AC 2012-5229: FACULTY SURVEY ON LEARNING THROUGH SERVICE: DEVELOPMENT AND INITIAL FINDINGS

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Faculty Survey on Learning Through Service: Development and Initial Findings

ABSTRACT

Learning Through Service (LTS), an innovative pedagogical method incorporating service as a means of meeting academic learning outcomes, is an integral part of a much-needed paradigm shift in engineering education. Although LTS has been around for a while and is well-known to spur students' growth on multiple levels, increase engagement and motivation, and attract women into the field, insufficient information is available regarding the motivations, challenges, and strategies faced by engineering faculty that integrate LTS in their curricular and extra-curricular engineering education endeavors. In order to fill this gap, this study aims to gain a deeper understanding of the faculty's experience with LTS. Herein, we present the thorough development of the *LTS Faculty Survey*, designed with content and construct validation processes in mind and included quantitative and qualitative items, as well as key findings from surveyed LTS faculty experts (N=25). The survey enabled us to measure characteristics of LTS curricular and extracurricular efforts, perceived barriers faced by faculty, motivations for implementing LTS efforts, attitudes about LTS, etc.– all from a faculty perspective. Key findings suggest that major barriers for LTS implementation are (1) faculty time/workload, (2) problems coordinating with the community, and (3) the lack of policy on the role of LTS in promotion and tenure. In regards to major benefits, surveyed LTS experts find LTS experiences to not only be academically rigorous and enabling students to meet course and program objectives, but also more motivating for engineering students. The implications of these findings for developing a framework upon which LTS-interested faculty can be empowered to initiate and/or improve their own LTS efforts are discussed.

Keywords – service learning, learning through service, student learning.

INTRODUCTION

The rapid pace of technological progress and future challenges for globalization, sustainability, complexity, and adaptability of engineering professionals call for a paradigm shift in engineering education. Such a paradigm shift would involve increased emphasis on the development of skills spanning beyond the technical knowledge, such as interpersonal and communication competencies, critical thinking, creativity, and problem-solving abilities [1, 4, 5, 20]. Moreover, innovative pedagogical efforts are needed for retaining underrepresented populations in engineering. Some evidence indicates that humanitarian efforts embedded in the service to society attract many students, notably women [8]. Learning Through Service (LTS) is a powerful pedagogical method that combines service to society with academics. Being inclusive, LTS is an umbrella term used to cover an array of efforts, from volunteerism to service-learning.

As an innovative pedagogical method that incorporates service as a means of meeting academic learning outcomes, LTS is part of such a paradigm shift. Empirical and anecdotal evidence indicates that LTS contributes to student development on the cognitive [12, 16, 22, 23], social [13, 14, 25, 26] and moral [11, 17, 18] levels. One example of an LTS-inspired effort is Engineers Without Borders

(EWB), which is a student-run humanitarian effort during which engineers-in-training work on the projects in the developing countries. Since EWB's inception, similar curricular programs have been widely incorporated in many institutions [21]. As a rich and authentic learning environment, LTS offers a natural avenue for shaping and directing students' professional aspirations. However, there are also numeral challenges to routine incorporation of LTS into the curricula that need to be addressed [3, 7, 15]. Some of these challenges include securing working relationships with community partners and aligning program outcomes with the stated program purpose. Due to these challenges and administrative hurdles, LTS is not as widely incorporated into the standard engineering curriculum. In order to investigate and ameliorate this situation, a three-year effort supported by the National Science Foundation (NSF) was launched with the overarching purpose of creating a community of LTS experts (in engineering and other fields). Engineering Faculty Engagement in Learning Through Service (EFELTS) led by the investigators from five diverse institutions is an effort consisting of two primary goals [24], as outlined in Table 1. Meeting these objectives is expected to result in a more comprehensive picture of the state of LTS from the view of the faculty, who are agents of university culture.

Table 1: Purpose, goals, and objectives of the EFELTS Project.

PURPOSE: "to provide the motivation, training, and resources to catalyze widespread adoption of LTS among engineering faculty, departments, and colleges interested in offering modern and effective curricula [24].	
Goal 1*:* Understand the motivations, obstacles, and strategies for engineering faculty who currently offer LTS opportunities.	
Objectives	a) understanding why faculty adopt LTS
	b) understanding how faculty implement LTS
Goal 2*:* Increase the involvement of engineering faculty engaged in LTS.	
Objectives	a) provide an insight on the level of faculty involvement in LTS
	b) promote widespread implementation of LTS in engineering education
	c) create faculty resources needed to lower barriers for participation while developing faculty expertise in LTS

Understanding why faculty choose to implement LTS both in the curricular and extracurricular contexts, combined with the insight into their attitudes toward LTS and the barriers they perceive, is likely to shed light on the state of the LTS practice in the engineering education arena (and beyond) as well as inform future practice. The following *research questions* were developed for guiding this study:

1) What are some characteristics (academic level, team-based vs. independent, etc.) of curricular vs. extracurricular LTS efforts?
2) What are some characteristics of partnerships with the community clients (local or international, ways of securing partnerships) in curricular vs. extracurricular LTS efforts?
3) What are the perceived barriers to incorporating LTS in curricula vs. extracurricular contexts?
4) What are faculty attitudes toward LTS and the effect of LTS on pedagogical practice?
5) What are the main reasons faculty use LTS in curricular vs. extracurricular LTS efforts?
6) What are the reasons faculty do not use LTS in curricular vs. extracurricular LTS efforts?

METHODS

To answer the above research questions, we developed an *LTS Faculty Survey* for investigating LTS with the purposes of gathering insight into not only the types of LTS experiences (e.g. curricular, extracurricular, etc.) and the characteristics of such experiences (e.g. group-based, type of community partner, duration, course characteristics, etc.), but also the benefits and barriers faced during LTS design, management, and assessment – all from a faculty perspective. Faculty attitudes on LTS efforts and the impacts on their students, themselves, their institutions, and their community partners were also measured.

