Effective Interdisciplinarity is like Alchemy

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This paper describes a theoretical framework for conducting design research with students based on early anecdotal evidence from an academic design research team that weaves a strengths-based approach to developing self-knowledge into an open-ended and non-hierarchical project investigation environment that explores inherently interdisciplinary 'wicked' problems. Key factors in this approach include:

- **encouraging students' self-knowledge using a legible system that increases comprehension of individual strengths,**
- **collectively examining the interrelationship of strengths across the cohort to understand where the team is likely to function with ease,**
- **continuous assessment with a growth or progression mindset by both peers and faculty,**
- **and a non-hierarchical structure in which students co-design the investigative or learning tactics and can shape project goals.**

The benefits of this approach are likely derived from its ability to increase self-efficacy and social connection in highly trusting group work settings where psychological safety is paramount and continuous growth-oriented assessment places value on process as well as product. Weaving this approach into architectural research and studio pedagogy will likely not only produce more resilient interdisciplinary-minded professionals ready to tackle complex contemporary issues such as climate change and social injustice in collaborative settings but also make architecture school a more responsive and inclusive place that welcomes inputs from a more diverse array of aspirants, not only those who arrive with the requisite resources and devotion to succeed in prevailing architecture culture in hand.

One of the treasures of the COVID era is abundant access to free online lectures, webinars, symposiums, workshops, panel discussions and so on hosted by organizations around the world. These events can now be attended in real time, every day of the week. At the University of Wisconsin – Milwaukee (UWM), our chair maintains an up to date and highly comprehensive list of these events that is emailed to the school community on a monthly basis. Scanning this monthly email has now taken the place of standing in front of the wall of lecture posters located just outside the School of Architecture + Urban Planning (SARUP) Media Lab. Most schools have such a wall – that collects and advertises events and programming worldwide in the juicy architectural accent colors of the moment. The monthly email is a stripped-down list, in contrast, but inspires an equally tantalizing daydream imagining what it would be like to listen to every one of these conversations. The COVID-19 pandemic, which has thrust us all online, renders this bookish daydream suddenly and entirely possible.

Feelings of urgency around the major global crises we collectively face amplify the desire to be everywhere, to surround and equip one's self with all contemporary thinkers and thoughts on the topics that present existential threat: ongoing environmental catastrophe, violent injustice towards Black[1] people, the COVID-19 pandemic that is slamming school doors shut as I type these words a few days ahead of the Thanksgiving recess in the United States. Many online event offerings orbit these questions. The horsemen of this "moment of convergent crisis"[2] are deeply entangled and therefore often confronted simultaneously. The Design as Protest Collective has been organizing regular national calls, in addition to running committees on youth advocacy, direct action and gathering commitments from individuals and institutions to its list of "Design Justice Demands."[3] The Yale Mental Health Symposium explored ways that the built environment both perpetuates stigmatization of mental health in the environment and the way that "the global pandemic and momentum of the Black Lives Matter movement have amplified the need to consider the intersection of racial and economic inequality with mental health."[4] One particularly loaded evening (October 15, 2020) a panel at the New York Review of Architecture probed the urgencies of public architecture education[5] at the same time that US Architects Declare was declaring action on the climate, justice and biodiversity emergency we face.[6] The intensity and frequency of these events feels appropriate to the moment. A lot of people in the world of architecture are gathering on a regular basis to talk with sincerity and care about very important matters

including our ability to begin learning how to practice architecture in a way that contributes to the collective healing that the threat of this moment obviously demands.

However, there is a certain question type that often arises in the discussion periods that follow these sessions. Just as the panel concludes, participants and audience alike breathless with care, the moderated Zoom Q+A box pings with: "Wow, these are all amazing ideas – but how will we ever convince our clients to pay for [solar panels / public education / advanced energy monitoring / research / it]?" This reasonable question often comes from a practicing architect. Equally reasonable is the usual inability of panelists to answer the question directly, with tactical suggestions that the askers seek. At present, we are partially equipped and growing in our ability to scope the challenges that we face – architects are excellent, if chronically underfunded, at articulating physical, social and systemic conditions as we find them.

