2 Learner-Centered Education – a cognitive learning approach

The purpose of learner-centered education is not so much the transmission of knowledge from the teacher to the student, but more that of building a student's knowledge to apply what is learned (Saulnier et al. 2008). To achieve this objective, learner-centered education provides a problem-solving approach for the student and allows the student to explore and experiment with different situations (Key 2003). While learner-centered education is a more hands-on approach to learning, it can also include lecturing at times. With the incorporation of lecturing into the learning experience, the lectures generally correspond to the material being learned through the hands-on experience around or at the same time (Saulnier et al. 2008). This approach allows students to both obtain the information necessary to learn and perform what they have learned. With learner-centered education, assessment is not conducted by testing the student with questions, but is conducted by the student submitting deliverables. In essence, the student is using the information learned in a real-life setting rather than attempting to temporarily memorize the information in order to pass an examination.

Camerero, et al. (2010) propose that one of the most significant benefits of experiential exercises is that they enhance learning by increasing student involvement in the learning process. and that experiential techniques can be designed to improve critical skills in the areas of decision making, problem solving, planning, written and oral communication, and creativity.

2.3 Project-Based Learning – a cognitive learning approach

Project-based learning is a student-driven, teacher-facilitated approach to learning and is a key pedagogical strategy for creating independent thinking that teaches curriculum concepts through real-world projects (Bell 2010). It takes a constructivist view in which learning occurs through the student's active processing of knowledge rather than as a result of passively receiving information (von Glasersfeld 1985; Tynjälä 1999). Consequently, the role of the teacher is to support and facilitate student learning (von Glasersfeld 1985, 2007; Adams 2006). This constructivist approach cultivates knowledge integration and problem-solving skills through proposing and defining problems, collecting and analyzing data, communicating with others and creating concrete results. Unlike other forms of learning, project-based learning treats the output of project work as a major learning outcome. Assessment procedures are embedded in the learning process, focus on authentic tasks and take into account the learners' individual orientations and foster their meta-cognitive skills (Hansen 2004). In so doing, it takes students' various learning styles into account to increase learning effectiveness. As project management students enter the workforce, they will be judged not only on their performance outcomes, but also on their ability to collaborate, negotiate, plan and organize. Project-based learning effectively equips students with this toolbox of skills and prepares them to be successful in the workplace. This approach is advocated by Mitchell (2006) and Reif and Mitri (2006) who concur that teaching methods that both facilitate the learning and understanding of project management concepts and enable the application of those concepts to complex situations required in the practice of project management should form the core of all project management curricula.

Inasmuch as all of the skill sets discussed above in the three types of learning are important aspects of project management it follows that project management courses should be delivered in a highly experiential way.

3. THE PROJECT MANAGEMENT COURSE

To this end, the instructor developed a project management course at a 4-year university in the Southeast USA in which instructor-centered, learner-centered and project-based learning methods were carefully integrated for maximum effectiveness. The focus of the course is the development of a set of project management knowledge and skills that equip students to work as project coordinators/managers upon graduation. The knowledge component of the course is closely aligned with the industry-standard CAPM® certification and the Project Management Institute's *A Guide to the Project Management Body of Knowledge* (PMBOK® Guide, 4th Edition). The instructor delivers the skills component of the course through a supervised, hands-on experience managing a 4-person project team consisting of students enrolled in another synergistic undergraduate course who are actively engaged in a business process analysis project for a real-world client company.

The directed instruction component of the learning process consisted of instructor-delivered PMBOK® knowledge, combined with learner-centered techniques that include hand-on use of the latest project management software, project management-related computer simulations and student in-class group presentations of the nine PMBOK® knowledge areas. The instructor carefully times delivery of all materials to correspond with the knowledge and skills needed to produce 14 deliverables related to management of the client project. This provided the student project managers with the necessary "just in time" knowledge and skills to enable the successful management of their project team.

The cognitive learning elements of the course comprised (1) in-class student presentation of content material, (2) computer simulations and (3) managing a client project.

