Design, Technology, and Research (DTR)

Annual Letter, 2023

Dear members of the DTR family,

Thank you for your encouraging reviews of my first letter. They inspired me to write this second letter, which continues to share DTR's culture and practice, and my reflections on learning, growing, and mentoring.

The annual letter is written from my perspective running a rather peculiar community for learning how to conduct research in design and technology at a university. But it is intended for anyone who learns, aspires, and grows; and anyone who wishes to foster that in others. I hope you find something in it that resonates with you.

In this year's letter, I reflect at length on *limits*: what limits a student's growth, and what limits me, as a mentor and coach. I share how I work with these limits, and how I try to practice patience, acceptance, letting go, and letting fall. But even with all this, working at the limits of our abilities—and of who we are—is, and will always be, difficult work. I try to give some shape to the challenges we face in working with our limits, and share some of the not-so-pretty thoughts that I sometimes have, in my personal struggle with limits.

As a consequence of all this, parts of this letter can feel a bit heavy. While you will find uplifting stories as well, I recommend a favorite snack and beverage, and a comfy chair.

Celebrating success

Let's begin by celebrating our DTR successes this year. During 2022-2023:

- I received 4 grants. Three are research grants, and the other one is for building out DTR's alumni network and programming with alums and the local HCI community. These grants allow us to pursue exciting new initiatives, and largely meet our short term research funding needs. Two more grants are pending still. It has been a good fundraising year, and the work I put into grant writing is bearing fruit.

- We made significant research progress in each of our five special interest groups (SIGs). In many of the SIGs, students made new conceptual breakthroughs needed to solve their problem.

- Kapil Garg, head of the Networked Orchestration Technologies SIG, presented his paper "Orchestration Scripts: A System for Encoding an Organization's Ways of Working to Support Situated Work" at CHI this year. The paper details his brilliant effort to advance technologies for supporting work and workplaces.

- Ryan Louie, head of the Collective Experiences SIG, will be starting his postdoctoral fellowship at Stanford in the Fall. We wish him well.

- DTR students received 9 (!) undergraduate research grants from the university.

- DTR students Amy Guo and Li Kang Tan were recognized as 2 of the 3 outstanding Weinberg CS seniors this year, for their outstanding contributions to the larger CS community at Northwestern.

- I successfully piloted a support group for junior faculty across institutions. More on this later.

- I have now mentored 140 students in independent research through DTR. Onwards!

By and large, DTR continued in 2022-2023 as it does: with rigor, and with warmth. Our community remains strong, and as vibrant as ever. One area where I wish we had done more in this year was publishing our research. We have a lot of newer and in-progress projects that I am eager to share out with the world, but alas, they simply aren't ready yet. Next year though, a few of them should be—and we should make every effort to share our work broadly. I look forward to helping our students learn how to do that, some of whom, will be writing an academic paper for the very first time.

A different approach

A fair portion of my work in DTR is helping students learn to consider a different approach, whether that's in their way of thinking about a problem, or in the way they approach working on a problem. A lot of times, fixating on a particular approach is never going to work, so the work is in seeing that there are other approaches, and in being willing and capable of trying another approach.

Often too, when a student is stuck choosing between option A and option B, the solution is neither, nor an interpolation between A and B. It's a different approach altogether, and the challenge is in seeing beyond the frame in which we have put the decision in the first place.

Sometimes, I can help students see things differently by painting a picture of how their current way of working is not aligned with their goals, and of another approach that would be. I can also help students visualize how they might reach an outcome that they couldn't envision before, or recognize a different way to look at the problem or their personal struggle. And sometimes, painting a picture of an alternative approach is all it takes. Something clicks, a new path appears, and the student takes it. Those are the easy days.

More often than not, the path is still somewhat hazy, or a student sees it, but actually walking it is hard. Taking a new approach often requires some leap of faith, and with it, some fundamental change in the person. In other words, when we ask someone to consider a new approach, we are also asking them to consider a new way of being. To be a different person, if you will.

Many of my more emotional meetings with my students are those in which I see the student repeating an ineffective approach, despite our many prior conversations about how that wouldn't work. These conversations can get heated (I can get frustrated), especially when I feel that the student is "purposely" doing this. Questioning someone's intentions is hardly a useful way to promote change, but I have trouble letting go of the idea that a part of them is holding on to their current approach, a part of them that, for whatever reason, won't let go of what isn't serving them.

When I feel strongly that a student cannot advance past a certain point without a change in approach, I try not to let it slide, because not changing fundamentally limits how effective that student can be and become as a researcher. Holding space for such a change in approach is critical, and I make it my job to create space for it, even if it feels impractical or uncomfortable at times.

Of course, there is no value in beating a dead horse, or in banging our heads against the wall, and I am certainly guilty of doing that at times. It helps sometimes to work on something else, and to come back to this particular issue later. Change cannot come overnight, and there is a certain patience, a certain acceptance and celebration of that slow process of change, that is needed to sustain the duration of the change.

That said, it is possible to craft experiences and learning pathways that help a student to change their approach, and to truly appreciate the value of that change. This starts with creating a moment in which the student sees and realizes why another approach may be better. All of the sudden, they understand the difference and its value. In such moments of deep understanding, I imagine the student understands it not only intellectually, but *feels it* in their bones. The new approach not only makes sense, but *resonates*. Instead of clinging to their current approach, a student becomes open to the idea of changing, to being different.

However, such moments of realization are not sufficient. For the change to actually take place, a student needs a practice that sustains their taking another approach, *consistently*. Here too, it is possible to craft a practice, and to provide a space in which to practice, and to become. But make no mistake: this is incredibly difficult work, and no amount of support can safely make big changes in approach (and in a person) happen overnight.

Patience. Lots of patience.

An independent researcher

DTR trains students to become independent researchers. The term "independent researcher" gets thrown around a lot, and often encompasses a lot more than what *we* mean by it. So I want to clarify that here, while raising some of the seeming paradoxes around independence that I think are important to understand.

