

### *Leadership for Broadening Engineering Ingenuity – Module Syllabus*

This module provides the framework for development of the core competencies necessary for leadership in the context of broadening engineering excellence and design ingenuity. We will use teaching in the k-12 domain as the foundation for building our leadership skills. The module presents the processes in engineering design; mechanisms for developing personal and team leadership styles; addresses differences in learning and personality styles; provides pathways for implementing mission statements and plans of action; offers opportunities for strategic thinking, problem solving and brainstorming; and utilizes teamwork in diverse settings for societal and k-12 service learning. The technical foundation of this module is centered upon the process of engineering design and implementation of engineering design/ingenuity projects in collaboration with the Lawrence Hall of Science (LHS). The project at LHS is entitled “*Ingenuity in Action*” and offers opportunity for implementation of projects that teach the engineering design process. Pedagogy skills include principles of education/teaching styles and levels of learning. Leadership skills developed include awareness of body language; methods for optimized communication; ethical considerations; time management; team-building, personal assessments, mentoring; and conflict resolution. The module will involve K-12 outreach teaching activities involving fundamental principles of design methodology for engineering technology.

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#### **Module Lecture Topics**

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**Teaching as Leadership:** Foundation of leadership skills and discussion of how teaching in k-12 builds these traits

**Design Process:** Fundamentals of engineering design and the problem solving cycle. A variety of engineering loops will be addresses.

**Development of Self:** Foundation for conversation. Assessment of strengths and weaknesses. Building congruency, trust and ethical standards. Life balance as a practice. Awareness of body language and voice. Strategic thinking. Problem solving. Creativity and innovation.

**Diversity and Teamwork:** Embracing differences in personality (Myer-Briggs) and learning styles (Global vs. Sequential; Intuitive vs. Sensing, Active vs. Reflective; Verbal vs. Visual). Optimization of strengths. Group communication, conflict management, difficult conversations and decision-making. Development of a plan of action (formulation, negotiation, fulfillment, and review). Brainstorming: engagement, exploration, evaluation, and extension.

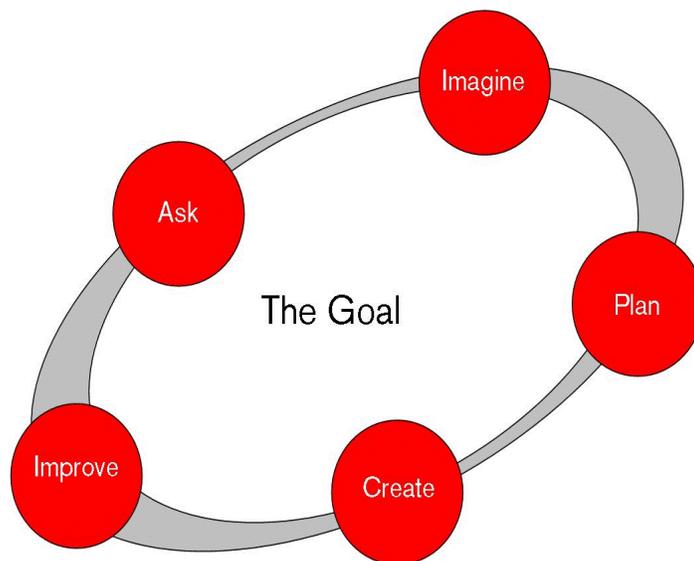
**K-12 outreach and user needs research:** Teaching basic engineering design process and ingenuity in the K-12 domain and societal service. Utilization of teaching as form of leadership practice.

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Leadership is necessary to build diversity, enhance service, and innovate excellence. There are several core skills that are needed to create knowledge, educate leaders, and serve society. The most fundamental of these competencies is the ability for conversation. Leaders must be highly competent in the ability to develop and implement appropriate dialogue between engineers and the technical community as well as society. Good leaders are trustworthy and ethical; they must know how to overcome adversity and resolve conflicts; and they embrace diversity. People who work with great leaders feel empowered; leaders are able to place people in challenging situations and mentor them through this process. These are the same qualities of a good teacher, and hence teaching can serve as an excellent pathway for building leadership skills. These fundamental leadership skills will be developed as we develop the core competencies for conversation using diverse mentoring, teaching, and service learning opportunities.