3.1 Student Presentation of PMBOK® Knowledge Areas

Students in the project management course were assigned into groups of 2 or 3 students to prepare and present the concepts, processes, inputs, outputs and tools/techniques for a PMBOK® knowledge area of their choice. Students were encouraged to present the material in a creative way including Jeopardy, Who Wants to be a Millionaire, PMBOK® knowledge 'pong', skits, etc. In addition, students were encouraged to reflect on how the material they

were presenting related to their current experiences in their roles as project managers of a client project. After approximately 2/3 of the class-time, the instructor summarized the knowledge area content, offered real-world examples applying the knowledge and engaged the students in an interactive group exercise to test their understanding and their ability to reason out the logical inputs, tools/techniques and outputs for each of the knowledge area processes. Necessary skills in using the different project management tools and techniques, required within each of the knowledge areas, were taught by the instructor coupled with in-class paper and pencil and computer software lab exercises to test student understanding.

3.2 Project Management Computer Simulation Exercises

At the point in the semester when the human resource and communications knowledge area had been discussed in the classroom, the students met for their next class session in a computer lab to work in groups on a computer simulation game that tested their ability to persuade people to support a project they are managing. Several weeks later, when students had presented all knowledge areas, the students again engaged in another group computer simulation game that tested their ability to initiate, plan, execute, monitor/control and close a project they are managing.

At all times, students were encouraged to apply what they were learning in the classroom to their ongoing experiences in the client project they were managing. Both simulations were run competitively with first, second and third place teams earning extra credit points.

3.3 The Client Project

The students conducted the client project over a 12-week period during weeks 4 through 15 of a 16-week semester. The instructor paired up students enrolled in the project management course to co-manage each client project. To determine the project manager pairs, the instructor evaluated the students using two cognitive instruments: (1) Myers-Briggs Type Indicator (MBTI) that classified them into a four-letter profile based on the four dimensions: Introvert/Extravert, Sensing/Intuition, Thinking/Feeling and Judgment/Perception and, (2) Creative Whack Pack Assessment (VonOech 1998) wherein students were classified as Artists, Warriors, Explorers and Judges based on their answers to a series of 64 behavioral questions. Student participation in these assessments was voluntary.

The instructor played the role of program manager throughout the semester. Each project team consisted of six students: two (2) project managers enrolled in the undergraduate project management course that manages a project team of four (4) students from an undergraduate systems analysis course. Both courses are taught by the same instructor.

In keeping with the tenets of the project-based learning approach, each project team was given the freedom to choose the company they would work with throughout the semester. Client companies included small, medium and large companies in a variety of industry sectors. After choosing their company, each team was given the initial task of identifying a problem, directive or opportunity within the company's processes that needed to be 'improved', 'fixed' or 'created'. Processes addressed included: inventory control, order processing, staffing, payroll, fundraising, invoice processing, food spoilage, equipment tracking and scheduling. To safeguard against a disparate level of effort, learning and achievement among the project teams, the instructor approved the choice of each company and process to control the scope, difficulty and importance of each client project. While the focus of the project team was on the requirements collection, problem-solving and modeling processes the team followed throughout the conduct of the project, the focus of the project manager was on team building, group dynamics, planning, scheduling, creating a work breakdown structure, allocating resources, managing project changes and generally managing the team throughout the five project management process groups, taking into account the nine PMBOK® knowledge areas.

In addition to moving their team through the nine knowledge areas and five project management process groups using the 42 PMBOK® processes, the instructor required each team of project managers to set up an electronic discussion group to facilitate communication between all group members throughout the project and to serve as a document repository. The instructor also required the project managers to keep a log of all online communication (email and online groups).

The project began with a kick-off meeting facilitated by the instructor and was attended by all project team members and the project managers. The instructor gave a list of 14 deliverables to each pair of project managers to submit throughout the course of the project, culminating in the creation of a project notebook in which the project managers documented all facets of the management of the project team. To allow project managers discretion in time management, all project deadlines, except that for the final deliverable, were designated as 'soft' deadlines that allowed late submissions.