First, some paradoxes. DTR students are responsible for all parts of their research project, yet rely heavily on help from peers and mentors. Students have a ton of autonomy, yet they are constantly overloaded with coaching feedback that questions everything they are doing. Students are challenged to listen well, yet also, to find their own voice and direction.

In DTR, our bar for independence is quite high. All DTR students are responsible for doing all the steps of the research process—including planning the research work, generating and testing hypotheses, and presenting results. But for me, doing all the steps of the research, on its own, does not qualify as independent research. For instance, it is not enough that the student does whatever they want in each of the steps—especially if their way is ineffective and they insist on continuing to do it that way. In other words, irrational thought and acting without deep understanding or regard for desired consequences— while certain to arise when we are learning to be independent—are not our ideals for

independence. Independence goes deeper, and necessitates a high level of skill and doing things well.

As research does not happen in a vacuum, independence also does not mean self-sufficiency. This is certainly true during the training phase: our students receive a ton of help and support in their learning to become more independent. But this is also true post-training: independence does not preclude learning from outside sources, asking for help, or collaborating with others. In fact, an independent researcher needs to be proficient at learning from others, help-seeking, and collaborating. At being open.

To say that independence requires going beyond doing whatever one desires and one's self-sufficiency is to say that independence requires a *letting in* of other ideas and other people. Independence is not a closed-minded pursuit of an island onto ourselves. Instead, it involves an open-minded letting in of the outside world, as that would help us achieve a deeper understanding, both of our research project, and of ourselves.

This openness to the outside need not preclude our having goals or values of our own. In fact, one needs to maintain focus on one's own goals, one's own values, and one's own *center*—as one lets in ideas from others. An example is taking advice from a mentor or a paper reviewer. It's helpful to receive feedback and to process it, but to also let it go thereafter and simply do what one thinks would be most helpful, from one's own (renewed) perspective. In other words, independence also necessitates a willingness and ability to go in a direction of one's own choosing, and to not waver too easily.

In practice, it can be difficult for a student to sort all this out. On one hand, it is easy to think that a mentor telling you to do something is impeding on your independence, when actually, *letting in* the mentor's suggestions can provide a clearer perspective on what you can do to reach your goals, thereby providing a path to independence. On the other hand, it is possible to overfocus on doing whatever the mentor says and lose one's own "self-direction." A student can become overreliant on the mentor, always asking for what to do next than to evaluate one's own work and to figure out what to do next for oneself.

The mentoring relationship is itself challenging. For it to work, there is a need to form a temporary "we" between the mentor and the student (credit to Patrick Barragán, who coaches competitive athletes, for helping me think through these ideas). Within this "we," the mentor holds the student's goals to be paramount, aligning their focus on the student achieving their goals. When the student wavers in their resolve, the mentor does not let them quit easily. Through the ups and downs—the mentor is with the student, holding

space for their learning and achieving their goal. As a mentor, it is not always easy to continue holding the goal, especially on the days when the student themselves are struggling, or questioning the goal (often because they are struggling). It can also be challenging to promote independence by removing support over time as the student becomes more capable. In these moments, the student can struggle some, which can be hard to witness. The student can also feel unsupported: they feel that the mentor is breaking the "we," and in a way, that's exactly what the mentor is doing.

A clear understanding of independence helps me clarify what I am trying to help DTR students with, and how I can do that. As I understand independence now, my work in DTR is clear: to create space for students to learn to act skillfully on their own accord, while at the same time, to learn to receive and to let in.

Let go, and let fall.

For me, research is about finding a path forward in the face of the unknown, searching for new knowledge in unexplored territory. While the goal is to know something at the end, the process calls for us to embrace not knowing, to take steps forward without knowing for sure where we will land.

Truly embracing the process of discovery requires a letting go of certainty and of control, something that, students don't always see the appeal of. To help us meditate on the benefits of letting go of control, in the Fall I shared with DTR students this quote from Josh Waitzkin, from his book *The Art of Learning*:

> The boating life has also been a wonderful training ground for performance psychology. Living on the water requires constant presence, and the release of control. A boat is always moving with the sea, lurching beneath your feet, and the only way to survive is to sink into rhythm with the waves and be ready for anything. I learned at sea that virtually all situations can be handled as long as presence of mind is maintained. On the other hand, if you lose your calm when crisis hits seventy miles from land, or while swimming with big sharks, there is no safety net to catch you.

Josh is pointing out the need to not control what cannot be controlled, but instead, to simply be present and ready for anything. This resonates with what we do in DTR—we

learn to be responsive to what comes up, rather than to count on things turning out the way we expect. We learn to deal with what *is*—rather than how we would like things to be. Knowing how to respond, and being willing to trust that we are okay in doing this, is exactly what we are learning.

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But I think, this idea that somehow all we need is presence of mind, misses the process by which we come to have such a presence. It also misses how, beyond surviving and achieving, I care about how students view themselves, and come to see themselves as people. Ultimately, we need to address the elephant in the room: that deep fear that many students have of failing, of drowning, of not being enough, of not being worthy. To embrace the unknown requires our embracing and appreciating the deep fears that we associate with the unknown. This is necessary for our becoming more successful in our research pursuit, and for our being present for it. It is also core to our embracing our humanity: I believe our relationship with not knowing shapes much of how we are with ourselves, and how we interact with the world.

I was looking for a new vocabulary that embraces not knowing, and that not only looks at giving up control as a necessary part of success, but as something meritorious and core to the human experience in and of itself. My search led me to Ann Cooper Albright, a dance professor at Oberlin College, who literally teaches people how to fall. In her beautiful book *How to Land: Finding Ground in an Unstable World*, she writes:

> To launch oneself into a process of becoming is an interesting conundrum. Taken seriously, it can expand our definition of will as domination into a notion of will as a willingness to submit to an experience, the outcome of which is unknown. This is the side of falling that has to do with faith—not in the religious sense, but as a sensibility that sustains our explorations of the unknown. I have always felt that falling is connected to grace, to a letting go of control just long enough to feel the suspension of disbelief. […] I believe that falling is best conceived not as a descent from the heights of paradise, but rather as a release into the support of the ground.

