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Wilde, Danielle

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Design Research Education and Global Concerns

Danielle Wilde

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DANIELLE WILDE

Department of Design and Communication,
University of Southern Denmark, Denmark
(corresponding author)

d@daniellewilde.com

Abstract

If the ecosystems that we are part of and rely on are to flourish, we must urgently transform how we live, and how we imagine living. Design education has a critical role to play in this transformation, as design is a materially engaged, world-building activity. Design is complicit in the problems we are facing, and informs and shapes how people live. In this article, I seed ideas about design research education for global challenges. I speak to the merits of post-disciplinary and hybrid strategies, and look to science for clues about how to respond to twenty-first-century challenges through design. I posit sustainability brokering as a new pathway for design, and anticipating alternative futures as a critical step in developing transformative innovation. I then propose participatory research through design as a foundational methodology; describe four pillars of practice to scaffold sophisticated research at undergraduate and master's level; and lay out a work plan for building research capacity in a doctoral school. Through this process, I articulate core skills that design researchers will likely require if they are to contribute to global challenges constructively. My aim is to seed fruitful regenerative discussion with these propositions.

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<https://doi.org/10.1016/j.sheji.2020.05.003>

- 1 IPCC, "Global Warming of 1.5°C," special report from IPCC, 2018, accessed May 18, 2020, <http://www.ipcc.ch/report/sr15/>; IPCC, "Special Report on Climate Change and Land," special report from IPCC, 2020, accessed May 18, 2020, <https://www.ipcc.ch/srcl/>; IPBES, "Introducing IPBES' 2019 Global Assessment Report on Biodiversity and Ecosystem Services," The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, May 2019, accessed May 18, 2020, <https://www.ipbes.net/news/ipbes-global-assessment-preview>; Walter Willett et al., "Food in the Anthropocene: The EAT–Lancet Commission on Healthy Diets from Sustainable Food Systems," *The Lancet* 393, no. 10170 (2019): 447–92, DOI: [https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4); Independent Group of Scientists appointed by the Secretary-General, *Global Sustainable Development Report 2019: The Future Is Now — Science for Achieving Sustainable Development* (New York: United Nations, 2019), <http://sustainabledevelopment.un.org>.
- 2 Christiana Figueres and Tom Rivett-Carnac, *The Future We Choose: Surviving the Climate Crisis* (London, UK: Manilla Press, 2020); Ann Light, Irina Shklovski, and Alison Powell, "Design for Existential Crisis," in *CHI Conference Extended Abstracts on Human Factors in Computing Systems* (New York: ACM, 2017), 722–34, <https://doi.org/10.1145/3027063.3052760>; Arturo Escobar, *Designs for the Pluriverse: Radical Interdependence, Autonomy, and the Making of Worlds* (Durham, NC: Duke University Press, 2018).
- 3 Victor Papanek, *Design for the Real World: Human Ecology and Social Change* (Thames and Hudson London, 1972).
- 4 Tomás Maldonado, *Design, Nature, and Revolution: Toward a Critical Ecology* (Minneapolis, MN: University of Minnesota Press, 2019 [1972]); Papanek, *Design for the Real World*; Thomas T. K. Zeung, ed., *Buckminster Fuller: Anthology for the New Millennium* (New York: Macmillan, 2001); Tony Fry, *A New Design Philosophy: An Introduction to Defuturing* (Sydney: UNSW Press, 1999); Tony Fry, *Design Futuring: Sustainability Ethics and New Practice* (Sydney: UNSW Press, 2009), 71–77; Tony Fry, *Design as Politics* (Oxford: Berg Publishers, 2010); Ezio Manzini, *Design, When Everybody Designs: An Introduction to Design for Social Innovation* (Cambridge, MA: MIT Press, 2015); Light et al., "Design for Existential Crisis"; Escobar, *Designs for the Pluriverse*.
- 5 Melissa Leach et al., "Transforming Innovation for Sustainability," *Ecology and Society* 17, no. 2 (2012): 11, DOI: <https://doi.org/10.5751/ES-04933-170211>.

Introduction

With increasing urgency, global and intergovernmental reports inform us that we must transform how we live if human society and the planetary ecosystem that we are both part of and rely on are to flourish.¹ Such transformation requires radical shifts in the beliefs, attitudes, values, and systems that guide, shape, and constrain our behaviors. It requires culture change, in society broadly, but also in design education, as design shapes our world. Humans—impactful species that we are—must become more mindful of how intertwined we are with nature, and with each other across the globe, and the broad-reaching impact of our situated (material, social, cultural, political, and ecological) practices. We need to make room for more diverse stories—a plurality of experiences and perspectives—and start choosing vibrant, regenerative futures that consider diverse, more-than-human concerns.² Design education is necessarily a part of this transformation. Design and designers have contributed in profound ways to the problems we face, and continue to shape our world. For design to contribute constructively, design education must be continually renewed. Rather than "teaching skills related to processes and working methods of an age that has ended,"³ we need to teach for the inherent instability of the circumstances at hand. We need to equip designers to respond not only to urgent crises such as COVID-19, climate change, ecosystem collapse, social and environmental injustices, war, mass migration, poverty, food scarcity, and more; but also to as-yet-unknown possibilities. This is not a new story. For decades, Tomás Maldonado, Victor Papanek, Buckminster Fuller, Tony Fry, Ezio Manzini, Ann Light and her colleagues, Eli Blevins, Arturo Escobar, and more have been telling this story.⁴ And yet, it still urgently requires our attentiveness and care.

In this article, I focus on design research education for global challenges. I make a series of propositions: taking a post-disciplinary approach, using hybrid strategies, and looking to science and creativity for clues about how design research education might become fit for twenty-first-century challenges. I posit sustainability brokering—a proposition of resilience and sustainability studies to transform innovation for sustainability⁵—as a new pathway for design. From this vantage point, I outline the value of anticipation if we want to develop radically different ways of living—more sustainable, nourishing, and regenerative. I then lay out the practices and principles that guide my design research pedagogy. I describe a participatory, applied action-reflection approach to research-through-design plus four pillars of practice that I find essential for designers to contribute to transformational innovation. These can scaffold sophisticated research at the undergraduate and master's level. I then describe a work plan for building research capacity in an art and design doctoral school. This process results in a list of core skills that (I believe) design researchers require if they are to contribute to global challenges constructively.

