Agents of Change and Learning

Grand Challenge Scholars Program Portfolio

Advancing Personal Learning

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

Reflection

As college graduates, we leave with a worldview we have grown and shaped over our undergraduate education. My four years at Olin were an opportunity to explore interests, passions, directions of technology and society, and what ambitions I have to make a difference in the world. This is a crucial time, transitioning between an education and the workforce, because it defines the point at which I map my ideals onto what I can accomplish in the world. With what organizations and corporations you can make the biggest impact, you should seek them out; but when there is the need for new initiatives to make change, I feel empowered to create them.

By virtue of Olin College's curriculum and following my own passions, I am applying to the Grand Challenge Scholars Program after contributing to the areas this program addresses, and through pursuing the betterment of society through my skills and education.

The lens of my education has shaped my wordview considerably. Engineering itself is an art of applied problem solving, but ultimately has the most impact when addressing people's needs and desires. To tackle any of the grand challenges requires an engineering and humanistic approach for creating change. In my four years of undergraduate education, user-oriented design education has inspired me to directly question my capacity for making significant change in the world. Change itself comes through a combination of passion, skills, and collaboration. From participating in classes that required me to be both a teammate and a project manager, I learned what skills (and discussions) are suitable in either role. Being a team member is not just about assuming as much responsibility as you are assigned, it is about creating accountability for a team for a particular area of expertise.

These educational experiences reflect the larger challenge of how to enact change in society around major issues. Whether advancing personal learning or improving technology for the betterment of biological research or space exploration, *effective* change cannot happen without interdisciplinary and entrepreneurial experience, and the empathy that comes from global awareness.

Grand Challenge Project

I've contributed to the Grand Challenge area of "Advancing Personal Learning" by building freely available educational materials for students to learn and become involved with web development.

There is a passionate group of upperclassmen at Olin College interested in the success of computer science education that takes advantage of the fast rate at which software development is growing. My project came about as the result of many discussions about redesigning our CS curriculum, in the same spirit of Olin College's mission to redesign engineering education.

I and three students, as well as several teaching assistants, decided to put these ideas into practice by creating a student-led class “Olin.js”. We volunteered our time teach web development to undergraduates using materials we authored ourselves and released free online.

Each of the student teachers spent several weeks leading up to the first semester of Olin.js formulating how software engineering relates to engineering, entrepreneurship, service, personal learning, and society. The curriculum we drafted describes the impact software has had on each of these topics, and what skills students would need in the next three to five years to be effective professionally. We also drew deeply from previous experimental classes taught by Olin college faculty before us, by incorporating company-sponsored biweekly projects to inspire students to think in a particular space for opportunities.

We began the class by teaching introductory programming to students for three weeks, quickly ramping up from basics of HTML to learning every common aspect of developing client/server applications. After this three week period, the students engage in several two-week sprints to develop product ideas and implement them on a technical level. Project-based learning, in tandem with deeper explorations on finer points as students progress, is meant to increase their personal learning about software engineering and how they can leverage the many resources available beyond the class ending.

This experience has given me new perspective on how learning takes place and the importance of sharing knowledge. I’ve had the opportunity to learn skills and techniques from my peers and put these into practice; through teaching, I’ve also reinforced fundamentals and improved my engineering skills, often times finding a better way to learn or becoming familiar with a concept that unexpectedly became valuable in a completely different context.

The most difficult part of this project was becoming educators and test administrators. Student education at Olin is very project-focused, and self-explorations are a common way to provide depth into a topic without having to impose structure via lesson plans. Because of the significant knowledge gap between students entering the class and mastering all the tools provided in web development, we couldn't utilize a project-based model alone without first covering the basics. Writing educational material required the input of all the upperclassmen involved, which was an

eye-opening view of how differently my peers came to learn and become passionate about these topics. Test administration was equally fascinating, as articulating what metrics by which we should judge student success sharpened our perspective on the significance of a classroom and mentorship setting that self-guided learning may not necessarily offer.

Overall, this experience was constructive to my ambitions of becoming an engineer and an effective developer. Education alone was not a significant factor before I began teaching this class; but once I saw the opportunities and realized how students reciprocated learning with their teachers and peers, I am coming to see this collaboration as an invaluable aspect of the science itself.

Entrepreneurial Experience

Entrepreneurial thinking is an agent of change in small and large organizations alike. If organizations are able to assume some risk of failure in order to creatively react to new circumstances and opportunities, they benefit from entrepreneurial thinking by continuing to remain relevant and effective.

Participating in the Grand Challenges areas require an entrepreneurial mindset. Fundamentally, each of these goals could not be accomplished without forming new ideas and solutions to today's problems—but every step iterates on previous successes, and brings us collectively toward better tools, solutions, and security.

During my four years at Olin, I have spent two years on the board of The Foundry, the student-run entrepreneurial group on campus. I helped oversee many projects, including:

- Creating a program for students to host their own online portfolios, and encouraging students to demonstrate their undergraduate work online for the purposes of making connections with industry and business. Students at Olin are amazing creators and thinkers, and the Internet is an amazing tool for publicizing these ideas; I know from experience that the biggest roadblocks from benefiting from technology is mostly capabilities or usability friction, and I did not want these to be a deterrent from students being able to demonstrate their amazing efforts to an audience they can engage and grow with.

- Running a "Startup Career Fair" each semester, in which startups recruit and advertise to Olin students the impact they can make at small companies. Because of the small natural of startups, investment into a community of like-minded peers that help each other is almost a necessity. I wanted to help Olin College, a collection of eager-minded students with new ideas, bring value to this community as well.

