

Learning Through Teaching

Grand Challenge Scholars Program Portfolio
Advancing Personalized Learning
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This portfolio is submitted in partial fulfillment of the Olin Grand Challenge Scholars Program requirements.

Personal Reflection

This portfolio consists of a series of narratives and reflections about my experiences at Olin College of Engineering. Much of the work builds upon that of Christina Powell, detailed in her portfolio, “Learning, Leading, and Teaching”.

Olin’s model and curriculum have set me on the path to becoming a Grand Challenge Scholar. Interdisciplinary, global, and entrepreneurial experiences are part and parcel of every student’s time at Olin and service learning opportunities abound. I chose to invest much of my time in a service organization, Engineering Discovery, dedicated to educational outreach with local preK-12 students. In addition, I joined a team of student researchers, advised by Professor Yevgeniya V. Zastavker, investigating project-based learning in undergraduate engineering education. The knowledge gained from my research has come to affect every hour I spend in the classroom through an awareness of my own learning style and my professors’ teaching; after four years, I can see how their methods fit into a greater framework and methodology, and how to take advantage of the strengths in their teaching.

Further, my experience developing and implementing activities for students in Engineering Discovery has solidified my interest in education outreach and even sparked a passion for sharing specifically science and engineering in fun and engaging ways. In addressing the Grand Challenge of advancing personalized learning, I aim to continue to learn how to instruct effectively and inspire students to explore engineering and design. Though I will always be an engineer, I will strive to maintain the educator in me as well. I have learned from my own students that teaching will be important for me to pursue in the future and as a Grand Challenge Scholar.

I entered college with a general interest in education and a taste for engineering; I had begun to merge the two by mentoring local FIRST LEGO League teams, but the potential for expanding the union was unclear. Through experiences at Olin – research, Engineering Discovery, and FIRST mentoring – I have found opportunities to continue outreach as a professional. New interests arose via entrepreneurial experiences, and I learned about my own learning through a rich study away experience. I have gained new insights into these areas because of the personalization of my own education and aim to create the same opportunities for others outside of Olin. The focused attention to learning style and holistic education were invaluable to me as a learner and as an engineer and teacher entering dynamic professional and educational landscapes. I seek to contribute to the advancement of personalized learning as a way of paying my debts while pursuing my interests and developing passion.

Interdisciplinary Reflection

Olin College and its faculty strive to create an authentic experience for students, presenting realistic problems and significant autonomy in project work. This approach, along with the college's relationships with Babson College, Wellesley College, and Brandeis University allows for opportunities for rich collaboration and interdisciplinary experiences.



I have taken courses that integrate principles of different disciplines from my first semester at Olin. These include courses that combine the more natural and expected science and math, but most striking to me have been those that combine elements of business and engineering (see the Entrepreneurial Experience section of this portfolio for details). By applying principles of the engineering design process to the development of a short-term business, I have learned and internalized much more about engineering and its processes, including the phases from inception to production of a novel idea or product. Interdisciplinary experiences have shown me that there are applications of the design process we practice at Olin that reach far beyond engineering in the traditional sense.



We see the effects of the application of a creative design process to a technical skillset throughout our time at Olin. One clear example comes through the course, *User-Oriented Collaborative Design*, in which I worked with a team of students to understand the needs and values of a given user group and to design for and with them. We were tasked with designing a product for people with tattoos that would make a meaningful contribution to their lives and their experience with their tattoos. In a semester, we defined our users, found them, got to know them, immersed ourselves in their lives and their minds, and designed a product *with* them. This was an experience for which I had no personal basis, so it was critical to test our assumptions against their reality. I learned how to discard my work gracefully when necessary and how to pivot to produce a more successful product – something with which our users would be happy and that they did not realize they desired. Only by means of an interdisciplinary design and technical approach did we produce something of value.

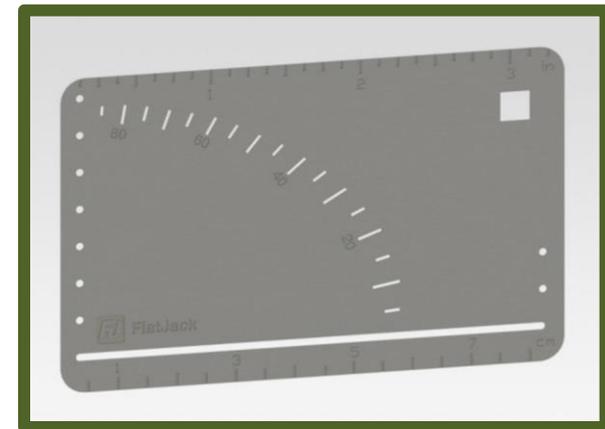
It is often said that much of the technical knowledge we gain through our college education will be obsolete or irrelevant within a decade or so. If that is the case, the true value in our education is learning how to think like an engineer, specifically how to problem-solve. I have had the privilege of stretching my engineering and design thinking beyond the isolated realm of traditional engineering to solve interdisciplinary problems already, before leaving college and facing 'real-world' problems and tasks. This continued practice in interdisciplinary critical thinking and cooperation will be crucial as I continue to address the Grand Challenges of the decade and into the future.

Entrepreneurial Experience

The most significant entrepreneurial experience I have had at Olin was through the course, *Real Products, Real Markets*. The class consisted of two main projects which involved the conception, development, refinement, and implementation of a business around a novel product. I was a part of Chisa+Huang, a business that produced location-inspired bracelets, and FlatJack, a producer of credit card-sized drawing aids.

Each venture began with a team of two to three classmates determining a product concept. We conducted market research, designed our products, produced prototypes, and manufactured final products through a professional contractor. Sales were conducted online and in-person, requiring rapid learning about effective approaches to both. I found great satisfaction in tracking web traffic and experimenting with text and photos, observing their effect on general traffic as well as customer follow-through. In current – and likely future – markets, this ability to quickly move a dial is a powerful tool in driving toward entrepreneurial success.