The instructor did not charge the project managers with keeping a budget since each project was performed free of charge to companies in the community. However, the project managers were asked to consider the value of each of their team members particularly when work had to be re-assigned. Throughout the semester, project team members and project managers met with the program manager (instructor) every two weeks for a progress review meeting. The sequence of deliverables required from the project managers is shown in Table 1.

Throughout the semester, the instructor met several times with each project group, in her role as Program Manager. In the meetings the project managers reported to the instructor on quality of planning, creating group deliverables, project and schedule status, monitoring and controlling techniques used, effectiveness of communication and collaboration techniques and group dynamics and the instructor offered suggestions and advice for improvements to the project managers, as needed. The instructor provided templates to the project managers for completion of many of their deliverables to simulate support typically provided by a Project Management Office.

Table 1 - Project Manager Deliverables

	Deliverable	Week Due
1	Individual group member skills, schedule constraints, contact details	4
2	Team member contact details based on information gathered at the kick-off meeting	5
3	Minutes of weekly team meetings	5-15
4	Log of all online communication activities between project managers and team members.	5-15
5	Team Charter	6
6	Weekly team Progress Reports	6-15
7	Weekly team member Time Sheets with team	7-15
8	Stakeholder Register and Stakeholder Strategy	7
9	Project Charter and Work Breakdown Structure	7
10	Baseline Gantt chart with project schedule and resource allocations	8
11	Tracking Gantt chart	9-15
12	Project notebook	15
13	In-Class Presentation of the project management experience	15
14	Individual Lessons learned for each project manager	15

3.4 Project Assessment

At the conclusion of the project, the instructor required the project managers to submit one project notebook and individual Lessons-Learned Reports. The project managers presented and discussed these documents in the final class session of the semester. The Lessons-Learned Report is a report that describes the lessons learned by the student from beginning to completion of the project. The instructor provided each student with a template to detail his/her lessons learned over the course of the project. This Lessons-Learned template was divided into the nine (9) knowledge areas and five (5) process groups. The report allowed students to detail the lessons they learned in each of the knowledge areas, as well as the student's opinion on how he/she might improve their project management skills. In addition to the teamwork and hand-on experience students gained by working on client projects, lessons learned in their project group and through the process of managing a project are also a useful learning tool that acts as a building block to supplement 'textbook' knowledge with 'real world' experience.

Lessons learned are one of the most important ways in which businesses can gather information on how well they are performing in business projects (Grant, 2009; Abramovici, 1999). Mengel (2008) proposed that lessons learned are equally important in the classroom, and proposes that encouraging students to reflect on their learning and performance leads to improvements in their project management abilities. It is important to capture both successes and failures on projects, since future projects can benefit by following the lessons learned that were successful and avoiding the failures.

The purpose of the lessons learned assignment in the project management course described in this paper was to encourage students to reflect on their experiences managing a client project and how the integration of both instructor-centered and learner-centered education in the course contributed to their project-based learning. In addition, analysis of the lessons learned allowed the instructor to identify the ways in which the various pedagogical approaches she had used throughout the course contributed to the students' overall learning experience.

The conduct of the study is summarized in Table 2.

4. RESULTS

The author analyzed lessons learned submitted by a total of 112 students enrolled in the project management course from Fall 2009 through Fall 2011, to assess the student experience. While each student had their own individual experience, certain patterns and themes emerged. These patterns and themes are discussed next within each of the nine knowledge areas and individual student comments help demonstrate the individual student experience with their client project. Due to space limitations, only those quotes that are most illustrative of the full complement of student comments are shown within each of the nine knowledge areas.

4.1 Integration Management

This was an area where managers reported that they did not initially understand the importance of this concept from their classroom learning and that it only became clear as they actually managed their client project.

While a few students recognized that integration should be focused on from the beginning and throughout the life of the project, several admitted that they did not do this, which in turn, hindered their overall progress. In retrospect, the students believe that they would have been able to more smoothly transition through all of the knowledge areas if they had grasped the important of integration management earlier in the process.