In Ann's telling, it is our willingness to give up control that sustains our searching further into the unknown. Applied to DTR, I think about how submitting to our experiences can

help us suspend disbelief just long enough to come to new understanding, both in our research and about ourselves. With this quote, I encouraged my students in Winter quarter to take risks, to fall, and to find their ground. I encouraged them to start to see failure differently, and by extension, their research and themselves differently.

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Around the same time, I started exploring Contact Improvisation, the form of improvisational dance that Ann teaches at Oberlin. Contact teaches one to let go, to fall with gravity, and to share one's weight with another. I found our local contact community in Chicago, where such letting go is encouraged and newcomers like me are welcomed with open arms.

I observed through my contact practice that I really struggle with letting go. In sharing weight, for instance, I struggled with putting my weight onto another body, and instead held on to the weight of the world myself, only to struggle and collapse abruptly, now giving my dance partner more weight than they expected. I saw, in my body, just how afraid I was of dropping my weight onto another person, and of falling myself. Contact emphasizes moving away from grabbing and grasping towards listening and submitting, moving with gravity than muscling my way through. Deprived of my usual ways of forcing my way through the world, who was the *I* that was left?

The self that I found in contact, was a far softer, and dare I say, freer self. That self embraced more of whatever came to be, and understood deeply that no result or successful prediction of an outcome can ever free us in the way that submitting to an experience, whose outcome is unknown, can. That despite all my fears, I am okay. That I can experiment, improvise, and embrace learning to be. That I can share my weight with other people. I still forget this often, and continue to struggle with letting go of control. But I got to experience the self within me that values letting go, and I like him.

I would really like my students to be able to experience this freer self, too.

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If becoming is about letting go, then what space is there for ourselves to direct where we go? Taken seriously, if we are to have any agency over our becoming, then becoming is as

much about letting go as our having a desire to be someone different. In the Spring, I asked students to find their own reasons for becoming, little by little, the person they wish to become. Agnes Callard's words from her book, *Aspiration: The Agency of Becoming*, seemed appropriate:

> In accounting for the genesis of our new values, we often have occasion to mention the effects on us of forces outside our control, such as a fortuitous coincidence, an influential mentor, an inspiring locale, a tragic loss, a bitter betrayal, a domineering parent, the emergency of an innate facility, the process of getting older. Nonetheless, none of these sorts of factors can amount to the whole story. A mentor cannot implant a love of music; the betrayal cannot, of itself, create a devotion to independence; coincidence cannot produce love; being in a culinary mecca cannot make one into a chef; talents do not develop themselves. [...] We have a hand in answering the question as to what things in the world are important to us, and our answers need not be, and typically are not, arbitrary or random. Agency, as distinct from mere behavior, is marked by practical rationality. Insofar as becoming someone is something someone *does*, and not merely something that happens to her, she must have access to reasons to become the person she will be.

While I agree with Agnes that reasons are important, I am not sure if my reasons are often, especially at the outset, very good. When I spoke with Agnes though, she assured me that they didn't have to be. Moreover, she noted that the reasons for our aspirations are rarely fully our own: we might catch them from a parent, a friend, an influential movie, or an advertisement. This too, she assured me, is okay: that part of the process of becoming, is starting with reasons that one takes as one's own (regardless of where they actually came from), to over time, discovering reasons and values that one embraces for themselves (or not). In this way, whatever reasons we find to start aspiring, the process of aspiring will teach us about ourselves, in our process of becoming more ourselves.

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In letting go, we allow our research to take us where it takes us. We open ourselves up to new experiences that shift our perspectives, approaches, and person. I want DTR to be a place where students embrace the unknown, and the giving up of control that comes with it. There is a kind of knowing that they are okay in the unknown—fears and all—that they

can fall and fail—and that is also okay. And that they can find reasons for becoming that resonates with themselves. There is a freedom in all of this that we so often deny ourselves, and my hope is that DTR helps us to recover these ways of being and becoming. We will practice, and we will see what happens as we venture ever deeper, into the unknown.

BAD. SHOULD. ENOUGH.

When I work with students, I sometimes see their struggles having deeper roots than at first appeared. A student can be struggling to make progress on their work, but the issue has nothing to do with their cognitive abilities for making progress, or even their desire to make progress (they want to progress!). The issue is somewhere else, and it can elude the student and me for quite some time.

Once in a while, I have a stroke of insight and right or wrong, I make a leap. For example, one day a student of mine was sharing some struggles he had with writing, and he was realizing how he wasn't using effective representations to help him structure his thinking and craft his story. He started with a bunch of what he should've dones and what he should do nows, much of which was about using better representations to make progress. And while typically I would have been content with that (who doesn't like a student who preaches the value of the representations I had been teaching all along?), that day I went somewhere else entirely.

I told the student that while I understood his diagnosis and cure, I wanted to share with him a story about a video game I used to play called Celeste. The game is about climbing a mountain, and it is brutally hard; my save file from completing the game had 4000+ recorded deaths. In the game, you play as Madeleine, who has some anxiety about herself, which eventually manifests as her alter ego, who she battles and tries to be rid of as she climbs. This alter ego is her harsh inner voice—the one that tells her that she is no good and that she has no chance of making it to the top. But this alter ego is also a part of her— her fears and her insecurities. It is only when she comes to embrace and make peace with *all* of herself that she reaches the top of the mountain. This integration, and acceptance of herself—good, bad, and ugly—is what helps her to become whole.

He cried listening to my story, as I think he heard his story. I teared up a bit, too.

