Doing Service Learning Projects in the Classroom

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It is axiomatic that Service Learning projects tend to be most beneficial to the student when they are conducted in conjunction with a specific topic being taught in the classroom. The benefit to the client is also most beneficial in that case because the students see a direct connection between their studies and the benefit to the client. This is, however, often a very difficult thing to do well because most courses are taught around a narrow topic and most projects involve a range of topics. A course dedicated specifically to the completion of a specific project, however, generally within the scope of the discipline in which it is taught, can resolve most of the issues surrounding poor outcomes in a typical, partial project, course element. This paper addresses some of the issues and concerns raised by the development and implementation of just such a dedicated, Community Engagement Projects Course.

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Project Elements versus Complete Projects

One of the more interesting, and perhaps most vexing, phenomena regarding Service Learning projects is the difference in opinion between what the student expects for an outcome, what the faculty expect for an outcome, and what the client expects for an outcome. They are generally very different and that can lead to all parties being unsatisfied by the results. Part of that issue arises from the nature of the typical Service Learning project. These projects are, by definition, designed to teach students the applicability of their studies to real-world problem solving. They use a problem posed by a client with an unsolved issue that is suitable for solution, *in part*, by the material being taught in the course to which the project is assigned. And therein lies the crux of the main problem with most such projects: only part of the solution is related to the course material being taught in that specific class and it is very difficult to fit the rest of the problem into the syllabus for that same course.

One solution, then, is to separate the various elements of the project into parts suited most conveniently to several courses that together teach the sum total of the project elements. The last class to get the project must then necessarily tie all the parts together into a whole for the client. While that may resolve most of the educational benefit issues (although not all because the interface between the various classes is often difficult to mesh properly) but takes an inordinate amount of time from the client perspective and clients generally (but not always) come forward with problems that need solutions fairly quickly. When a long-term solution is acceptable – up to three or four semesters in some cases – then this solution may work well; otherwise, it is doomed to frustration or failure at the outset.

A different solution is to create a class, generally a technical or major elective course, which is designed specifically to solve complete problems during a single semester. Note is taken that the definition of a "complete problem" may be different from an educational viewpoint, based on time constraints, and a client view of the world of

engineering. Nevertheless, once negotiated with the client, complete projects, or complete portions of a project, can be completed in one semester.

Types of Projects Suited to a Community Engagement Course

Freed from the constraints of a specific topic to apply to the project, the Community Engagement Course can broaden the scope of work significantly. The principle constraints will be relevance of the project to the major and time to complete the project. Once those constraints have been satisfied, the broader scope of the project can be far more beneficial to both the student and the client. For example, a hydrologic study of a proposed dam removal project can be assigned to a Hydrology class, but the students there would be limited to an analysis of the data developed elsewhere for the watershed or site in question. When the same project is assigned to a Community engagement class, the elements of project management, development of the hydrology of the watershed and the site, the analysis of those data, and the preparation of a final report can all be completed within the one course in the same semester. The students get to see the whole project and the client gets a complete project element.

This leads to a general definition of the type of project that can, could, or should be assigned to a Community Engagement course. That definition is the following; it is not all that different from the general Service Learning project, but does include some definitive elements not allowed in the shorter elemental projects.

> The Community Engagement Project is one that incorporates and involves the integration of as many engineering topics as possible into a comprehensive project with a clear scope and outcome useful to the client as a stand-alone project outcome or stand-alone element of a larger project and which involves client interaction at all stages of project development and completion.

This definition does have room for ambiguity, as do almost all project descriptions at one point or another in their development. Nevertheless, it does provide a framework for developing appropriate classroom projects. The following projects are examples of some that could be considered appropriate to this form of elective course.

1. Historic Site Survey and Mapping at a Known Historic Mill site

This type of project involves the study and evaluation of an historic mill site that will need to be investigated prior to renovation of the site for fish passage. The specific tasks involved are generally the following and would involve working closely with an historian and archeologist at the site.

- Map and do an archaeological survey of the site at reasonable detail
- Research historic state and local historic commission maps, plans and documents from the time the land was first granted to identifiable owners and encompassing the dam, mill site and mill pond, including construction of any existing dam or dam remnants
- Identify the most important remaining archaeological features of the site which might be disturbed or destroyed by site projects proposed by the client
- Work with the client to design the proposed project so as to least disturb the remaining archaeological features of the mill and mill site

This project may include project management, important research on engineering elements not commonly encountered in the classroom, land surveying, bathymetric surveying, sediment sampling and analysis, structural analysis, design of fish passageways or other aquatic life passage, community involvement, regulatory involvement, environmental impact assessment,

hydrology, hydraulic analysis, weather data analysis, and technical report writing, among other engineering skills.

2. Viewing Stand for a Baseball or Whiffle Ball field used by a Non-Profit Organization for Fund Raising

This project will involve the design of a set of bleachers to fit onto an existing hillside overlooking the selected ball field. The stand will be constructed on a hillside (or perhaps on a flat area) overlooking the ball field and be handicapped accessible by wheelchairs and ambulatory access.

This project may include project management, important research on engineering elements not commonly encountered in the classroom (slope stability, erosion, drainage, building codes), land surveying, structural analysis, community involvement, regulatory involvement, environmental impact assessment, design drawing development, and technical report writing, among other engineering skills.

