First-Year Engineering Program: Student Instructional Leadership Team – Expanded and Restructured

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Abstract

Since its initial creation, the Student Instructional Leadership Team (SILT) within the First-Year Engineering Program (FEP) at The Ohio State University (OSU) has been responsible for training and supporting students and instructional staff. In recent years, SILT has been expanded and restructured to meet the needs of a growing student body and ever-changing program. SILT currently has 13 members working across all 4 tracks of FEP. This team helps manage over 2,000 students and 200 teaching assistants (TAs). SILT assists with various FEP resources such as its computer lab and laboratories. SILT also provides professional development opportunities for student employees. Furthermore, the leadership team strives to enhance the program's learning objectives, support curriculum enhancements, and create consistency. Through continued change and improvement, SILT has become a model for involving TAs in the management of a large scale educational unit such as FEP.

Introduction

History of Student Instructional Leadership Team

In 2009, the First-Year Engineering Program (FEP) at The Ohio State University (OSU) created a Student Instructional Leadership Team (SILT).[1] The team, which consists of experienced Graduate Teaching Associates (GTAs) and Undergraduate Teaching Assistants (UTAs), was developed to ensure that all FEP students and instructional staff receive the best training and support possible. In its original form, SILT consisted of five graduate and undergraduate teaching associates (TAs) who worked in various leadership positions across FEP. In its fourth year of existence, SILT has been expanded and restructured to now include a total of thirteen members.

This paper will explore the evolution and activities of SILT since its origin. SILT continues to support FEP TAs through personal and professional development, course specific training, mentoring and coaching. In addition, the leadership team supports FEP students through enhancements to in-class teaching, out-of-class tutoring, grading, and curriculum. SILT strives to continually align with the overarching goals of FEP by supporting efforts to teach the fundamentals of engineering to students while helping them adjust to college.

First-Year Program at Ohio State

The First-Year Engineering Program (FEP) within the College of Engineering at The Ohio State University (OSU) provides introductory engineering courses to all (approximately 2,300 per year) incoming engineering students. FEP is part of the Engineering Education Innovation Center (EEIC) established to enrich the student experience and to strengthen the academic credentials of OSU undergraduates. While aligning with these goals, FEP courses teach students the fundamentals of engineering including: technical communications, technical graphics, problem solving (hand, Excel, Matlab), the design process, data collection and data analysis. The goal of the two-course sequence is to expand that knowledge to a point of maximum usefulness with respect to both students' future academic work and professional career.

FEP consists of four tracks: 1) Fundamentals of Engineering - Standard (FE) for non-honors and non-scholars students, 2) Fundamentals of Engineering - Honors (FEH) for students with honors designation, 3) Fundamentals of Engineering - Scholars (FES) for students with university scholars designation, and 4) Fundamentals of Engineering - Transfer (FET) for students who have transferred from another institution. FE, FEH, and FES are two-course sequences (of varying credit hours), and FET is three-course sequence from which students take one to three courses, depending on transferred coursework. The FET sequence covers the same material but in a different configuration. The structure of each program, including their respective teaching teams, is presented below in Figure 1.
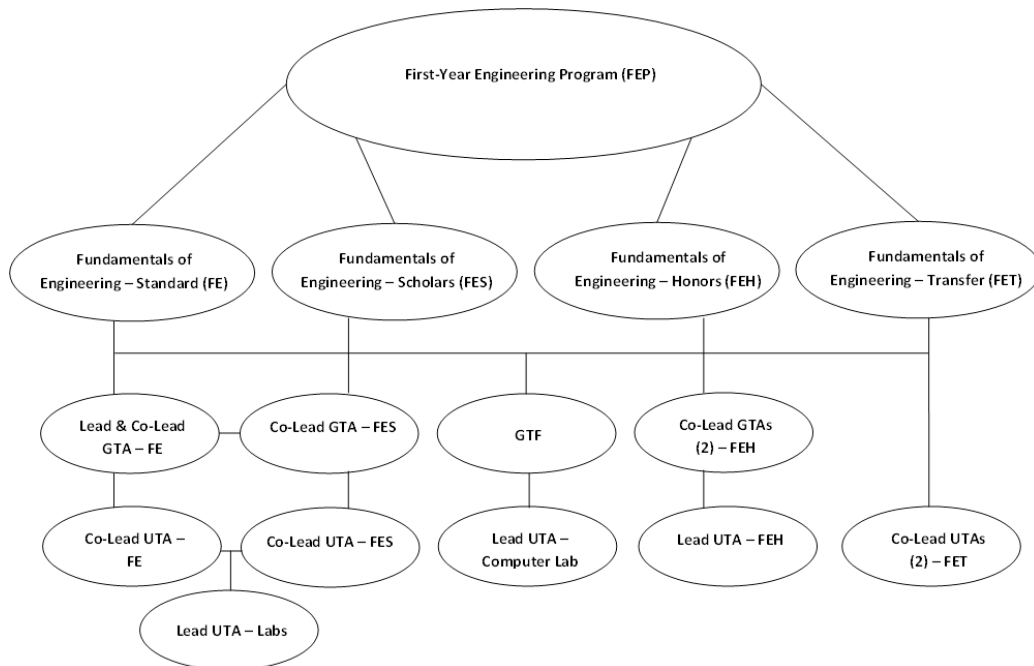

