Leesha Maliakal Shah *Teaching Statement*

I create learning environments that use scalable models to foster self-directed learning and promote broader access to quality mentorship. As a researcher and undergraduate research advisor, I explore scalable studios for training undergraduate researchers to self-direct research work. As a teacher, I adapt these studio-based approaches for large, single quarter project courses. To further my educational mission, I extend my approach to diverse settings, such as high school and undergraduate summer programs and faculty training models. Below, I detail the outcomes and principles of my teaching approach for each of these settings.

Creating Effective Undergraduate Research Studios at Scale

Since Fall 2015, I have advised 16 students (15 undergraduate and 1 masters; 18.8% BIPOC; 62.5% female) in independent research. I have worked with students ranging from 1 to 6 quarters, culminating in 48 quarters of research mentoring. In my coaching, I train students in the regulation skills required to lead design-research work. Specifically, I focus on coaching students to strategically plan out their work, seek help from the resources around them, and reflect on their process. I have advised students on advancing three branches of research that stem from my own research direction, much like how a P.I. advises Ph.D. students in project directions that align with a broader grant vision. My students have won a cumulative $10,000 of undergraduate research funding from their proposed projects, resulting in 5 submissions to student research competitions, late-breaking work, and full paper tracks at top-tier human-computer interaction (SIGCHI) conferences.

I am able to effectively train undergraduate researchers at scale through the Design, Technology, and Research (DTR) program at Northwestern University, a program that I design and research. In repeated 10-week studio sessions, graduate and faculty mentors work with students to identify a research direction, explore and iterate over their designs, prototype at varying fidelities, build working systems, conduct evaluative studies, and report findings through publications. DTR implements the Agile Research Studio (ARS) model -- a learning ecosystem that integrates agile processes, technical tools, and social structures to distribute learning across a community of practicing researchers. For instance, Special Interest Group (SIG) meetings bring together undergraduate students, graduate students, and faculty working on different projects in the same research area to discuss weekly deliverables and devise strategies for overcoming challenges. Each SIG operates as its own mini-lab, initially led by a faculty member who fades over time, as a graduate student mentor gains competencies as an advisor and leads the advising themselves.

More broadly, the DTR program has trained 109 students (98 undergraduates, 2 masters, 10 Ph.D.) in independent research, 42% of which are female. Collectively, students have published 18 papers and extended abstracts at top-tier SIGCHI conferences, won 44 undergraduate research awards, and 6 major ACM student research competitions. Undergraduate research programs of this scale and caliber are unprecedented. **I look forward to directing my own research studio, and training other faculty to adopt similar practices, as a way to rapidly expand undergraduate research opportunities for students.**

Scaling Studio Learning For Large, Single-Quarter Project Courses

At Northwestern, I served as Head TA for Computer Science 330: Introduction to Human-Computer Interaction, a 10-week course with a 120+ student enrollment. I designed and orchestrated the week-by-week course plan (including topic selection, project timeline, readings, and course logistics), guest lectured for the weeks of Risk Assessment and Interface Arguments and led 2 discussion sections where I coached 35 students. Finally, I created a TA mentor training program where I taught 5 TAs best practice in coaching design work.

To scale the effectiveness of our 30-person studio version of the course for 120+ students, I redesigned our processes, social structures, and tools. First, I designed the curriculum to focus on the processes that expert designers practice. In addition to foundational design skills (i.e. prototyping techniques), students in our course actively practice the planning strategies that expert designers use to lead complex work. For instance, students learn to articulate the underlying argument behind their design approach, identify key risks in their logic, and focus their weekly iterations plans on mitigating those risks. Students also practice weekly design sensibilities, or mindsets of an expert designer as they work. For instance, the week that students complete their first round of user testing, we coach them to practice patience in understanding what worked and what didn't, rather than rushing into the next iteration. Next, due to limited mentoring resources, I implemented new social structures that enabled us to scale the 1:1 coaching required to train students in these skills. Specifically, I designed and directed a 10-week mentor training program for our team of 5 TAs (4 undergraduate, 1 masters), where I introduced best coaching practices, reviewed common student pitfalls, ran practice coaching sessions, and conducted live observations to direct coaches on how to improve their practice. Lastly, I modified our tooling to handle any large scale changes on the fly. For instance, each student was given individual progress maps and self-assessments to track and reflect on their progress throughout the quarter. I redesigned these tools to live-import from master templates as a way to quickly deploy changes across all students.