The ideas I present are not new. However, I find that they are not always successfully disseminated or assimilated into practice, and when introduced to fledgling design researchers, these approaches often prove game-changers. Further, my understanding of their value has become more pointed during the COVID-19 pandemic (unfolding as I write), as design students

- 6 John Dewey, *Art as Experience* (New York: Penguin Group, 2005); John Dewey, "Democracy in Education," *The Elementary School Teacher* 4, no. 4 (1903): 193–204, available at <https://www.journals.uchicago.edu/doi/pdfplus/10.1086/453309>; John Dewey, *The Public and Its Problems: An Essay in Political Inquiry* (New York: Holt, 1927).
- 7 Jane Addams, *Democracy and Social Ethics* (Chicago: University of Illinois Press, 2002).
- 8 George Herbert Mead, *Mind, Self and Society*, vol. 111 (Chicago: University of Chicago Press, 1934).
- 9 Paulo Freire, *Pedagogy of the Oppressed*, trans. Myra Bergman Macedo (New York: Bloomsbury Academic, 2000), 36.
- 10 Jutta Weber, "From Science and Technology to Feminist Technoscience," in *Handbook of Gender and Women's Studies*, ed. Kathy Davis, Mary Evans, and Judith Lorber (London: Sage Publication, 2006), 397–414; Astrida Neimanis, Cecilia Åsberg, and Johan Hedrén, "Four Problems, Four Directions for Environmental Humanities: Toward Critical Posthumanities for the Anthropocene," *Ethics & the Environment* 20, no. 1 (2015): 67–97, DOI: <https://doi.org/10.2979/ethicsenviro.20.1.67>; Maria Puig de la Bellacasa, *Matters of Care, Speculative Ethics in More Than Human Worlds* (Minneapolis, MN: University of Minnesota Press, 2017).
- 11 Nina Lykke, *Feminist Studies: A Guide to Intersectional Theory, Methodology and Writing* (New York: Routledge, 2011), 18.
- 12 Donna Jeanne Haraway, *The Haraway Reader* (New York: Routledge, 2004), 335.
- 13 Lykke, *Feminist Studies*, 19.

and researchers lose access to the workshops and facilities integral to our practice. I hope that juxtaposing and articulating them from my particular perspective serves to refresh them, and thereby bring them in new ways to the consideration of the design community.

As a design researcher and educator, my praxis is informed by American pragmatism—Dewey's active inquiry, expansive aesthetics, and problem-centered pedagogy;⁶ Jane Addams's pragmatism in action: relationality, contextualization, diversity, and ethics of care;⁷ George Herbert Mead's perspectives on relations between self and community.⁸ It also leans on Brazilian educator and philosopher Paolo Freire's commitment to praxis as theory in action—combining creative reflection and thoughtful action to transform the world;⁹ and feminist philosophies—a critical commitment to self-reflexivity, contextuality of knowledge, and (more-than-human) empowerment.¹⁰ My stance is research-oriented and practically informed. I teach and supervise into second and third cycle (master's and PhD) design research programs in Scandinavia and elsewhere, and make occasional forays into undergraduate education, using the same research-oriented methods. My primary areas of expertise are embodied design, and participatory, speculative, and critical research-through-design. I have an unconventional education—I transitioned from professional practice into a design master's program; I hold a PhD but do not have an undergraduate degree. My professional experience includes live art, working with food and developing policy advice. From these divergent perspectives, I reflect on what research-oriented design students might expect of the academy, what the world might need from design, and thus what I, as a design research educator need to deliver. I begin with post-disciplinarity.

Post-Disciplinarity

Feminist studies scholar Nina Lykke explains that while her field can be interpreted as an independent field of knowledge production, it "should claim its innovative force and academic authority in contrast to traditional disciplinarily specialized ways of organizing scholarly knowledge;" and "keep alive the tension that is embedded in defining itself both as a field of knowledge production in its own right and as a field characterized by a total openness to transversal dialogues, crossing all disciplinary boundaries."¹¹ This double stance is what makes Feminist Studies a post-disciplinary discipline (or post-discipline). I suggest her reasoning can be applied word for word to design research, to the benefit of the field. From this perspective, design research renegotiates not only the content of science and knowledge production, but also what Donna Haraway calls its thinking technologies,¹² including its

"modes of working and organizing, critically posing questions such as, 'What kind of phenomena are science and scholarly knowledge production? How should they be carried out to reach good results? What is a good result? What does it mean to work and write in a scholarly way? Which kinds of organizational structures give the optimal basis for reaching good results?'"¹³

- 14 Doreen Massey, "Negotiating Disciplinary Boundaries," *Current Sociology* 47, no. 4 (1999): 5–12, DOI: <https://doi.org/10.1177/0011392199047004003>; Stephen Edelston Toulmin, *Return to Reason* (Cambridge, MA: Harvard University Press, 2009); Tomas Hellström, Merle Jacob, and Søren Barlebo Wenneberg, "The 'Discipline' of Post-Academic Science: Reconstructing the Paradigmatic Foundations of a Virtual Research Institute," *Science and Public Policy* 30, no. 4 (2003): 251–60, DOI: <https://doi.org/10.3152/147154303781780407>.
- 15 Alan Blackwell et al., "Creating Value across Boundaries: Maximising the Return from Interdisciplinary Innovation" (research report, UK National Endowment for Science, Technology and the Arts, 2010), https://media.nesta.org.uk/documents/creating_value_across_boundaries.pdf.
- 16 Michael Gibbons, *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies* (London: Sage, 1994).
- 17 Tim Coles, C. Michael Hall, and David Timothy Duval, "Tourism and Post-Disciplinary Enquiry," *Current Issues in Tourism* 9, no. 4–5 (2006): 293–319, DOI: <https://doi.org/10.2167/cit3270>.
- 18 Michael W. Meyer and Don Norman, "Changing Design Education for the 21st Century," *She Ji: The Journal of Design, Economics, and Innovation* 6, no. 1 (2020): 18, DOI: <https://doi.org/10.1016/j.sheji.2019.12.002>.
- 19 Johan Rockström et al., "A Safe Operating Space for Humanity," *Nature* 461, no. 7263 (2009): 472, DOI: <https://doi.org/10.1038/461472a>.
- 20 Leach et al., "Transforming Innovation for Sustainability," 11; Will Steffen et al., "Planetary Boundaries: Guiding Human Development on a Changing Planet," *Science* 347, no. 6223 (2015): 1259855, DOI: <https://doi.org/10.1126/science.1259855>.
- 21 John M. Drake and Blaine D. Griffen, "Early Warning Signals of Extinction in Deteriorating Environments," *Nature* 467, no. 7314 (2010): 456, DOI: <https://doi.org/10.1038/nature09389>; IPCC, "Global Warming of 1.5°C"; Wenyuan Fan et al., "Stormquakes," *Geophysical Research Letters* 46, no. 22 (2019): 12909–18, DOI: <https://doi.org/10.1029/2019GL084217>.
- 22 IPCC, "Global Warming of 1.5°C."
- 23 The other three are performance challenges, systemic challenges, and contextual challenges. See Ken Friedman, "Design Education Today—Challenges, Opportunities, Failures," *Academia*, October 3, 2019, <https://www.academia.edu/40519668>.
- 24 Meyer and Norman, "Changing Design Education," 16.

A post-disciplinary stance recognizes that in many contexts, clear-cut categories and separation of disciplines is no longer useful or viable. Indeed, when disciplinary concerns dominate, salient issues may be rendered invisible.¹⁴ So while disciplines per se are not abandoned, a post-disciplinary researcher tries to remain vigilant to their limitations, and in doing so, test their boundaries and contribute to their growth. This approach runs counter to the interdisciplinary approach to innovation that brings together knowledge from different research disciplines to generate ideas.¹⁵ It offers an emergent and responsive approach to complex, contemporary issues in ways that transgress disciplinary—and other siloed—ways of thinking. When taking a post-disciplinary approach to applied research, knowledge emerges from the context of application with "distinct theoretical structures, research methods and modes of practice which may not be locatable on the prevailing disciplinary map."¹⁶ This stance enables researchers to respond to the situated concerns at hand. Post-disciplinarity is routine in public and private sector consultancy, for example in the service industries.¹⁷ Bringing this mindset into a university structure enables researchers, educators, and students to bring divergent perspectives to a context of concern, converge existing approaches, and invent new ones in response to emergent issues.

