

Passing out cheap plastic necklaces, I smiled uneasily at the crowd of young girls that had formed around me. As a Fisher-Price intern, I was there to market the latest product for girls to “design” pre-made jewelry pieces by coloring them whichever color (of the four included markers) they chose. The play value of this product was in stark contrast to my experiences as a child constructing environments out of LEGOs that would be destroyed at the end of the day and built anew the next. The construction of these cityscapes translated into my endless curiosity to discover how other objects were “put together” and ultimately influenced my choice to study mechanical engineering.

My goal as a researcher is to rethink and redesign educational products for children. I am especially interested in creating design experiences that enable children to discover engineering principles through hands-on play. Increased concerns about STEM literacy in the United States, continued underrepresentation of women in engineering fields, and a lack of migration into collegiate engineering programs strongly point towards developing more effective ways to increase interest in engineering. My experiences as a designer in a variety of industries including toy products, interactive whiteboards, and interactive exhibits connect with my involvement as an instructor for after-school engineering programs for children. These experiences have convinced me that children are not only highly capable of understanding engineering concepts but also excited to learn through meaningful personal projects. Early exposure to engineering is a powerful means to engage children in engineering practice.

During my junior year at MIT, I was a volunteer instructor for a weekly after-school LEGO robotics class in South Boston. Through hands-on projects, middle school students without prior experience in robotics were able to apply concepts such as torque, traction, and gear ratios in just a few weeks. Students were immensely proud of their work, showing off the physical instantiations of their ideas to their parents and classmates. In addition, programming the robots to perform tasks introduced the children to analytical problem solving and strengthened their understanding of how objects move. The coupling of tangible components to a digital programming environment gave students a compelling and effective means to express their ideas.

My experiences working for companies that create children’s products and educational tools have convinced me that there is much room for improvement. After my junior year at MIT, I combined my interests in engineering and product design as a mechanical engineering intern at Fisher-Price. While there, I noticed a critical problem: Industrial designers with no background in education or psychology drove the design of products marketed as providing developmental benefits. Large companies simply do not feel that thorough assessment is part of their responsibility. Expertise in engineering design, educational theory, and developmental psychology is necessary to pursue thoughtful research on developing and assessing educational products.

I selected Stanford to pursue research in design methodology and engineering education. At Stanford, I became interested in how designers capture their work and how they utilize prior work to drive their own designs. Although referencing prior work is an important part of the design process, documentation techniques remain surprisingly primitive, as pictures and videos often leave out much of a designer’s process. Furthermore, documentation is often a time-consuming process that discourages designers from documenting their work. I became

interested in the concept of improving documentation methods for non-digital design work, and as a result, I invented a system that automatically records spatial arrangements of tangibles to scaffold learning.

SLATE, System for Learning and Assessment through Tangible Exploration, is a system that captures design work consisting of tangible components arranged on a vertical screen. Users arrange the tangibles to solve various challenges, and designs are documented into a library of solutions such that subsequent users can build and test others' work. Through a course taught by Paulo Blikstein in the School of Education, I worked with a partner to develop the system as well as Mechanix, a toolkit of simple-machine components that can be used with SLATE. In just a few months of development, we presented Mechanix at SIGGRAPH and were awarded the Disney Research Learning Challenge Innovation award for "clearly pushing the design possibilities and technological execution to develop a system to advance learning." We are presenting Mechanix and SLATE at TEI next month and are developing and optimizing the system further so that other inventors can create their own tangible toolkits.

As a graduate student in mechanical engineering, my research within the Stanford Center for Design Research has focused on retention of undergraduate engineering students. My work has involved coding interview transcripts and analyzing academic transcript data to closely examine factors influencing non-persistence. Although this research is of great interest to me, it has consequently helped me appreciate the reasons I chose to study mechanical engineering; I have always been particularly interested in product design, as it allows me to integrate my passion for engineering design, art, and designing for people. I realized that the type of research I would like to pursue is not suitable for mechanical engineering departments whose design research does not actively involve the researcher in hands-on design but instead involves having the researcher study *others* who are actively designing. I want to be in a program in which the process of designing is an integral part of the research and where the academic community is passionate about integrating new technologies. The Media Lab embodies these characteristics while interweaving expertise in a wide range of disciplines; as a result, it is the ideal place for me to continue my graduate education.

Having UROPed in the Media Lab, I am comfortable with and excited by the energy and intensity of the Media Lab. I UROPed in the Personal Robotics Group and Lifelong Kindergarten, where I was first introduced to the idea of multidisciplinary design. I believe that the Media Lab is ideal for me because of its unparalleled resources: inspiring professors, talented students, cutting-edge research, and amazing prototyping resources. At the Media Lab, I hope to pursue several research interests including developing tangible toolkits for pre-college engineering education, creating better documentation techniques for non-digital work, and enabling communities of practice using these documentation techniques. The Lifelong Kindergarten, Tangible Media, and High-Low Tech groups are most aligned with my interests. The Media Lab will enable me to combine my interests in hands-on design, human computer interaction research, and engineering education with the goal of becoming a professor within an engineering or multidisciplinary department. I am excited and hopeful about the potential of supporting education with the affordances of new technologies and know that the Media Lab will provide the resources for me to pursue this interest.