Effects of Service-Learning Projects on Capstone Student Motivation

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Study Overview

- Examines whether students *motivations* and *valuation* of capstone projects vary based upon whether or not the project is *service-based*

- Conducted survey of 118 engineering students at York College of Pennsylvania and Valparaiso University during Capstone

- Students showed positive *value* and *enjoyment* of capstone projects, however *value* was affected by their views of *service*.

# Wide Variation in Capstone Projects
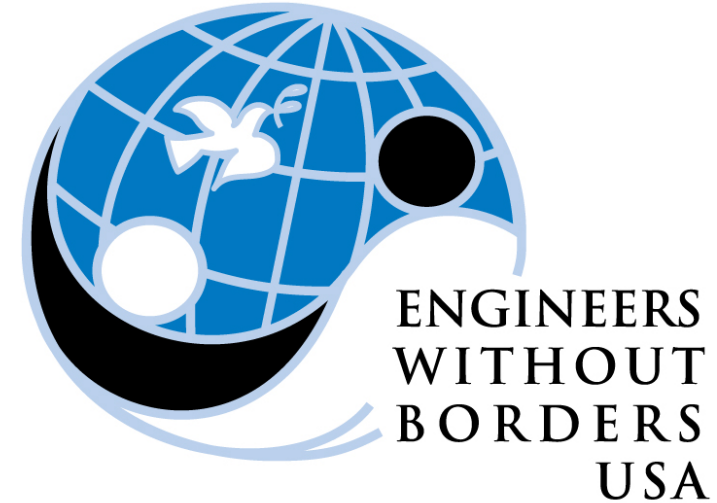
Overview of Project-Based Service Learning

- Integration of service learning elements into capstone design (project-based learning)

- Service-learning: increased student performance, retention and recruitment, and interest in studying engineering

- Vary in scale from international, national, and local project

- Not without challenges: product/process, interactions with third-parties (government, charity…etc.).

Movement into Community-based Capstone Projects
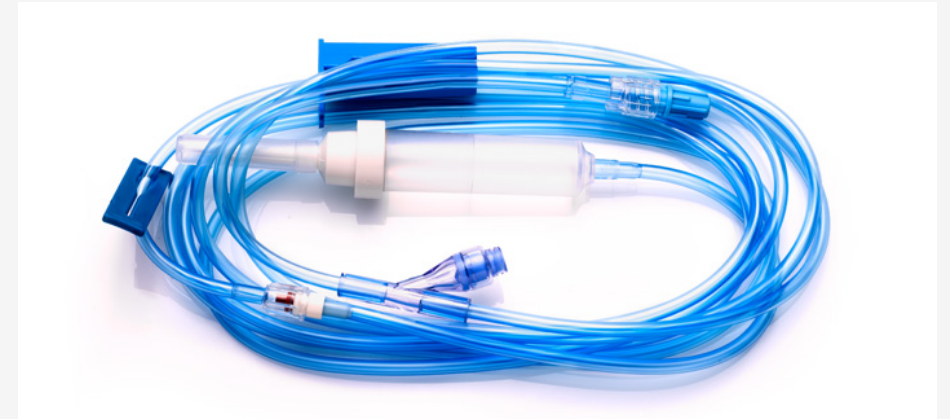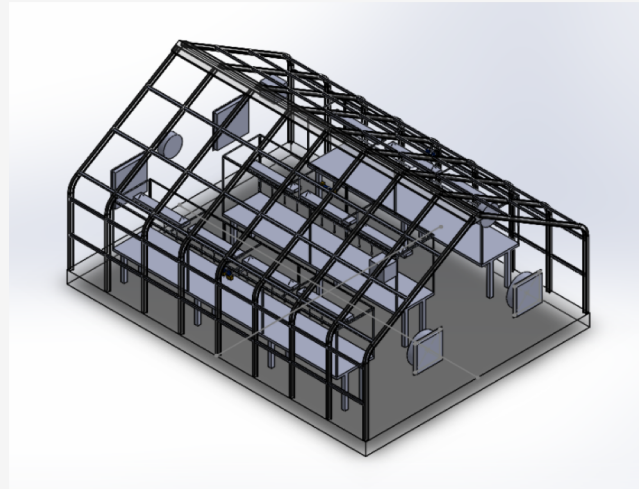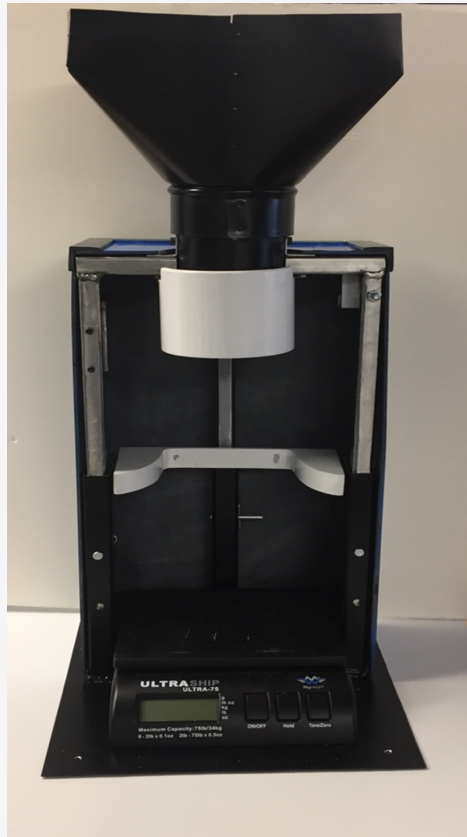
Motivation and Research Questions