We all have an inner critic, and for some of us that voice can be quite loud. I wish it wasn't so, but we can soften, submit, and place that voice in its proper place, as a part of ourselves and our experience. We can come to understand that we ain't so bad after all.

We can grow to not only be more effective in our work, but to more fully embrace ourselves and our experience. This is the mountain that I want my students to climb, and this is the mountain, I think, through which we come to truly enjoy our work.

I have many more stories like this, and I suppose what I value most about DTR is that it can be a place for learning about oneself. This process of embracing more of ourselves comes with a letting out, a coming out. For me, finding this multifaceted self has meant showing more sides of myself, including what I see as the uglier and weaker sides. As I have learned to trust myself and the people in my life, I have found it safer to share, and that with their support and my hearing my truths, I can become bolder and more myself in my pursuits. This is the process of becoming that I am on, and that we are creating a space for, in DTR.

The limits of my ability as a mentor and coach

One of my biggest frustrations is when I feel helpless in helping a student learn and realize something that I find critical to their growth. I can get downright angry at myself, like I am supposed to do better. If only I can find a different approach and get through to the student, everything will be better and everyone better off. In the moments when I can't, I often feel exhausted, ashamed of myself, and in pain.

Change happens at its own pace, on its own calendar. I get that, but when I see an academic quarter near its end, my students approaching graduation, I feel a special form of despair, of running out of time. Time constricts space, and there is simply too little time for creating the space to grow in the ways we had set out to. In these moments I can feel sad and scared, helpless and ashamed. I can get frustrated easily, and of course that doesn't help.

Beyond my desire to be an incredible mentor and coach—and my fears that I am not that and will never be that—there is a genuine sense of "helplessness" or "not-in-control-ness" that is core to my experience of helping a student grow. When I find myself not so effective, I can feel incredibly small, and ashamed of my inability and my smallness. I can also feel *disconnection*, like there is no way for me to reach the other person and connect them (and myself) to their future self.

As a mentor and coach, I am always looking for that edge—that edge where if a student takes a leap from there—they embody a new way of being that they couldn't previously imagine for themselves, effectively becoming someone else. In that magical moment, I can

see the student's face of joy and surprise, hear their voice of confidence and excitement, and feel their sense of attentiveness to their own being that is undeniable, thrilling, and addicting. I am into creating this moment of leaping and becoming, so I actively look for edges for students to leap from, all excited.

And then they don't jump. They turn around and run away. Or they just stand there, for a very long time. Or they try, but it feels half-assed. Or they face-plant. Whatever the hell this is, it's not the leap that I was looking for.

It should all be okay. Learning and growing is a process, and we don't have to become someone else today. But I can get impatient, as if not leaping is *not* okay. As if my not finding the "right" edge for them is not okay. As if staying the way we are now, is *not* okay. I can grow resentful of our current selves, our limitations, and wish even more that we can just change, right here, right now.

I am how I am, but I also try to envision myself as the mentor and coach that I'd like to become. I see a person who embraces students just as they are, and who understands that like a gardener, I can only plant seeds and water them. The actual growing happens on its own, when and if it happens. I don't add too much fertilizer, which can speed up growth but can also damage the soil, the roots, and the ecosystem. I am patient. I encourage. I don't look for an edge for the student to leap from. I support the student to grow at their pace, as they will. If flowers do not bloom, I do not despair. I know that in the greater journey of life, I need only be present, responsive, allowing, and supportive. This is the source of my joy. The sun, the earth, and the plant itself will do the rest. Everything will happen as nature intends it to. I, the gardener, need only be a gardener.

Zen as can be, but this vision feels impossible to attain. Who plants flowers, if not to see them bloom? Who allows things to happen at their own pace, and faces results as they are? Have you ever seen Animal Planet? Survival of the fittest is scary stuff. Plants too, can fail to grow to their full potential.

Ultimately, my struggles come from my not accepting three fundamental truths:

1. I want students to reach the intellectual and spiritual heights that come from their leaping towards growth. But such leaps may not happen, and certainly not always by the time I want them to.
2. Change comes on its own terms, There is a limit to anyone's ability to promote positive change in another human being. There is a need for patience, and for

embracing our moments of inability, of our not "getting there." In these moments, I often feel so bad about myself that I react with frustration.

3. In the competitive and challenging academic world that we live in, there are no guarantees.

Will I come to terms with this reality that I find myself in, especially when I am at my limit? I love my students, but obsession is not love. Accepting my students and myself, meeting ourselves where we are, is. As is supporting the process of learning and growing, wherever that journey may lead. Somewhere in between being honest about who I am and who I'd like to become, I find some peace in my inabilities, and eventually perhaps, will come to see my limitations as beautiful.

Teaching models for thinking

In last year's letter I shared our model for "How We Coach and Teach Design Research." While our approach to doing design research is fully intact, the way I teach it changed quite a bit this year. I share these changes below, and refer you to last year's letter for a refresher on our approach (reproduced in the Appendix).

As many new DTR students joined our studio, I saw them struggling in LIP (Learn, Instruct, and Practice) sessions, during which students learn and practice using different representations for assessing and addressing risks in their research project at the whiteboards. Some struggle is expected, and it is largely our job as coaches to teach these representations and to provide feedback on how to use them more effectively as we see our students work. But some things bothered me:

- New students were at a disadvantage, as they knew fewer representations and how to use them. They focused a lot on practical matters in their design, without thinking through the core conceptual approaches of their research. I suspected that this happens because conceptual approaches are more abstract and generally harder to think about, and also because we typically teach the practical design representations first (problem statement, design argument, interface and system models) before the conceptual ones (approach tree, conceptual diagrams and arguments, technical arguments). This can lead new students to focus on practical problems that are less relevant to the core conceptual questions in the research.

