Experiential Learning: Engineering in the Liberal Arts

Marie Dillon Dahleh\(^1\) and Fawwaz Habbal\(^2\)

Harvard College students have demonstrated a strong interest in developing capabilities allowing them to engage in solving complex societal issues. Engineering and design thinking, as well as computer science and computation have emerged as essential foundations for solving such issues. Although Harvard undergraduate students may not have the time or bandwidth to dedicate to significant learning in each of these disciplines, a broad foundation of the applied sciences and liberal arts is deeply valued by them. Where a gap exists between these educational goals, a curriculum that supports both breadth and depth is required.

The School of Engineering and Applied Science (SEAS) at Harvard University was established in 2007 and is committed to providing learning opportunities for all Harvard College undergraduates. SEAS exposes students to engineering through design concepts embedded throughout our curriculum and emphasizes experiential learning through curricular and co-curricular activities. The overarching goal is to expose all undergraduates at Harvard to the exciting possibilities which engineering offers, including the design thinking process. After this initial exposure, some students may shift their emphasis to engineering, and SEAS offers degree programs in EE, ME, Biomedical, as well as the Engineering Sciences to meet this demand. Others are content with selecting courses that align with their interests while concentrating in a social science or literature field. To facilitate such educational paths, SEAS curriculum has evolved to accommodate these needs.

Examples of this curricular evolution may include offering courses with minimal or no prerequisites; and bringing in new teaching methodologies into introductory courses. The curriculum had to be enhanced through introductory computer science and engineering courses, structured to emphasis projects and experiential learning. Additionally, several courses have recently been developed which focus on design and innovation embedded into engineering and applied sciences learning. The school has also established several types of co-curricular experiences, including hands on workshops related to fabrication, design boot camps, and a competitive process for students to request funding for independent design projects. This infusion of design throughout the school has energized both the faculty and students. The fall, spring and January term activities culminate in design fairs at the end of each semester allowing students to present their learning and often how they have translated concepts into real-world applications.

In this presentation we will elaborate on this new ecosystem, and the required support for this evolution of teaching and learning. We discuss design transformation and illustrate it by examining Engineering Sciences 50, (an introductory project-based course for electrical engineering,) as a case study. We will demonstrate roots of success as illustrated by a growth in enrollment by

---

\(^1\) Harvard School of Engineering and Applied Sciences, 29 Oxford street, Cambridge, MA 02138, mdahleh@seas.harvard.edu

\(^2\) Harvard School of Engineering and Applied Sciences, 29 Oxford street, Cambridge, MA 02138, habbalf@seas.harvard.edu
almost factor of 9 over 3 years to reach 180 students this year. Select co-curricular activities will be also presented to illustrate the role they play in the experiential learning environment.

*Keywords:* experiential learning, design thinking, co-curricular activities