The survey includes Likert scale items, open-ended questions, and multiple choice items. Phase I of our effort was inspired by evaluating an existing faculty survey on service-learning from the University of Massachusetts (UMass), Lowell [9]. This existing survey, which is used annually at UMass-Lowell was refined and expanded by the collaborative team of LTS content experts and assessment specialists. Critical LTS characteristics were identified from the literature and personal experiences to develop new items that would provide a more comprehensive understanding of LTS efforts. Phase II of survey development involved recruitment of additional content experts for feedback on content validity. Understanding that content and construct validation refers to the cyclical, multi-stage processes of determining whether the instrument measures the construct it purports to measure, we also focused on the validationof the interpreted scores, as well as any implications for action from these interpretations [10]. This group of participants provided valuable feedback which enabled our team, comprised of faculty (LTS experts, non-LTS experts, and assessment experts) and graduate students to closely examine the scale development process, which is essential for assuring appropriate content and construct validation [19]. Further, close examination of the scale development process entailed (a) establishing the context, (b) defining the constructs to be assessed by the instrument, (c) generating items to tap into these constructs, (d) conducting expert judgment reviews, (e) piloting the items to a small sample to ensure clarity, and (f) scrutinizing the self-report nature of the instrument. More specifically, pilotingthe survey with a group of LTS experts (N=5) and also witha group of LTS non-experts (N=5) enabled us to gain insight into the degree to which responses on the instrument reflected the faculty's actual knowledge of the construct of interest and to examine how the instrument functions across different population groups.

Shortly prior to a two-day EFELTS LTS Experts Summit in September 2011, participants completed the *LTS Faculty Survey* online administered on the Qualtrics platform. Demographic information on the participants was collected, as well information regarding their positions at their respective institutions, the departments they work in, and the level of faculty involvement in LTS in the department. In addition to demographic and descriptive questions, the survey consisted of the following four parts, which are described in the following paragraphs: (1) Curricular LTS, (2) Extracurricular LTS, (3) Attitudes toward LTS, (4) Additional information.

Part 1 of the *LTS Faculty Survey* pertained to course-based or curricular LTS and included both quantitative (Likert-scale and selection of pre-categorized responses) and qualitative (open-ended) questions about the type of LTS activity (e.g., team-based versus independent), duration, academic standing of students involved, and nature of the partnership with the community. Participants were also prompted to provide information on their LTS efforts including course

title, its academic level (graduate, senior, junior, etc.), a brief description of the LTS effort, and any assessment processes used. Furthermore, participants provided open-ended responses pertaining to the main reasons they HAVE used LTS in their courses as well as the main reason(s) they HAVE NOT used LTS in their courses. Then, they rated what they saw as barriers to integrating LTS into their courses (regardless of whether or not they engaged in course/curricular LTS) on a 9-point Likert scale (ranging from 1 – strong/always a barrier to 9 – no barrier).

Part 2 of the *LTS Faculty Survey* pertained to extracurricular LTS (e.g., Engineering Society Chapter) and also included both quantitative and qualitative questions about the type of extracurricular LTS activity, duration, nature of the partnership with the community. Participants were also prompted to provide information on their extracurricular LTS efforts including group or individual efforts, academic level of involved students, and a brief description of LTS effort. Next, in the similar vein to Part 1, participants provided open-ended responses pertaining to the main reasons they HAVE used LTS in their extracurricular activities as well as the main reasons they HAVE NOT used LTS in their extracurricular activities. Then, they rated what they saw as barriers to engaging in extracurricular LTS (regardless of whether or not they engaged in extracurricular LTS) on a 9-point Likert scale (ranging from 1 – strong/always a barrier to 9 – no barrier).

Part 3 of the *LTS Faculty Survey* pertained to the participants' attitudes toward LTS and also included a mix of qualitative and quantitative questions. First, participants rated their agreement with a set of statements intended to reveal their perception of, and level of interest in, LTS on a 9-point Likert scale (ranging from 1 – strongly disagree to 9 – strongly agree). Second, they rated the extent to which LTS effort(s) have affected them related to a set of statements (or their expectation of its effect) by selecting the degree of change (increased, decreased, or no change) using the 9-point Likert scale (ranging from 1 – strongly decreased to 9 – strongly increased). Third, participants selected the ABET Criterion "3a-k" outcomes that were met, in their opinion, by the LTS efforts.

Part 4 of the *LTS Faculty Survey* pertained to the additional information, such as other contributions that the EFELTS project can make to assist faculty in engaging in LTS efforts, and anything else that faculty participants wished to share regarding LTS or engineering education in general. This last part consisted of open-ended qualitative questions.

Selected items from this survey were chosen for analysis herein. Table 2 presents the survey items analyzed in this paper and mapped to the corresponding research questions.

Table 2: Research Questions and Corresponding LTS Faculty Survey Items.

Research Question	Survey Item	Type
RQ1: What are some characteristics (academic level, team-based vs. independent, etc.) of curricular vs. extracurricular LTS efforts?	My course-based LTS efforts can be characterized as follows [Check ALL that apply]	quaN
	My extracurricular LTS efforts can be characterized as follows [Check ALL that apply]	quaN
RQ2: What are some characteristics of partnerships with the community clients (local or international, ways of securing partnerships) in curricular vs. extracurricular LTS efforts?	During your LTS efforts, what describes your partnership(s) with the community [Check ALL that apply]:	quaN
	Which of the following characteristics seem to describe your community partners: [Check ALL that apply]:	quaN
RQ3: What are the perceived barriers to incorporating LTS in the curricula vs. extracurricular contexts?	WHETHER YOU DO OR DO NOT engage in course/curricular LTS, please rate what you see as barriers to integrating LTS into your course(s).	quaN
	WHETHER YOU DO OR DO NOT engage in extracurricular LTS, please rate what you see as barriers to integrating LTS in such activity(s).	quaN
RQ4: What are faculty attitudes toward LTS and the effect of LTS on pedagogical practice?	Rate your agreement with the following statements, which are intended to reveal your perceptions of, and level of interest in, LTS.	quaN
	Rate the extent to which LTS effort(s) have affected you related to the items below (or your expectation of its effect) by selecting the degree of change (increased, decreased, or no change) using the 9-point scale.	quaN
RQ5: What are the main reasons faculty use LTS in curricular vs. extracurricular LTS efforts?	What are the main reasons you HAVE used LTS efforts in your course(s)?	quaL
	What are the main reasons you HAVE used LTS efforts in extracurricular activity(s)?	quaL
RQ6: What are the main reasons faculty do not use LTS in curricular vs. extracurricular LTS efforts?	What are the main reasons when you HAVE NOT used LTS efforts in your course(s)?	quaL
	What are the main reasons when you HAVE NOT used LTS efforts in extracurricular activity(s)?	quaL