Figure 1: Diagram of FEP with SILT members

SILT Goals

As SILT was first established for the 2009-2010 academic year, the original set of goals has undergone several iterations in the years since. These goals serve to keep SILT focused and effective in providing the best service it can to FEP.

- Support and mentor student employees. This is an essential goal because there are always new TAs entering and experienced TAs exiting the program due to the transient nature of university education. Due to SILT's support TAs at any experience level know there is a place where they can turn for help, advice, or materials.

- Improve FEP learning objectives and focuses. Up to 4 GTAs on SILT also serve on the FEP Advisory Committee to help revise and establish FEP learning objectives.

- Meet FEP learning objectives through continued support for curriculum enhancements. Many of the members of SILT are also in charge of curriculum improvements. The members who have curriculum duties work directly with other student employees and faculty. This serves to create a framework providing consistency and priority to FEP learning objectives.

- Provide professional development opportunities for student employees. FEP offers professional development opportunities to student employees through activities and services provided by SILT.

- Create consistency. FEP serves over 2,000 students every year and employs nearly 200 student employees. SILT wants each student to receive an experience consistent with other students in the program, and strives to provide our student employees with the tools to make this happen. Consistency within sections, between sections in FEP, and year-to-year is the end goal.

SILT Roles and Responsibilities

All SILT members are appointed through a nomination and application process. As FEP teaches all first year engineering students and has no graduate program itself, all TAs, including SILT members, come from a variety of engineering disciplines. Currently, SILT members hail from the following engineering fields: Biomedical, Civil, Electrical and Computer, Engineering Education, Industrial and Systems, Materials Science, and Mechanical. All nominees must have at least one full year of teaching experience with FEP. The FEP director and current SILT members make final selections after reviewing each application. Each position is for a one-year term. The roles and responsibilities of each SILT position are outlined in the following section.

<u>EEIC-at-Large</u>

GTF

The Graduate Teaching Fellow (GTF) coordinates and leads SILT meetings. Therefore, the GTF schedules the meetings, drafts the agenda, and records meeting notes. There is a larger, university-wide community in which the GTF participates, that provides an opportunity to learn and interact with GTFs from other academic departments. The University Center for the Advancement of Teaching (UCAT) sponsors GTFs.[2] All GTFs across the university must attend a summer seminar, in which teaching and professional development are stressed. In addition, throughout the academic year, GTFs continue to meet with one another at monthly meetings. Within FEP, the GTF's main responsibility is professional development for all TAs, in the form of orientation, workshops, and mentoring. The GTF also serves as a link between FE and FEH, helping to share best practices and provide consistency. Furthermore, the GTF is a member of the FEP Advisory Committee and attends the FEP curriculum committee meetings.