- Benefits are largely external/programmatic (recruitment, retention, interested in engineering…etc.).

- How does this experience affect the students that are <u>currently</u> involved in capstone?

- RQ 1: Do student *motivations* vary based upon the amount of service in a capstone project?

- RQ 2: Do students *value* their capstone experience differently based upon the amount of service in a capstone project?

Aspiration Index and Intrinsic Motivation Inventory

- Validated surveys with scored [0-4]. Ranging from absence of scale or not being important to extremely important or accurate.

- *Community* subscale of Aspiration Index examines whether an individual desires to contribute/improve community and others.

- *Enjoyment* subscale of IMI reports intrinsic *motivation* for activity. Associated with positive academic behaviors.

- *Value* subscale of IMI reports international of an activity.

Study Population

- Survey of 118 Junior/Senior Electrical, Computer, Mechanical, and Bioengineering students. 72 from Valparaiso and 46 from York College.

- All students at beginning of Capstone II experience. Wide range of service and traditional projects at each institution.

- Both schools are small, comprehensive, private universities offering degrees in ME, ECE, and Civil. Biomedical only at Valparaiso.

Capstone Project at York College and Valparaiso

Table 1: Capstone projects at each university based upon service attributes

	York College of Pennsylvania	Valparaiso University
Service Projects	• Medical Device • Shadowfax Assistive Technology • Agriculture Drone	• Biometric Gait Identification • Bottle Injection Molding • Wrist Exoskeleton • Solar Research • Go Baby Go • Automatic Baby Stroller Breaking • Concussion Detection and Monitoring • Bionic Children's Hand • Automatic Plant Watering
Non-Service Projects	• Formula SAE Internal Combustion Race Car • Formula Electric Race Car • Baja Off-Road Vehicle	• Automatic Drill Bit Sizing and Sorting • Quiet Coffee Grinder • Remote Home Lock • Formula SAE Car • Telepresence Robot • Autonomous Go Kart

Results: Comparison Across Institutions

Scale	YCP Score	Valparaiso Score
Community**	$\mu = 2.80 \pm 0.78$	$\mu = 3.21 \pm 0.54$
Enjoyment	$\mu = 2.93 \pm 0.69$	$\mu = 2.83 \pm 0.81$
Value	$\mu = 3.18 \pm 0.71$	$\mu = 3.03 \pm 0.83$

- All students reports general enjoyment and value in capstone projects

- Community scale difference between YCP and Valpo (p<0.001)

Results: Comparison Across Project Types

Scale	Service Project	Non-Service Project
Community**	$\mu = 3.21 \pm 0.53$	$\mu = 2.91 \pm 0.76$
Enjoyment	$\mu = 2.77 \pm 0.81$	$\mu = 2.98 \pm 0.68$
Value	$\mu = 3.02 \pm 0.78$	$\mu = 3.18 \pm 0.77$

- Students more likely to select service-oriented project based upon their personal value of community ($p < 0.01$)