Those managers who were satisfied with the overall outcome and/or had no issues had developed their project charter and developed their project management plan in a timely manner; efficiently monitored and controlled project work; identified, evaluated, and managed changes throughout the project life cycle; and finalized all activities to formally close the project. The managers with an unsuccessful outcome either did not accomplish these

Table 2 – Conduct of the Study

	1st phase of study	2nd phase of study	3rd phase of study
Learning Approach	Instructor-centered	Learner-focused	Project-based
Content	9 PMBOK® Knowledge Areas	Hands-on use of MS Project PM related computer simulations Student presentation of 9 PMBOK® knowledge areas	Interface with client companies Manage improvement of company processes Manage Team Determine Scope Set/Control Schedule Manage Changes
Student Team Composition	Selected by instructor	2-3 students in presentation groups and simulation teams	2 – IT project managers 4 – team members from u/g systems analysis course
Learning Objectives	Know 9 knowledge areas and 5 process groups of PMBOK®. Describe the inputs, tools/techniques and outputs of the 42 PM processes,	Better understand PMBOK® materials and apply them in computer simulations	Apply knowledge and skills learned in 1st and 2nd phases of the study and reflect on learning experience.
Anticipated Outcome	Development of project management knowledge and skills to better perform as project coordinators to improve employability. Demonstration of ability to successfully apply theoretical/conceptual knowledge to a client project.		

processes in a timely manner, or completed some but not all of the processes, causing them to lack focus in their management of their client project.

> "Integrating all aspects of the project is a hard process. NOTHING comes together like you plan. People don't finish things when you plan and there are always problems."

> "Working on this project I learned that for any project to be successful all of the knowledge areas have to be constantly in the mind of the manager over the course of the project for things to run smoothly."

> "Getting everything together and to flow was the hardest part of the project. Getting everything to run smoothly and cohesively was a challenge."

> "Integration is a difficult to grasp as a concrete topic. Actually managing a project team really helped me get my head around it and understand what it was all about."

The following two main themes emerged related to project integration management. The number in parentheses indicates the number of student comments associated with each theme:

1. It is important to focus on project integration 'early and often' throughout the project (12)
2. Transition through all other knowledge areas would have been smoother had they grasped the importance of integration management earlier in the project lifecycle (8)

4.2 Project Scope Management

While some of the students had no difficulty in understanding the concept of scope and were able to define project scope in their client project, it is clear that some students had difficulty both understanding the concept of project scope introduced in the classroom and with managing it in a 'real world' setting. A small number indicated that although they understood the concept they faced challenges in managing major changes to the initial scope of the project.

At the beginning of the project, some managers allowed their team members a lot of freedom, but quickly found out that they were becoming victims of scope creep. These managers suggested that although this freedom helped keep their team members working and interested in the project, they needed to limit the amount of freedom and hold team members accountable for the tasks assigned to them by the project manager.

Those project managers who felt they were unable to clearly define, understand, and control the scope gave several reasons for this: their team members did not get enough detail from their client, the project managers had no fallback plans and had failed to clearly state project objectives to their team members. In terms of not having enough detail, project managers felt they had not required their team members to acquire a sufficiently detailed description of what the project entails from their client, hadn't secured an adequate understanding of how deliverables should be completed from their instructor, and hadn't considered the different ways in which they could conduct team meetings.

Several managers reported that they struggled to get their project off the ground. This struggle was for two (2) specific reasons: the company they originally chose backed out or the process initially chosen to improve was changed by the client. Fallback plans would help the team be prepared for

these types of situations and the time required to look for a new company or process would be saved. In each of these situations, radical changes to the project scope were necessary.

Some managers felt they had not clearly stated the project objectives to their team. By clearly stating the project objectives and constantly re-evaluating the project, the managers felt they would have improved their approach to scope management.

Typical student comments that reflect the type of cognitive learning that occurred related to managing project scope, include:

> "We learned about scope creep in class, but actually doing this project allowed me to see just how easy it is for this to happen."

> "I learned that it is very important to thoroughly define scope early on, we didn't and ended up spending time on things that we shouldn't have."

> "In hindsight, I really appreciated how essential a clearly defined work breakdown structure is to the scope of the project."