- Some students didn't really get why they were using the representations, and how they connected to their week-to-week work in DTR. Students often didn't have a

clear sense of what their project risks were, nor where they were trying to get to. This makes it difficult to apply the representations they are learning to their work, and to integrate risk assessment, planning, and thinking-while-doing into a coherent workflow. As a consequence, LIP started to feel more like busy work, or a place to do some thinking that may or may not be integrated back into their actual research work.

- We rely on our SIG heads (my senior PhD students and myself) to teach the skills that I do not teach during LIP, but I never taught my graduate students how to teach the conceptual thinking and planning skills that I was failing to teach through LIP (heck, I didn't know how to teach them). This means that we had a big risk in how we were coaching the undergraduates, but also in my training my graduate students to become more effective research mentors.

- I sensed that LIP felt very lonely for the students. I suppose they were always that way, facing a board alone with your thoughts. But I felt that the students were especially anxious, and that lack of stability made it difficult for them to do the thoughtful LIP work that was required. We needed a new energy.

By winter quarter, students no longer chose which learning module and its associated representation they would work on during LIP. Instead, we as a studio worked through a series of learning modules that taught students representations for thinking through their conceptual approach and argument, and how that is linked to their practical design and study work. This included learning modules on:

1. Building conceptual diagrams of existing approaches and why they fail on a class of problems.

2. Building conceptual diagrams of their novel approach.

3. Making a practical diagram that instantiates the conceptual diagram on an example domain and problem.

4. Linking their user testing to their conceptual diagram, so their user testing provides evidence on not only the practical solution but on the conceptual approach it embodies.

5. Going through a paper a former DTR student published, that shows how the conceptual story is interwoven throughout a practical tool design.

What these learning models provided for DTR students was a way to see the goal of design research as understanding new conceptual approaches, and that whatever practical design

work they were doing, they should always, *always*, focus on advancing their conceptual understanding of their problem. In other words, the conceptual diagram serves as a compass for what we are trying to do, anchoring our conversations and the practical work we do each week. Moreover, learning the many use cases of a single, rich representation (the conceptual diagram) is more accessible and meaningful to new students than learning many representations at once.

For each learning module, I demonstrated how to use the conceptual diagram and its variants on an example, and then gave students ample time to practice—sometimes across multiple weeks—to sketch and refine the relevant diagrams for their own project. While this work still happened individually and in pairs at the boards, the students all did the same activity each week, and shared what they did with others through feedback and critique. This further reinforced our community culture, and that despite our working on different projects, we shared a community of practice.

As the weeks went on, I can see our students' thinking getting clearer, and that my discussions with students included more and more of the conceptual concerns of the work. Even practical concerns raised included references to how they got in the way of learning about the conceptual approach behind the project.

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Still, I didn't feel comfortable going back to our previous structure for LIP. Something else was missing. Over spring quarter, I used LIP to teach students an expert planning model for design research, including how to:

1. Identify risks by assessing what we know and don't know.
2. Construct sprint stories and create the perfect representation for a project deliverable
3. Create the perfect representations for accomplishing stories and tasks, either by using existing representations in their research canvas, or constructing new, intermediate representations that help guide thinking.
4. Use effective planning strategies to make progress, such as scoping, slicing, and setting milestones.

As the representations we teach are useful for identifying and working on risks, I also sprinkled in plenty of opportunities to quiz students to recall all the representations they knew about by drawing them at the whiteboard (which they really struggled with).

What I wanted was to help students build the foundations for approaching their research work each week, which, also serves as the foundations for them being able to effectively use the representations we are teaching (see "How We Coach and Teach Design Research" from last year's letter). In other words, while I had been promoting students using the representations to advance their work on their own, students weren't ready for it, because they didn't have a model for how to plan out their research work that valued and clarified how various representations can be used to advance their thinking.

While DTR students get plenty of feedback on their plans through weekly SIG meetings, this is actually the first time I have "formally" taught an expert planning model, by breaking down how we can thoughtfully approach each aspect of planning our research work. To teach these ways of thinking, I created serious games that students can play together, like "What Do You Know, What Don't You Know" for assessing risks, and "The Perfect Rep" for one's deliverables and for the thinking work needed to reach a deliverable. While the work was plenty serious and difficult, I tried to keep the atmosphere curious and playful, so that students would engage with a sense of wonder.

While students still had plenty of struggles as they worked on these learning modules, I could really see them coming to appreciate the value of having good representations, and for their attending to planning with more rigor. This is really difficult work, but they were engaging with it thoughtfully, taking in feedback, and seeing more clearly with each attempt how they can work more effectively and think more clearly. My graduate students grasped the value of these learning modules as well, and they themselves renewed their commitment to teaching these expert planning models in their SIGs, and practicing them in their own work. I am pleased with how it has all turned out.

<center>* * *</center>

As a coda, committing to these big changes was not very difficult, despite our having a well-established and mature model for running LIP that in many ways, was still working well. DTR is steeped in tradition and practices, but our commitment is ultimately to our values and to our students, and to learning to practice effectively. I made these changes simply because they felt right for this time, for these students and their learning needs. We

will capture what we did this year as learning modules for future students, but I have no idea when I will teach them again in the ways that I did this year. In many ways, we can now return to our previous model for teaching LIP, now that our students have a more solid foundation for thinking conceptually and for planning.

I expect that our openness to changing how we go about things, while staying firmly rooted in our values and in valuing practice, will continue to serve us well.

Lessons from unpleasant encounters

I had two particularly memorable unpleasant encounters with students this year. These experiences were with students who aren't in DTR, but they hurt mightily as they challenged fundamental values I hold as a teacher and mentor.

In the first encounter, a prospective PhD student, in their first question to me during their visit, asked: "How do you feel about publishing lower quality work?" The student proceeded to tell me about how important it was for them to land a faculty job, and how, publishing a lot is the only way and that my emphasis on quality over quantity is likely hurting my students' chances, and certainly, could hurt their chance. The student also asked me to justify why learning to mentor other students was important, and noted that all that "faculty stuff" should be left for after they land a faculty job. When I reasoned that I was simply preparing students for the job of being a faculty member (which of course, requires mentoring students), the student again countered that all I was doing was diverting my students' capacity to publish, which if anything, hurts their chances.