Design research is at once multifaceted, theoretically engaged, and applied. These characteristics position it ideally to embrace post-disciplinarity as a pathway to move beyond siloed understandings of problems, and co-create, with stakeholders, radically new ways of responding to challenges and concerns. When designers understand "how to use the specialized knowledge of all the different disciplines involved in [a] task in a way that best produces a positive outcome"¹⁸ they can support themselves, their team, and others to reinvigorate how we approach wicked problems and grand societal challenges. A post-disciplinary stance can assist designers in evolving their practice and step up to challenges in ways that are at once empowered and empowering.

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Takeaway: Skill in post-disciplinary practice will benefit designers who wish to engage with wicked problems and global challenges.

The Grandest Challenge?

In 2009, Johan Rockström and his colleagues¹⁹ identified nine planetary boundaries, beyond which we risk triggering earth system tipping points, uncontrollable ecosystem feedback loops, and an unsafe operating space for humans. We have long transgressed several of these global thresholds,²⁰ and as a result are experiencing more extreme and complex weather events and accelerating species extinctions.²¹ With business as usual, we might expect increasingly catastrophic outcomes.²² This problem is a global challenge—one of four challenges for design education identified by Ken Friedman²³—and is currently not well covered by design education.²⁴ And yet, it touches every material interaction that humans enact. To take a single, potent example: the human food system pressures all nine planetary boundaries and affects all seventeen of the UN World Sustainability

- 25 United Nations, "About the Sustainable Development Goals," accessed October 31, 2019, <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>.
- 26 Willett et al., "Food in the Anthropocene"; For additional examples, see Future Earth, "The Future Earth Initiative," FutureEarth, accessed April 15, 2020, <https://futureearth.org/>.
- 27 Jeffrey D. Sachs et al., "Six Transformations to Achieve the Sustainable Development Goals," *Nature Sustainability* 2 (2019): 805–14, DOI: <https://doi.org/10.1038/s41893-019-0352-9>; Figueres and Rivett-Carnac, *The Future We Choose*.
- 28 Tabitha Carvan, "How Do We Go On?," ANU Science, Health & Medicine, 2019, accessed May 18, 2020, <https://science.anu.edu.au/news-events/news/how-do-we-go>; Figueres and Rivett-Carnac, *The Future We Choose*.
- 29 Elizabeth Shove, "Beyond the ABC: Climate Change Policy and Theories of Social Change," *Environment and Planning A: Economy and Space* 42, no. 6 (2010): 1273–85, DOI: <https://doi.org/10.1068/a42282>.
- 30 Ann Light, "Talking about Collaborative Economies: Platforms, Trust and Ethnographic Methods, Keynote Talk," in *Ethnographies of Collaborative Economies Conference Proceedings*, ed. P. Travlou and L. Ciolfi (University of Edinburgh, October 25, 2019), paper no. 17, available at <http://sharingandcaring.eu/sites/default/files/files/Paper17%20Light.pdf>; Figueres and Rivett-Carnac, *The Future We Choose*.
- 31 Ezio Manzini, "New Design Knowledge," *Design Studies* 30, no. 1 (2009): 6, <https://doi.org/10.1016/j.destud.2008.10.001>.
- 32 Melissa Leach, Kate Raworth, and Johan Rockström, "Between Social and Planetary Boundaries," in ISSC/UNESCO, *World Social Science Report 2013: Changing Global Environments* (Paris: OECD publishing and UNESCO Publishing, 2013), 84–89, DOI: <https://doi.org/10.1787/9789264203419-en>; building on: Kate Raworth, *A Safe and Just Space for Humanity: Can We Live within the Doughnut?* (UK: Oxfam, 2012), <http://policy-practice.oxfam.org.uk/publications/a-safe-and-just-space-for-humanity-can-we-live-within-the-doughnut-210490>.
- 33 Leach et al., "Between Social and Planetary Boundaries," 85.
- 34 Eduardo Gudynas, "Is Doughnut Economics Too Western? Critique from a Latin American Environmentalist," Oxfam, February 15, 2012, <https://views-voices.oxfam.org.uk/2012/02/is-doughnut-economics-too-western/>.
- 35 Björn-Ola Linnér and Henrik Selin, "COCOYOC DECLARATION: How It All Began: Global Efforts on Sustainable Development

Development Goals (SDGs).²⁵ Humans must eat—eating is a biological necessity and essential socio-cultural practice. Yet our current food system is making both people and planet sick.²⁶ Fortunately, if the science is right, it is not too late to reverse this trend.²⁷ We need to reconnect our everyday actions and our development pathways with the biosphere's capacity to sustain them. Experts tell us that this challenge is neither a science problem nor a technology problem—it is a problem with our sociopolitical values.²⁸ We need social change²⁹ to shift the beliefs, attitudes, values, and societal structures that drive our behaviors; to rebuild our cultures from the bottom up; and to develop new models for living.³⁰ How to make this shift is an intricate design problem; to address it we need to be educating designers and design researchers, positioning it as both background and foreground for every single design action. As Manzini eloquently stresses, "These changes require designers to rethink themselves, to rethink how they operate and reshape their position in society."³¹ I propose that they require designers to forge new kinds of collaborative partnerships and engage with new kinds of knowledge in an ongoing, self-reflexive, regenerative process.

Takeaway: The ability to think and discuss design beyond the discipline itself will enable designers to forge new kinds of collaborative partnerships and engage with new kinds of knowledge, in an ongoing, self-reflexive, regenerative process; this will enable designers to continually renew our discipline towards locally situated, globally sensitive impact.

In 2013, Melissa Leach, Kate Raworth, and Johan Rockström³² mapped out social and planetary boundaries, to delineate an alternative, just pathway for sustainable development.

"Just as there are planetary boundaries beyond which lies environmental degradation that is dangerous for humanity, so too there are social boundaries below which lie resource deprivations that endanger human well-being.... Combining the inner limits of social boundaries and the outer limits of planetary boundaries ... creates a doughnut-shaped space within which all of humanity can thrive by pursuing a range of possible pathways that could deliver inclusive and sustainable development." (Figures 1–3).

Their framework clarifies one of humanity's major challenges: ensuring "that the use of Earth's resources achieves the human rights of all ... while simultaneously ensuring that the total pressure on Earth systems remains within planetary boundaries."³³ This model is not without critics. Latin American environmentalist Eduardo Gudynas,³⁴ cautions we cannot forget the long tradition of debates on development and the environment,³⁵ nor uncritically adopt Western concepts of development. We must break with anthropocentric ethics and acknowledge the rights of nature. In the new ethic, rather than separating environmental and social components, some would be contained within others. We need non-Western voices, to make such shifts.

Building on this research, the *Digital Revolution and Sustainable Development: Opportunities and Challenges*³⁶ report details six transformations

Figure 1

Raworth's "Doughnut Diagram." Between the social and planetary boundaries lies an environmentally safe and socially just space in which humanity can thrive. Source: Kate Raworth, *Doughnut Economics: Seven Ways to Think like a 21st-Century Economist* (White River Junction, VT: Chelsea Green Publishing, 2017), 38. Image courtesy of Chelsea Green Publishing.

