

Engagement in Practice: Building service focused multidisciplinary groups to develop adaptable solutions

Ms. Micaela Sandoval, Texas A&M Health Science Center

Micaela is a Master in Public Health candidate in Epidemiology at Texas A&M University, interested in protozoan parasitology, neglected tropical diseases, and infectious disease epidemiology. Her current research interests center around disparities in healthcare access and education, diseases of poverty, and emerging zoonotic diseases. Her education research centers around the evaluation of diversity and inclusion measures at Colleges and Schools of Public Health and the development of innovative service learning curricula.

Dr. Malini Natarajarathinam, Texas A&M University

Dr. Malini Natarajarathinam is an Associate professor with Department of Engineering Technology and Industrial Distribution. She teaches classes on strategic relationships for industrial distribution and distribution logistics. She is interested in researching on the impact of high impact practices on the learning and engagement of students in Industrial Distribution and other STEM disciplines. She is also interested in creating awareness about Industrial Distribution and related STEM fields among the public.

Ms. Lauren Neala Holder, Texas A&M University Mary Kathryn McDougal, Texas A&M University Dr. Mary E Campbell, Texas A&M University Dr. Bruce E. Herbert, Texas A&M University

Dr. Bruce Herbert is Professor of Geology and currently serves as the Director of the Office of Scholarly Communications in the Sterling C. Evans library At Texas A&M. As Director of OSC, Dr. Herbert is responsible for strengthening the Library's efforts in scholarly communications and open access through engagement and collaboration with the faculty across campus at Texas A&M University.

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Introduction

Service learning is the practice of incorporating real-world applications into instruction with the express goal of contributing to community development initiatives. Universities have begun to include service learning as a pedagogy within a variety of courses; these high-impact learning experiences allow students to work directly with nonprofit organizations, putting theory into practice (Hurwitz et al. 2014). University educators from a variety of fields have documented the positive impact of service learning on student growth, but few articles describe the underlying design models used to support innovation and student development within the classroom (Cheng et al. 2016). This article outlines the theoretical framework for and preliminary progress of a newly implemented interdisciplinary service-learning course at A STATE University. This spring, a group of approximately 120 undergraduate students in the disciplines of industrial distribution, sociology, and computer technology management are working together in multidisciplinary teams to boost the ability of "The State" food banks to better understand their clients and their needs, reduce costs and enhance efficiency.

Design in service learning

Integrative service learning curricula create a bridge between two major design philosophies: engineering design and design thinking as shown in Figure 1. While both concepts describe similar methods, they differ in the prioritization of relevant factors. Design thinking's most striking characteristics are the focus on empathy and the co-ownership of the design process by clients and designers ("An Educator's Guide to Design Thinking" 2017). In contrast, engineering design centers on the efficient development of a usable product (Tayal 2013).

The basic tenets of design thinking dictate three 'innovation spaces': inspiration, ideation, and implementation (Brown 2010). The 'inspiration' space contains traditional brainstorming and discussion, as well as techniques to foster empathy between clients, target populations, and designers, and to immerse team members in the environment of the community in need. The 'ideation' stage encompasses both the formal identification of the problem and the discussion of proposed solutions. 'Implementation' typically encompasses prototyping and feedback structures in addition to execution and evaluation (Seidel and Fixson 2013). Throughout the design thinking experience, users rely on two-way communication between all parties, emphasizing empathy and the development of common experiences; the model attempts to ensure independent sustainability by incorporating disparate perspectives from inception to execution (Melles, de Vere, and Misic 2011).

Engineering design is more analytical with respect to goals and processes. Engineering problem-solving primarily works to "balance competing criteria of desired functions, technological feasibility, costs, safety, esthetics, and compliance with legal requirements" (NRC, 2012). Engineering design plans are highly structured and detailed, as they seek to predict and prevent a multitude of adverse outcomes (de Vere, Melles, and Kapoor 2009). At its heart, this system relies on the application of basic science principles to industrial or consumer demands, but engineering design has grown to embrace the holistic needs of a target population including

environmental sustainability, operations safety, distribution logistics, social acceptability, and growth potential (Behm, Culvenor, and Dixon 2014). Within engineering education, prototyping is a learning strategy, rather than an evaluation tool; students are encouraged to build models to foster creativity throughout the design process (Puente and Jansen 2016). The National Academy of Engineering (2012) identified a 29 engineering programs that attempt to bring in real-world experiences into the classroom, but only four of these self-identify as service learning: the EPICS program (Purdue), the FUSE Program (Boise State), the McCormick Office of Career Development (Northwestern), and the NAE Program (Duke). Of these programs, only the EPICS program works with multidisciplinary engineering groups; unlike the EPICS program, our project focuses on parallel learning across traditional instruction and practical applications.