I was dumbstruck during the entire exchange (which spanned several hours), and no less dumbstruck by further conversations I had with this student. But putting all that aside, did the student have a point? First, what are my values over the quality and quantity of publication? Second, how do I really feel about keeping my students out of faculty jobs, as this student was positing my doing (ouch)?

The first question is easy to answer: we won't compromise on quality, and will continue to work on problems that we deem interesting and important. This doesn't mean that others will like our work, but if I don't like our work, I won't rest even if others do. In the same vein, I would never value quantity *over* quality—if the work isn't very good, why do I want to have more of it? And if the work *is* good—of course, we would like to see more of it, and our goal is to produce as much good work as we can. Unfortunately, a lot of times we simply cannot do that any quicker, as good work often requires coming up with new

conceptual approaches and understanding, and that is inherently more difficult, and takes time. So we learn to be as effective as we can be, and simply do the best we can.

The second question is harder to respond to. Nowadays, many computer science departments are overwhelmed by the number of faculty job applications, and it is not uncommon to see job applicants with one, two, or more dozens (!!) of publications by the time that they are on the job market. Implicitly or explicitly, many schools do count publications, if only as a prescreening mechanism. But this still values quantity first, especially since evaluating quality is so much harder without significant effort and depth of understanding. Moreover, most R1 research institutions do not focus on how prepared faculty job candidates are to mentor students. Since mentoring well is so difficult anyways (and hard to evaluate), it is often safer to hire the most prolific research-producing faculty, who may in turn, attract the most prolific research-producing students.

Can my students survive in such an ecosystem? Was the prospective student right to be concerned about working with me? More than these questions, I was asking myself: am I a terrible mentor? Am I the one leading my students down the path of professional ruin? In moments of self-doubt, I felt my whole world on unstable ground.

In this instance, what helped me recover was recognizing that however valid or absurd the prospective student's concerns were, I am how I am. I am transparent about the kind of work I do with my students, and I always try to act with my students' best interest in mind. In talking to my current PhD students about this, we also came to a clearer understanding of just what it is that we do—and how far we have come as individuals and as researchers in our years together. In the times when the work took longer than expected, we talked about alternative strategies that may have helped (which I have forgotten by now). Largely, we are okay and proud of the work we did, the process we took to get here, and who we are becoming.

I realized also, that in pursuing research the way that we do in DTR, we will always be on unstable ground, because we so often search in unknown territory. This choice is not for the faint-hearted, and no amount of bravado can guarantee that this approach will bear fruit in line with communal academic expectations for landing a faculty position. But we are thoughtful about how we work with the unknown, and do our best to help students learn to do that for themselves. We are doing all that we can do, and so far, our external track record has been good. My internal score card, though, is even better: I know just how far each of my students have come, and I am proud of their learning and growth.

* * *

In the second encounter, two students in my introductory HCI class violated the learning contract that we had set. When I confronted them about it, instead of taking responsibility for their actions, they deflected and lied. After passing on multiple chances to come clean, they decided instead to protest about their grade, first to me, and then to the dean and the chair of my department.

Whenever I teach, I try to create a learning environment built on trust and openness. I try to be myself with the students, and leave myself vulnerable as I ask them to be open and vulnerable, too. In a deeply personal way, these two students' dishonesty violated that trust. I felt burnt by being open and trusting, and it really hurt. For weeks, the experience left me questioning my entire approach. Was I a good teacher at all? Am I a complete fraud?

When I spoke about my encounter with Elisa Mitchell, Assistant Director of the Garage and a trusted supporter and friend, I mentioned to her how I wanted this not to hurt so much, and that this situation shouldn't hurt so much. Instead of coddling me, she disagreed and told me that, given how open I am with students, I should expect nothing but to be hurt by what happened. Of course it would hurt, to leave myself vulnerable and to have my trust violated. She said that sooner or later, I needed to accept my experiencing hurt in this situation. She said also that I shouldn't question what I do because of this. That what I do with students is wonderful and so uniquely my gift to the world, that it'd be a shame to let this, or the pain that this causes me, to change any of that.

Elisa helped me see how when I am hurt, I can really pile it onto myself even more: that *I* add insults onto my injuries. That I rather tell myself that I am not good enough than to look at my pain honestly, and to let those close to me know that I am hurting so that they can support me. That instead of reacting to my pain with bravado or shame, I can submit to my experience, and be kind to myself. That as a mentor and teacher, I too can find grace in the support of the ground, and in the people around me.

Junior faculty support group

In last year's letter, I commented on the sustainability of DTR, and broadly on creating the kind of learning space that we have. My thoughts continued onto junior faculty, and on how the long-term sustainability of having good, dedicated faculty mentors that create

effective learning spaces for students requires us to do a better job of sustaining and advancing the wellbeing of our junior faculty.

This year, I made an attempt to support junior faculty by piloting and facilitating a junior faculty support group. There were 8 of us from 8 different institutions, and we met over five long sessions across 10 weeks (2-2.5 hours each), during which we shared and listened to our experiences on many facets of academic life. We also talked about our lives beyond our careers, and raised larger questions about how we wanted to be as academics, and as people.

I asked the junior faculty who attended to share their experience in the group, and how they felt it helped them. Here is what some of them had to say:

> Our support group was a source of both informational and emotional support for me. As a faculty in my first-year as an Assistant Professor with two children under two, it was a busy and at times quite stressful year. I was grateful to have a space to talk through challenging aspects of the job, such as how to work with disruptive students in the classroom, how to establish a mutually supportive relationship with PhD students, and how to deal with the disappointment of rejection. Doing this together with a cohort of other faculty in the field of human-computer interaction provided a shared identity, vocabulary, and set of experiences. It also helped us establish a willingness to be vulnerable in a way that I am still not in front of the colleagues in my own department. Our biweekly call was a source of comfort for me at times when I felt overwhelmed.