The question itself also reveals what may be missing, earlier in the experience of the askers and perhaps also the respondents. If basic architecture education provided students the opportunity to learn the skills necessary to engage in innovative (often divergent) thinking and work effectively in groups across domains, I think we would see the appearance of the question wane and respondents' ability to offer accessible tactics in response rise. To grapple, together with colleagues from many knowledge domains, with the unthinkably huge and entangled existential threats we now face, architects must experience more explicit education in interdisciplinary collaboration. Architects must be able 'go off script' into unfamiliar territory with enough trust in colleagues to do this continuously and collectively over long periods of time. Weaving these eminently teachable skills into architectural research + studio pedagogy, I further propose, will be likely not only to produce more resilient interdisciplinary-minded professionals ready to tackle 'wicked problems' but also make architecture school a more responsive and inclusive place that welcomes inputs from a more diverse array of aspirants, not only those who arrive with the requisite resources and devotion to succeed in prevailing architecture culture in hand.

A SELF-EFFICACY + PSYCHOLOGICAL SAFETY HYPOTHESIS

This paper describes a theoretical framework for conducting design research with students based on early anecdotal evidence from an academic design research team that weaves a strengths-based approach to developing self-knowledge into an open-ended and non-hierarchical project investigation environment that explores inherently interdisciplinary 'wicked' problems. Key factors in this approach include:

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- and a non-hierarchical structure in which students co-design the investigative or learning tactics and can shape project goals.

This approach is evolving in the aging + environment-focused Phase III design research team at UWM-SARUP in collaboration with organizational dynamics expert, Adam Seaman,[7] and in the elective design research studio I am currently teaching with a group of undergraduate and graduate students on the topic of person-centered design with people who experience traditionally pathologized vulnerabilities. Both settings engage students in group work with professionals from outside of architecture and have the goal of developing person-centered design processes and projects. The emergent hypothesis is that this approach has the effect of increasing student perceptions of self-efficacy and rapidly cultivating psychological safety and trust among group members. When students experience feelings of self-efficacy and form trusting bonds with teammates, they will perceive the learning environment as less stressful, perform more effectively in teams, develop the capacity to work adaptively in interdisciplinary settings, be more productive, demonstrate increased openness to difference and achieve higher GPA performance.[8, 9, 10, 11, 12, 13, 14] One will note that these skills are not domain specific – they do not have to do with teaching the usual content contained in architecture course syllabi. That is because this approach, rooted in easily teachable positive psychology and character-strength concepts, aims to provide students with something more like a compass than a roadmap: an internalized set of reliable tools for confidently navigating any problem space rather than a context-dependent method reliant on responding to observed conditions alone. Architects with the opportunity to learn this skill set alongside other architectural knowledge will be more resilient, able to operate under ambiguous circumstances and open to working harmoniously with colleagues in a variety of knowledge domains – all of which are essential to both the sustainability of an individual's career and architecture's ability to operate meaningfully in the future we all face.

Finally, there are important alignments between the key factors involved in this approach and the principles of practice that BIPOC-led organizations such as Design as Protest, Dark Matter University and BlackSpace are advancing to make architecture inclusive.[15, 16, 17] These alignments hint at the potential that this pedagogical approach could have in supporting the transformation of architecture education and practice being led by these organizations.