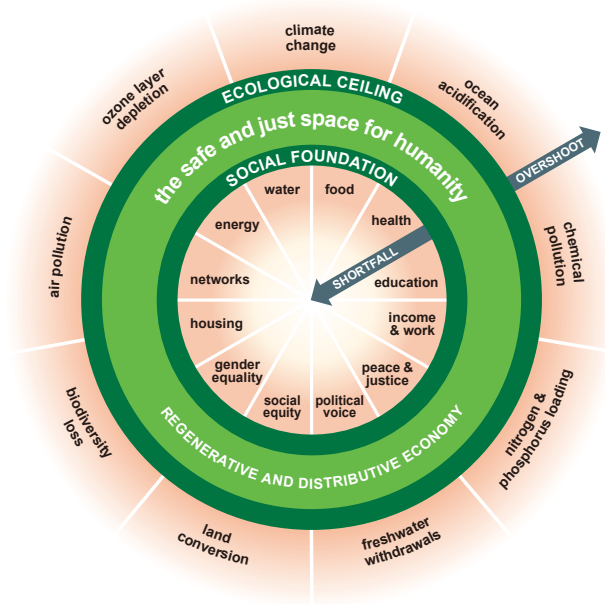


Figure 2

Shortfalls in the social foundation and overshoot in the ecological ceiling (illustrated by red wedges). Source: Kate Raworth, "A Doughnut for the Anthropocene: Humanity's Compass in the 21st Century," *The Lancet Planetary Health* 1, no. 2 (2017): e48. Licensed under CC BY 4.0. An interactive version of this model can be found at Kate Raworth, "What on Earth Is the Doughnut," accessed May 18, 2020, <https://www.kateraworth.com/doughnut/>.

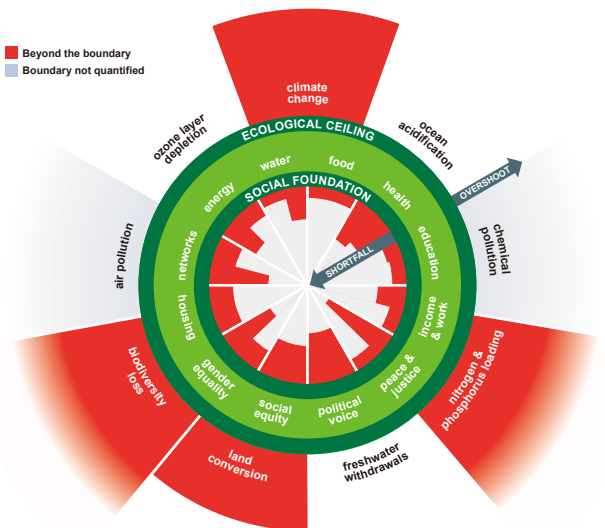
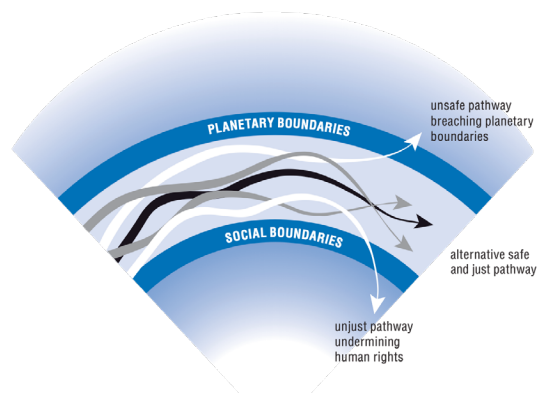


Figure 3

Possibilities within the safe and just space for humanity. Source: Melissa Leach, Kate Raworth, and Johan Rockström, "Between Social and Planetary Boundaries," in ISSC/ UNESCO, *World Social Science Report 2013: Changing Global Environments* (Paris: OECD publishing and UNESCO Publishing, 2013), 87. Licensed under CC BY-SA 4.0.



from Stockholm to Rio" (Presented at the 6th Nordic Conference on Environmental Social Sciences, Åbo, Finland, June 12–14, 2003), also available at *Cambridge Forecast Group Blog* (blog), December 3, 2006, <https://cambridgeforecast.wordpress.com/2006/12/03/cocoyoc-declaration/>.

- 36 TWI2050 — The World in 2050, *The Digital Revolution and Sustainable Development: Opportunities and Challenges* (Laxenburg, Austria: Laxenburg, IIASA, 2019), DOI: <https://doi.org/10.22022/TNT/05-2019.15913>.
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- 37 Sachs et al., "Six Transformations to Achieve the Sustainable Development Goals."
- 38 Gudynas, "Is Doughnut Economics Too Western?"
- 39 Daniel Hausknost, "Tackling the Political Economy of Transformative Change," *CUSP* (blog), November 21, 2019, <https://www.cusp.ac.uk/themes/p/blog-dh-transformative-change/>.
- 40 Tim Jackson, *Prosperity without Growth: Foundations for the Economy of Tomorrow*, 2nd ed. (London: Routledge, 2016).

Table 1

Six transformations necessary to alter our trajectory towards human and planetary flourishing, considering the impacts of our actions on the UN Sustainability Development Goals (SDGs).

- 1. Education, Gender, and Inequality.**
Involving ministries of education, science and technology, gender equality and family affairs, this transformation covers investments in education (early childhood development, primary and secondary education, vocational training and higher education), social protection systems and labor standards, and R&D. It directly targets SDGs 1, 2, 4, 5, 8, 9, and 10, and reinforces other SDG outcomes.
- 2. Health, Wellbeing, and Demography.**
Group interventions to ensure Universal Health Coverage (UHC), promote healthy behaviors, and address social determinants of health and wellbeing. It directly targets SDGs 2, 3, and 5 with strong synergies into many other goals. Implementation will need to be led by ministries of health.
- 3. Energy Decarbonization and Sustainable Industry.**
This transformation groups investments in energy access; the decarbonization of power, transport, buildings, and industry; and curbing industrial pollution. It directly targets SDGs 3, 6, 7, 9, 11–15, and reinforces several other goals. Implementation will require coordination across a large number of industries, including energy, transport, buildings, and environment.
- 4. Sustainable Food, Land, Water, and Oceans.**
Interventions to make food and other agricultural or forest production systems more productive and resilient to climate change must be coordinated with efforts to conserve and restore biodiversity; and interventions to promote healthy diets alongside major reductions in food waste and losses. Important trade-offs exist between these interventions, so we recommend identifying and addressing them inside one transformation, which will need to mobilize a broad range of ministries, such as agriculture, forestry, environment, natural resources, and health. This broad transformation directly promotes SDGs 2, 3, 6, and 12–15. Many other SDGs are reinforced by these investments.
- 5. Sustainable Cities and Communities.**
Cities, towns, and other communities require integrated investments in infrastructure, urban services, as well as resilience to climate change. These interventions target of course SDG 11 and they also contribute directly to goals 6, 9, and 11. Indirectly virtually all SDGs are supported by this transformation, which relies on leadership from the ministries of transport, urban development, and water resources.
- 6. Harnessing the Digital Revolution for Sustainable Development.**
If managed well, digital technologies, such as artificial intelligence and modern communication technologies can make major contributions towards virtually all SDGs.

necessary to achieve dramatic improvements on the UN World Sustainability Development Goals and move us back into the safe operating space for humanity (Table 1).³⁷ These transformations read as management and coordination issues. Yet, without widespread societal integration—broad-reaching acceptance and uptake—they will not gain traction.