### E-10 Lawrence Hall of Science "Ingenuity" project

The Lawrence Hall of Science is interested in engaging our visiting public in the engineering design process. LHS needs your help in developing engaging educational activities that teach the design process and provide a pathway for bringing engineering into the k-12 and public sector. The current *Ingenuity Lab* and *Ingenuity in Action* project activities are primarily tinkering (engineering) activities—visitors try different solutions to a design challenge—yet are not necessarily thinking about the process they use or how that connects to the realm of professional engineering. The E-10 students in this section will be working together to develop and test a facilitation framework for making the steps of the engineering design process more visible to the LHS visitor audience. The basic design loop that will be utilized at Lawrence Hall of Science will be that used by the Boston Museum of Science in its “engineering is elementary” project (shown below):



**The Engineering is Elementary® 5-Step Engineering Design Process.**

Spring 2011: E 10  
 Professor Lisa Pruitt  
 Engineering Leadership Module

**3108 Etcheverry Hall MWF 10-11 am**

**Leadership Lectures (schedule): Module A**

Week	Date (M)	Monday	Wednesday	Friday
1	February 7	Teaching as leadership	What is leadership? Body language	Learning/personality styles
2	February 14	Brainstorming	Design methodology	Decision-making tools
3	February 21	<b>Holiday**</b>	Mission statements	Goals/time management
4	February 28	Project life cycle- Rhythm of action	Conflict resolution	Teamwork ( <i>Guest speaker: Hans Cabrera</i> )
5	March 7	Technical communication/intellectual property ( <i>Guest speaker: Tony Keaveny</i> )	Leadership in society	Module Assessment

**3108 Etcheverry Hall MWF 10-11 am**

**Leadership Lectures (schedule): Module B**

Week	Date (M)	Monday	Wednesday	Friday
1	March 14	Teaching as leadership	What is leadership? Body language	<b>Holiday **</b>
***	<b>March 21</b>	<b>SPRING BREAK</b>	<b>SPRING BREAK</b>	<b>SPRING BREAK</b>
2	March 28	Brainstorming	Design methodology	Decision-making tools
3	April 4	Learning/personality styles	Mission statements	Goals/time management
4	April 11 (SFB)	Technical communication/intellectual property ( <i>Guest speaker: Tony Keaveny</i> )	Conflict resolution (RS/FA)	Teamwork ( <i>Guest speaker: Hans Cabrera</i> )
5	April 18	Project life cycle- Rhythm of action	Leadership in society	Module Assessment

**ORGANIZATIONAL DETAILS FOR THE LEADERSHIP MODULE**

*5-week module (participation in all activities is mandatory):*

**10-11 am M/W/F: LECTURES held in 3108 Etcheverry**

**2-5 pm T/W/Th: LABS held at LHS.** First week we will go up together on the shuttle bus (leaves from Hearst Mining Circle) and will have a full orientation at LHS. You will be expected to arrive at LHS for future lab sections by 2:30 pm (catch the 2:10 tram up to LHS). You may also opt to take the AC Transit 65 Bus. See <http://www.lawrencehallofscience.org/visit/info> for more detail.

Module A				Module B			
E10 Lab room numbers at LHS for:				E10 Lab room numbers at LHS for:			
Week	Tues.	Wed.	Thurs.	Week	Tues.	Wed.	Thurs.
Feb 8-10	165	165	175	March 15-17	175	175	175
Feb 15-17	175	165	165	March 29-31	175	175	175
Feb 22-24	175	175	175	April 5-7	175	165	165
March 1-3	175	175	175	April 12-14	175	175	165
March 8-10	150	Auditorium	Aud.	April 19-21	Aud.	Aud.	Aud.

**2-hours/week:** User research and outreach teaching at the Lawrence Hall of Science Ingenuity Lab (scheduled with your team and LHS). **Each person must perform 8 hours of outreach teaching/educational research and 2 hours of project implementation at LHS.**