> Starting a new faculty position during a global pandemic was daunting. Everyone in our group was faced with challenges that the vast majority of our colleagues could not relate to (having established their labs and careers in the years prior). Having a distributed support group to talk about the unique struggles that impact our cohort was a major lifeline when stress was running high. Led by Haoqi, we had a place to talk about things going on in our lives (e.g., how to deal with students, department politics, work-life balance) with others uniquely qualified to understand. This was extremely helpful for my personal wellbeing and I am very grateful to have been able to participate.

> Our support group gave me community when I needed it the most. It was that perfect mix of "stranger on a train" and "others walking in your shoes" that allowed

me to share and open up in ways I couldn't do elsewhere. Our support group was disconnected from the politics and systems of my university, but the members of the group were also facing many of the same challenges as I. I needed to know that I wasn't alone in not just the situations and stresses of the job, but in how I reacted and felt about them. This wasn't an accident, but I feel one of the clear goals Haoqi had in forming this support group. Haoqi helped create an open and minimally structured space to enable this. He has an empathic ear, oftentimes able to "hear" between the lines and bring out the larger issue that was being alluded to.

It was great to hear about how others approach their teaching and to share methods and tactics to support our students best. The empathic atmosphere in the group helped me to open up and to talk about my own struggles as well. I was able to raise the problems I face and received valuable feedback to solve them. I am also very grateful for the kind exchange of teaching materials which already happened only some months after our first online encounters. All in all, it was a real pleasure to meet such nice and inspiring people with heart and soul for research and teaching. Many thanks for so openly sharing your experiences and all the inspiration! You gave me hope to carry on.

This support group was an enriching and safe space for me to reflect on my role as an assistant professor. A few weeks before the group began, I faced several changes and challenges in my professional and personal life. I was looking forward to teaching, researching, and serving. However, I never expected how complex and uncertain these jobs could be. I was frustrated with my daily progress and felt alone navigating this new career. For these reasons, this support group became a great source of advice, emotional support, and wisdom. It helped me realize that I was not alone and that others have also faced many of my challenges. This group gave me hope and confidence that I could do it, that I could be a successful professor.

I am glad to have created a space for junior faculty to express themselves, and to see their struggles through a different perspective, while having the full support of their peers. What really surprised me was the vulnerability within our group: both in people's willingness to share the difficult struggles they were having, and to listen intently to others sharing their struggles. It's heartwarming to see, and I look forward to running another group this fall.

An invitation: DTR's 10 year anniversary

DTR is turning 10 next year. We would love for you to celebrate this occasion with us all year long. If you are on your way to the Chicago area, don't hesitate to reach out to me, and to come visit us in studio on Friday afternoons. We welcome you.

We will also host an in-person 10-year anniversary celebration. DTR students, alums, and affiliated faculty: **please hold Friday, 5/31/2024 and the weekend, 6/1/2024 and 6/2/2024** for this. Mark your calendars, and start making plans to gather with us in Evanston.

For those less familiar with DTR but would like to learn more, I invite you to watch the DTR documentary, available at http://forward.movie. Faculty interested in learning more about what we do, and adapting our model for running your lab back home, should see Agile Research University (http://agileresearch.io) for resources and possible workshops and visits. I encourage you to also write me directly to let me know of your interest. That will help kick me into gear and improve our offerings.

Junior faculty interested in joining our support group this Fall can find more information at http://haoqizhang.com/group. Please apply to join soon; spots are limited.

This year, we had a record number of alums join us for our end-of-year dinner (photo below). We had students who were just graduating, and alums who had been in DTR since the very beginning. We shared stories, toasted and roasted our seniors, and enjoyed the evening by the Chicago lakefront. It was so wonderful to come together, and to see our community as strong as ever. I loved hearing from our alums that even after so many years, our community's spirit remains the same. It will continue to, and I invite you to come experience it for yourself.

Cheers,

Haoqi Zhang
Director and Founder, DTR
July 27th, 2023

Appendix: How we coach and teach design research

(Reproduced from the 2022 Annual Letter)

As this point, DTR has a fairly well-developed model for coaching and teaching design research. It's quite involved, but it is built on a few simple ideas that are useful for problem solving and coaching generally, that I will share below. These ideas build on work from Matt Easterday and Dan Rees Lewis, with whom I run the Delta Lab with; see their research for more on this topic.

To start, I think it's important to emphasize that our primary goal for DTR students is that *they* learn to self-direct complex work. It is not to provide students with solutions to complex problems so that the problems get solved. This orientation is important to understand and underlies how we work with students: we are trying to help them towards independence, and not with just getting their problem solved.

Specifically, then, at any point in the research process, we want students to be able to answer the following 2 questions:

1. What are the riskiest risks in my understanding right now?
2. What are effective ways to work through these risks to advance my understanding?

It's really hard to answer these questions without having:

1. Ways to represent and analyze what I know and don't know about the problem I am working on, and the solution space.
2. Effective representations and structures that I can use to figure out how to learn more about what I don't know, and to analyze and synthesize what I do know.

Our model for learning and coaching, then, provides students with the tools for representing their knowledge, assessing what is risky (what do I not know that is getting in the way of my understanding and solving this problem?), and thinking through what can be done to address the risks. In other words, we teach structures and representations for thinking about every aspect of the research and design process. Students learn these representations and use them to guide their thinking over risks and situations they encounter in their research process.

The key idea is that once these representations are mastered, a student is never stuck; they can assess where they are by noting what is known and what are the risks, and then use

(or come up with on-the-fly) a representation for guiding their thinking that will help them progress. This representation might, for example:

- help students synthesize their findings following a prototype test to reflect new learnings about their problem statement, design argument, interface/system arguments, and testing approach, which they can then use to plan the next test.