ARCHITECTURE STUDIO AS TESTING GROUNDS

Martin Seligman, one of the pioneers of the positive psychology movement that began in the early 1990s, and his co-authors advocate for teaching well-being in schools as a way to enhance satisfaction, creativity and achievement. The three elements of well-being that are both measurable and teachable, he claims, are: positive emotion, a state of flow and access to a sense of meaning or purpose. "From a positive psychology perspective," he says, "meaning consists in knowing what your highest strengths are, and then using them to belong to and serve something you believe is larger than the self."[18] He also argues that school, not home, is the best place to teach a framework of well-being due to the sheer amount of time students spend in the classroom. Finally, teaching well-being rooted in a strengths-based approach need not displace any courses because it is effective when woven into existing curriculum.[19] Strengths-based positive psychology techniques are being shown to enhance learning outcomes in a variety of educational settings,[20, 21] but have not yet been studied in the context of architecture school.

Architecture students are likely to spend so much time in studio courses alone that they neglect other areas of life including sleep, proper diet, exercise and social connections outside of architecture.[22] A 2010 study shows that architecture students were consistently found to spend greater than 40 hours per week on studio and other coursework and average less than five and a half hours of sleep a night.[23] Studio is both where architecture students spend most of their time and where they confront complex, open-ended problems that do not have objectively correct solutions. This inherent ambiguity in the studio setting, even when not explicitly interdisciplinary, gives architecture students an advantage when confronting the challenges of interdisciplinary work, which usually entails engagement with information from areas outside of own's own expertise. The overwhelming stress that is commonplace is studio, however, places students at a disadvantage in their ability to access balanced and thriving levels of learning and teamwork. Although this paper describes the emergence of an approach in a small extracurricular design research team, future work will focus on the ways that this approach can be deployed in larger studios to maximize the effects of reducing stress, developing resilience, enhancing performance and cultivating interdisciplinary teamwork capacity in larger cohorts of students at various levels of degree progress.

IMPLEMENTING A STRENGTHS-BASED APPROACH

The key factors in implementing a strengths-based approach in groups of students working collaboratively in an interdisciplinary setting are engaging in strengths-based assessment and feedback, exploring the influence of individual strengths on the team dynamic, providing continuous progress-oriented (not perfection-oriented) feedback that values the process as well as product, resisting traditional forms of hierarchy between faculty and student and approaching project work using methods that can be clearly articulated regardless of team members' primary knowledge domains. This non-domain-specific approach increases self-efficacy and trust, leading to a myriad of benefits to both the individuals involved and the outcomes of the collaborative work. Like the fabled philosopher's stone in alchemy that turns any base metal into gold, this process transforms both the experience of working in interdisciplinary teams on complex, ambiguous problems and the capacity of the team to nimbly prototype solutions. It is a catalyst for innovation, not the innovation itself.

Implementing a strengths-based approach to collaborative work requires an easily understandable system for assessing individual strengths, that is, the characteristics or talents each person brings to the table regardless of prior training. Various tools for assessing, teaching and understanding strengths exist: some examples include the VIA Survey of Character Strengths,[24] Gallup StrengthsFinder,[25] and Myers-Briggs Type Indicator[26] (which has been used in a previous study to form collaborative groups in an architecture studio setting).[27] In the description that follows, we used the Gallup StrengthsFinder.

During Summer 2020, organizational dynamics expert Adam Seaman and I ran a series of five strengths-based workshops with the Phase III design research group at UWM-SARUP, concurrent with the group's work to advance processes for advancing person-centered care in the design of the physical environment for older adults. This team engages the fields of gerontology, healthcare administration, community-engagement, machine learning and linguistics as a routine part of its project development. The workshops took place online every other Friday morning over 11 weeks and lasted for 1.5 - 2 hours in duration. For context, the group met to collaborate on direct project-related content for 4.5 hours per week which does not include additional time that students spent outside meetings working on projects.