Through this experience, I learned about the financial investment and brute dedication necessary to any entrepreneurial ventures. A skillset ranging a spectrum of disciplines, whether housed in an individual or a team, is critical to success. No prosperous venture can be built on technical, design, sales, or general interpersonal skills alone; learning to stretch oneself or build a strong team is essential to entrepreneurship. Before my experience at Olin, I could not imagine myself as an entrepreneur; I now understand the value that problem-solving and design skills I have developed can contribute, and my potential for success in the business and entrepreneurial realms.



Global Awareness



Prior to attending Olin, I had never left the contiguous 48 states and lived in a largely homogenous Midwestern suburb. I was encouraged to apply for a passport when friends were planning a day trip to Canada, but did not expect to get as much use out of the little book as I did that year.

Studying away in college had been on my radar since high school, but only as a far-off, “that would be nice” blip. Fortunately, it became remarkably feasible at Olin, and in September of my third year, I found myself in Leeds, England. Though some argue that I couldn’t have had a “true” study away experience in the UK, it was a different world to me. That semester was the first time I used another currency, crossed an ocean, lived in a city, regularly heard non-Americans criticize American policy and people, ordered a pint in a pub, saw a rugby game, and most importantly, it was the first time I was the obvious minority. As soon as I shared my name or spoke a full sentence, I was pegged as different (American, in most cases). All stereotypes and preconceptions courtesy of mass media and popular culture – positive and negative – were attached to me. Standing out with such ease was a new sensation and certainly disconcerting.

The academic portion of my experience was frustrating, as I was coming from an institution built on dynamic curriculum and hands-on projects. Lecture halls filled with more people than the enrollment of Olin, pure recall tests, and assignment partners not pulling their weight were new to me. I had to learn quickly how to compromise between my optimal learning style and that expected of me, while learning about the nationally-standardized grading schema. This, most of all, led me to appreciate the allowances afforded to me at Olin. Upon my return, I recognized and leveraged efforts to keep student engaged, to construct and support effective project teams, and to assess knowledge holistically. I became, in general, a more engaged student dedicated to taking advantage of Olin’s benefits.

In addition, though I was in an English-speaking country, the northern dialect might as well be an entirely different language. Add British slang and terminology, and I was reduced to an approximately 60% comprehension rate in an average exchange (and had to repeat most of my own utterances). I managed the typical language immersion component of studying away after all!

Service Learning Experience

Engineering Discovery (<http://ediscovery.olin.edu>) was a newly-revived organization when I came to Olin, comprised of students interested in teaching science and engineering to children. I have seen the group grow in several ways over the course of my time here.

In 2010, we developed a mission statement to succinctly convey the group's efforts: "Engineering Discovery is dedicated to fostering passion and excitement for engineering and science in K-12 students of all backgrounds. Through open-ended, hands-on team projects, we work to help our students discover the value and joy of technical problem-solving."

Since then, we have strived to uphold and expand upon the mission, increasing our presence at the elementary and secondary school levels even while expanding to preschool levels. This organization quickly became an important part of my time at Olin, and I took on small leadership roles as soon as possible (in my first year), moving on to a co-director position in my third and fourth years. Through this service, I have learned valuable leadership skills (plan ahead, delegate to teammates whenever appropriate and possible, and never assume you will remember to reply to that email solicitation later) in addition to effective teaching and lesson development methods. I have seen firsthand that a focus on personalized, hands-on projects maximizes learning, and I will strive to implement this approach in any future educational venture as a result.

Further, I have learned significant things about myself. First, my interest in education is not fleeting. This is something that will be important to me for a long time to come. Second, I enjoy leadership and organizational roles. I did not expect to find as much satisfaction in planning for group meetings and activities as I do. Only through this service opportunity did I learn so much about myself and my interests, while developing practical skills that I can take with me as a Grand Challenge Scholar, pursuing the Challenge of advancing personalized learning.



Grand Challenge Project

Personalized Learning

I have chosen to address the Grand Challenge area of Personalized Learning – tailoring learning to each student’s needs, interests, and learning style – in my time at Olin through various means. Most significant is my work with Engineering Discovery (see the Service Learning Experience section of this portfolio), through which I have directly taught hundreds of students. Hands-on activities with low student-to-instructor ratios are most often used in these lessons, allowing me to tailor explanations to individual learning styles and to engage students in different ways. Demonstrations, interactive blackboard lessons, and prototype construction serve different needs in a group of students, and I strive to include elements of all in any given lesson.



Structure and delivery are further influenced by my research in project-based learning, conducted with a team of fellow students and Professor Yevgeniya V. Zastavker. This theoretical knowledge base serves to inform decisions made in developing lessons and teaching my own students, and to hone an awareness of my teaching techniques that I would not otherwise be granted. By learning about students’ self-efficacy and motivation, I am able to better tailor lessons to suit individual needs.

This awareness also influences my time spent with FIRST Robotics and LEGO League teams, whether coaching, mentoring, or volunteering at events. Passionate, motivated students in these programs are eager to learn and to produce, and need guidance from those with even slightly more experience. When helping them toward their own success, it is important to consider their learning preferences and highly variable expertise and interests, from the 11-year-old programming robots for fun to their classmate obsessed with a single sport. That challenge is one that I relish with each encounter.

Little is more satisfying than witnessing a student’s “aha!” moment, when they understand something new and become excited about it and their accomplishment. Those victories in individual students illustrate to me my own achievement in addressing this Grand Challenge. My students’ successes can be largely attributed to personalized learning, which should be at the forefront of educators’ efforts.