The work of Raworth, Leach, Rockström, and Sachs and his colleagues is critically important as we try to grapple with global challenges. At the same time, we cannot sweep aside the concerns raised by Gudynas.³⁸ In an address to the 2019 UN Sustainable Development Transformation Forum, Daniel Hausknost³⁹ suggests that the Western approach to sustainable development is "dying of improvement," driven by three myths: 1) green growth;⁴⁰ 2) a belief in—and reliance on—conscious individual behavior

- 41 Hausknost, "Tackling the Political Economy."
- 42 Carl DiSalvo, Johan Redström, and Matt Watson, "Commentaries on the Special Issue on Practice-Oriented Approaches to Sustainable HCI," *ACM Transaction on Computer-Human Interaction* 20, no. 4 (2013): article no. 26, DOI: <https://doi.org/10.1145/2509404.2509408>; Terry Irwin, "Transition Design: A Proposal for a New Area of Design Practice, Study, and Research," *Design and Culture* 7, no. 2 (2015): 229–46, DOI: <https://doi.org/10.1080/17547075.2015.1051829>; Bran Knowles et al., "Design Patterns, Principles, and Strategies for Sustainable HCI," in *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems* (New York: ACM, 2016), 3581–88, DOI: <https://doi.org/10.1145/2851581.2856497>; Victor Margolin, *The Politics of the Artificial: Essays on Design and Design Studies* (Chicago: University of Chicago Press, 2018); Ankita Raturi et al., "Designing Sustainable Food Systems," in *Proceedings of the 2017 CHI Conference Extended Abstracts on Human Factors in Computing Systems* (New York: ACM, 2017), 609–16, DOI: <https://doi.org/10.1145/3027063.3027075>.
- 43 Blevins, "Seeing What Is and What Can Be."
- 44 Light et al., "Design for Existential Crisis."
- 45 Escobar, *Designs for the Pluriverse*.
- 46 Manzini, *Design, When Everybody Designs*.
- 47 Richard Dobbs et al., "Resource Revolution: Meeting the World's Energy, Materials, Food, and Water Needs," McKinsey & Company, 2011, accessed May 18, 2020, <https://www.mckinsey.com/business-functions/sustainability/our-insights/resource-revolution>; Martin L. Weitzman, "Can Negotiating a Uniform Carbon Price Help to Internalize the Global Warming Externality?," *Journal of the Association of Environmental and Resource Economists* 1, no. 1/2 (2014): 29–49, DOI: <https://doi.org/10.3386/w19644>.
- 48 Nicholas Stern, *The Economics of Climate Change: The Stern Review* (Cambridge: Cambridge University Press, 2006).
- 49 Shove, "Beyond the ABC."
- 50 Peter Rogers, "The Rigidity Trap in Global Resilience: Neoliberalisation through Principles, Standards, and Benchmarks," *Globalizations* 10, no. 3 (2013): 383–95, DOI: <https://doi.org/10.1080/14747731.2013.787834>.
- 51 For example, see Christopher A Le Dantec and Carl DiSalvo, "Infrastructuring and the Formation of Publics in Participatory Design," *Social Studies of Science* 43, no. 2 (2013): 241–64, DOI: <https://doi.org/10.1177/0306312712471581>; Ann Light, "Ideas of Autonomia: Buzzwords,

change; and 3) that innovation will save us. When subjected to critical scrutiny, none of these myths holds. We need to move away from such thinking. A "purposive and time-bound transformation entails non-linear, disruptive, and, by definition, unpredictable forms of change, and ... political institutions with the capacity, power, and legitimacy to make transformative decisions of creative destruction."⁴¹ Or—as Hausknost starkly characterizes our current position—we can continue to talk about transformation without actually meaning transformation and govern ourselves into irreversible climate collapse.

Takeaway: These intertwined challenges suggest that, if design is to constructively engage in world-making, design researchers need to be inter-linking situated concerns, planetary science, and governance.

I am not alone in believing that design should respond to this challenge, and is increasingly well-positioned to do so.⁴² Blevins posits sustainability as a foundational imperative of design;⁴³ Light and colleagues declare climate change an existential crisis—not only for humanity but for design as a discipline.⁴⁴ In *Designs for the Pluriverse*, Escobar provides a new vision for design theory and practice aimed at channeling design's world-making capacity toward ways of being and doing that are deeply attuned to justice and the Earth.⁴⁵ His vision of locally organized, radical interdependence further politicizes Manzini's thesis that everyone designs.⁴⁶ It foregrounds the need to acknowledge and empower people from all walks of life to (re)interpret and (re)design products, services, and materials to fit their situated needs; and empower them to take ownership of the innovation process.

In the top-down, dominant model for climate change response, economists develop policy mechanisms to internalize the external ecological and moral costs of an individual's or country's actions on others.⁴⁷ They then appeal to governments to inform, educate, and persuade citizens to respond to climate change.⁴⁸ This approach places the onus on individuals to align their actions with policy directives. It "obscure(s) the extent to which governments sustain unsustainable economic institutions and ways of life, and the extent to which they have a hand in structuring options and possibilities."⁴⁹ It is shaped by normative epistemologies and goals including faith in technological progress and universal conceptions of the public and the public good.⁵⁰ In contrast, bottom-up approaches to capacity building and policy-making from participatory design, research through design and co-design,⁵¹ common issues to empower civil society actors to be collaborative agents for systemic change. Such approaches recognize climate risks as both product and driver of social and natural systems and their interaction.⁵² They leverage design's capacities for world-making to help people imagine and then prototype radical change. In doing so, they open the door towards a more profound engagement with the climate crisis, ownership of transformational ideas, recognition of their relevance to personal situated experience and thus a shift from invention to transformative innovation, through societal integration. As Light explains, such creative processes, "allow people to explode systems, expand cause-effect relations, and raise consequences

