

Interdisciplinary Teams? An Industrial Engineering/Physical Therapy Project

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Abstract

At the 1995 ASEE Annual Conference, we reported on a newly developed project combining 4th semester Industrial Engineering students and 8th semester Physical Therapy(PT) students.[3] This project required them to develop various reports and recommendations for implementing the Americans with Disabilities Act (ADA) on and around campus. At the 1996 Illinois/Indiana section conference we reported on a parallel project among the same IE students along with Teacher Education(ETE) 6th semester students.[4]

Since that time, the projects have evolved and the method of guiding the students has changed. Also, the outcomes required have been modified to provide less content on the actual project and more on the development of interdisciplinary teams and teams in general. It is only on the last lecture day of the semester that the IE students have explained the underlying concepts of team formation that they had been exposed to.

The concepts that are, sometimes dramatically, placed before the students include the need to provide “investment” time when a group is heterogeneous, the presence of authority from outside the group activities (the nearly graduated PT majors often awe the sophomores with their professionalism), and the need for good, if sometimes brief, communication among the group members. Depending on the project chosen, other concepts and other pieces of their education are brought into use.

The PT and TE students do not have the advantage of two projects being manipulated in different manners. However, the exposure of other professionals to IE has a number of benefits, not the least is that some engineers are directly involved in topics not normally thought of as engineering. This paper reports on the continuing evolution of the teaching mechanisms in both the IE and PT courses involved. Various successes and failures are noted as well as plans for the future.

Introduction

The problem of providing students with “real world” problems which are also academically rigorous remains in the forefront of educational planning. In 1997 the Society of Manufacturing Engineers published a list of competency gaps found by industry in newly hired engineering graduates. (See <http://www.sme.org/cgi-bin/eduhtml.pl/?mep/intro.html&&SME&>) These gaps included communication skills, teamwork, project management, and continuous or lifelong

learning. These have been updated in 1999, but teamwork, communication skills and project management remain in the list and near the top.

During the same time period as reports of these gaps were being developed, the Bradley IE department (now IMET) was developing a course to bring students into the team problem solving paradigm well prior to the senior capstone project. Plant layout and quality control courses came too late in the curriculum (6th or 7th semester) to allow for a series of engagements. A fourth semester course had recently been redesigned to combine work methods and study with managerial engineering. The faculty decided to develop this course into an experiential course with significant laboratories and projects, all fostering the team approach. The laboratories would deal with time and motion study, job design, and various managerial aspects of engineering. The projects, however, needed to be multi-discipline and outside the usual range of IE material.

Similarly the accreditation standards from the Commission on Accreditation of Physical Therapy Education Programs¹ also reflects this wide spectrum of curricular goals and educational standards for the graduate of a Physical Therapy Program. Among the standards that emphasize the evaluation and treatment of patients, there are standards that relate to communication, collaboration with other disciplines, management, legal considerations and consultation. The ADA project meets some aspect of all these standards. In order to succeed in this project the students had to function as a team and thus collaborate and communicate with each other. This was perhaps one of the greatest challenges for students.

Project Development

Two distinct projects have evolved over the last few years. The IE/PT project starts early in the semester, usually the second week. A lunch is provided by the local IIE chapter and the students are teamed during lunch to discuss where they will develop their project. They are provided copies of various prior projects and of various task force reports on ADA at Bradley. Two separate status reports are required of the IE teams; this tends to keep them focused.

The IE/ETE (Teacher Education) project begins a few weeks later. The ETE students have chosen their topic for a math learning center prior to the meeting. The meeting is in a basement classroom of an older building on campus; the room is usually very crowded. The exact role of the IEs is not specified. They have been asked to build the various apparatus needed and they have been asked to provide math input. The very disparate views of mathematics is apparent immediately.

¹ Commission on Accreditation in Physical Therapy Education. *Evaluative Criteria for Accreditation of Education Programs for the Preparation of Physical Therapists*. Alexandria, VA: American Physical Therapy Association; 1996.

