



## **Creation of a Paradigm Shift in Student Humanitarian Service – An Experience of One Third Century**

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## **Abstract**

A strategy for integrating student learning and humanitarian service was developed and successfully utilized in two sections of CEE 2011 Civil Engineering Materials in Spring 2016 and SP 2018, and one section of Transportation Engineering in SP 2018. The strategy was based on the author's three decades of experience in engineering, education and community service.

The students actively took part in the national Sound the Alarm program conducted by the American Red Cross (ARC). They received extensive training with ARC officers and the course instructor. After the training students formed teams of three and visited homes in the most fire prone neighborhoods of Philadelphia to install smoke alarms, replace alarm batteries and help residents make home fire escape plans. The students also provided education and materials on home fire preparation. In the past five years they distributed materials and provided information to over ten thousand people in homes and on the streets of the city.

The students were required to submit a technical report about the behavior of steel under high temperatures (i.e., home fires). The report also required a two-page reflection on the service.

"The Environment" class was taught 23 times from Fall 1991 through SP 2013. An optional assignment without Red Cross participation was given to students with the same requirements. During the semester breaks 161 students from the 23 sections conducted the household surveys at some of the worst fire-prone areas of cities near their homes.

In Civil Engineering Materials SP 16 course grades went from an average of 68% in the control group to 78% in the required public service group. Course grades increased from 66% to 75% in Civil Engineering Materials SP 18 and from 71% to 81% in Transportation Engineering SP 18. The weighted average improvement of the 58 students was 14%. In the Environment classes, the controlled and experimental groups' course grades were 64% and 76% respectively, an improvement of 19%. The grade increases were statistically significant at an alpha value of 0.05.

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## **1. Introduction**

Governments recognize that student volunteers play an important role in developing an engaged civil society [1]. A school that actively participates in neighborhood activities unites students, teachers, staff, and community stakeholders. This increases a school's ability to produce engaged and civic minded citizens. Students participating in community projects gain a sense of belonging and security which can lead to academic success as well as civic engagement. Studies have shown volunteering and service projects benefit students, communities, educational institutions, and employers [2]. Students have many pressures (e.g., academic, financial, social, family) which can prevent them from engaging in community service (3). Some students have a negative perception of volunteering as time-consuming and not useful [4, 5, 6]. The most likely deterrent to student participation in service projects, however, is financial strain.

The Federal Reserve Bank of New York [7] states the price of obtaining a college degree (e.g., room, board, tuition) has increased for the past four decades [8, 9]. According to the National Center for Education Statistics [10], the average cost per year for the 2015-2016 academic year was \$19,000 for a public four-year university. The figure doubled for a private university. The Federal Reserve Bank of St. Louis [11] states the average annual growth in wages was only 0.3% during the same period. Some students must use credit cards for college expenses. Students who need to commute might have auto loans. Many students take part time jobs to cope with the financial pressures [12]. The difference between the rising costs of education and stagnating wages makes it harder for students to participate in community activities.

The authors believe student volunteering plays an important role in developing an engaged civil society. Given the barriers to student participation in service projects, the author decided to make service a course objective rather than an optional experience. This paper seeks to create a paradigm shift in student humanitarian service by giving students the time and structure to engage in community service projects. Previous service with ARC's Disaster Action Team (DAT) has made the authors aware of the devastating effects of home fires. Every day, seven people die in home fires, most victims in homes that lack smoke alarms. ARC's Sound the Alarm [13] program works in communities, providing smoke detectors and education about fire safety. The decision was made to have students participate in the Sound the Alarm program as part of their course requirements.

## 2. Methods

The first author of the paper, while he was a graduate student at the University of California, Berkeley had three years of experience (from June 1986 through July 1989) in providing 346 families with 415.2 hours of fire prevention education. Over the past 30 years students in Civil Engineering Materials and Transportation Engineering courses, core courses in the BS-Civil Engineering degree program at Temple University, have been taught the importance of community service. “The Environment” class was taught 23 times from Fall 1991 through SP 2013. This is a required science course for approximately 40 majors. Sophomores and juniors take this class. Students were given an optional assignment, worth 2% of the course grade, without Red Cross participation. During semester breaks 161 students from the 23 sections conducted the household surveys at some of the worst fire-prone areas in cities near their homes. The cities and number of students participating in each city are as follows: Philadelphia (107), Trenton, NJ (12), New York (8), Washington, D.C. (8), Los Angeles (7), Chicago (6), Huston (6), Dallas (4), and Boston (3).