- Borderlands and Research through Design," *Strategic Design Research Journal* 11, no. 2 (2018): 147–53, DOI: <https://doi.org/10.4013/sdrj.2018.112.11>; Per-Anders Hillgren, Ann Light, and Michael Strange, "Future Public Policy and Its Knowledge Base: Shaping Worldviews through Counterfactual World-Making," *Policy Design and Practice* (April 9, 2020): 1–14, DOI: <https://doi.org/10.1080/25741292.2020.1748372>; Salu Ylirisku, Jacob Buur, and Line Revsbæk, "Resourcing in Co-Design," in *Proceedings of DRS 2016, Design Research Society 50th Anniversary Conference*, June 27–30, 2016, available at <https://www.drs2016.org/342>.
- 52 Mark Pelling, *Adaptation to Climate Change: From Resilience to Transformation* (Abingdon, UK: Routledge, 2010).
- 53 Ann Light, Ruth Wolstenholme, and Ben Twist, "Creative Practice and Transformations to Sustainability — Insights from Research" (SSRP Working Paper No. 2019-1, Sussex Sustainability Research Programme, University of Sussex, 2019), <https://www.sussex.ac.uk/webteam/gateway/file.php?name=sussex-sustainability-research-programme-wp-1.pdf&site=492>.
- 54 Useful starting points are: Kazuhiko Takeuchi, ed., *The Journal of Sustainability Science*, bimonthly Journal from Springer, accessed April 25, 2020, <http://www.springer.com/journal/11625>; Robert S. Emmett and David E. Nye, *The Environmental Humanities: A Critical Introduction* (Cambridge, MA: MIT Press, 2017); Raworth, *Doughnut Economics*; Steven Bernstein, Matthew Hoffmann, and Erika Weinthal, eds., *The Journal of Global Environmental Politics*, quarterly journal from MIT Press Journals, accessed May 10, 2020, <https://www.mitpress-journals.org/loi/glep>; Philip E. Auerswald and Iqbal Z. Qadir, eds., *The Journal of Innovations: Technology, Governance, Globalization*, quarterly journal from MIT Press Journals, accessed May 10, 2020, <https://www.mitpressjournals.org/loi/itgg>.
- 55 Emery Roe and Paul R. Schulman, *High Reliability Management: Operating on the Edge*, vol. 19 (Stanford University Press, 2008).
- 56 Frances Westley et al., "Tipping toward Sustainability: Emerging Pathways of Transformation," *AMBIO* 40, no. 7 (2011): article no. 762, DOI: <https://doi.org/10.1007/s13280-011-0186-9>. Cited by Leach et al., "Transforming Innovation for Sustainability," 5.
- in a manageable way. At their most effective, [they] inspire people to make changes for themselves and ... inspire others to follow.⁵³
- If we are to make a systemic shift from the top-down model, we require systems and frameworks that empower people from civil *and* civic society to engage interdependently in creative world-making. Working together, individuals and communities would benefit from articulating, and perhaps reconfiguring, their desires; imagining new practices that are desirable and fit within the safe and just space for humanity; resourcing and developing infrastructure for these practices — new policies, technologies, relationships — so they might be adopted, adapted to unique circumstances, and also proliferate. This process would enable us to evolve our values and traditions, by using situated practice as a pathway to cultural transformation. To be sustainable, underlying design actions must be directed towards aligning policy, techno-science, and creative engagement *across the board* towards social, material, cultural, political, and ecological sustainability. That means transforming the values that drive business, government and scientific research as well as everyday situated actions.
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- Takeaways:** Familiarity with sustainability science, environmental humanities, economics, and environmental politics and governance⁵⁴ will enable design researchers' to better respond to global challenges, with the added benefit that the learning process will further their capacity for effective post-disciplinary practice. Designers need to be willing to engage with divergent perspectives and situated understandings of what is considered valuable by different actors, to ensure a plurality of voices inform their work. They need skills in creative practices and bottom-up approaches to world-making and policymaking to be able to move fluidly between diverse and divergent disciplines and worldviews and direct design actions towards aligning policy, techno-scientific research, and creative engagement.
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- In the next two sections, I argue that capacities in sustainability brokering and anticipation may strengthen designers' ability to develop that familiarity, those skills, and that fluidity.
- ## Sustainability Brokering
- Drawing on the management sciences,⁵⁵ Leach and colleagues explain that
- "navigating the complex, uncertain world and dynamic thresholds that challenge sustainability requires us to track between big-picture planetary and social boundaries and the ways they interact in particular local settings."⁵⁶ Global and regional scenarios, forecasting, and backcasting need to be triangulated with grounded local processes and implications. An understanding of shifting global planetary boundaries, safe operating spaces, and the global SDGs required to stay within them needs to be combined with appreciation of particular local, sustainable development meanings and goals, and of how to draw from innovative grassroots capacity. Such *sustainability brokering involves skills and competencies that are currently seriously neglected*. Building these requires new kinds of training, capacity building, and recognition.

- 57 Leach et al., "Transforming Innovation for Sustainability," 5, emphasis mine.
- 58 Ibid., 1.
- 59 Westley et al., "Tipping toward Sustainability."
- 60 Wendell Bell, *Foundations of Futures Studies: History, Purposes and Knowledge*, vol. 1 (London: Transaction Publishers, 2003).
- 61 For examples of the method in applications, see "Alliance for Strategic Sustainable Development," accessed May 23, 2020, <http://www.alliance-ssd.org/>.
- 62 Göran Broman, John Holmberg, and Karl-Henrik Robört, "Simplicity Without Reduction: Thinking Upstream Towards the Sustainable Society," *Interfaces* 30, no. 3 (2000): 13–25, DOI: <https://doi.org/10.1287/inte.30.3.13.11662>; John Holmberg, "Backcasting: A Natural Step in Operationalising Sustainable Development," *Greener Management International*, Autumn 1998, available at Gale Academic OneFile, accessed May 22, 2020, <https://go.gale.com/ps/anon-ymous?id=GALE%7CA55308829&sid=-googleScholar&v=2.1&it=r&linkaccess=abs&issn=09669671&p=A-ONE&sw=w>.
- 63 Joan Manuel F Mendoza et al., "Integrating Backcasting and Eco-Design for the Circular Economy: The BECE Framework," *Journal of Industrial Ecology* 21, no. 3 (2017): 526–44, DOI: <https://doi.org/10.1111/jiec.12590>; Josefin Wangel, "Change by Whom? Four Ways of Adding Actors and Governance in Backcasting Studies," *Futures* 43, no. 8 (2011): 880–89. <https://doi.org/10.1016/j.futures.2011.06.012>.
- 64 I am on the management committee of COST Action (CA16229), the European Network for Environmental Citizenship, which brings together researchers representing the natural and physical sciences, social science and education. I am the only design researcher involved.

Guided by wider political debate about values, interests, and priorities ... sustainability brokers could form the vanguard of transformation now needed to safeguard our planet for current and future generations."⁵⁷

The type of transformative innovation they describe gives greater recognition and power to grassroots innovation actors and processes, and involves them within an inclusive, multi-scale innovation politics.⁵⁸ The skills and competencies needed include the capacity to anticipate shocks, support engagement, and co-create; the ability to conduct careful design and facilitation, resourced by research geared to stakeholders' needs; and creative, cross-sector, and cross-disciplinary decision making and innovation. Sustainability brokers also need the capacity to design processes to sustain knowledge integration and behavioral change; and build worldwide communities of like-minded people cutting across disciplinary divides, eventually bound together by trust and by shared values and understandings.⁵⁹ Critically, it involves *backcasting*, an approach from Future Studies.⁶⁰ In contrast to forecasting—trying to predict the future from today's trends—backcasting begins by defining the objective and then asking "what shall we do today (and subsequently) to achieve the objective?"⁶¹ The method involves four steps. 1) *Define* conditions for a sustainable future—for example, aligning with the just space for humanity identified by Leach, Raworth and Rockström. 2) *Analyze* situated activities and competencies in relation to these conditions. 3) *Envision* future possibilities, free of existing constraints. 4) *Identify* strategies to link the present situation with the desirable future sustainable situation.⁶² When approached interdependently, these steps enable people to define objectives, sensitive to local conditions. Thus, through a focus on the desired future state, rather than the problematic present, and involving diverse stakeholders in the process—including grassroots innovation actors and processes—backcasting assists people to leapfrog iterative development⁶³ and enact transformative innovation.

Sustainability brokering sounds suspiciously like design as I know it—participatory, experimental, and collaborative research through design, informed by principles of equity, access, diversity, and social justice; bringing scientific knowledge around the SDGs and planetary boundaries together with deep engagement in grassroots, situated practices. My experience also suggests that design research is what many scientists in sustainability science are looking for ... although they may not realize it.⁶⁴ The questions, thus—for design research education, as well as practice—become, "Are designers (researchers and educators) ready to tackle the role of sustainability brokers?" "Are we able to use the social and planetary boundaries, and the notion of a just operating system as guiding principles, as we respond to situated concerns?" The idea is to engage with all 17 sustainability development goals and 169 specific targets, while ensuring deeply informed consideration of planetary impact as situated research unfolds—rather than simply using these boundaries as a checklist.

