Session # 1475

Practical Methods for Keeping Project Courses on Track

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Abstract

"The term project, clear milestones and objectives, the course was well thought-out and presented."
A major project, I learned a lot of information and skills without stress or loads of pointless homework."
"Previous professors were not as good at communicating and teaching the course objectives."
"The plan the professor used and followed made the class easily understandable and conducive to learning."

We all would like to have student evaluations positively reflect our sincere efforts in keeping both technical learning and skill acquisition on track in project courses, wouldn't we? We've all struggled with organizing and encouraging such learning in a project-oriented course. Sometimes the efforts required to juggle technical learning with general skill enhancement while keeping a project-oriented course on track seem enormous.

Industries that hire our graduates expect our students to have enhanced communication, teamwork, interpersonal and project management skills in addition to their technical learning in project courses. From some students' perspective in project courses, the completion of a project dominates their view of the course. For others, the teamwork itself is the complicating factor in the course.

Though the expectations of our customers are great, and we, as teachers, are encouraged to furnish our students with projects providing hands-on, real-world experiences, few practical guidelines exist to help us manage the process. This paper intends to provide guidelines for teachers interested in taking the kinks out of teaching a project-oriented course. Example formats will be provided to show you how to:

-identify the learning objectives to the student
-improve achievement of those learning objectives
-communicate assignment requirements

Readers of this paper will gain insight into how to focus on the skills the students need to learn, how to plan to achieve learning, and how to assess the learning that occurred. The following information is applicable to project management courses as well as courses requiring a term project.

Where to Begin

Success in project-oriented courses depends on a variety of factors. Three key elements include communication, use of class time, and assessment. A good course plan will combine these elements to achieve and assess learning. Success takes focus. In other words, what do you want them to learn from the experience? Success takes planning. How will you guide the learning that is taking place? Success takes assessment, for without assessment how will you know what you accomplished and where to make improvements in the future? A properly constructed project-oriented course needs to have a well-thought-out plan followed by careful assessment to assure that the appropriate skills have been mastered. Communication is the cornerstone of this process.

Communication

Good communication begins with the knowledge of what needs to be accomplished. Before communicating through syllabi and assignments, it is critical to determine what you intend to accomplish in your course. Most of us formalize these intentions by writing course objectives. The concern with course objectives is that they may sometimes become an end unto themselves rather than a guide for the course.

Instead of jumping right into the creation of formal course objectives, consider brainstorming a short list of the skills and knowledge that you hope the students will attain during the course and project. You may want to think of it in terms of beginning with the end. What results would you like to see at the end of the project or course? At this point, you should contact individuals in industry who are hiring your graduates and ask them what skills and knowledge they would expect someone who has taken the course to have. In general, as so aptly put by Kolar and Sabatini's, employers will respond that they want graduates with good communication skills, good interpersonal skills, team work experience, adeptness at self-guided learning, strong oral and written communication skills, the ability to apply knowledge in a variety of settings, creativity, effective time management and a host of other skills.[3] In your discussions with representatives from industry, try to develop a list of skills particular to the course and its project too. Your list may be similar to the one shown in Figure 1. Once developed, this specific list can be used to guide the selection and progression of assignments throughout the term. Create the assignments based on specific skill set desired then integrate the general skills into the assignments.

The student's first communication concerning the course and its requirements is usually the syllabus. This document provides guidelines and objectives related to the course and its project. Information you gleaned from your discussions with members of industry can significantly enhance your syllabus. Instead of creating traditional course objectives, consider phrasing the desired skills in terms of questions the students will be able to answer after completing the course and its project. Questions directly related to the type

of work they will be performing on the job can breathe life into their introduction to the course. Since these questions will also guide the assignments during the term, students can relate their introduction to their activities during the term. Identifying skills to be mastered in question format catches student interest. Another benefit of the question format is enhanced student understanding of the desired skills, they can more clearly see what is expected of them and where it will be applied after graduation. Figure 2 provides an example of how learning objectives can be communicated to the students in a question format.

Creating both clear introductory documentation and well thought-out assignments for specific activities related to the term project helps define learning and skill acquisition throughout the term. The form of communication that assignments take during the term will either enhance or detract from your success in a project-oriented course. Properly communicated assignments improve student understanding and comfort with course material. The point of activities, both in and out-of-class, is to make the most of student efforts in a course, maximizing learning and skill acquisition while minimizing distracting elements. Done properly, this will elicit comments such as: 'a major project, I learned a lot of information and skills without stress or loads of pointless homework' and 'the term project, clear milestones and objectives, the course was well thought-out and presented'.

Conveying requirements requires organizing your thoughts. When creating these assignments consider using a backward chaining thought process. Begin with your desired list of skills (Figure 1) and translate those desired results into objectives in the form of questions (Figure 2). Use these questions and objectives to determine what you would like as the overall result of your project. For instance, you may wish that they create a project proposal and a project plan. The question format and skills list may enable you to more clearly define your expectations. So, instead of an assignment stating 'student must complete a project by the end of the term', the assignment will have specific components and expectations related to the course material and objectives (Figure 3-5).