First, all team members including faculty leaders took the StrengthsFinder assessment online: this consists of 177 statement pairs from which the test taker has 20 seconds to choose and results in a ranking of 34 themes, or natural talents that can be developed into strengths. Strengths are "tendencies that are unique to each individual but [can] be developed into strength with practice."[28] When team members understand the talents they possess before embarking on a complex problem, they have a toolset that is independent of the challenge at hand for navigating difficulty and understanding personal growth, or learning, even if the problem is not solved in a traditionally satisfactory way. Put another way, building a foundation based on innate strengths detaches achievement from traditional outcomes and supports risk tasking - another requirement for real innovation and an important component of psychological safety in teams.[29] The first workshop we conducted this summer laid this foundation, by sharing each team member's Top 5 strengths and then discussing each one in an

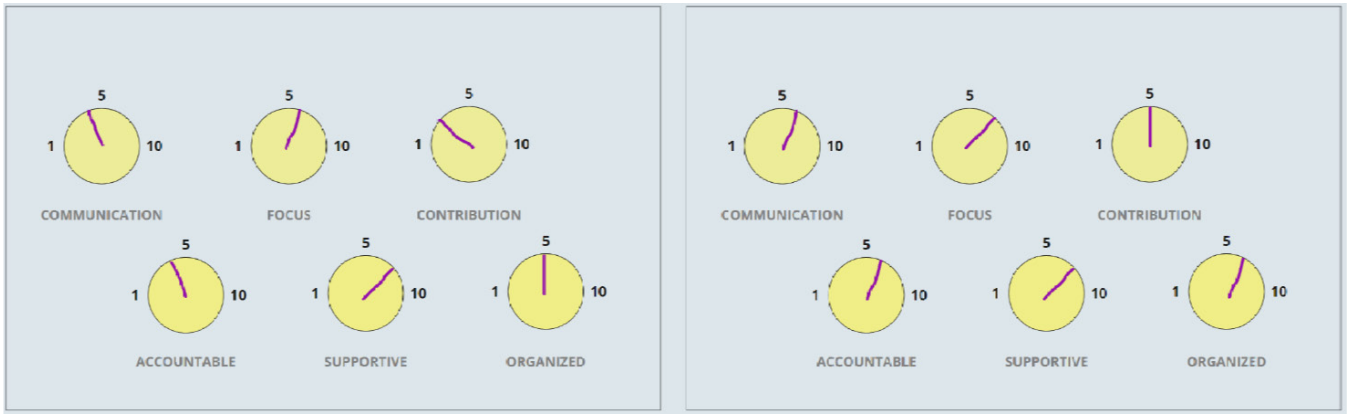

Figure 1. Iterative performance evaluation for a student researcher using the first 'dial system' continuous assessment prototype. Trudy Watt.

open format to explore the attributes of each strength and notice where strength similarities, contrasts and complements exist among team members.

The following workshops focused on developing individual strengths knowledge gained in the first workshop into relational strengths knowledge among teammates. The beneficial common language[30] provided by the StrengthsFinder themes made conversation about likely strategies for success and likely pitfalls easier. It also continues to provide a strong basis for providing positive feedback – shown to be more effective than negative feedback in student perceptions of learning [31] - framed in individual and team tendencies. Feedback from students indicates that the strong tendency of team members to remain highly engaged with the Phase III team regardless of incentive may point to the high level of social connection, trust and learning that this research setting provides. One of the limitations of this paper, however, is the anecdotal nature of these observations which should be followed by more formal study.

Two additional elements that appear to be supportive of sustaining the positive effects of this strengths-based approach are: 1) actively eroding the traditional faculty-student hierarchy and 2) providing continuous growth-oriented assessment. In Phase III, we do this by maintaining transparency, openly sharing successes and failures and using a continuously updated 'dial system' (Figure 1) for gauging both individual and collective performance. This dial system has also recently been expanded into a more complex system of continuous assessment (Figure 2) that is showing promise in an upper level undergraduate and graduate elective studio focused on person-centered design for traditionally pathologized vulnerabilities. Using this system, we visualize the fluid nature of the various components of success and understand that high achievement is not identical with perfection. The literature agrees that teaching interdisciplinary collaboration to enhance student strength (fluency) will look more like a partnership than a typical academic hierarchy.[32] It also confirms that continuous assessment of collaborative groups positively contributes to performance and aligns with student preference.[33]

FUTURE CAREERS WILL REQUIRE RADICAL COLLABORATION SKILLS

One reason that teaching the skills of radical interdisciplinary collaboration is so important is because new professional opportunities are arising in the interstices between architecture and other fields such as business and medicine. The invention of entirely new practice areas and professions that marry design and higher earning professions like business and medicine may be more likely to produce more financially sustainable careers that justify the high cost of design education, licensure and professional activity. There are suitors at the door.