The larger question of this article is, "If design is to effectively engage with global challenges, how do we educate for such roles?" To this I might add, "Does design have an image crisis?" My answer to the latter is yes, for three reasons. First, design is not a homogenous ecosystem; however, the dominant

- 65 Participatory design, co-design, bio-design, and others.
- 66 Geoffrey Tweedale and Philip Hansen, "Protecting the Workers: The Medical Board and the Asbestos Industry, 1930s–1960s," *Medical History* 42, no. 4 (1998): 439–57, DOI: <https://doi.org/10.1017/s0025727300064346>.
- 67 For example, see Papanek, *Design for the Real World*.
- 68 Neimanis et al., "Four Problems."
- 69 For a range of compelling examples, see John Thackara, *How to Thrive in the Next Economy* (London: Thames & Hudson, 2015); Paul Hawken, ed., *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming* (London: Penguin, 2017); Julia Watson, *Lo-TEK: Design by Radical Indigenism* (Colonge: Taschen, 2020); Pablo Calderón Salazar, Mela Zuljevic, and Liesbeth Huybrechts, "Southern Manners in Northern Lands: Design Interventions for Autonomía," *Strategic Design Research Journal* 11, no. 2 (2018): 103–14, <https://doi.org/10.4013/sdrj.2018.112.06>; Figueres and Rivett-Carnac, *The Future We Choose: Alliance for Strategic Sustainable Development*, <http://www.alliance-ssd.org/>.
- 70 For a discussion, see Johan Redström, "Certain Uncertainties and the Design of Design Education," *She Ji: The Journal of Design, Economics and Innovation* 6, no. 1 (2020): 83–100, DOI: <https://doi.org/10.1016/j.sheji.2020.02.001>.
- 71 Ibid.
- 72 For example, see Danielle Wilde and Jenny Underwood, "Designing towards the Unknown: Engaging with Material and Aesthetic Uncertainty," *Informatics, Special Issue on Tangible and Embodied Interaction* 5, no. 1 (2018): 13, DOI: <https://doi.org/10.3390/informatics5010001>.

cultural understanding of design seems to be adding aesthetic sophistication to material products. Second, wide swathes of the design industry are complicit in many of the problems we need to address. Third, the types of design practice oriented towards achieving more just societies⁶⁵—more socially, materially, and ecologically regenerating societies—are relatively alien to anyone who hasn't had first-hand experience with them. What design research can bring to global challenges is thus little known by many of the (government, industry, scientific, and civil society) actors who might benefit from collaboration with design researchers, expert in such methods.

Transformative innovation requires we move far beyond solution-oriented approaches to problem solving. We need to engage with complex systems and have the humility to recognize that any seemingly positive contribution we make may come with bigger headaches later on. For instance, asbestos resolved a number of issues in the building industry with extraordinary efficacy but is still causing health issues around the world today—more than a hundred years after the first documented death.⁶⁶ We need to move beyond a search for efficient solutions, and deepen our understanding of what might be at stake. Many negative impacts on human and planetary life, throughout history, can be traced back to acts of design.⁶⁷ Today, many designers remain complicit in the creation of complex issues. As a community, we must act—and we must do so with care. Design shapes the world we live in. Rigorous design research, in particular when approached from intersectional perspectives, can combine theory, practice, and creativity in unique ways. The grand challenge of reconfiguring how humans live within our planetary and social boundaries demands a response. The design community cannot stand to the side, nor can we resolve this issue on our own. As a community of practice, we must participate, collaborate, and invite participation in the act of brokering transformative innovation. We can look to resilience and sustainability science, economics, environmental humanities, and critical post-humanities⁶⁸ for clues as to how to engage across disciplinary boundaries, fortify our post-disciplinary practice, and broker sustainability. We can—and should—also look elsewhere: to other fields, sectors and other forms of action.⁶⁹ In any case, the experimental nature of design research enables us to expand what we might imagine by thinking through moving, making, and situated doing. Design makes things possible in the face of uncertainties.⁷⁰ And, while I agree with Redström, that "we cannot ignore the issue of how to make design less certain of itself,"⁷¹ I also know that design has experience and methods for staying with uncertainty and designing into the unknown.⁷² We must draw upon this experience, develop relevant capacities, and approach grand challenges with humility.

Takeaways: The grand challenge of design education appears to be twofold:

- i) Equip designers to innovate transformatively, by developing the necessary skills and capacities to broker sustainability and *anticipate* transformative innovation; and
- ii) Ensure actors across society recognize the potential of design—beyond material and interaction aesthetics—so that designers may leverage their world-making skills towards profound and meaningful impact.

- 73 For more information, visit <https://theconversation.com>.
- 74 For more information, visit <https://medium.com>.
- 75 Alexander Leicht, Julia Heiss, and Won Jung Byun, eds., *Issues and Trends in Education for Sustainable Development* (Paris: UNESCO, 2018), available at <https://unesdoc.unesco.org/ark:/48223/pf0000261445>.
- 76 William Colglazier, "Sustainable Development Agenda: 2030," *Science* 349, no. 6252 (2015): 1048–50, DOI: <https://doi.org/10.1126/science.aad2333>; William M. Lafferty and Katarina Eckerberg, *From the Earth Summit to Local Agenda 21: Working towards Sustainable Development* (Abindon, OX: Earthscan, 2013); Marco Rieckman, "Learning to Transform the World: Key Competencies in Education for Sustainable Development," in *Issues and Trends in Education for Sustainable Development*, ed. Alexander Leicht, Julia Heiss, and Won Jung Byun (Paris: United Nations Educational, Scientific and Cultural Organization, 2018), 39–56, <https://unesdoc.unesco.org/ark:/48223/pf0000261445>.
- 77 Leicht et al., *Issues and Trends*, 10.
- 78 Rieckman, "Learning to Transform the World," 45–46.
- 79 Roberto Poli, "Introducing Anticipation," in *Handbook of Anticipation*, ed. Roberto Poli (Cham, Switzerland: Springer International Publishing, 2017), 1–14, DOI: https://doi.org/10.1007/978-3-319-31737-3_1-1.

To respond to (i): Designers require skills and competencies, as well as opportunities to form partnerships, anticipate shocks, and support engagement and co-creativity; to conduct careful design and facilitation, informed by stakeholder-relevant research; to make creative, cross-sector and cross-disciplinary decisions; to design processes to sustain knowledge integration and build worldwide communities that cut across disciplinary divides.

While many programs deliver some of these skills, I am unaware of any that deliver all of them in ways that foreground the design research strength of thinking through moving, making, and doing throughout. And yet, I posit that embodied engagement with the materiality of our world—thinking through moving, making, and (situated) doing—is what transforms such activities into design research skills.

To respond to (ii): Design researchers must be skilled in diverse forms of dissemination—not only peer-reviewed publication, websites, and social media. For instance, they may maintain longer form blogs; make efforts to have their work featured in magazines; write for accessible fora such as The Conversation⁷³ and Medium;⁷⁴ produce non-scholarly books; postcards, posters, video, zines, and more. To create this material will require them to reframe their work at each step. It will enrich their understanding of the research, as it unfolds. In the process, they may consider their potential contributions from scientific, methodological, cultural, and designerly perspectives—and become effectual in ways that move radically beyond siloed understandings of academic relevance and impact.