You may wish to use a series of assignments that unfolds the project as the term progresses. Instead of assigning the project and waiting until the end of the term to review it, break the project down into several parts. These smaller assignments, graded as part of the total project, help ensure that everyone is on track during the term. This progression of assignments will allow you to monitor learning and skill acquisition throughout the term. Assigning activities related to developing specific skills during the term, breaks skill development into smaller bite-size learning experiences. With this sort of feedback, you can alter later assignments accordingly to keep things focused on the course objectives. One possible format for a progression of assignments is given in Figures 3 through 5. Note how many of the original questions have been integrated into the assignments.

Class Time

Depending on the structure and objectives of the course, different uses will be made of class time. Proper utilization of class time will enhance student skill acquisition and project performance.

Most projects require team work. For many students, meeting outside of class for project work, though necessary, is difficult due to demands on their time, such as part-time work. Dr. Larry Michaelsen, in his paper, "Team Learning: A Comprehensive Approach for Harnessing the Power of Small Groups in Higher Education", encourages allowing class time for group work.[5] Properly directed, class time for group work is an opportunity for the teacher to provide groups with direction on the project as well as group dynamics and team development. To make the most of in-class project work time, create group assignments that require individual pre-class preparation for group work. Encouraging preparation for class can also be accomplished by requesting that the project teams make individual assignments to group members in the preceding class. The amount of individual input and participation can be graded in this manner.

Groups can be formed by either the teacher or the students. Since group work on projects is supposed to enhance team working experience, proper group formation is key to teaching students about team dynamics. To further this process, use a group formation process that ensures that group dynamics are workable. This means that individual student assets and liabilities should be spread across groups. Care should be taken to ensure that pre-existing cohesive subgroups are minimized. The best groups are not necessarily those where the best students or all part-time or full-time students are in same group.

Assessment

Assessment improves the achievement of the identified learning objectives. Any type of assessment should provide valid and useful information to both the teacher and the project participants. In project courses, skills acquisition must be assessed to determine whether or not the methods and assignments utilized during the course have allowed for appropriate skill development. Ideally, assessment occurs throughout the course. Breaking a term project into a series of assignments can lead to better assessment of skill acquisition.

Grading projects can be complex, particularly if you have left room for creativity on the students' part. How will you know whether or not they learned what you meant for them to learn? This is more than just letting them know in general what they will be graded on, used properly, feedback throughout the term should guide the students in their learning process.

Performance criteria will allow you to tie together the entire course, from your introduction, to the skills the student should possess upon completion of the course, to what they will be graded on in the final project. When you have identified the objectives and related skills necessary for the course, complete your assessment plan by developing performance criteria for each objective or skill. Performance criteria are used to align the course material with the project, ensuring that the appropriate skill set is taught and utilized in the course. Performance criteria will enable you to determine what components need to exist in the project and course in order to teach the student the desired skills. When grading, use these criteria to judge whether or not you have accomplished your objectives and to what level the students are able to perform the associated skills when the project is complete. The list of questions you created earlier will be very helpful when developing criteria against which the student projects can be graded. After all, these questions came from those who hire your graduates. Naturally, these assessment activities will be refined as you evaluate how well they are providing feedback.

During your course, be sure to use systems that give your students feedback on their activities in a timely fashion. Develop and use a grading system that provides incentives for: 'individual pre-class preparation for group work, active participation in discussions, and high quality output'[5]. The grading system, though focused on the project, must hold individuals accountable. Individual accountability can be judged by the amount of pre-class preparation for in-class work time or can be determined by asking for group member input. Let the students participate in the grading process. Allow them to provide and receive feedback on themselves as well as other participants in project. Ask for specifics. Having them assign themselves and other students in the group letter grades is not nearly as effective at providing feedback as having them give specific examples of the participation of all group members. Allow them to grade their presentation skills by having them watch videos of themselves, preferably without sound. Then ask them to point out what they're doing right and wrong. When generating feedback, do not overwhelm them, two or three positives with one or two negatives can sometimes be enough to work on and remember. Be sure to have more positives than negatives.

Conclusion

Completing term projects is complex for both the teacher and the students working on the project. Clear, complete identification and communication of the desired skills enhances project work by enabling the students to understand what is expected of them, both in terms of the project and skill acquisition. A well-thought-out project process, including assessment can ease the amount of work for all parties.

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Project Management

Project Selection
Project Managers
Project Teams
Project Planning
Scheduling (PERT/CPM)
Resource Allocation
Project Budgeting and Control
Project Auditing
Project Termination
Management Styles
Communication
Negotiation and Conflict Resolution
Teams/Teamwork

Figure 1

Project Management

Primary Goal:

The goal of this course is to familiarize the student with the complexities of managing a project. The tools provided will help guide the user through the project effectively. Upon completion of the course, the user should be able to answer the following questions:

-How do I write a project proposal?
-How is a project proposal different from a project plan?
-What are the components of a complete project plan?
-How will I know the project is under control?
-How will I manage the project team effectively?
-What is the best way to ensure effective communication of project ideas, concepts, and requirements?