- Encouraging students to attend networking events in the Greater Boston Area with other colleges' entrepreneurship and technology organizations. Different universities and colleges have drastically different approaches to entrepreneurship, each tailored to the school’s individual culture. Like our career fair, building a community that encompasses schools in the greater Boston area can bring new perspectives and ideas to Olin we would not have been able to do alone.

I have carried the impact of entrepreneurship over to our lesson plans in our student-guided class Olin.js. Students were directed to produce ideas that not only were technologically interesting, but had a particular user/market interest. We teach that ideation for technology's sake alone is not success, but when users are directly involved, we create real opportunities for students to develop skills and create societal value.

Having been heavily involved with entrepreneurship at Olin, I feel it’s finally time to start one of my long-term goals: this summer I will be pursuing my long-term goal of becoming a technology entrepreneur by forming a startup with two of my classmates, Jon and Jialiya. We are interested in revolutionizing the space of hobbyist embedded development, creating a new class of devices and computing platform to enhance people's lives. Entrepreneurship would be a core component of our vision whether we were at a corporation or set out on our own; because the vision we are seeking is to jump start a new industry, we feel momentarily we can make the biggest impact by forming our own startup. It’s the Olin community which has empowered this feeling, and will continue to shape our direction as we set out to make the biggest difference possible in our careers.

Global Awareness

I have spent time building an International awareness on an academic and personal experience level. Before high school, I did not have many opportunities to leave the country or experience other cultures. In the fall of 2011, I saw the opportunity to take a break from school, and in doing so develop a greater societal and international awareness for myself. I spent time visiting several countries across western Europe and Northern Africa with other classmates, traveling and experiencing what it is like to live in substantially different cultures. A lot of the fear I had about traveling to new places was alleviated experiencing them with classmates and friends; aside from the excitement of visiting new places, I met people with drastically different backgrounds who shared their experiences and homes with us.

Experience with different cultures is an opportunity. As much of my work has been in Internet technologies, it has naturally occurred that I have been put in touch and collaborated internationally overseas with developers in Sweden and Spain:

- SketchPatch is an initiative by several Spanish developers to create an open playground for developing coding skills through visual "sketches" that incorporate interactivity and design to create programming experiences. Processing, the language used by SketchPatch, is itself is a non-profit initiative for a coding environment that is fundamentally educational. I joined SketchPatch to unify my efforts to create a similar environment online, as I wanted this for my own exploration and to foster an environment for people to easily create interactive media without needing heavy experience.

- I was put in touch through mutual interests with a Swedish developer interested in developing new experiences for vintage video game consoles with historical significance. We recovered many abandoned programming manuals, materials, and code snippets, and interest was revived in the console's history by releasing a new game for the first time in 30 years for the console.

Day to day, I am active on Github and several development communities, and much of my development work is on open source projects. Engineering is an international language, but just one way in which international collaboration can bring together the best ideas from many cultures together and foster innovation. As I begin my own startup, I hope to continue to benefit from this collaboration by reaching out to where embedded platforms are seeing the most innovation, Western Europe. It will be an exciting challenge, with many opportunities.

Service Learning

olin.js
olinjs

Much of my engineering has been shaped by the wealth of knowledge and utility generated from open source efforts. I believe it's important to foster ecosystems which have enabled me to gain the knowledge I have today, and that these systems will inevitably form the foundation of many of the solutions to these grand challenges. The systems which are the most open and are unencumbered by digital rights restrictions have the potential to make the biggest impact, and are in general model for how the collaborative effort of many different developers can be more impactful than their duplicated efforts alone.

My Grand Challenge project was an excellent vessel for demonstrating these values. Together with my teaching assistants, we generated documentation that is released for free and available online. As with so much knowledge in software development, much of what is learned is given back to the community so that others can benefit without cost. This is an egalitarian system where everyone is elevated to the level of being effective developers, and it helps foster an ecosystem that is matched in its friendliness only by its effectiveness.

Because this is such an excellent model, we are interested in contributing this model back to students and the greater software development community to spur similar developments in freely available education.

Our initial three weeks of student education was very traditional in its design of a weekly lesson plan coupled with in-class engagement and instructions, but we structured it in a way that was not tightly coupled to class attendance. As such, we've been able to reach even more students than those who are enrolled by encouraging others interested in web development to follow our assignments outside of the classroom, taking the success of our classroom project to a level we weren’t expecting at first. We can now see the opportunity and value in bringing these materials to as many people as possible, empowering the ecosystem which has given us not only the opportunity for employment, but to also very effective at making new types of change using the Internet.

Interdisciplinary Experience

Olin College's curriculum is strongly based around interdisciplinary education. Our first year foundation classes concentrated on Design, Simulation, Circuitry, and Programming, but each was taught in one or more classes along with project management. This helped not only illuminate the breadth of topics that engineering covers, but also helped to reinforce concepts by showing how each of them applies to a more cohesive story of engineering and problem solving. This interdisciplinary education has been crucial in revealing the intricacies of creating change on a massive scale.

Because I have been interested in computer programming since a young age, my skillset has always been very engineering-heavy. During undergraduate, I wanted to broaden my exposure to many different fields: product and user experience design, circuitry, mathematics and simulation, and business. I took mechanical prototyping to gain experience with fabrication of 3D devices and assembling with sheet metal and wood; I am currently taking classes in business finance and selling; and my senior capstone project was in embedded development and teaching introductory circuitry. Additionally, my other passions included digital art and design. This exposure to a broader set of disciplines has opened up new opportunities for me I could not have imagined before.

I see many truths in the statement by Marc Andreessen that "Software is eating the world", in that more markets than ever are being revolutionized by software. It has been my hope to not only explore but benefit different fields through software engineering. My first attempt at this will be after college, where we will be revolutionizing embedded electronics and prototyping with the benefits of modern software development, something that would not be possible without interdisciplinary experience.