> "During research into requirements, new ideas emerged and we had to manage the team to encourage them to step back and focus on the originally planned functionality to avoid scope creep."

Summarizing the lessons learned in scope management, the following five themes emerged:

1. Scope Creep - Scope was defined, but difficult to control (22)
2. Scope Definition - Scope was difficult to define, but easy to control (20)
3. Defining scope is critical – must be able to define 'what's in and 'what's out' (18)
4. Scope had to be changed (8)

4.3 Project Time Management

The biggest issue to arise with respect to time management was difficulty finding a uniform time for weekly team meetings and occasional client meetings. The student managers attributed this to the fact that "many college students have multiple responsibilities to tend to throughout the semester, so scheduling can become difficult, and at times, impossible." Interestingly, in a class discussion on this issue, the students were surprised that this was an issue that they would face when they take up a job. They had the mistaken idea that in a real-world situation they would only be assigned to work on one project at a time with no other competing responsibilities!

An interesting, but not unexpected lesson learned, was the presence of slackers in the group coupled with noticeable levels of procrastination that created time pressures for the project managers. Student managers also complained that time seemed to "creep up on students during a project", sometimes because of too much time spent trying to perfect a single deliverable or generally getting behind on work and having to playing catch-up.

Another common concern was with the timely completion of deliverables. Many managers felt there was not enough time to complete the deliverables. They also had difficulty staying within the established time constraints and manager initially struggled to lay out a timeline in which to complete work. However, some managers disagreed and stated that there was more than enough time to complete and submit the deliverables on time and that the time element is strictly in the hands of the project managers.

The following student comments demonstrate some of the individual time management issues faced in the project:

> "Managing my time was easier said than done. There were so many unforeseen obstacles that we had to deal with, such as weather, sickness, and so on."

> "Managers and team members had to stay consistent and persistent with their work to make sure that the final project got finished on time."

> "The largest obstacle facing our team in time management was getting team member schedules to line up so that we could fit in weekly meetings to discuss progress and updated objectives. Also finding a mutually convenient time to meet with the client was a challenge, but manageable."

> "Estimating time needed to complete tasks is hard to do and sometimes had our group trying to race the clock"

The following four main themes emerged related to project time management:

1. Coordinating team member meeting times can be difficult (24)
2. It's not always easy to stay within time constraints established (18)
3. Time was difficult to control throughout the project (10)
4. Estimating timeline to complete work is difficult (10)

4.4 Project Cost Management

Cost management was not directly addressed in this project.

4.5 Project Quality Management

The biggest lesson learned by the majority of students in regard to quality of work expected in this project was that it was important to gain a statement of what 'quality' meant to their client company. Some managers reported that they had to sacrifice the quality of their work to meet deadlines. Others took advantage of the 'soft deadlines' and chose to turn the deliverable in late to ensure quality work. A number of managers also reported that the quality of work was comprised because they failed to implement any quality

assurance methods to assure the work consistently satisfied the client needs.

It is noted that almost all the managers felt that quality should be a focus from the beginning of the project through to final completion. While a large portion of students responded that the quality requirements were easy to satisfy or the team experienced no quality issues, an equal amount of managers reported difficulty with quality issues. For the managers who did not experience any quality issues, a few suggested that by implementing some quality guidelines their teams knew what was expected and worked toward it. Those who experienced quality issues, admitted that they failed to put any quality assurance measure in place. Some of these teams ended up sacrificing quality to meet deadlines. In those cases, managers suggested that a team member from each group should be assigned the role of Quality Manager.

Managers who implemented quality assurance measures and designated a Quality Manager were much more likely to closely monitor the quality of work and consistently monitor team progress throughout the project.

Student comments demonstrate the nature and extent of quality management issues:

> "From the start we all realized that quality was an important aspect of the project and we tried to focus on keeping a high level of quality throughout the project"
>
> "We worked hard to make sure we did things right the first time so we didn't have to waste much time going back and redoing everything."
>
> "We implemented quality audits, statistical methods and quality control charts to track quality"
>
> "When you have group members who have a good understanding of the project and a great work ethic, I had a high level of confidence that the quality of work would be high. With other team members, I was concerned that quality would suffer."
>
> "As the semester wore on, some members tried to push their work off onto other members and tried to do as little as possible to get by. This affected the quality and time management of the project."
>
> "Different members of the team had different definitions of quality work and different levels of motivations to put forth the work required to meet a given level/grade. So these expectations had to be managed and I hadn't anticipated that."
>
> "We had trouble with people actually putting the time and effort into the quality of the work. Some things that we asked for took too long to get done or had to be redone once received."