Tools Taught:

-Project Selection
When a variety of projects are competing for the same resources, how are projects selected?
How can we improve our project's chances of being selected?
-Project Proposals
What are the components of an effective project proposal?
-Project Planning
What are the components of an effective project plan?
Why is a project plan so important?
How is a project plan used to manage a project?
How are project budgets prepared?
-Project Control
What is meant by project control?
How are project's controlled effectively?
How are project budgets used to control projects?
-Project Auditing
How do we know that we did what we said we would do when we said we would do it?
How do we know that we spent what we meant to spend and got what we meant to get with the money?
-Project Termination
How is a project brought to a close?
-Project Managers
What does it take to be an effective project manager?
Are project managers leaders?
How do project managers help their team members work effectively?
-Project Teams
What does it take to create an effective project team?
How do project managers help their team members work effectively?
How can team members help their project go smoothly?
-Communicating
What does it take to communicate effectively?
How does effective communication help a project go more smoothly?

Figure 2

Project Management
Project Update Reports

***Project Report #1*: The Project Proposal**

Please consider yourselves project managers who have begun working on this project at Time Zero, the project's conception. As the reports progress through the term, so will the time elapsed in the project. Please create a project proposal for potential investors.

For your project proposal, use the general outline described on pages 68 to 71. You may wish to discuss the following questions within your project proposal (but not as a list of questions you answer). These questions are essentially the project proposal guidelines you should have learned from Chapters 1 and 2. Your project proposal is due **Jan. 27**.

General Project Description (the Technical Approach)

What is the purpose and scope of your project?

Why do you feel that your project should be selected?

What is the life cycle (time from beginning to end) of your project?

What is the complexity level of your project?

Is there anything that makes your project unique?

What measures will you be using to judge your project's performance?

Implementation Plan

What is at stake here? What level of risk is associated with your project?

Have you any financial information concerning your project?

Logistic Support and Administration

Describe the facilities, equipment and skills that are needed for the entire project.

What difficulties do you perceive during the construction/implementation phase of your project?

What are your contingency plans? How do you propose to deal with those difficulties?

Experience

Who will you select to be your project manager? What is their experience?

Who else will be necessary to help with this project? What is their experience?

Why did you select them over the others? What necessary talents will they bring to the project?

Figure 3

Project Management
Project Update Reports

***Project Report #2*: The Project Plan**

Please create a project plan for investors.

Congratulations, your project proposal has been accepted. The investors have asked for a more detailed plan of the project. Please use the following information and Chapters 5, 7, 8, and 11 as a guide. You may want to look at the cases following Chapter 5. They have several examples of project plans.

Project plans usually go through several iterations. Please prepare your first draft for your investors by **February 10th**. The second iteration will be required by **February 17th**. The final project plan will be due on **February 24th**.

The Project Plan

The creation of a project plan combines the Definition, Analysis, and Design phases of a project. By defining your project, in essence, you create a mission statement. By analyzing your project, you investigate and clarify the who, what, where, when, why and how aspects of your project. The design phase details how you plan to accomplish your project, in other words, how will you fulfill the mission you created in the Definition phase of the project?

Project Plan Elements

- Overview (mission and the deliverables; what will the final outcome be?)
- Objectives (specific objectives supporting mission)
- General Approach (technicalities of who, what, where, when, why, how)
- Contractual Aspects (specifics of who is required to do what)
- Schedules (what time is needed to support each aspect of the plan)
- Resources (what is needed to support each aspect of the plan)
- Personnel (who is needed to support each aspect of the plan)
- Evaluation Measures (performance, effectiveness, cost; how will you keep the project on track?)
- Potential Problems (what could go wrong? how will you deal with it?)

Be aware that the sections covering the objectives and the general approach to meeting the mission will be quite lengthy. It is in these sections that you explain what it will take to do what you said you would do. This is the details, the specifics of what has to happen in order to complete the project. Give this section serious consideration.

Figure 4

Project Management

Project Update Reports

***Project Report #4*: The Project Manager, Project Organization**

As your existing project nears completion, your project team decides that it is time to interview for a new project management team position. Investors associated with the next project are interested in what you learned from your current project that will make your project management team more valuable for this next project. You may wish to use Chapters 3 and 4 as a guide. For **April 13**, please prepare a 15-minute presentation that details:

- What insights have you gained from your current project?
- How will you organize your approach to your next project?
- What adventures did your team have to face?
- How did your team overcome difficulties?
- What proof do you have that your team can adapt to new/unusual situations?
- What did you learn about the composition of your team?
- What changes would you make to the team for future project?
- What did you learn about yourself as a member of a team?
- What traits do you feel are critical for a project manager to possess?
- How will you change yourself?
- What else of interest did you learn about project management?

Figure 5