While many did participate, there were also many who did not have the time or did not live near large urban areas. The authors decided to add a service project requirement to the course objectives in order to give all students the opportunity to understand the professional and personal value of community service.

Several changes were made to the courses to accommodate the new requirements. Group discussions were added encouraging students to reflect on the reasons for and value of community service. Students were asked to generate a list of reasons for volunteering. The list included: (i) good feeling of overcoming substantial obstacles, (ii) effortful, (iii) interactions with strangers,

(iv) seeking out opportunities versus opportunities appearing suddenly, (v) help an ongoing national project, (vi) clearly trying, (vii) internal psychological forces to overcome obstacles and get involved, (viii) understanding neighborhood, (ix) imparting humanitarian value to the self, (x) networking to fit in and get along with social groups, (xi) practicing leadership roles, (xii) learning and practicing skills that otherwise go unpracticed, (xiii) coping with inner anxieties and feelings of inferiority, (xiv) variety in life, (xv) self-development, (xvi) social rewards and social disapproval, and (xvii) miscellaneous reasons not mentioned here. It is encouraging to note a few students in each class expressed negative perceptions of volunteering in the beginning but changed their opinions after listening to their peers’ positive statements.

A survey was then conducted asking students to rank their reasons for volunteering. The reasons were classified into six motivations or psychological functions for student volunteering [14, 15]:

- (1) Value Function, (2) Social Function, (3) Understanding Function, (4) Career Function, (5) Protective Function, and (6) Enhancement Function [16].

As shown in Table 1, 15 out of 55 (27%) of the students ranked Career Function, developing or increasing leadership skills, as the number one reason for volunteering. Value and Social functions were each ranked second. 20% of the students saw volunteering as a way to increase both society’s and their own value. 20% of the students believed Social Function, fitting in and getting along with social groups and neighborhoods, was important. Some went on to say that volunteering would help them become good leaders and better serve people. 4% of the students ranked Protective Function as the reason for volunteering. They participated in the program to satisfy a protective need by engaging in volunteer work to cope within inner anxieties and conflicts, affording some protection for the ego to reduce feelings of inferiority.

**Table 1: Number of students in various psychological functions**

| Function                   | Materials<br>SP 2016 | Materials<br>SP2018 | Transportation<br>SP 2018 | Total |
|----------------------------|----------------------|---------------------|---------------------------|-------|
| (1) Value Function         | 5                    | 3                   | 3                         | 11    |
| (2) Social Function        | 4                    | 4                   | 3                         | 11    |
| (3) Understanding Function | 2                    | 3                   | 2                         | 7     |
| (4) Career Function        | 5                    | 4                   | 6                         | 15    |
| (5) Protective function    | 0                    | 1                   | 1                         | 2     |
| (6) Enhancement function.  | 2                    | 3                   | 4                         | 9     |
| Total number of students   | 18                   | 18                  | 19                        | 55    |

A required service project was developed and successfully utilized in two sections of the course CEE 2011 Civil Engineering Materials SP 2016 and SP 2018 and one section of Transportation Engineering SP 2018. 18, 16, and 14 students participated in CE Materials SP 2016, CE Materials SP 2018 and Transportation Engineering SP 2018 classes respectively. The grading formula for the courses is shown in Table 2. The control group consisted of the semesters of Materials and Transportation courses without the service project.

**Table 2. Grading Formulas**

|                                                         | Control group | Experimental group |
|---------------------------------------------------------|---------------|--------------------|
|                                                         | (%)           | (%)                |
| 1. Assignments                                          | 20            | 20                 |
| 2. Attendance and class participation                   | 10            | 10                 |
| 3. Mid-term examination                                 | 30            | 25                 |
| 4. Final Examination                                    | 40            | 30                 |
| 5. Service Project (Group assignment of three students) |               | 15                 |
| Total                                                   | 100           | 100                |

The students took part in the national Sound the Alarm program conducted by the ARC [13]. ARC officers and the course instructor provided extensive training for the students. At the end of the training, students formed teams of three and visited homes in the most fire prone areas of Philadelphia. They installed smoke alarms, replaced alarm batteries and helped residents make home fire escape plans. Appendix 1 shows details of the ARC's fire safety education (modified by the instructor). Appendix 2 shows ARC's fire escape plan (modified by the instructor). They distributed materials including Appendices 1 and 2 to each house hold in a four block radius during each event. They knocked on each door, handing the materials to the person and providing detailed information when invited to do so. For homes where no one responded, students hung the bag of materials on the door knobs. Students also spoke to persons on the streets, handing out materials and answering questions about home fires and fire safety. In the past five years students distributed materials to over ten thousand people.