Both engineering design and design thinking philosophies have been widely utilized in educational settings (Dym et al., 2005). However, these concepts are rarely integrated into multidisciplinary undergraduate service-learning courses (Puente and Jansen 2016). As novice designers, students may not be accustomed to participating in multidisciplinary efforts or producing concrete results (Razzouk and Schute 2012). Thus the open, judgment-free format of the design thinking model may help reticent team members communicate evidence and experiences from disparate fields of study. The success of any program is derived from quantifiable measures of efficiency and resource appropriation; providing student groups with a framework for addressing specific needs, such as engineering design, can ensure the ultimate realization of innovative products (NRC, 2012). The shared notions of prototyping, in both engineering design and design thinking, as a creative process, rather than an evaluation methodology, are ideal for an iterative, flexible design process in a university classroom. Students suggest, critique, and research strategies throughout the design process, and the values and perspectives of multiple disciplines can be integrated smoothly and multilaterally.

University service learning programs may develop problematically paternalistic or hierarchical relationships between faculty, students, and community partners (Laninga, Austin, and McClure 2011). Within the evolution of service learning programming, university representatives have begun to step back from the 'expert- recipient' model of intervention and shift towards a truly collaborative community-based enterprise (Frankel 2011). To develop acceptable solutions appropriately tailored to the university and community partners, all parties must be afforded equal status within the design process. Additionally, students should be encouraged to treat both faculty and nonprofit representatives as equivalent resources in the assessment of community needs (Rosing and Hofman 2010). Interdisciplinary service learning encompasses a curated web of faculty, administrative staff, community partners, and students contributing to and benefitting from a shared pool of knowledge and experiences (Swope and Siplon 2011).

Course aims and description

Faculty and staff at A STATE University have developed a unique partnership with the Feeding "The State" network of food banks, the AmeriCorps VISTA program, and numerous local food service agencies to build a new multidisciplinary group: the Famine to Feast project. The aim of this program is to allow students to learn through practice while providing instrumental food service organizations with tangible benefits such as market analysis to support their future campaigns and innovative solutions to complement their existing initiatives. Previous to the development of this program, faculty from the College of Engineering, coordinated connections between members of the Central "The State" Food Bank and students in the Industrial Distribution program, and faculty from College of Education and Human Development and the College of Liberal Arts were subsequently invited to participate. Agency directors or volunteer coordinators were contacted by faculty representatives and invited to participate in an equal partnership with the university team. The clients were promised a needs assessment encompassing a problem of their choosing; the teaching staff stressed the open-ended nature of the project in all communications with the agency representatives. Through the course itself, each agency will construct an applicable problem statement as well as reasonable expectations in direct cooperation with student groups, instead of faculty generating project assignments. Participating agencies were asked to commit to several virtual meetings and the administration of a client questionnaire.

The objectives of this course were crafted to incorporate the principles of design thinking and engineering design as shown in Figure 2. By utilizing this hybrid model of design, we aim to create a safe but productive learning environment. We hope that the team-teaching system of instruction will help our students experience more diverse perspectives and problem-solving approaches.





The interdisciplinary class, which is being taught for the first time in the spring of 2017, grants credit for one of the following undergraduate courses: Distribution Logistics (300 level), Introduction to Race and Ethnicity (200 level), or Contemporary Issues in Technology

Management (400 level). Students attend course-specific sessions for half of the course contact time and joint instruction alongside all participating disciplines for the other half. The combined sections' grading policy is based on the semester project, but students are also responsible for the coursework and exams specific to the course in which they are enrolled. Each course also offers equivalent non-service-learning sections, so any student could choose to enroll in a service-learning or a traditionally taught course. We recognize that some students may have been previously inclined to service learning, which could bias our measures of interest in community involvement.

In addition to discipline-specific instruction and the practical application of theoretical coursework, this course should help students expand problem-solving skills and acquire deeper metacognitive skills through guided reflections. The University Libraries staff, as well as guest lecturers from public health and the humanities, are providing resources to bolster students' research and discovery skills, and the Writing Center on campus has pledged technical communication and presentation support. Figure 3 serves as a visual display of the course and learning objectives and elements. Each student group (typically four or five members) is also assigned a faculty mentor, who will facilitate relationships with partner agencies and provide insight into the possible ramifications of proposed solutions. By committing their time and energy to an outside organization, they will define their own knowledge gaps and opportunities for advanced scholarship. We hope that passionate students will be inspired to pursue further work in food equity or community development.