The four main themes that emerged relative to quality management were:

1. Necessary to implement quality guidelines and appoint a Quality Manager (18)
2. Quality assurance steps must be taken (16)
3. Understanding quality of work expected is not always easy (12)
4. Don't sacrifice quality to meet deadlines (6)

4.6 Project Human Resource Management

Many of the managers found it challenging to manage team members who had different personalities and idiosyncrasies. These include team members who were not motivated to work on assigned tasks, delayed team progress by procrastinating, caused morale problems within the team, and/or did not complete tasks on time. This was by far the biggest lesson learned concerning human resources. Another aspect of human resource management that surprised many of the students was the need to manage interactions between certain group members. For example, some of them brought 'baggage' with them from previous interactions and this adversely affected their performance within the group and tested the skills of their project managers.

And, then there were some totally unexpected events. For example, a team member was injured (broken leg at the beginning of the semester), required surgery, dropped the class, and in one sad case, a team member was killed in a car accident in week 7 of the semester. These situations required the managers to lose momentum as they had to reassign tasks and consider how to handle team morale issues.

Student comments concerning human resource management included:

> "As a manager you have to learn how to step back and allow the team to take responsibility for their actions and see who stepped up to lead was important to know who we could rely on."
>
> "Don't rely solely on the 'top guys' all the time, just because it's easier. Figure out ways to get others involved to benefit the overall project."
>
> "Making sure that you assign the right person to each task was harder than I thought it would be."
>
> "Managing a team was completely different from what I thought it was going to be. It's pretty difficult."
>
> "One area we had trouble with was the various over resource allocations that popped up as we entered our schedule into the MS Project Gantt chart. Outside of understanding why those over allocations occurred, our team had problems getting one team member in particular to pull his weight and complete his share of the work."

Four main themes emerged relative to human resource management issues:

1. Some people are not motivated to complete work and need to be encouraged to participate (32)

2. Teams are made up of people with different personalities/traits (26)
3. Need to allow group members to work in areas they enjoy to achieve greatest efficiencies (20)
4. People are sometimes difficult to understand and/or work with (6)

4.7 Project Communications Management

The main message that came across loud and clear in communications management is that "communication is key". Managers soon discovered that understanding the methods of communication preferred by team members and using that method of communication was essential to get timely responses. For example, face-to-face communication proved to be the best communication method to use, while some managers reported that group members refused to adapt to new or currently used communication methods or failed to respond back to members who attempted to contact them. Consequently, establishing a routine of regularly scheduled face-to-face meetings was an important aspect of communications management, together with the creation of an electronic repository for storage of all team deliverables and communications.

Some managers also experienced that the company they were working with was too busy to discuss the project and others just 'gave team members the run-around' and a few managers struggled to establish initial communication with the company.

Student comments on Communications Management demonstrated the following communication management issues:

> "Not everyone uses communication tools equally. We had some issues with response times to e-mail when it may have been better to text/call them for a faster response."

> "The majority of the group members communicated well, but one team member seemed to struggle with responding to communications and making scheduled meetings"

> "I learned that you really have to be persistent with your group. As soon as you let things slide things get out of control. At times the group will just do their own thing and leave out the managers because we aren't one of the "analysts". However this really hurts everyone if people are left out. Everyone needs to be in the know so things can go smoothly."