3. Access Ramp to provide wheelchair access to the ball fields described above from the top of the hill overlooking the field

This project will require consideration of a wheelchair ramp that could traverse the hillside overlooking the ball field. It would likely start at the top of the slope, turn along the top of the slope, moving vertically down an existing incline in that area, then turning to go back along the face of the slope, perhaps interacting with new or existing bleachers, perhaps requiring a modification to those bleachers, until the ramp reaches the bottom of the slope. This might be seen as a dirt path, with structural soil on top for wheelchair passage and proper drainage to minimize runoff, washout and muddy conditions, or a w9oden path to minimize weather damage over time.

4. Drainage issues associated with a Little League ball field or a football field

This project involves a review of the current drainage conditions around the target and the surrounding area. These areas are often subjected to significant runoff causing gullies and washouts along access roads and soggy conditions on the field. Whether subsurface drainage systems (built so that they do not pose a danger to players) or surface reconfigurations to maximize runoff while minimizing slopes, is the appropriate direction, or some other solution is apparent, will need to be investigated.

This project may include project management, important research on engineering elements not commonly encountered in the classroom (rainfall frequency and intensity mapping, local topography), topographic land surveying, soil sampling and analysis, structural analysis, structural design, drainage system design, community involvement, regulatory involvement, environmental impact assessment, hydrology, hydraulic analysis, weather data analysis, and technical report writing, among other engineering skills.

5. Bleachers at an Elementary School

This project would incorporate existing stairs that lead up a small slope to an outdoor classroom created by the teachers for the children. The bleachers would extend along the face of the slope and be tied into the existing staircase so that the students could be seated for instruction before going to the top and entering the outdoor classroom.

This project may include project management, important research on engineering elements not commonly encountered in the classroom building codes, life-safety codes, slope stability measurement, erosion control measures), land surveying, soil sampling and analysis, structural analysis, structural design, community involvement, regulatory involvement, hydrology, hydraulic analysis, weather data analysis, design

drawing development, and technical report writing, among other engineering skills.

There were nine projects similar to these proposed for the second course offered at Wentworth Institute of Technology. Students were allowed to form groups of 4 students (four groups in the class) and each group was allowed to select one project to work on, except that only one group would work on any specific project. Student groups were also allowed to propose their own project, provided that it had all the necessary elements of a Community Engagement Project, a real client, and a suitable outcome possible.

Issues Associated with the Initial Course

In the initial course, there were 8 students. They were asked to organize into a single team and to select a team leader. The project had been pre-determined; it was to prepare an action plan for modifying an existing flood control structure and removal of rock obstructions at the outlet of a small downstream pond to allow for fish and aquatic life passage. The client was the local Neponset River Watershed Association and the state Department of Conservation and Recreation that owns both sites. The work had been started by an earlier class of students unsuccessfully trying to do an unconnected element of the project. This project would complete that earlier work.

It did not go well. The students resisted the need to organize, expecting data to be provided to them so that they could do some calculations and come up with answers. That was not the intent of the faculty, however. At the end of the first week, one student was assigned as Project leader and given specific instructions (during the class, so that all the students were equally informed as to their responsibilities) on how to proceed. It took about three weeks of fumbling progress before the faculty took over the direct role of project manager and assigned project elements to individual students. That worked out much better. The students started over developing a proper scope of work, a time line, and an outline of what the final report needed to include so that all the necessary elements could be addressed by the class. Two earlier studies, done in the late 1960s and early 1970s when the existing flood control structure was built, were used as guides and as sources of information. In the end, the students resisted the need to spend Saturdays in the field doing the necessary field work, even when classes would be cancelled during the week, and they spent precious little time doing work between class sessions.

In the end, far too many assumptions had to be made regarding rainfall estimates, flood flow estimates, and aquatic life in the area. In addition, a local historian had discovered that the small pond in question was an old mill pond and the site of an historic mill dam. Remnants of the former dam and the mill site were identified in a preliminary site inspection, significantly altering the view the students took of the site and the recommendations for remediation. In the end, the final report did not accomplish the intended goals for the course, but did provide significant insight for the students into the need to evaluate historic, and potentially historic sites. That was very good from an educational viewpoint. The client is flexible on timing and easily absorbed the minor time setbacks needed to further investigate the history of the area and to develop proper plans for achieving the fish passage desired, while protecting the historic nature of the dam.

Changes to the Second Course

For the second course, in the spring of 2016, several changes have been implemented. First, there will be four groups of no more than four students each. That will allow for much easier group dynamic development and, hopefully, more productive group efforts. Second, there are 9 project options suggested and an open-ended option for groups that have a connection to a proposed project suitable for a Community engagement project. Groups may choose from among those projects, but only one group will

work on any project at one time. Third, the groups were provided with a significant volume of materials explaining the process of project development and management prior to the start of classes, including the list of projects and a notation that groups would be formed on the first day of classes (January 6), and that a Scope of Work (also defined in the documents submitted before the start of class) would be required from each group the following Monday (January 11). Fourth, the students were provided with a schedule of generic deliverables required each week from each group to ensure that every group stayed on track and focused on the outcomes required. These include draft reports and weekly progress update reports. Fifth, required field work was outlined in the Scope of Work submitted by each group and accepted by all members of the group before the selected project was accepted for that group.

As this paper is written, the second semester has not begun and the success or failure of the five most prominent modifications to the course have net been evaluated. At the time of presentation the data will be updated, for better or for worse.