The student teams were also required to read relevant articles from the Journal of Materials of the American Society of Civil Engineers and submit an 8-10 pages technical report on the behavior of steel under high temperatures. They analyzed the factors contributing to home fires and suggested alternate materials based on the materials' behaviors in high temperatures. The team reports counted for 15% of the course grade. The report included a required two-page reflection on the service experience, counting for 5% of the course grade. The instructor's emphasis on the importance of the reflection along with making the reflection a separate grade helped motivate students to take the reflection piece seriously. Understanding the behavior of materials at high temperatures and usage of alternate materials to mitigate fire damage are learning goals in the two

courses. Technical communication and working in teams satisfied two of the ABET's student outcomes.

### 3. Results, Discussion and Implications

Table 3 shows the improvements in the course grade when a service project was included as part of the course work. Civil Engineering Materials SP 16 course grades increased from 68% to 78%. Civil Engineering Materials SP 18 course grades increased from 66% to 75%, Transportation Engineering SP 18 from 71% to 81%. Environment class grades increased from 64% to 76%. The weighted average improvement of all 58 students was 14% as shown in Table 3. The improvements were measured using t tests with significance at an alpha value of 0.05 [17,18,19]. Many students who read this paper will benefit from it and contribute to its purpose in the open-ended future.

**Table 3. Improvements in the course grade due to service project**

| Sl. No.          | Class              | Semester | No. of Students | Test Scores (%)  |                       |              |
|------------------|--------------------|----------|-----------------|------------------|-----------------------|--------------|
|                  |                    |          |                 | Controlled group | Service Project group | Improvements |
| 1                | CE Materials       | SP 16    | 18              | 68               | 77                    | 13           |
| 2                | CE Materials       | SP 18    | 21              | 66               | 75                    | 14           |
| 3                | Transportation Eng | SP 18    | 19              | 71               | 81                    | 14           |
| Weighted Average |                    |          | 58              | 68.3             | 77.6                  | 14           |

### 4. Conclusions

The weighted average for the three classes of Transportation Engineering and Civil Engineering Materials courses improved from 68% to 78% because of the service project included in the course requirements. The individual and weighted average improvements were measured by t tests with a weighted average improvement of 14%, statistically significant at an alpha value of 0.05. In the 23 Environment classes, grades increased from 64% to 76%, a 19% improvement.

Many students expressed appreciation for the assignment stating it helped them understand the behavior of engineering materials in fire and come up with alternative materials that could enhance the safety of fellow citizens. The authors plan to implement this strategy in three more courses.

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## **Appendix 1. Fire Safety Education (American Red Cross-Sound the Alarm Program)**

The students were trained to have face interviews with the residents of Philadelphia. They explained the importance of obtaining the knowledge and material to equip themselves for preparing against fire disasters. They made sure that the residents were comfortable during their detailed interactive conversations. They started with the following question.

Did you know that if a fire starts in your home you may have as little as two minutes to escape? During a fire, early warning from a working smoke alarm plus a fire escape plan that has been practiced regularly can save lives. Learn what else to do to keep your loved ones safe!

The students provided the following tips as part of the residents' preparation.

### **Top Tips for Fire Safety**

Install smoke alarms on every level of your home, inside bedrooms and outside sleeping areas.

Test smoke alarms every month. If they're not working, change the batteries.

Talk with all family members about a fire escape plan and practice the plan twice a year.

## **Appendix 2. Fire escape plan**

The students explained to the residents that if a fire occurs in their home, they must GET OUT, STAY OUT and CALL FOR HELP. They must never go back inside for anything or anyone.

The students explained the residents how to use the graph to draw their home's floor plan and plot home fire escape routes.

The students provided the residents with the following tips for creating the residents' home fire escape plan and practicing their 2-minute drill:

Everyone in the household should know two ways to escape from each room in your home.

Smoke is dangerous. Get low and go!

Decide where to meet once you get outside:

Get out and stay out. Never go back inside for people, pets or things.

If a fire starts, the residents may have less than two minutes to get to safety. So, time the fire drills and find out: what's the escape time?

If a fire starts in the residents' home, they get out to safety, then dial 911.

Practice the 2-minute drill. Test the smoke alarms monthly.