Lead UTA: Computer Lab/Tutor Room

The Lead Tutor Room UTA for the FEP's main responsibility is to coordinate and organize staffing the 64 seat open computer lab with UTAs. He or she compiles data about the number of students helped and typical reasons for needing assistance in order to determine any necessary adjustments to the curriculum.

<u>FE - Honors</u>

Lead GTA(s): FEH

The Lead FEH GTA(s) coordinates lab trainings for FEH TAs and ensures all documents for the labs are updated and then uploaded online for student access. This team member also serves as a general resource for all TAs in FEH and serves on the curriculum and advisory committees. There are approximately 9 FEH GTAs and 25 lab specific FEH UTAs who are coordinated by the Lead FEH GTA(s).

Lead UTA: FEH

This team member works to edit and check grading keys and rubrics, and informs UTAs if a mistake or correction is made. The Lead UTA also serves as a general resource for all FEH UTAs. There are approximately 30 FEH UTAs who are coordinated by the Lead FEH UTA.

<u>FE - Standard and Scholars</u>

Lead GTA: FE

The Lead GTA for FE has several roles and responsibilities. This individual provides advice and guidance to other TAs, manages the program's online resource page, serves as a primary link between instructors and TAs, assists with curriculum enhancements, helps coordinate weekly training sessions for TAs, plans exam review sessions for students, schedules annual micro-teaching sessions, and solicits volunteers for open houses and campus visits. There are approximately 30 FE GTAs and 26 lab specific FE UTAs who are coordinated by the Lead FE GTA(s).

Co-Lead GTA: FE

The Co-Lead GTA assists the Lead FE GTA with all of the aforementioned roles and responsibilities. In addition, this person maintains a GTA presence among faculty members by attending weekly faculty meetings, helping to create and update answer keys and rubrics for laboratory assignments, and helping to orient new staff members and GTAs during the year.

Co-Lead GTA: Scholars

The Co-Lead GTA for Scholars also assists the Lead GTA with the aforementioned roles and responsibilities. In addition, this individual works in conjunction with the Ohio State Engineering Scholars Program Coordinators on program development both inside and outside of the classroom. This individual is also responsible for scheduling TAs for FE Scholars courses.

Co-Lead UTAs: FE and Scholars

The Co-Lead UTAs for FE and Scholars maintain the curriculum that pertains to the lecture material. This includes managing UTAs, sending weekly newsletters, developing grading keys, attending faculty meetings, helping to organize the weekly lab training session, and serving as an administrator on the professional development page's discussion forum. There are approximately 105 FE UTAs who are coordinated by the Lead FE and Scholars UTAs.

Co-Lead UTA: FE Labs

The Lead Lab UTA's main responsibility is preparing and maintaining the FE labs each week. Maintaining them is a crucial part of the program and ranges from fixing broken equipment to assembling new lab set-ups. The Lead Lab UTA also supervises and instructs the other TAs on the lab team concerning required weekly tasks.

<u>FE - Graphics and Transfer</u>

Co-Lead UTA: Graphics/Transfer and Service Courses

The lead UTAs for this area maintain the graphics, transfer, and service courses. They are responsible for course support, assembling grading keys, and serving as a connection to the main first year engineering courses.

Program Initiatives

Since its initial creation, SILT has been involved in a variety of activities. The following topics describe the activities that SILT has undertaken in recent years to meet the aforementioned goals.

<u>Curriculum</u>

Inverted classroom

During the 2012-13 academic year a university-wide switch from quarters to semesters allowed EEIC to evaluate FEP and change from a lecture-based teaching style which was originally implemented during the program's inception. With this switch, FEP decided to incorporate an inverted classroom-style of instruction. The inverted classroom-style of instruction allowed students to learn the topics before coming to lecture so the majority of classroom time was spent working on problems. Therefore, student assignments were organized into pre-class, in-class, and out of class work. This provided large advantages for students because theory was first being learned outside of class and then applied hands on in class. With this new style of teaching, the students were required to complete basic homework questions and quizzes before a lecture over that material. This repetition allowed students to become familiar with class concepts prior to receiving help from instructional staff and increased the amount of information being retained. By forcing students to be prepared for class, students also had more in-class time to receive help on homework assignments.