PARTICIPANT DEMOGRAPHICS AND CHARACTERISTICS

The majority of participants (64%) were tenure-track or tenured. Out of 11 (44%) participants who indicated that their position was administrative, 3 (12%) were Associate Deans, 5 (20%) were directors of service-learning programs, 1 (4%) was an undergraduate Vice Dean and 1 (4%) was a Department Chair. The majority of institutions with which EFELTS participants were affiliated were research institutions that offered doctorate level degrees. The majority of

EFELTS participants worked in the mechanical engineering department (29%), civil engineering (25%), or environmental engineering (21%). The following departments were listed under "Other": Engineering Education, General Engineering, Engineering Design and Professional Programs, English and Media Studies, Materials Engineering, Liberal Arts and International Studies, and Service Learning Center. The majority of the departments in which EFELTS participants worked were of small size consisting of 10-19 faculty members (35%), followed by larger departments consisting of over 40 faculty members (26%) and medium-sized departments consisting of 20-29 faculty members (26%). The majority of EFELTS participants (48%) indicated that 10% to 25% of the faculty members in their department engaged in LTS efforts. Out of 25 participants who reported their gender, 16 (64%) were male.

In regards to curricular and extracurricular LTS experience, the majority of the participants had experience with both. Out of 26 participants who responded to the question on whether they have incorporated LTS in at least one of their courses, 23 (88%) reported that they did. Out of 25 participants who responded to the question on whether they have incorporated LTS into at least one extracurricular activity they supervised, 17 (68%) reported that they did. Furthermore, the majority had this experience recently. Specifically, out of 22 participants who responded to the question asking to check the academic years during which they incorporated LTS efforts into at least one of their courses, over 70% reported that they incorporated LTS from 2006 to 2011. Out of 8 participants who responded to the question asking to check the academic years during which they incorporated LTS efforts into at least one extracurricular activity, over 70% reported that they incorporated LTS from 2006 to 2011.

RESULTS

In this section, we present the survey responses collected from the participants of the *LTS Faculty Survey* as outlined in the methods section. The results are organized by research question and by addressing each of the survey questions posed in Table 2.

RQ1: What are some characteristics of curricular and extracurricular efforts?

Pertaining to the curricular LTS efforts, the majority of respondents (out of 26) characterized their LTS efforts as student team-based (95%), lasting the entire semester (86%), and mandatory in the courses (82%). Half of the participants (50%) characterized their LTS efforts in lower academic levels as requiring engineering classes, about 41% characterized their LTS efforts in upper academic levels as requiring engineering classes. About half (50%) reported that LTS efforts were undertaken as independent studies. A smaller proportion of the participants described their curricular LTS efforts as lasting a couple of weeks (23%), being student-independent, with each student working alone (9%), and undertaken for extra credit (9%). When asked to elaborate on their curricular LTS efforts in the open-ended format, participants described them as "final project", "global internship program", "capstone design", "doctoral courses in higher education", and "multi-disciplinary and not just for engineering students". Pertaining to the extracurricular LTS efforts, 100% of the respondents (8 out of 8) characterized their LTS efforts as student team-based and lasting over the number of years and student groups. The majority (88%) characterized such LTS efforts as involving both engineering and non-

engineering students. A smaller proportion of the participants described their extracurricular LTS efforts as lasting less than 3 months in total (63%), involving engineering students only (38%), and being student-independent, with each student working alone (13%). Detailed results for both curricular and extracurricular LTS effort characteristics are presented in Appendix A.

RQ2: What are some characteristics of partnerships with the community clients in curricular vs. extracurricular LTS efforts?

Pertaining to the curricular LTS efforts, the majority (86%) said that they sought to find community partners, a smaller proportion (45%) said that the community partners found them, and an even smaller proportion (41%) said that students initiated the community partnership (see Table 3). When asked to elaborate their partnership with the community while working on the curricular LTS project in the open-ended format, the following descriptions were included: "used their Community Based Learning office for some match making", "Students analyzed different communities even when they could not interact directly with them", "Brought by other faculty and university staff", and "I engaged representatives of an international community."Out of 22 participants who responded to the question asking to endorse the characteristics that best describe their community partners in the curricular context, the majority (82%) said that the community was local or regional and non-profit (77%). A smaller proportion described their community partner as international (55%), national (14%), non-engineering industry (9%), for-profit (9%), and engineering industry (5%) (see Table 4).

Pertaining to the extra-curricular LTS efforts, the majority (88%) said that they sought to find community partners, a smaller proportion (50%) said that the community partners found them, and an even smaller proportion (38%) said that students initiated the community partnership (see Table 3). When asked to describe their partnership with the community in the open-ended format, one participant said that partnerships were secured through "other advisor seeking it out through EWB." When asked to describe their community partners in the extracurricular context, the majority (75%) said that the community was local or regional and non-profit (75%). A smaller proportion described their community partner as international (63%), national (38%), engineering industry (38%), for-profit (25%) (see Table 4).

Table 3 presents participants' responses to the question asking them to describe their partnership with the community while collaborating on curricular and extracurricular LTS projects.

Table 3: Responses to the question "During your LTS efforts, what describes your partnership(s) with the community [Check all that apply]."

During your LTS efforts, what describes your partnership(s) with the community? [Check all that apply]	**Curricular (*N* = 22)**		**Extracurricular (*N* = 8)**	
	Response	%	Response	%
I sought to find community partners	19	86%	7	88%
The community partner found me	10	45%	4	50%
Students initiated the community partnership	9	41%	3	38%
Other (please specify)	4	18%	1	13%

Table 4 presents participants' responses to the question asking them to endorse the characteristics that best describe their community partners, in the curricular and extracurricular contexts.