- Generally enjoy and value projects but no variation based upon type

Examining Student Project Valuation Further
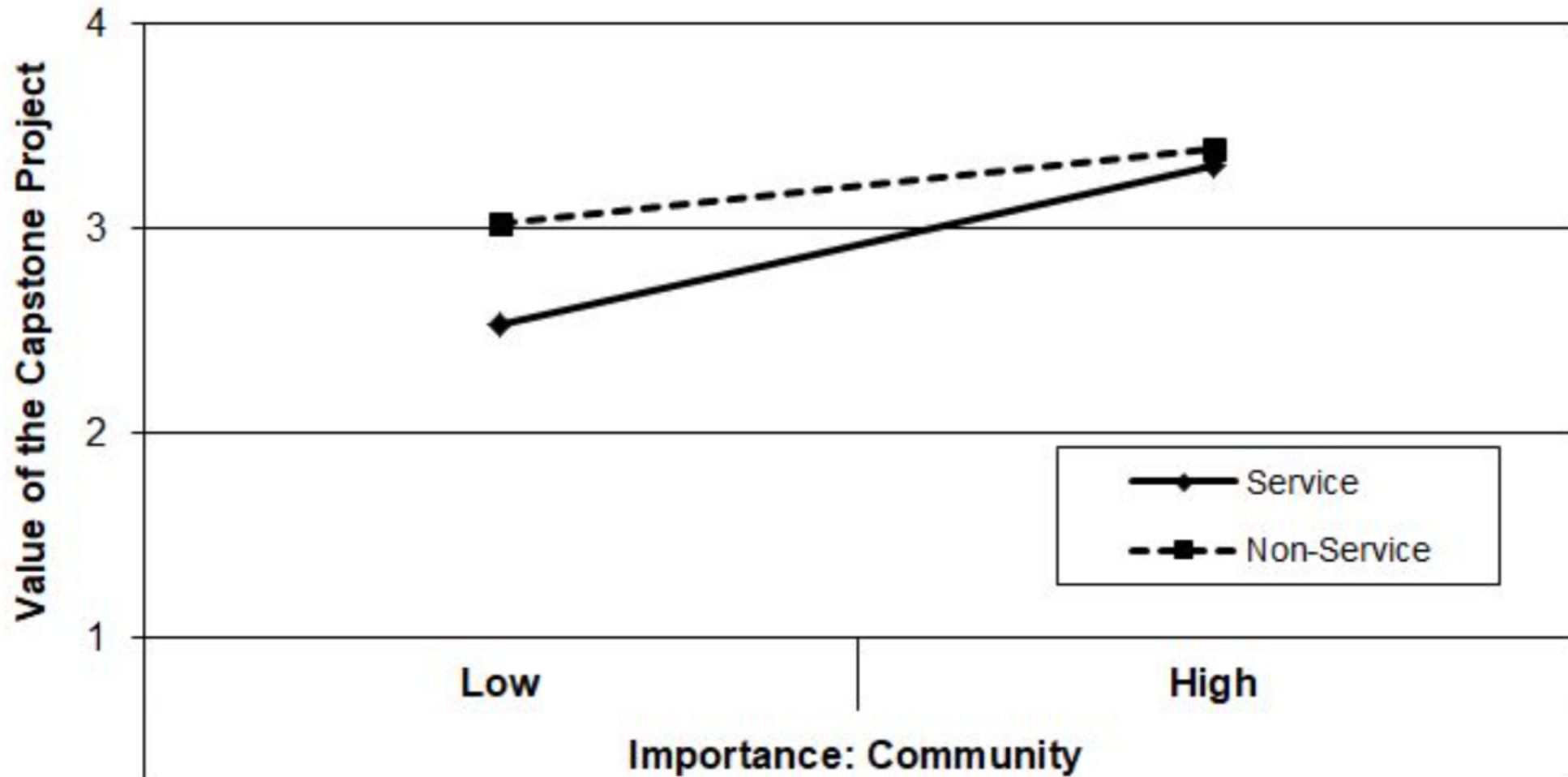
Returning to Research Questions

- RQ 1: Do student *motivations* vary based upon the amount of service in a capstone project?
  - No, there was no difference in *enjoyment* scale by project

- RQ 2: Do students *value* their capstone experience differently based upon the amount of service in a capstone project?
  - No, there was no difference in *value* scale by project

- However, the relationship between *community* and *value* may be more complex as *value* did vary based upon *community* score.

Implications for Capstone Faculty and Students

1. Students across all projects enjoy their capstone experience. Given the wide differences between institution and projects, there is probably no "one correct" way to teach capstone.

2. As students with low community score saw less value for projects, faculty should consider a student's viewpoint before assigning projects. The student's perception may not be known to faculty.

3. No major differences in motivation/enjoyment by project type. Faculty should weight benefits/challenges of community-based projects.

Conclusions and Future Work

- Survey of 118 engineering students at two universities.

- Assess attitudes to community service, value and motivation towards capstone project.

- No difference in motivation based upon project. However student value of project was varied by their own views on community service.

- Expand to view service as continuum rather than binary choice.

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Questions?

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