Early Results

The most consistent negative aspect of the project, from the students' perspective, was finding time to work as a group and defining and clarifying expectations. Successful groups worked through these team issues. Sometimes this required active problem solving on their part as illustrated by what one group wrote, "Due to conflicting schedules of the students, arranging workable time for group meetings was difficult. Handling this problem was accomplished by organizing and preparing within individual groups before meeting as a whole; therefore limiting required numbers of meetings." In their analysis of the project, some groups indicated that they indeed did function as a team and use good management techniques. When commenting about the project one student group wrote, "...goal setting took place at our first meeting. Planning began immediately, and time frames were established to reach our goals." This group learned first hand the benefits of using the techniques of a good group work.

Because this project dealt with the ADA and job descriptions, the students were forced to explore some legal issues and policy issues as they applied their skills to real life situations of employers who may need to comply with the ADA. Also, this project gave them the experience of acting as a consultant. It introduced to them, in a tangible way, what might be required of them in that role, such a planning a project, doing an on-site analysis and writing a professional report.

Besides efficiently meeting some of our curricular goals, the project has many other benefits to both the PT students and the IE students. The PT students became aware that the language they used was unfamiliar to the IE students. In referring to the IE students, one student group wrote, "We could not use the regular physical therapy lingo that we have grown so accustomed to." From the other side, engineers wrote, "Terms such as 'umbilicus' (belly button) and 'orthosis' (crutches) occasionally stumped the engineers, but communication was not a problem in this project." This is an important interdisciplinary awareness that will hopefully carry over into their professional careers.

A benefit for both the IE and PT student was learning about each other's profession and the positive aspects to working on an interdisciplinary team. The following student comments illustrate this. "One positive aspect of this project was working with students outside of the physical therapy department. It was interesting to learn another profession's point of view and expertise. The engineering students provided us with a different perspective of what could be done." "Going into this project, both sides of the group had pre-conceived notions of what the others would be like. As it turned out, we all pretty much got along, and now have a new way of looking at "those engineers'." "We needed each other to correctly complete this project. Our group found that many heads definitely work better than one." This is an important awareness coming from students who for the most part of their higher education experience had to function and survive as an individual. Though our students need to function independently, they also need to understand the necessity of relying on others who have specialized skills and knowledge. This project was an excellent tool to help nurture this understanding.

One reason that this project seems to work well, at least from the students perspective, is that it provides a real life and tangible experience that has actual benefit beyond the students and the curriculum. Several student groups have commented how they felt good about doing a project

that may benefit others on campus. “We liked the idea of putting this assignment to practical use, where it may actually be helpful beyond the classroom.” Another group commented, “There was a clear and useful purpose in mind. Regardless if our suggestions will ever be used, at least we did something that could potentially help someone.” As instructors it may be easy to forget that students have an inherent desire to be useful and appreciated, the same as their instructors. Much of our classroom and laboratory teaching does not tap into that inherent motivation. One of the unintentional benefits of this project was seeing some of the students approaching this project as something beyond themselves and their required course work. This was also evidenced by an engineering team who stated, “...the work ethic the senior PT’s displayed was far superior...Being in school for engineering, we finally received a glimpse of what we will be doing in the future which is far more exciting than looking dazedly into a Calculus book.”

The realization that there needed to be a maturing process struck many of the IE students. “[T]he PT students were very focused in their goals as well as during meetings, especially when compared to our ETE project...They were able to break up portions of their responsibilities whereas we were not able to do so to the same extent.”

Comparison of Projects

As mentioned above, the IMET students have the advantage of two out-of-college projects which overlap in time. This fact is definitely manipulated in the course structure to allow students to develop an appreciation of the importance of various teaming processes. It is in this light that some of the comments must be taken as few of the students either had the understanding beforehand or the time to consider the situation given task pressures. (For a more complete discussion of multi-disciplinary teams see references 1 & 2.)

While all students in these projects reported difficulty in finding meeting times when all members could participate, the ETE students were reported to be most difficult: “In trying to work with the ETE students, it was a miracle to set up a meeting with them. The PT students are more alike in they have stringent daily work and want to accomplish the project ahead of schedule where the ETE students did not really show a good work ethic.” The engineers did not often fault the quality of the work by either the PT or ETE students, just the ease of communication and desire to act in a seemingly timely fashion. At an extreme we find—“Overall, this project has been a disaster for both the IE and the ETE group[s]. To start out, both groups were quite successful about getting together and contributing ideas...Then the IE group kept receiving e-mail on [the] night before or the day of the meeting telling us that they were too busy with other things and canceled.”