Table 4: Responses to the question "Which of the following characteristics best describe your community partners [Check all that apply]."

Which of the following characteristics best describe your community partners? [Check all that apply]	**Curricular (*N* = 22)**		**Extracurricular (*N* = 8)**	
	Response	%	Response	%
Local or regional partner	18	82%	6	75%
Non-Profit partner	17	77%	6	75%
International partner	12	55%	5	63%
National partner	3	14%	3	38%
Non-engineering industry partner	2	9%	0	0%
For-profit partner	2	9%	2	25%
Engineering industry partner	1	5%	3	38%

RQ3: What are the perceived barriers to incorporating LTS in the curricula vs. extracurricular contexts?

Pertaining to the curricular LTS efforts, the majority of respondents (79%) endorsed faculty time/overload as the strongest barrier, followed by the size of course or number of students (63%) and problems coordinating with the community (63%). Other aspects were endorsed as occasional barriers, such as lack of information on how to implement LTS successfully (39%) and limited amount of class time (38%). When asked to elaborate the barriers to curricular LTS in the open-ended format, participants listed the following: "Not always appropriate", "I am not tenure track which helps me to remain involved in service learning in my view", "Students' beliefs about how superior they are in knowledge and expertise compared to the communities they are trying to serve", "I have not taught an engineering course", and "Identifying appropriate project with a community partner".

Pertaining to the extra-curricular LTS efforts, the majority of respondents (76%) endorsed faculty time/overload as the strongest barrier, followed by the limited amount of time (74%) and problems coordinating with the community (60%). Other aspects were endorsed as occasional barriers, such as financial support (33%) and liability risk (33%). When asked to describe the barriers to extracurricular LTS in the open-ended format, participants listed the following: "Students are not willing because of their hectic schedules," and "Incorporating intentional learning goals and assessing their achievement." Detailed results on participants' responses to the question asking them to identify perceived barriers to implementing LTS both in curricular and extracurricular contexts are presented in Appendix B.

RQ4: What are faculty attitudes toward LTS and the effect of LTS on pedagogical practice?

When asked to rate their agreement with various statements regarding their attitude toward LTS, over 90% of participants agreed or strongly agreed that LTS efforts can be academically rigorous, that with LTS, it is possible to meet learning objectives while also meeting community

needs; that with LTS, students become better engineers; that when LTS is done well, students learn engineering subject matter better than in a traditional lecture-based classroom setting; and that LTS activities require greater time commitment on the part of the faculty.On the other hand, over 40% of participants disagreed or strongly disagreed that LTS efforts are valued during annual evaluation reviews and that LTS efforts are valued during promotion and tenure reviews. The detailed report of agreement ratings of the statements intended to reveal faculty's perceptions of and level of interest in LTScan be found in Appendix C.

When asked about the past or expected effects of LTS on their pedagogical practice, over 90% of faculty participants said that the following increased or strongly increased as a result of LTS: knowledge of issues and resources in the community, emphasis on community issue/problems in my class or program, belief that students can make a difference in their communities, the existence and strengthening of partnerships between my institution or program and other organizations in the community.Other positive statements were endorsed by the majority of the participants (70% or over) as increasing or strongly increasing. A complete break-down of the results can be found in Appendix D.

When asked to endorse which ABET "3a-k" criteria were mastered by students through LTS, over 90% of the participants endorsed the following:

- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- An ability to communicate effectively
- The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- An ability to function on multidisciplinary teams

RQ5: What are the reasons faculty use LTS in curricular vs. extracurricular LTS efforts?

Next, we present the results from the thematic analysis of the survey questions that can be found in Table 5. Qualitative analysis (i.e., identifying codes and coding text segments) was independently conducted by two researchers who reached consensus after the first round of independent coding was completed. Raw frequencies are provided along with the percentages for each theme, so that comparisons can be made as to the relative frequency of occurrence of each theme, across questions pertaining to curricular and extracurricular LTS.

Table 5: Open-ended survey questions thematically analyzed.

	Survey Question	Purpose
Curricular	What are the main reasons you HAVE used LTS efforts in your course(s)?	Attempts to identify the main reasons why faculty use LTS in their courses
	What are the main reasons when you HAVE NOT used LTS efforts in your course(s)?	Attempts to identify the main reasons why faculty do not use LTS in their courses
Extracurricular	What are the main reasons you HAVE used LTS efforts in extracurricular activity(s)?	Attempts to identify the main reasons why faculty use LTS as an extracurricular activity
	What are the main reasons when you HAVE NOT used LTS efforts in extracurricular activity(s)?	Attempts to identify the main reasons why faculty do not use LTS as an extracurricular activity

Two open-ended questions analyzed herein "What are the main reasons you HAVE used LTS efforts in your course(s)?" and "What are the main reasons you HAVE used LTS efforts in extracurricular activity(s)?" attempted to identify the main reasons why faculty use LTS in their courses and extracurricular activities. The themes for curricular and extracurricular contexts are presented in Table 6. More themes were identified for curricular LTS as opposed to extracurricular LTS, partially due to the fact that more faculty participants were involved in curricular LTS (N = 22) as opposed to extracurricular LTS (N = 8). Nonetheless, several themes were common across these two contexts. Specifically, *Civic Responsibility Learned in Applied Context* was the most prominent theme for both curricular and extracurricular use of LTS. This observation reveals that, regardless of the context in which LTS occurs (curricular or extracurricular)it provides an authentic, real-world learning environment in which students learn social justice and civic responsibility. According to one participant, curricular-based LTS allows "students to better understand that good engineering solutions in the real world are not strictly technical". Another participant said the following about extracurricular LTS: "This generation of students is very service-oriented and this gives them an opportunity to get involved". The second most frequently occurring theme common for both curricular and extracurricular LTS is *Student Engagement and Retention*. In both contexts, LTS leads to increased student engagement, retention, and motivation. In the curricular context, LTS "promotes student academic engagement, more closely approximates the conditions that promote lifelong learning", it is "fun and exciting" and a "better way to teach design". In the extracurricular context, LTS is "rewarding, fun and gives purpose to life for students, faculty, partners and community members". Moreover, involvement in extracurricular LTS plays a role in motivating students to remain in the engineering field long-term. Consider the following quote about students engaging in extracurricular LTS efforts:

> "Almost all of the undergraduate students with whom I work pursue further graduate studies in medicine, public health, engineering or work with companies with a desire for higher studies in the future. The graduate students are seeking employment with companies or non-profits which are engaged in improving health care delivery systems."