- help students recognize risks in their design argument prior to testing (e.g., outcomes that aren't measurable, user obstacles that are not overcome by the characteristics they propose to test), based on which to improve their design.

- help students distinguish their conceptual approach from existing approaches, so they can recognize gaps in their understanding of why existing approaches are ineffective for the class of problems they are studying.

And the list goes on and on and on…. because there are a lot representations and structures for thinking that are useful for doing research. The most effective representation to use depends on the particular situation that the student is facing, and of course, depends on the area of research, the type of research (e.g., a needfinding study, a novel system design), or even the medium of presentation (e.g., a talk, a paper, a grant proposal). *But the key idea is that these representations can be externalized and taught*, and that students can learn to use them while facing a wide range of situations they might encounter in the research process. Ultimately, what helps our students learn to self-direct their research projects is growing their ability to risk assess and to then effectively structure their thinking to make progress.

My guess is that all research mentors teach some version of this: after all, they themselves have structured ways of thinking they use to make effective research progress. But mentors often focus more on helping students solve whatever problem is arising than on teaching effective representations for thinking. What makes DTR special is that we teach representations for thinking explicitly, and infuse them into students' weekly practice and our way of coaching. Here is how it works:

- Students maintain a *research canvas*, which represents their current and changing state of knowledge about the problem and solution. Think of the research canvas as an (incomplete) model for what will eventually go into the research paper: students capture in it their understanding of the problem statement, their design argument, study design, findings, etc, all subject to change. In addition to providing a space for students to record what they know, the research canvas contains prompts that help students reason about what they don't know — based on which they can

identify risks (e.g., parts of their research they hadn't thought about in depth; arguments that don't quite line up or work as expected).

- Each week, as part of planning, students use their research canvas to assess their *riskiest risk*. Based on this they orient their sprint towards *deliverables* that address this risk. This might include testing a critical design argument (hypothesis) for which they yet have evidence for; designing an interview protocol that seeks to better understand obstacles users face than is currently understood; addressing a key weakness in argumentation in a paper draft, and so on.

- Through *LIP (Learn, Instruct, and Practice)* sessions during studio, students learn and practice using representations for assessing and addressing their risks with the help of their coaches (myself, and a couple of my senior PhD students who are learning to coach). The role of the coaches is to teach students the representations, and to *promote effective practice* using the representations. In other words, the coach focuses on helping students develop a practice for thinking through specific problems they face, guided by the structures provided in the representations they are learning.

- The various representations we teach (e.g., design argument, problem statement, interface model, approach trees, etc) for thinking through different aspects of the research problem are taught verbally (1-on-1), via workshops and office hours, and via a set of *learning modules* we provide for the students. Each learning module generally provides some guidance on how to use a representation and provides a few examples — just enough to get the student started. The rest of the learning happens through practice and coaching in LIP.

- LIPs are taught *mysore style*, modeled after the mysore-style practice in Ashtanga Yoga, which supports individualized self-practice and coaching within a community setting. In a typical LIP session, a mentor coaches 6-8 student teams in a one-hour period (we go for 2 hours, with half of the teams doing pair research while the other half is doing LIP). Students work at the board, with each team using whatever learning module or representation that they and their coach think may help them in their situation. The coach walks around the room to address any questions and to facilitate students learning to use the representations effectively. Once a student or team has a path forward, the coach leaves the student to practice on their own. At its core, despite the significant amount of coaching that happens during LIP, mysore is first and foremost a *self-practice* that helps students build a practice of their own.

Focusing student learning on representations and ways of thinking for assessing and addressing the risks that arise in their research, and promoting their practice thereof, is how we help students learn to self-direct complex work. This is not to say that we as mentors don't help students think through conceptual issues in their research, or share ideas for advancing their projects—far from it. But it is to say that we help students build a self-practice that allows them to effectively pursue research on their own. One of my most rewarding moments as a mentor is when a student comes up to me, tells me that they are stuck, and then I ask them what their risks are, and what representations they know for thinking through it—and they know exactly the risk and how to approach it. Having a process for how to proceed doesn't provide students with an immediate answer, nor guarantees one — but it helps students know how to move forward in their search, and how to search effectively. Ultimately, *our practice* is what gives our students the confidence to lead projects and to seek new knowledge and solutions. They practice a process for intelligently moving forward in the face of the unknown.

Four years in, this aspect of DTR's model has proven its worth by reducing students' reliance on mentors (more independence), promoting clarity and depth of thinking while surfacing risks sooner for discussion, and generally increasing students' abilities to identify risks and to address them. Still, our way of doing things is not easy:

- For students, facing project risks head-on by frequently externalizing their thinking about what they don't know on the whiteboard requires a tremendous amount of courage and vulnerability, as does receiving coaching on how *they* are thinking about the problem. This is the "sharing" that I discussed earlier: making the private public. And since we are always working on what we know the least about each week (our riskiest risk), there is a certain tenderness in such sharing.

- For mentors, coaching multiple students and projects in LIP simultaneously is a real mind exercise. Having standardized representations through learning modules is essential, as they provide structured windows into the students' thinking that mentors can readily follow and analyze. But still, to truly understand how each student is thinking, and to identify ways of practicing that are helpfully tailored for each and every student, to their particular needs and where they'd like to focus each week, takes a lot of mind and practice. As a mentor, I still find it hard to leave LIP feeling fresh.

I have no intention of moving away from our model for learning and coaching design research anytime soon, but it is important to acknowledge just how hard it is, and how

much commitment it takes from everyone. And this makes sense: what we have is a model for deliberate practice in design research, no more and no less. Deliberate practice is effortful in nature. Luckily, DTR provides a wonderful environment in which to apply good effort, making such practice a good fit for our culture.

I will share more reflections about our model for learning and coaching design research in the years to come. So far, so good.