Figure 3- Course Mapping: Course Objectives, Learning Objectives, and Course Elements Course Mapping- Course Objectives, Learning Objectives, Course Elements



Anticipated outcomes

We derive our theoretical framework from the work of Kolb (1984) and the Cycle of Experiential Learning. This constructivist framework is evident in the course planning: students are encouraged to form concrete experiences alongside agency stakeholders while propagating abstract thinking, planning, and guided reflection through interdisciplinary instruction (Kolb et

al. 1984). By using this framework, we can evaluate metrics such as reflection on both learning and the affective domain, and conceptualization of learning and problem solving. A major priority of this novel service-learning course is the growth and development of student abilities. Students learn how to draft a statement of work, design and implement a survey, analyze the results, and conduct a needs assessment, all while continuing to work collaboratively with group members, faculty, and community partners. These project elements are expected to contribute to students' research, project management, and problem-solving skills. By incorporating elements of both design thinking and engineering design into the framework of this course, we hope to create an efficient, egalitarian, and creative environment. Throughout the course, student groups will be held to rigorous quality standards to ensure that participating nonprofit agencies receive usable, appropriate deliverables, assessed using rubrics designed by the multidisciplinary faculty and staff. While each client agency will require a unique approach, student groups will be responsible for the following deliverable items: a comprehensive statement of work, a survey/data collection toolkit, a problem-specific needs assessment, and a final proposal/presentation. Each project has the potential to offer a variety of benefits to participating organizations, depending on the agency's size, capacity, and demonstrated need. Opportunities include: developing a more comprehensive understanding of client needs or trends, identifying which services are useful to clients, classifying initiatives by immediacy, recognizing inefficient use of resources, and utilizing evidence-based analyses to strengthen grant proposals and support future initiatives. Faculty mentors will be responsible for evaluating the core competencies set forth in the project description and collecting feedback from participating agencies after the final presentations.

To assess the progress of student problem-solving, critical thinking, and affective changes, the research staff will use a concurrent nested mixed-method design (Hesse-Biber and Leavy, 2011). A pre-test distributed at the beginning of the course coupled with a post-test administered at the end of the semester will test students' awareness of other disciplines, willingness to accept the contributions of disparate points of view, and changes in attitudes. We refer to this survey as nested because it does not aim to answer the more broad goals of the project but does serve to answer auxiliary research questions. Students will be provided examples of effective contracts components, and asked to create group contracts, which are approved by teaching assistants. They will then be given the chance to reflect upon this contract and collaboratively modify it during the semester. We hope that this reflection activity provides the students with opportunity to consider how their team works together and how to improve their working habits. In addition to survey data and reflections, one research member will conduct in-person interviews towards the end of the semester to assess students' ability to make decisions that are both integrative and inclusive (Hesse-Biber and Leavy, 2011). These interviews will also capture details about group dynamics, engagement, self-efficacy, and cultural competency; each consenting student will answer similar questions during recorded interviews. These interview reflections will serve as a tool to enhance student metacognition while simultaneously serving as a form of triangulation to corroborate other methods of assessment (Hesse-Biber and Leavy, 2011). We will use a content analysis methodology to extract behavioral data from student final reports, including arguments and decision-making processes, to validate our qualitative data. Additionally, we will use aggregated qualitative information from final reports and interviews in future semesters; this mixed method design focuses on collecting qualitative data early in the project so that the research team can focus on common themes in future iterations of the course (Hesse-Biber and

Leavy, 2011). We will incorporate the qualitative data gathered this semester to inform future quantitative data collection; however, we will also continue to interview students to obtain more detailed information about the state of learning in the classroom.

Conclusions

The Famine to Feast project is innovative in the co-design of problem statements by nonprofit representatives and student groups and the fluid incorporation of traditional course material. A primary goal of this course is to develop a support structure to facilitate the scaling up of service learning initiatives at A STATE University in the near future by showcasing the potential impact of the Famine to Feast program with community partners located around the state. While this semester's project is centered on fighting hunger in Central "The State", the multidisciplinary service learning community model can be adapted to any significant humanitarian challenge.

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