Evidently, LTS has a power of not only engaging students, but also maintaining their interest long-term. Another theme common for both contexts was *Community*, which pertained to the benefits to the community partners. "Having an impact on the community" and providing

"community service" was frequently mentioned across both contexts. There were also several themes that differed across the two contexts. Expectedly, themes pertaining to academic achievement emerged for the curricular LTS. These themes were: *Better Facilitation of Learning* (e.g., critical thinking skills, non-technical learning outcomes), *Communication* (e.g., written and oral communication skills), and *Meeting External Criteria (ABET).* On the other hand, two themes were identified for extracurricular context only: *Academic Credit* (the added benefit of extracurricular LTS is that it offers students academic credit, unlike traditional volunteering) and *Faculty Satisfaction* (e.g., some identify extracurricular LTS as their professional passion and derive delight from it).

Table 6: Summary of emergent themes for survey question "What are the main reasons you HAVE used LTS efforts in your course(s)/ in your extracurricular activities?"

Emergent Theme	**Brief Description**	**Curricular (*N* = 22)**		**Extracurricular (*N* = 8)**	
		Response	%	Response	%
Civic Responsibility Learned in Applied Context	LTS project being used as a contextual, authentic, real-world learning environment in which students learn social justice and civic responsibility.	14	64%	8	100%
Student Engagement and Retention	LTS project leading to increased student engagement, retention, and motivation.	11	50%	5	63%
Community	LTS project benefitting the community.	2	9%	4	50%
Better Facilitation of Learning	LTS project leading to higher learning.	7	32%	N/A	N/A
Communication	LTS project facilitates the development of oral and written communication skills (specifically, communicating technical information to lay audience).	6	27 %	N/A	N/A
Meets External Criteria (ABET)	LTS projects satisfy externally imposed learning objectives or criteria (e.g., ABET).	1	5%	N/A	N/A
Academic Credit	LTS project completion provides academic credit to students.	N/A	N/A	1	13%
Faculty Satisfaction	LTS project brings professional satisfaction to faculty.	N/A	N/A	1	13%

RQ6: What are the main reasons faculty do not use LTS in curricular vs. extracurricular LTS efforts?

The next two open-ended questions analyzed herein "What are the main reasons when you HAVE NOT used LTS efforts in your course(s)?" and "What are the main reasons when you HAVE NOT used LTS efforts in extracurricular activity(s)?" attempted to identify the main reasons why faculty opt not to use LTS in curricular and extracurricular contexts. The themes for curricular and extracurricular contexts are presented in Table 7. Several themes were common

for both contexts. Namely, *Time* and *Community Partners* were identified for both contexts. Lack of time and faculty work overload surfaced as reasons for not engaging in LTS in both curricular and extracurricular contexts. Difficulties associated with securing and maintaining community partners to collaborate with were also mentioned across both contexts, although not too frequently. Several themes related to the reasons for not engaging in LTS pertained to the curricular context only. For example, *Content/Nature of the Course* did not allow for the integration of LTS in situations when the course is one-week intensive, based outside of the USA, or if the class is based heavily on scientific theory as opposed to engineering design, and thus not conducive to the LTS project. *Lack of Resources* was another theme that emerged when analyzing the reasons for not including LTS in the curriculum. According to one participant, "These projects are faculty-resource intensive and require extra effort to develop and maintain external contacts and sponsors." There were also several themes identified as applicable only in the extracurricular context. For example, the *Not Applicable* theme refers to the occasions when extracurricular activities are outside of faculty's immediate duties or they just have not had a chance to engage in them. *Lack of Incentives* refers to the lack of rewards for engaging in extracurricular LTS. Notably, this theme did not surface in the curricular context and was not prominent in the extracurricular context, leading us to believe that the lack of incentives was not a major obstacle to engaging in LTS.

Table 7: Summary of emergent themes for survey question "What are the main reasons when you HAVE NOT used LTS efforts in your course(s)/ extracurricular activities?"

Emergent Theme	**Brief Description**	**Curricular (*N* = 22)**		**Extracurricular (*N* = 8)**	
		Response	%	Response	%
Time	Lack of time for LTS project.	7	39%	6	38%
Community Partners	Difficulties securing and maintaining community partners to collaborate with.	6	33%	2	13%
Content/Nature of the Course	The course content, focus, or level is not conducive to the LTS project	8	44%	N/A	N/A
Lack of Resources	Lack of resources (human or others) for implementing LTS project.	4	22%	N/A	N/A
Not Applicable	Occasions when faculty do not supervise extracurricular, focus solely on curricular, or just have not had the opportunity to engage in extracurricular activities.	N/A	N/A	11	69%
Lack of Incentives	Lack of incentives or rewards for engaging in extracurricular LTS.	N/A	N/A	1	6%

DISCUSSION

The majority of LTS studies to date have focused on curricular LTS efforts. Herein, though, we were interested in adding to this body of literature by not only continuing to better understand the characteristics of curricular LTS efforts, but certainly also better understand extracurricular LTS efforts. In interpreting the data presented in this paper and in this section, it is important to keep

in mind that the majority of the participants in this study are themselves LTS experts so the views presented are not representative of non-LTS experts.