As an example - beginning in 2014, Thomas Jefferson University's Sidney Kimmel Medical College (SKMC) supported two distinct design programs embedded in medical curriculum: the "College Within a College Design Track" (which became JeffDesign and is now known as the Health Design Lab) and MEDstudio@JEFF (no longer active), led by Bon S Ku, MD and Peter Lloyd Jones, PhD, respectively. As then SKMC Dean Mark Tykocinski put it in a 2015 alumni bulletin that announces the near simultaneous emergence of both programs, "Cross cutting knowledge domains and higher-order thinking skills will be what distinguishes the physician of the 21st century. Design thinking is one of those foundational elements that offers a route for purposefully cultivating creativity."[34] Although MEDstudio@JEFF is no longer active and the Health Design Lab has grown into the established design-integration program at Jefferson, assuming the mantle of the "first co-curricular design thinking program at a US medical school,"[35] the fact that there was a multi-year period of time that an academic medical center supported two nascent health and design entities marks an important moment in the way design pedagogy is valued – and designers should take note. Interest in integrating health and design in this way has only grown

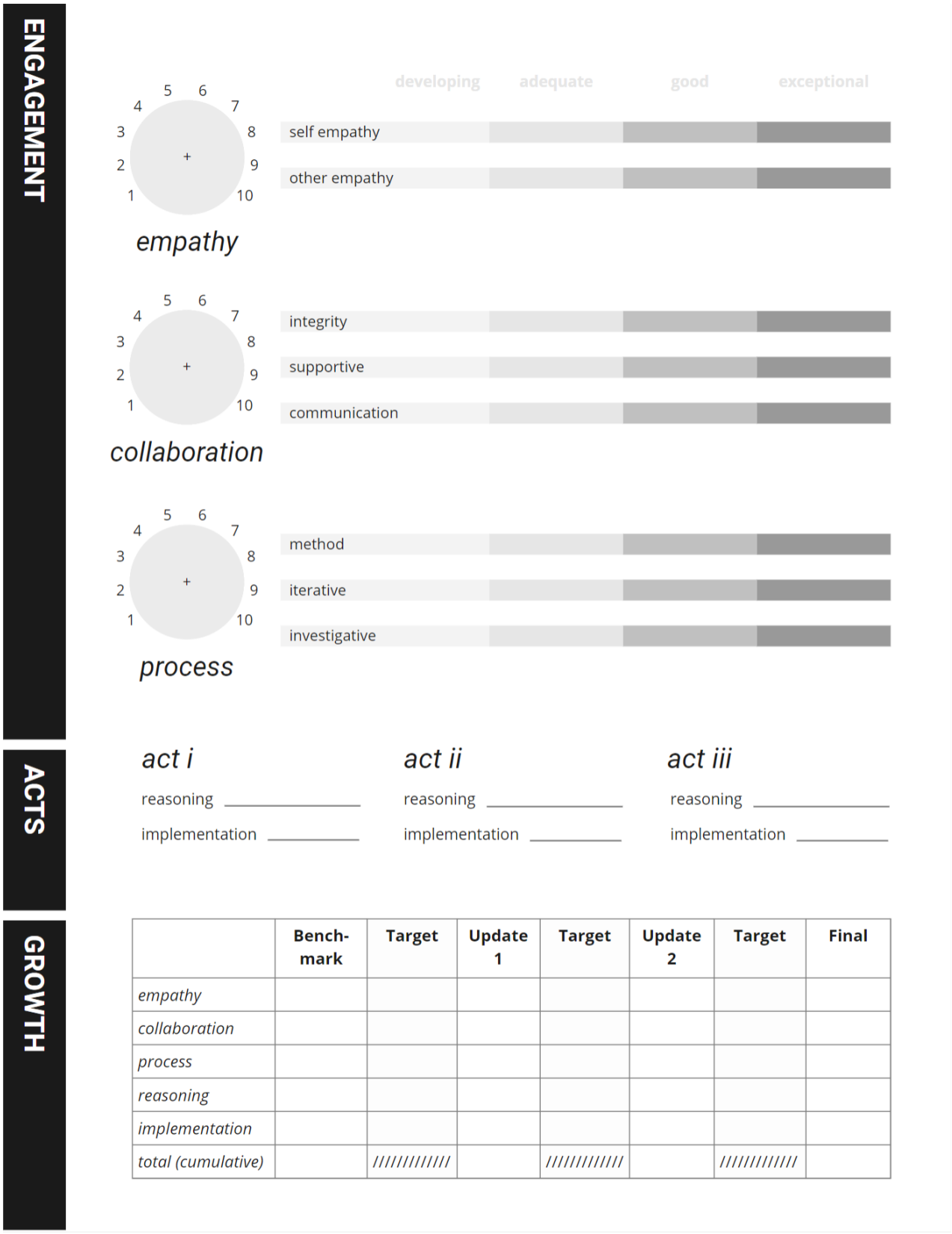

Figure 2. The most recent evolution of the growth-based dial system for continuous assessment used in an elective studio. Trudy Watt.

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in recent years as evidenced by the rapidly growing body of literature since 2009 that explore the role of design thinking in medical education,[36] proliferation of medical education programs that teach it (UCSF, JEFF, Penn State, UT-Austin Design Institute for Health) and publications such as the co-authored Health Design Thinking.[37] Interesting, too, is the relative lack of designers in positions of leadership among these emerging design entities – most are led by MDs. Just as these leaders in medicine initiated a re-imagining of medical education that integrates the complex problem-solving power of the design process to train more resilient and creative medical professionals so too must design educators re-imagine our training methods to train canny, self-confident and powerfully collaborative design professionals capable of taking a seat at