Many large-scale introductory HCI courses focus on high-level design skills, where students implement *usable* interfaces, but may not build *useful* systems that address clear user problems. To train students to plan meaningful iterations that tackle critical risks in their projects, my approach focuses students on improving the underlying arguments behind their designs. Further, my approach overcomes limitations in mentoring resources by explicitly training TAs in the coaching methods required to mentor these skills for undergraduates. **As enrollment in computer science grows exponentially across the world, I am prepared to fill a pressing need for large scale introductory courses that maintain effective training for students.**

Teaching as Service in Diverse Design/Research Education Settings

Being a researcher of learning environments, I value sharing my teaching practices in diverse educational settings. In this way, I create opportunities for others to benefit from my designs, broadening the impact of my teaching approaches. Below, I detail a few example settings.

I designed and implemented a coding curriculum as part of BraveCamps, a week-long design camp based in Chicago, for middle school and high school girls interested in technology. Girls in the program are guided through a design-based research process, where they identify a problem in their community, and design a solution that they implement as a website. As part of the camp, I designed a coding curriculum curriculum to scaffolded students from virtually no coding experience, to learning basic HTML/CSS/JavaScript, to publishing their websites using GitHub Pages. In the first two years of this program, I taught my coding curriculum to 10+ BraveCamps, reaching 100+ middle and high school girls. My curriculum work was later published and used to train a team of coding coaches. **Collectively, we used my curriculum to run 25 camps, reaching over 700+ girls in 8 cities across the US.**

As part of a research project, I designed, implemented, and taught a 10-week iterative planning curriculum for Design for America Summer Studio at Northwestern University. Students enrolled in Summer Studio worked in teams, serving as design consultants for community partners across Chicago. Each week, I designed and led a planning workshop with students, where I taught them new aspects of the design space (e.g. problem statements, value propositions, risk assessment, etc), walked through examples, and then led a practice session where they applied the principles to their iteration plans that week. **My work led to 3 publications in top-tier Learning Sciences conferences and journals.**

To further the reach of our research, my advisor and I worked to design Agile Research University (ARU), a program for faculty interested in starting their own research studios, based on our Agile Research Studio (ARS) model. As part of the program, I designed and implemented a starter kit that included templates of tools used in our studios. I also helped host faculty members for immersive visits, where they participated in our studio practices for a week and consulted with us about how to adopt our practices at their home institutions. **Through the ARU program, we have supported 10+ faculty from Berkeley, MIT, CMU, UCSD, Virginia Tech, Michigan, Northwestern. NYU, University of Washington, King's College London, and Microsoft Research.**

Finally, I have seized opportunities to guest lecture in undergraduate courses across the country. For example, In March 2020, I was invited by Dr. Elena Glassman to guest lecture for Harvard's Computer Science 179: Design of Useful and Usable Interactive Systems. Here, I discussed how I think about creating systems for design argumentation and community support. As another example, in November 2020, I was invited by Dr. David Cochran to guest lecture for Purdue Fort Wayne's Systems Engineering 530: Systems Engineering Management. Here, I taught students how to use design arguments to de-risk designs like an expert system designer, and led a workshop where they applied the principles to assess their own design projects that semester.

Teaching and mentorship are an integral part of my research career. Whether I am reading literature on design education and metacognitive practice, investigating questions on how to design learning ecosystems that scale effective training, or applying my learning to redesigning the learning environments in which I teach -- it is time spent toward a central goal of mine. **I aspire to foster the skills students need to tackle the problems of tomorrow, and perhaps more importantly, the skills they need to grow into more self-directed learners, driven to improve themselves and the communities around them.**