In characterizing and comparing characteristics of curricular and extracurricular LTS efforts, we learned that the majority of the participants (23, 88%) reported being primarily involved in curricular LTS efforts, with a smaller proportion (17, 68%) indicating that they were involved in extracurricular LTS efforts (although only 8 participants responded to questions pertaining to extracurricular LTS). While LTS curricular projects ranged in scope and design, the majority were team-based, lasting at least a semester, being a requirement in courses, similarly represented in upper-level and lower-level course, and almost evenly split in terms of representation in required vs. non-required courses in the curriculum. Extracurricular LTS efforts were all team-based with a duration of at least one year and many were multi-disciplinary (often bringing together engineering and non-engineering majors together). These results suggest that curricular LTS efforts inevitably place some constraints (e.g. LTS project duration and team disciplinarity of LTS projects) in how they are carried out in comparison to LTS extracurricular efforts. These results though also suggest that this particular group of participants seek out incorporating LTS efforts in many of their activities and this is evident in how they incorporate LTS in required and non-required engineering courses as well as extracurricular learning experiences. In regards to community partnerships, although there was slight variability on the nature of community partnerships for both LTS curricular and extracurricular efforts, the majorityof community partners were local or regional non-profit partners, whom the faculty themselves sought out. International partners were also sought out by the faculty, but not at the levels in which local and regional partnerships were sought out. It was also not uncommon, at least for about half of the faculty participants, for the community partner or a student to initiate a partnership. This finding suggests that institutions and departments should work to facilitate partnerships that are initiated by not only the faculty, but certainly the community and the students.

In regards to faculty perceptions of barriers to integrating LTS into courses and extracurricular activities, lack of time and faculty overload were identified as the major barriers. This was followed by problems coordinating with the community partner, unclear policies on value of LTS in promotion and tenure, student time/workload, and financial support. These findings corroborate those previously discovered in the literature ofsurveyed engineering faculty members who identified perceived *time* (their own time, course time, and student time) as a major barrier to employing LTS in the curriculum [2, 6, 9]. Furthermore, for both curricular and extracurricular contexts, difficulty coordinating with the community, including securing and maintaining community partnerships were identified to be barriers to implementing LTS. This is also in agreement with a previous study [2]. Furthermore, factors such as logistical issues, fit between class material and the project, incentives, and lack of definitional clarity came up in the current study as well as in previous studies [2, 9].

In addition to our findings corroborating with findings of previous studies, our effort also adds to the body of literature when comparing curricular and extracurricular LTS efforts. For example, results herein show that size (i.e. number of students involved) is a bigger barrier for curricular LTS efforts over extracurricular efforts, but lack of information on how to implement LTS and limited amount of course/meeting times are bigger barriers for extracurricular LTS efforts over

curricular efforts. This is probably because the constraints of curricular (i.e. fixed duration, fixed and known meeting times) LTS efforts aid in better defining the LTS experience in terms of expectations and deliverables (for both the students and the community partners). On the other hand, extracurricular LTS efforts are longer and probably more open-ended and less-defined (i.e. more experimental in nature). Such findings suggest that for faculty interested in starting to implement LTS (curricular or extracurricular), it might be advantageous to start with a smaller group of students and a LTS project or activity that is somewhat defined, with clear expectations for the students and partners, as well as agreed upon deliverables and a timeline.

In regards to faculty perceptions of LTS, almost all of the faculty participants in this study believed that LTS efforts can be academically rigorous, conducive to meeting student learning objectives as well as community needs, conducive to students becoming better engineers and engaged global citizens, and conducive to superior mastery of the material when compared to lecture-based learning. These findings are congruent with previous studies. For example, in 2008 Burack[9] reported that over the course of just a few years of practicing LTS in courses, faculty attitudes regarding LTS have improved dramatically. More specifically, this study[9] reported the results of an annual survey and in-depth interviews with faculty members, indicating that faculty perceive LTS as conducive for students meeting learning objectives and mastering the subject matter. Abes and colleagues (2002) surveyed over 500 faculty members from various institutions representing diverse disciplines about their views on using LTS in their courses and found that student learning outcomes were a main factor appealing faculty to the use of LTS, followed by the community benefits[2]. Furthermore, a large majority of the participants herein also believed that LTS revitalized their teaching and enabled them to produce scholarly activities (publications, grants, etc.). Although faculty participants believed their dean, department hear/chair, and colleagues to be supportive of their LTS efforts, the majority did not believe that their LTS efforts were valued during annual evaluations nor valued during promotion and tenure reviews. These findings suggest that although faculty implementing LTS acknowledge the learning value for students, programmatic and institutional valuing of LTS efforts is possibly greatly hindering LTS implementation.

Furthermore, faculty participants identified the following common reasons for engaging in LTS in both curricular and extracurricular contexts: civic responsibility learned in applied context, student engagement and retention, and community benefits. By far, though, the overarching reason for engaging in LTS pertained to the benefits of learning, motivation, and engagement for the students. It is interesting that the Burack et al. (2008)[9] study raised some concerns about whether service learning is appropriate in the engineering curricula, given that the primary goal of engineering education is to produce competent engineers and not "social activists," because this concern was not at all voiced in the present study. This was probably because the majority of the faculty participants are themselves current LTS practitioners and proponents, who clearly see the benefits of LTS on student learning, motivation, development, and engagement.

CONCLUSION

Overall, the present study showed that the attitudes and perceptions of faculty participants' (as LTS implementers) toward LTS were overwhelmingly positive.The development of the LTS Faculty Survey, designed with content and construct validation processes in mind, enabled us to measure characteristics of LTS curricular and extracurricular efforts, perceived barriers faced by faculty, motivations for implementing LTS efforts, attitudes about LTS, etc. Contributing as validation evidence, many of our findings were in agreement with previous LTS studies; yet, there were some new contributions this paper added to the body of literature. In particular, we gained some insight into the similarities and differences between curricular and extracurricular LTS efforts in regards to how they are designed and implemented.

From this group of faculty, we gained insight into characteristics of LTS curricular and extracurricular efforts as a means of also better understanding how these LTS efforts are designed and implemented. The barriers and challenges LTS faculty face were also better understood. Such insight from current LTS implementers can aid LTS-interested faculty to develop and implement LTS in their curricular and extracurricular efforts. For example, identifying a small and manageable student cohort (curricular or extracurricular), seeking out an appropriate community partner, and establishing a strong professional relationship so that expectations and deliverables are well-defined are some strategies that can help offset some of the barriers that have been identified about LTS. All in all, the findings herein provide a solid body of evidence indicating that faculty members favor LTS and recognize the many educational benefits. Nonetheless, work is needed to lift the obstacles to using LTS so that more professors in engineering and beyond can successfully employ this pedagogical practice both in the curricular and extracurricular activities. Future work using this survey will enable us to investigate differences in attitude across different type of institutions (research-focused, teaching-focused, etc.) as well as disciplinary differences toward LTS within engineering and beyond engineering.