the table. If architectural educators do not make space in design curriculums and pedagogies to explicitly train students in the skills of interdisciplinary collaboration, an opportunity for abundant growth and access to financially sustainable careers in our field will pass. Design thinking, so wonderfully accessible to all, will make sure of it. On the other hand, when we can integrate these practices into our teaching meaningfully, an array of new professions at the intersection of medicine and design await the graduates of our degree programs.

CHALLENGES

The strengths-based approach to teaching studio and interdisciplinary experiential learning courses across knowledge domains described in this paper will likely face several challenges to implementation, especially a strong sense of contrast to the prevailing charismatic mode of teaching architecture. The "charismatic mode" of teaching, which Joan Ockman also refers to as the "guru method" involves students absorbing the cultural capital of a studio critic by means of repeated imitation.[38, 39] In other words, practicing the building design process under a varying set of studio masters (often white men[40]) whose performance evaluation criteria vary widely from one to the next and often privilege the product on review day over all aspects of process. Although there are advantages to teaching this way, it frequently leaves students confused about 'what their professors want.' Adherence to this method of teaching will also continue to discourage many BIPOC students from entering the field due to a lack of representative studio leaders, representation known to be one of the most highly correlated factors contributing to well-being and achievement across professions.[41] Although it may appear beside the point, the strengths-based pedagogy under development described here promises to increase self-efficacy and social connection, facilitate fluency in interdisciplinary group work and make architecture school if not easier, a bit less stressful. It may also aid in the creation of new, better-compensated careers at the interstice between current knowledge domains. These will be welcome changes for many, especially those who have been excluded on the basis of lacking the resources to cope with the overwhelming demands architecture schools place on students.

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