**Facilitator Contact Information:**

**Professor Lisa Pruitt;** [lp Pruitt@me.berkeley.edu](mailto:lp Pruitt@me.berkeley.edu); Office hours: M 8-9 am in 5134 Etcheverry  
**Eli Patten** (GSI, Tues. lab); [epatten@me.berkeley.edu](mailto:epatten@me.berkeley.edu); OH: M&Th 1:30-2:30 in 2121 Etch  
**Ryan Shelby** (GSI, Wed. lab); [ryan\\_shelby@berkeley.edu](mailto:ryan_shelby@berkeley.edu); OH: Tu 2-4 in 450 Sutardja Dai  
**Farzana Ansari** (GSI, Thurs. lab); [fansari@berkeley.edu](mailto:fansari@berkeley.edu); OH: M&W 11:30-12:30 in 2121 Etch  
**Gretchen Walker** (Lawrence Hall of Science); [gwalker@berkeley.edu](mailto:gwalker@berkeley.edu)  
**Jennifer Wang** (Lawrence Hall of Science); [jennifer\\_wang@berkeley.edu](mailto:jennifer_wang@berkeley.edu)  
**BEAM** (Berkeley Engineers And Mentors)—UCB student group; <http://beam.berkeley.edu/>

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**A bound design notebook is required for this leadership module.** The design notebook should be your personal journal for this class and it should contain: (i) Lecture notes and assignments; (ii) User research from **EVERY** trip to LHS, including any data collected, survey questions and results, (iii) Pre-lab deliverables, i.e. your individual thoughts on your group's mission statement, 3-5 design concepts, prototype/storyboard, and details of final project. The contents should be neat and legible, dated (**no backdating**), and written in pen (no whiteout). Notebooks should clearly identify your name, SID, and method to reach you in the event that it is lost (e-mail or cell phone). Notebooks are subject to random collection at any time.

**GRADING:**

- |                                 |                               |
|---------------------------------|-------------------------------|
| <b>LHS Project - 60 %</b>       | <b>Design Notebook - 25%</b>  |
| <b>LHS Research Hours - 10%</b> | <b>Class Assignments - 5%</b> |

## Lawrence Hall of Science Guidelines for outreach teaching and user needs research

### *Where*

The Lawrence Hall of Science (LHS) is just up the hill behind Memorial Stadium. On weekdays, you can take the Hill line bus from Hearst Mining Circle or the AC Transit bus line 65. On weekends and holidays, you can take the AC Transit bus line 65, which leaves from Euclid and Hearst. The Hill Line departs from the Hearst Mining Circle (right outside Evans Hall) at 10 minutes after each hour and half-hour. Buses depart LHS for campus 3 minutes before each hour and half-hour. See <http://www.lawrencehallofscience.org/visit/info> for more detail.

### *When*

You must complete a total of **10 hours** at LHS. Each week, you sign up for at least one 2 hour shift through the online system Volgistics:

<https://www.volgistics.com/ex/portal.dll?FROM=11959>. This can be with your group, but does not have to be. We recommend you sign up as soon as possible to reserve time slots. You must be punctual (not Berkeley time, so 12 (noon) is 12:00, not 12:10). The schedule is as follows:

M/W/F 12-2, 2-4      Tu/Th/Sa/Su 10-12, 12-2, 2-4

If you have scheduling issues, contact Jennifer Wang ([jennifer\\_wang@berkeley.edu](mailto:jennifer_wang@berkeley.edu)).

### *Why*

The purpose of this lab is for you to conduct background research to get to know your users (the visitors) and your client (LHS). By facilitating the exhibit, you will learn about education in an informal drop-in environment, the influence of interaction between facilitator and visitor, the logistics of an exhibit, and most importantly, the children that your project will cater to! You can also test out certain facilitation or exhibit procedures with the visitors (as part of your design process) in order to engineer the best method for teaching the engineering design process.

### *What*

There are three different components of the Ingenuity in Action exhibit: cars, wind tubes, and bridges. On weekends, the Ingenuity Lab will also be open with a rotating monthly challenge. Visitors at the exhibit and the Lab engage in the design process; they design something, test it out, modify, retest, and so on. However, they often don't realize that what they're doing is engineering. Your project is to find some way to engage visitors more fully in the design process so that they come up with the best solution to their challenge or problem.

### *How*

If you are the first facilitators of the day, you must set up the exhibit. There will be staff members who will help out, and this will also be shown to you at your first lab. Do not leave any component of the exhibit unstaffed. Throughout your shift, keep the place tidy and make sure things are picked up off the floor (this will make it much easier for cleanup at the end). If anything breaks, please let a staff member know. At the end of your shift, you must clean up. If you are the last facilitators of the day, you will also need to put all the cars and bridges away. Visitors cannot take anything home, including what they make at the wind tubes. Remember, you are there to do your lab for E10 and get to know your users and clients - not to do homework. The visitors want to learn from and engage with you, a Cal engineer.