LIMITATIONS

There are several limitations to the current study. The population sample available was limited in size, especially in regards to the faculty members specializing in extracurricular LTS efforts. Also, every participant surveyed in the current study was an EFELTS attendee and thus an active LTS practitioner. Perhaps surveying faculty members who are LTS-novices or skeptics will add another dimension to our understanding of LTS from diverse faculty perspectives. In the future, we plan to administer the same survey to LTS non-experts and compare the findings. Another limitation inherent in survey research is that surveys rarely provide a direct measure of the whole phenomenon of interest. In other words, there are likely to be aspects of faculty's attitudes toward LTS, perceived barriers to LTS, and nuanced differences between curricular and extracurricular contexts that were not detected in this survey. Future research efforts will focus on triangulating both quantitative (surveys) and qualitative (interviews and focus groups) methods in order to obtain a complete picture of LTS from the faculty perspective.

Bibliography

1. ABET (2008). *Criteria for Accrediting Engineering Programs Effective for Evaluations During the 2009-2010 Accreditation Cycle*, 21 pp., ABET Engineering Accreditation Commission. www.abet.org
2. Abes, E.S., G. Jackson, S.R. Jones. 2002. Factors that motivate and deter faculty use of service-learning. Michigan Journal of Community Service Learning. Fall, 5-17.
3. Aidoo, J., J. Hanson, K. Sutterer, R. Joughtalen, and S. Ahiamadi (2007). International senior design projects – more lessons learned, *National Capstone Design Course Conference Proceedings*, Paper 11810. Boulder, CO.
4. American Society for Civil Engineering (ASCE) (2008). *Civil Engineering Body of Knowledge for the 21st Century: Preparing the Civil Engineer for the Future*, 2nd Edition, 191 pp., ASCE. www.asce.org.
5. American Academy of Environmental Engineers (AAEE) (2009).*Environmental Engineering Body of Knowledge*., AAEE, 91 pp. www.cecs.ucf.edu/bok/publications.htm
6. Banzaert, A., S. Ariely, D. Wallace, B. Masi. 2005. Faculty views of service learning in mechanical engineering at MIT. *American Society of Engineering Education Annual Conference Proceedings*.12 pp.
7. Bielefeldt, A.R., K. Paterson and C. Swan (2009). *The State of Project-Based Service Learning in Engineering Education*. NSF Report. 25 pp.
8. Bielefeldt, A.R., K.G. Paterson, and C.W. Swan (2010). Measuring the Value Added from Service Learning in Project-Based Engineering Education. *International Journal of Engineering Education. In press for Special Issue on Problem-Based Learning*, Accepted for 26(2).
9. Burack, C., J. Duffy, A, Melchior, and E. Morgan (2008). Engineering Faculty Attitudes Toward Service-Learning. ASEE Annual Conference. Paper AC 2008-1521
10. Cronbach, L. J. Test validation. In R. L. Thorndike (Ed.), *Educational measurement.* Washington, D.C.: American Council on Education, 1971
11. DeVries, R. and L. Kohlberg (1987). Constructivist early education: Overview and comparison *with other programs*. Washington, D.C: National Association for the Education of Young Children.
12. Dewey, J. (1938). *Experience and Education*, Collier Books: New York.
13. Duckworth, E. (1996). Either we're too early and they can't learn it, or we're too late and they know it already: The dilemma of 'applying Piaget', in *The having of wonderful ideas and other essays on teachingand learning*, 2nd. Ed., Teachers College Press, New York, pp. 31-49.
14. Felder, R.M. and R. Brent (2004). The intellectual development of science and engineering students. Teaching to Promote Growth, *Journal of Engineering Education*, 93(4): 279-291.
15. Hanson, J.H., R. J. Houghtalen, J. Houghtalen, Z. Johnson, M. Lovell and M. Van Houten (2006). Our first experience with international senior design projects – lessons learned, *American Society for EngineeringEducation (ASEE) Conference and Exposition Proceedings*, June 18-21, Chicago, IL.
16. Harrisberger, L., R. Heydinger, J. Seeley and M. Talburtt (1976). *Experiential Learning in Engineering Education, Project Report*, American Society for Engineering Education, Washington, D.C.
17. Jaccoby, B. and Associates (1997). *Service-learning in Higher Education*, Jossey-Boss, San Francisco, CA.
18. Kohlberg, L. (1975). The cognitive development approach to moral education, *Phi Delta Kappan*, 56, 670-677.
19. Moskal, B.M., J.A. Leydens, and M.J. Pavelich. 2002. Validity, reliability and the assessment of engineering education. *Journal ofEngineering Education* 91 (3): 351–54.
20. National Academy of Engineering (NAE) (2004).*The Engineer of 2020: Visions of Engineering in the New Century*, Washington, D.C.: National Academies Press, 118 pp.
21. Paterson, K.G., A.R. Bielefeldt, and C.W. Swan (2009). An online community for project-based service learning, www.d80.mtu.edu/PBSL
22. Piaget, J. (1977). *The development of thought: Equilibration of cognitive structures*, Viking Press, New York.
23. Siegler, R. (1991). Piaget's Theory on Development, In *Children's Thinking,* Prentice Hall, Englewood Cliffs, NJ, pp. 21-61.
24. Swan, C.T., Duffy, J.J., Paterson, K., Bielefeldt, A. R., and Pierrakos, O. (2011). The EFELTS Project - Engineering Faculty Engagement in Learning Through Service. *American Society for Engineering Education (ASEE) Conference and Exposition Proceedings*. June, Vancouver, BC, Canada.
25. Vygotsky, L.S. (1978). Interaction between learning and development, in L.S. Vygotsky, *Mind and Society: The development of higher psychological processes*, Harvard University Press, Cambridge, MA, pp 70-91.
26. Vygotsky, L.S. (1986). The development of scientific concepts in childhood, in L.S. Vygotsky, *Thought and Language*. MIT Press, Cambridge, MA, pp. 146-209.