Instructor to TA Interactions

SILT members serve as a bridge between FEP instructors and TAs. To help make this connection, select SILT members participate in weekly faculty meetings to convey changes and suggestions between the two instructional groups. This helps maintain consistency and a regular method of communication. Another benefit of these meetings is learning how to make grading consistent between classroom sections. For example, after understanding the standard deviation in average grades among sections, SILT is able to improve grading rubrics.

Qtr to Semester

With the switch from quarters to semesters, the entire FEP has taken the chance to revise curriculum to better suit the needs of students and instructional teams. SILT has played an instrumental role in shaping curriculum by not only taking an active role in making changes, but also working to modify it after initial implementation. Members of the team worked on developing curriculum changes, and they have spent time making keys, rubrics, and clarifying materials for FEP. For example, during one of the first labs, teaching teams recognized that students were not understanding circuitry and how a breadboard functions. Therefore, SILT made an additional video for students to view, which cleared up their confusion. Also, another common issue is the challenge of distributing the workload evenly throughout the semester. SILT has often worked with the instructional staff to smooth out inconsistencies so teaching assistants are not overwhelmed with work over short intervals of time.

TA Support & Mentorship

Orientation

Prior to the start of each academic year, FEP hosts an annual orientation for all graduate and undergraduate TAs. All instructors are also present. The event is organized by the GTF with the assistance of SILT and the program director. SILT has had a role in the Fall Orientation for some time, but has recently begun to take on a more active role in its planning and execution. The new semester schedule allowed SILT members to create the entire schedule this past year. For the 2012-2013 academic year, the orientation schedule included: (a) an EEIC and FEP program overview, (b) icebreakers, (c) a panel discussion with Q&A featuring experienced instructors and TAs, and (d) breakout sessions on specific course content. The break-out sessions were led by SILT members and included topics such as in-class specifics, grading/writing, technology (various software used by TAs), lab training, and a sample lab exercise. SILT's increasing involvement in the orientation has provided more focus on a variety of topics that are of most importance to both new and returning TAs.

Mentor/Mentee Program

SILT established a mentor/mentee program to help new GTAs become acclimated in their respective roles. Experienced GTAs are paired with one or more new GTAs to aid in their transition to the program's instructional staff. The interactions between mentor and mentee have been informal and are most crucial during the first few weeks of the semester. During this time, the experienced GTA ensures that the new hire understands and can successfully handle the requirements of the position.

TA Training

The leadership team works with FEP administration to organize and facilitate TA training. FEP has weekly training that covers both class and lab material. SILT also helps prepare TAs by sending out weekly newsletters summarizing a variety of announcements and additional information. These are crucial for keeping everyone informed on FEP developments. Outside of regular training, SILT also helps organize additional sessions for specific program needs. For example, as the quarter to semester transition drew near, the leadership team helped plan several meetings to disseminate information to TAs. Lastly, members of SILT also make videos to aid with TA training. Videos typically cover grading techniques and solutions in order to provide consistency across sections.

Prof. Development

SILT has established several tools to help TAs develop professionally. One form of professional development consists of annual microteaching sessions in which GTAs can give short presentations on a topic of their choosing, receive feedback from other TAs, and obtain a video recording of the lecture. In addition, university representatives have conducted workshops on topics such as networking and public speaking. Furthermore, an online resource and professional development page was created to provide ongoing links to helpful files and services. Lastly, TAs are given an opportunity to gain practice and experience with public speaking by leading exam review sessions for current students and assisting with open houses or campus visits for prospective students.

Assessment

FEP constantly strives to improve by assessing the effectiveness of (a) curriculum and (b) teaching. SILT has assisted in this effort by implementing various assessment tools. An ongoing tool that exists is a discussion board on the program's online resource page. The discussion board provides a space for TAs to call attention to curriculum and course errors, inconsistencies, or points of confusion. Members of SILT regularly check the board and answer questions posed by other TAs. During the middle and end of each term, SILT distributes evaluation forms to students in order to assess and improve teaching within the program.