Students noticed the lack of direction provided by instructors, but reported different reactions such as: “The situation was not aided by the fact that the ETE students’s instructor gave them little direction for the project. The IE student’s assignment was also very open-ended, but they took the initiative and devised a direction for the project.”

More useful learning was reported when lack of communication and planning was compared to the ADA project. "These two different group experiences showed the importance of communication and planning ahead."

The Projects

Early in the Spring semester, usually the first week of February, the IMET students invite the PT students to lunch in the Work Methods/Ergonomics Laboratory. The local IIE chapter provides pizza and soda. Given various schedules, not everyone can attend. However, both groups have been broken into teams prior to the luncheon. Each team has a number of representatives. At this meeting everyone first gets lunch and then teams with a group from the other discipline. The lab setting allows free motion of seats and a larger area than a regular classroom. As they begin lunch, the two instructors explain that they are to find a job on or near campus, get permission to evaluate the job, and provide a set of recommendations for possible accommodations required and an ADA compatible job description. They are provided copies of previous reports as well as of a campus committee's study for accommodation of handicapped students. They are left to their team; the instructors remain in the background as resources only. A list of references in the library is provided.

Projects have ranged from the annual descaling of boilers through secretaries and janitorial tasks to a chemistry professor and the Taco Bell Express on campus. Even the women's basketball coach has been studied. We have not noticed any difficulty in finding topics.

Contrast this to the IMET/ETE project which visits an evening section of the TE class a few weeks after starting the IMET/PT project. The room is small and in a basement. A portion of the class period is used to form teams and to exchange necessary information. The TE students have already chosen a topic and have no idea why engineers are included. A half-sheet set of instructions has been provided (see reference 4.) Copies of previous papers are not then available (they are later, if asked for) and the IMET students are asked to leave after about 30 minutes as there is other class work. The task is to develop self-teaching games/tools for K-6th grade students which can be self-graded. Topical areas include statistics, fractions, ratios, arithmetic, etc. Not all definitions of these words are agreed to.

The Future

We hope to continue this project as it brings many benefits to both departments and to both sets of students. Future plans include a joint seminar of IE and PT students taught by one or both PT and IE faculty on the ADA. This would model collaboration among faculty of different professional areas. We also hope to expand this project to include a graduate student team that would do an actual consulting project in the community. This might take on the format of an independent study project.

Conclusion

In summary this project demonstrates many benefits that out weight the efforts by the instructors

to setting up, monitor and grade the projects. First it meets some of our curricular goals many of which relate to our accreditation standards. Secondly, the students benefit from the knowledge gained regarding the ADA and benefit from experiencing first hand what a consultant may do. Thirdly, they learn first hand about working as a team to accomplish a common goal and in the process they learn about the specialized skills and knowledge brought from another profession.

References

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The interdisciplinary team often demonstrates more a robust teamwork culture, increased effectiveness and work satisfaction. It is demonstrated that specialist neurological rehabilitation of people with a traumatic brain injury is a long-term and ongoing process, which over time should involve various specialists'™ input addressing traumatic brain injury sequela and prevention of secondary complications.Â The swallowing impairment management programme set by Speech and Language Therapist, Physiotherapist, Nurse, Occupational Therapist with advice on swallowing, positioning and suitable equipment to ensure effective assessment, safe and successful implementation. (G49 of RCP Rehabilitation after Acquired Brain Injury Guideline) [5]. There are many different Engineering disciplines and specialisation options which do not fall into any of the main Engineering disciplines. These Interdisciplinary Engineering disciplines are a combination of two or more Engineering disciplines. Check out the list below for more information on these specialisations. Interdisciplinary. Interdisciplinary platforms. As part of its research and development work, the ZHAW School of Engineering maintains a number of interdisciplinary platforms. Thanks to the specific expertise contributed by a number of individual institutes and centres, these platforms are able to take a holistic approach to addressing a range of current issues.