Appendix A

Responses to the question "My LTS efforts can be characterized as follows [Check ALL that apply]"

Answer	Curricular (*N* = 22)		Extracurricular (*N* = 8)	
	Response	%	Response	%
Student team-based LTS efforts (i.e. students working in teams)	21	95%	8	100%
LTS activities typically last the entire semester in my course(s)	19	86%	N/A	N/A
LTS activities are required in my course(s)	18	82%	N/A	N/A
LTS in lower-level required engineering classes (freshman or sophomore)	11	50%	N/A	N/A
LTS in non-required engineering classes (i.e. independent study, etc.)	11	50%	N/A	N/A
LTS in upper-level required engineering classes (junior or senior courses)	9	41%	N/A	N/A
LTS activities typically last a couple of weeks in my course(s)	6	27%	N/A	N/A
Student independent-based LTS efforts (i.e. students working alone)	5	23%	1	13%
Other – Please specify other characteristics of your LTS efforts	2	9%	N/A	N/A
LTS activities typically last over a number of years and student groups	N/A	N/A	8	100%
LTS with engineering and non-engineering students	N/A	N/A	7	88%
LTS activities that typically last for less than 3 months in total	N/A	N/A	5	63%
LTS with engineering students only	N/A	N/A	3	38%

Appendix B

Responses to the question "WHETHER YOU DO OR DO NOT engage in LTS, please rate what you see as barriers to integrating LTS into your course(s) or extracurricular activities"

Question	Context	% endorsing 1 – 4 (Always a Barrier)	% endorsing 5 (Occasional Barrier)	% endorsing 6 - 9 (No Barrier)	(*N*)	Mean
Faculty time/workload	Curricular	79%	13%	8%	24	2.88
	Extracurricular	76%	16%	8%	25	2.56
Problems coordinating with the community	Curricular	63%	21%	17%	24	4.08
	Extracurricular	60%	12%	28%	25	4.28
No clear policy on the place of LTS in promotion and tenure	Curricular	54%	13%	33%	24	4.29
	Extracurricular	56%	8%	36%	25	4.16
Student time/workload	Curricular	54%	21%	25%	24	4.63
	Extracurricular	54%	29%	17%	24	3.92
Size of course or number of students	Curricular	63%	21%	17%	24	4.00
	Extracurricular	31%	30%	39%	23	5.43
Financial support	Curricular	46%	33%	21%	24	4.38
	Extracurricular	46%	33%	21%	24	4.29
Lack of information on how to implement LTS successfully	Curricular	17%	39%	43%	23	5.74
	Extracurricular	40%	24%	36%	25	5.16
Liability risk	Curricular	26%	26%	48%	23	5.78
	Extracurricular	33%	33%	33%	24	5.29
Limited amount of class time/time	Curricular	29%	38%	33%	24	5.08
	Extracurricular	74%	17%	9%	23	3.04

Appendix C

Agreement ratings of the statements intended to reveal faculty's perceptions of and level of interest in LTS.

Question	% Endorsing 1 – 4 (Strongly Disagree - Disagree)	% Endorsing Neutral or Don't Know	% Endorsing 6 - 9 (Agree - Strongly Agree)	(*N*)	Mean
LTS efforts can be academically rigorous.	0%	0%	100%	25	8.40
With LTS, it is possible to meet learning objectives while also meeting real community needs.	4%	0%	96%	25	8.28
With LTS, students become better engineers.	0%	8%	92%	25	8.16
When LTS is done well, students learn engineering subject matter better than in a traditional lecture-based classroom setting.	0%	4%	96%	25	8.12
LTS activities require greater time commitment on the part of the faculty.	0%	4%	96%	25	7.88
LTS can be an effective way to increase the involvement of women and other underrepresented groups in engineering.	4%	8%	88%	25	7.76
With LTS, students become more engaged global citizens.	4%	8%	88%	25	7.64
LTS efforts have led to scholarly publications or other activities (i.e. grants).	4%	8%	88%	24	7.63
LTS efforts have revitalized my teaching.	8%	13%	79%	24	7.25
LTS activities require greater time commitment on the part of the students.	8%	12%	80%	25	6.88
The dean is supportive of LTS efforts.	13%	13%	75%	24	6.71
The department head/chair is supportive of LTS efforts.	17%	21%	63%	24	6.21
It is possible to integrate LTS efforts into existing engineering	28%	4%	68%	25	6.08

courses without adding to the overall workload of students by replacing existing homework, projects, lab experiments, lectures, etc. with similar activities solving real problems in the community.					
Other faculty in the department/program are supportive of LTS efforts.	17%	13%	71%	24	6.00
LTS efforts are valued during annual evaluation reviews.	42%	21%	38%	24	4.71
LTS efforts are valued during promotion and tenure reviews.	54%	29%	17%	24	4.04

Appendix D

Ratings of the extent to which LTS efforts have affected or are expected to affect faculty participants.

Question	% Endorsing 1 – 4 (Strongly Disagree - Disagree)	% Endorsing Neutral or Don't Know	% Endorsing 6 - 9 (Agree - Strongly Agree)	(*N*)	Mean
My knowledge of issues and resources in the community.	0%	8%	92%	24	7.63
My emphasis on community issue/problems in my class or program.	0%	4%	96%	24	7.63
My belief that students can make a difference in their communities.	4%	0%	96%	24	7.54
The existence and strengthening of partnerships between my institution or program and other organizations in the community.	0%	8%	92%	24	7.38
My sense of pride and satisfaction with engineering.	0%	17%	83%	24	7.29
My use of student-led projects in educational efforts.	4%	21%	75%	24	7.21
My day-to-day workload.	0%	13%	88%	24	7.13
My role as a resource for colleagues in my College or program.	0%	21%	79%	24	7.13
My sense that I am confident and capable as an educator.	0%	25%	75%	24	7.13
My access to resources and people (materials, grants, professional development) that help me improve the quality of my work with students.	0%	17%	83%	24	6.92
My personal commitment to improving the community.	0%	29%	71%	24	6.88
My connections with other engineers who share my interests and ideals.	0%	17%	83%	24	6.71
My ability to address ABET outcomes in my teaching.	0%	46%	54%	24	6.54