> "The lesson I learned is to meet with your team every week and also contact them through text or email to make sure they are where they need to be. "

The following four main themes emerged in Communication management:

1. Face-to-face communication works best (40)
2. Different communications methods must be used to involved all team members (26)
3. Communicating with the client is critical but not always easy (16)
4. Regular meetings are important to progressing the project (10)

4.8 Project Risk Management

Interestingly, and not unexpectedly, a number of managers primarily associated risk management with meeting deadlines and receiving a bad grade as their major risk exposure. Consequently, a number of managers did not plan ahead for risks that arose nor did they consider how they would respond to different types of risks. As a result, many managers were not properly prepared to respond to risks that appeared throughout the project, despite a comprehensive discussion of risk management in the classroom. Unanticipated risks that arose included: two companies withdrew after 2 or 3 weeks and the affected teams had to 'regroup' and find a new client; team members dropped the course, team members were injured, one team member was killed in a car accident in week 7 of the project, computer files were lost or corrupted and family emergencies prevented team members from participating. However, the managers realized in retrospect that by outlining a good risk management plan, the team(s) would have been able to better identify, analyze, and plan for the possibility of these types of risk. Also, by implementing risk response methods, they felt it would have better enabled their teams to handle any risks that appeared throughout the project.

A valid point that one student made was that regardless of whether or not a team felt they had faced any risk within the project, there are still other external risks to which that any team is susceptible. For example, one semester classes were cancelled 6 times because of bad weather when campus was closed. In addition, all teams are susceptible to technological malfunctions or other project files mishaps. By creating a plan to back up files and keep them in a central repository that is accessible by all team members, the teams would be addressing some of the necessary risk response measures to protect their project documents.

A selection of student comments that illustrate the overall project manager experience with risk management issues in this project, includes:

> "I learned that it is really important to identify, analyze and respond to risk before, during and after it hits."

> "We found out firsthand that when starting a project you must provide time to make up for unanticipated risks – in our case the winter weather. We didn't do this and we struggled because of it. By not planning for possible delays due to weather the first month of our project fell way behind."

> "We did not think about the risks we were going to have with team members not actively participating. Once we realized and identified these risks we did what we could to monitor and control them, but there was only so much that we could do at this point."

> "Next time I would assess the possibility of specific risks. I found that it was very important to constantly monitor and control risk management. I would also make sure that every team member is aware of each risk and associated consequences as well."

> "I learned what can go wrong, what will go wrong, how to manage, prepare, prevent, foresee, avoid mitigate and otherwise know all about risky situations in a project."

> "I learned that all projects have risk and every project will have its own unique risks."

> "I learned how to calculate whether the risk is worth the price and that all risks are not negative."

> "Next time I will make sheets and charts about potential risks and share them with supervisors and stakeholders early on."

> "The lesson I learned is never to assume that nothing unusual is going to happen. At the beginning of the project you have to put contingency plans into place."

The two main themes that emerged from risk management are:

1. ALL projects have their own unique elements of risk that must be anticipated and planned for early in the project (40)
2. Creating and Maintaining a Risk register, that includes human resource, technology and quality risks is essential, and must be started early on in the project (10)

4.9 Project Procurement Management

While procurement is an important knowledge area, students were not exposed to it since no outside resources were engaged.

4.10 Summary of Results

The results across all knowledge areas can be summarized in the following three short points that many students took away from managing their project team:

- Communication is key
- Timing is everything
- Successfully managing human resources is essential to project success

When asked what they had learned in the client project that they would not have learned analyzing a case or creating and conducting a 'hypothetical' project, the students commented on the following "teachable moments" from their projects:

- Concept of integration vs. the reality of integration when managing a 'live' team
- It is important to plan for and achieve successful damage control
- Don't assume – always ask questions
- It is important to consider choice of medium and tone when communicating with team members and stakeholders
- There is a difference between cognitive vs. emotional learning – student had a much greater vested interest than in a case study or a hypothetical project
- Learned to deal with unavoidable problems
- It is important to require evidence of work done by team members
- There is a difference between 'leading' and 'managing'
- Applying HR management concepts is much more difficult than learning the concepts

Overall, comments made by the student managers on their project experience were very positive and demonstrate the value of client projects in undergraduate project management courses where many of the students have not worked in a professional environment. The following comments capture the essence of the overall student experience as a 'hands on' project manager:

> "This project was a great learning experience that will be very beneficial for me going out into the 'real world'.