As previously mentioned, SILT strives to provide support, mentorship, and professional development opportunities for student employees. To understand how SILT has assisted TAs, a short survey was administered to all student employees. Individuals were asked to describe the ways in which SILT has assisted them with their teaching role in EEIC. The following are quotes from TAs stating how SILT has helped student employees by (a) sharing teaching/grading strategies, (b) providing training and preparation, (c) serving as a link between faculty and TAs, and (d) answering general questions on material.

One undergraduate teaching associate talked about how members of SILT have shared teaching/grading strategies through the following statement:

> They've definitely helped me out with how to better communicate with students and how to grade assignments in a fair manner.

A graduate teaching associate mentioned how SILT also provided training and preparation by saying,

> SILT helps us prepare for everything coming up in the week! They provide grading rubric updates, weekly updates, and helpful tips. They provide a panel of knowledge for anyone to come to.

Another TA indicates how SILT members serve as a link between faculty and TAs and answer general questions.

> They are a general resource for questions. Sometimes just a second opinion. They are a bridge between faculty and the rest of the TAs.

Lastly, a TA noted that SILT members have provided clarification and answers to questions about course material.

> SILT has assisted by being there to answer any questions that I have about course material.

The above excerpts provide evidence of SILT's positive impact on student employees. When examining the aforementioned quotes the qualitative rather than quantitative nature of the survey should be taken into consideration. For example, qualitative research is more concerned with the quality and ability to make meaning of data rather than the quantity of participants or ability to make generalized statements.[3, 4]

Although the presence of SILT improves the overall quality of FEP, the program has never tried to isolate SILT as a variable when assessing student grades or retention. The College of Engineering's retention from first to second year has been about 80%, on average for several years, but it is difficult to determine SILT's direct impact on student retention or success.[5] Furthermore, with an increasingly large student population in FEP it is hard to show incremental change in retention rates. For instance, the net number of students being retained keeps increasing, even though the % change may appear "flat" over time. Nonetheless, SILT still continues to support and mentor students as outlined in the following section.

Student Support & Mentorship

Exam Preparation

SILT helps students prepare for exams by offering several different review options. For midterm exams, SILT prepares review materials which help clarify laboratory and classroom concepts for students. Students can then attend an additional review session where GTAs review practice problems based on in-class concepts and laboratory experiences. For the final exam, SILT initiates an 'open lab' help session which takes place on the students' reading day, on which there are no scheduled classes. This session consists of an open lab staffed by TAs the entire day, enabling students to come and go at their convenience. Recently, this type of review proved to be very successful in accommodating students' individual needs and schedules. Due to the success of this review, SILT is working on reformatting all future exam reviews to the 'open lab' style to better serve the students.

Tutor Room

The tutor room is a resource the FEP program designed to provide out-of-class assistance to students through prompt in-person questions and answers. It not only helps students, but it also helps the instructional teams by decreasing the number of e-mail questions about class material. The computer lab is staffed by UTAs who are expected to answer questions about FEP courses, but they also answer questions about other classes when possible. As UTAs help students, they keep track of the assignments students receive help on each day. The Lead Tutor Room UTA compiles the information for future curriculum improvements.

Conclusion

In conclusion, SILT exists within FEP to ensure that students and instructional staff receive the best training and support possible. Since its initial creation, SILT has been expanded and restructured to meet the needs of a growing student population and ever-changing world. SILT currently seeks to do the following: (a) support and mentor new student employees, (b) meet FEP learning objectives through continued support for curriculum enhancements, (c) improve FEP learning objectives and focuses, (d) provide professional development opportunities for student employees, and (e) create consistency within the program. To meet these goals, SILT helps manage over 2,000 students and 200 teaching assistants in the four tracks of the program: FEH, FES, FE, and FET. In addition, SILT helps manage various FEP resources and initiatives such as its computer/tutor room, laboratories, curriculum, and training sessions. Through SILT's ongoing role within FEP, teaching assistants have had increased opportunities to serve in leadership roles, develop professionally, improve instruction, and impact student learning.

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