> "I thought the project was a good learning experience and it gave a good hands-on/real world look at how a project team might be managed, what problems can arise and solutions or alternatives that need to be pursued to achieve a successful outcome."

> "Overall, this project was very interesting and I really enjoyed working with my team. I learned a lot about the importance of communication and scheduling and how meeting face-to-face is much more effective than just sending emails."

> "This project was unlike any other I had ever done, and I believe that it was a very beneficial experience for me."

> "This project has by far been the most demanding project I have ever had. I learned a lot about managing people and what to do and what not to do. I learned a lot more than I thought I would. Thank you for allowing me to do this project it was a valuable learning experience."

> "Overall, with the experience I've gained in trying to get people to communicate, in solving problems

and in recognizing potential problems that may crop up, I just wanted to say I truly believe this was a valuable experience for me and I will take its lessons with me into the field as I graduate."

"Not only was working in a group setting an extremely helpful experience, but the fact that we were able to interact with people in a real business - that we usually wouldn't get to do - gave me a better understanding of how a client feels and what they think."

"This project could not be replaced by book work and I believe it was very helpful to my education and I would definitely recommend people to take this course."

"I really would like to thank you for the opportunity to have completed such a project. This was definitely the most hands-on experience and fun, I have had in any of my classes."

"What I really took from the class was the work we did with the project."

"I am glad we got to do this project this semester, because I have never learned so much in a class as I have in this one."

5. CONCLUSION

This paper presented an overview of three methods of teaching and how they were combined in a college-level, project management course project through the use of a student-managed client project.

Taking the stance that students often cannot immediately apply the 'soft skills' they learn from textbooks and classroom lectures and a client project, which is much more complex than course practice exercise, case studies or hypothetical projects, provides immersion in those soft skills to link the classroom learning with experience and enables the 'light bulb' to be turned on in the students' minds, a client project was introduced into the course. This provided students with a valuable hands-on experience that corresponds to material learned in the class delivered using a 'just-in-time' approach to facilitate their real-world project experience. In this way, student classroom learning was reinforced and students were able to gain an understanding of how various aspects of project management manifested themselves in a real-world setting and gained confidence in their abilities to interact in a professional environment.

Client project reconnect universities with their local communities and, at the same time offer learning opportunities that go beyond the classroom walls. This paper has demonstrated how client projects can be incorporated in a project management classroom to bring alive the nine knowledge areas of project management and student reflections on their lessons learned indicate that most of the students appreciated the opportunity to participate in a real-life project and found that that managing the project helped them understand project management concepts.

By integrating instructor-centered learning, student-centered learning and project-based learning methods of education, the instructor achieved her role as the transmitter of knowledge and moderator, while the student is filled his/her role as the builder of his/her own knowledge. In addition, from the student 'lessons learned' collected at the end of the course, it can be concluded that project-based learning provided students with a learning environment that prepared them well for future work. Students commented that they were able to grow and learn more with this project than in any other project in which they had participated. Many also felt that this project better prepared them for the real world and allowed them to focus on the areas in which they needed to improve.

Overall, the students indicated that the method of delivery in the course added greatly to their level of project management knowledge and growth. This paper demonstrates meaningful roles for both directed and constructivist learning methods. While each learning method has individually proven to be effective, it appears that a combination of the methods provided very positive results and the learning experience that ensued is greater than the sum of its parts.

It is hoped that the experiences of the students and the instructor reported here may encourage other project management educators to consider incorporating similar client projects into their offerings and that this experimental learning pedagogy can be a valuable addition to project management education. For those who would consider incorporating a similar project into their classes I would recommend both courses be under your control. In addition, the initial project kick-off meeting and regular scheduled 'program manager' meetings have proved to be extremely beneficial to bringing the managers and teams members together and assist in maintaining a 'team feeling' throughout the semester. The effort and resources to undertake the project should not be underestimated, particularly in terms of time and effort on the part of the instructor. However, the trade-off in the authentic experience that clearly enhances learning outcomes as compared to traditional classroom lectures is well worth the price.

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