Anticipation

When developing their 2018 *Issues and Trends in Education for Sustainable Development* report,⁷⁵ UNESCO built on profoundly considered bottom-up guidelines including Agenda 21, Agenda 2030 and more.⁷⁶ They concluded that if we are to achieve sustainable development, “individuals must learn to understand the complexities, uncertainties, trade-offs, and risks related to global and local sustainability challenges. They must become ‘sustainability citizens’ ... [who] participate in socio-political processes, moving their societies towards sustainable development.”⁷⁷

The authors articulate eight key competencies crucial for people to think and act in favor of sustainable development: systems thinking, anticipation, normative competency, strategic competency, collaboration, critical thinking, self-awareness, and integrated problem-solving. Sustainability citizenship depends on the interplay of all eight competencies with people’s values and motivational drivers, and relevant opportunities.⁷⁸ Some—such as systems thinking, critical thinking, and self-awareness—might be considered prerequisites for others. In this section, I focus on *anticipation*. Anticipation enables us to move from future imaginaries to new practices (oriented towards long-term flourishing) that can be implemented today.

The field of Anticipation Studies⁷⁹ champions a pathway akin to design world-making processes and backcasting to develop policies and technologies to support the newly imagined practices. Enacting anticipation through design involves two moves. 1) Develop context-specific projects and

- 80 Jens Beckert, "Capitalism as a System of Expectations: Toward a Sociological Micro-foundation of Political Economy," *Politics & Society* 41, no. 3 (2013): 323–50, DOI: <https://doi.org/10.1177/0032329213493750>.
- 81 See Note 69.
- 82 Poli, "Introducing Anticipation."
- 83 Beckert, "Capitalism as a System of Expectations."
- 84 Richard Bronk, *The Romantic Economist: Imagination in Economics* (Cambridge: Cambridge University Press, 2009).
- 85 "Anticipation 2019," accessed October 31, 2019, <http://anticipationconference.org/>.
- 86 Blythe, "Seriously Silly"; Larissa Vivian Nägele, Merja Ryöppy, and Danielle Wilde, "PDFi: Participatory Design Fiction with Vulnerable Users," in *NordiCHI '18: The 10th Nordic Conference on Human-Computer Interaction* (New York: ACM, 2018), 819–31, DOI: <https://doi.org/10.1145/3240167.3240272>.
- 87 James Auger et al., *Reconstrained Design* (Funchal, Portugal: M-ITI, 2019), available at https://www.researchgate.net/publication/336870773_Reconstrained_Design; James Auger, Julian Hanna, and Enrique Encinas, "Reconstrained Design: Confronting Oblique Design Constraints," in *Proceedings of the 7th Conference on Nordic Design Research (NORDES '17)*, 2017, <https://www.researchgate.net/publication/317823687>.
- 88 Spiel et al., "Micro-Ethics for Participatory Design"; Katharina Spiel et al., "Participatory Evaluation with Autistic Children," in *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (New York: ACM, 2017), 5755–66, <https://doi.org/10.1145/3025453.3025851>; "More-Than-Human Lab," accessed October 29, 2019, <http://morethanhumanlab.org/>.
- 89 Danielle Wilde, Anna Vallgård, and Oscar Tomico, "Embodied Design Ideation Methods: Analysing the Power of Estrangement," in *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (New York: ACM, 2017), 5158–70, DOI: <https://doi.org/10.1145/3025453.3025873>.
- 90 Irwin, "Transition Design."
- 91 C. Otto Scharmer, *Theory U: Learning from the Future as It Emerges* (Berrett-Koehler Publishers, 2009).
- 92 Carl DiSalvo, "FCJ-142 Spectacles and Tropes: Speculative Design and Contemporary Food Cultures," *The Fibreculture Journal* 20 (2012), available at <http://fibreculturejournal.org/wp-content/pdfs/FCJ-142Carl%20DiSalvo.pdf>; Light, "Ideas of Autonomía"; Hillgren et al., "Future Public Policy and Its Knowledge Base"; Kristina Andersen and Ron Wakkary, "The Magic Machine Workshops: Making

targeted participatory actions that enable civil and civic society actors to find common ground in issues, and from their new perspectives, imagine what scholar Jens Beckert would call imaginaries of the future.⁸⁰ This is not an unfamiliar process in design. 2) Help participants backcast from these imaginaries, and negotiate the infrastructure needed to transform them into what I call *implementable nows*. Implementable nows are transformative innovations that can be implemented today. The aim is to envision divergent new practices for today, inspired by future imaginaries, and then infrastructure them. Rather than forecasting, the process leapfrogs the adjacent possible to articulate eminently more desirable—perhaps wildly fantastic—futures, unconstrained by existing poor choices or perceived technological limits, then backcasts to work out what the next step might be. Once the next steps have been identified, local actors forge new relationships and (as required) work in collaboration with industry, government, scientists, policymakers, and technology developers, to resource the newly imagined practices. This process is context dependent, so cannot be systematized here, though many successful examples may be found.⁸¹ In its entirety, the approach enables actors to bypass iterative development and make actionable, transformative leaps.

Anticipation involves stakeholders from civil and civic society. It flattens existing hierarchies by involving and recognizing individual felt experience and phenomenologically grounded expertise. It thus affords bottom-up transformation of top-down systems and structures from within. Such a process encompasses the two necessary but distinct components of anticipation: "a forward-looking attitude and the use of the former's results for action."⁸² It leans powerfully on Beckert's notion that imaginaries of future situations can provide orientation in decision making, despite the incalculability of outcomes.⁸³ It allows actors "to move beyond inherited thought patterns and categories by bringing them into an *as-if* world in which given reality is surpassed and a different one considered."⁸⁴ In essence, anticipation leverages design's world-making capacities to generate new practices, policies, technologies, and relationships. In doing so, it ensures these are personally meaningful, contextually relevant, and ecologically impactful. It connects to language that policymakers are engaging with through UNESCO and venues such as the Anticipation Conference (which brings together policymakers with researchers from future studies, anticipation studies and design).⁸⁵ It facilitates the process, and furthers the cause, of legitimizing design research as a critical twenty-first-century practice.

Anticipation competency can be instructed via mastery of existing experimental design methods, and reconfiguring them to unique research contexts. Methods such as: design fictions,⁸⁶ critical speculative design,⁸⁷ critical participatory design,⁸⁸ embodied design,⁸⁹ transition design,⁹⁰ Theory U,⁹¹ and other forms of critical intervention, futuring, and world-making.⁹² As they develop these competencies, designers may leverage embodied sense-making, estrangement, and enchantment to respond to complex impasses, and surface new imaginaries in new ways of thinking.⁹³ They can then investigate possibilities from which to resource (or develop infrastructure for) their new imaginaries to ensure real-world change.

Personal Design Knowledge," in *CHI '19: Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (New York: ACM, 2019), 1–13, DOI: <https://doi.org/10.1145/3290605.3300342>; Meike Schalk, Thérèse Kristiansson, and Ramia Mazé, eds., *Feminist Futures of Spatial Practice: Materialisms, Activisms, Dialogues, Pedagogies, Projections* (Baunach, Germany: Spurbuchverlag, 2017).

- 93 Wilde et al., "Embodied Design Ideation Methods"; Genevieve Bell, Mark Blythe, and Phoebe Sengers, "Making by Making Strange: Defamiliarization and the Design of Domestic Technologies," *ACM Transactions on Computer-Human Interaction* 12, no. 2 (2005): 149–73, DOI: <https://doi.org/10.1145/1067860.1067862>; Arthur Coleman Danto, *The Transfiguration of the Commonplace: A Philosophy of Art* (Cambridge, MA: Harvard University Press, 1981).
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- 94 Le Dantec and DiSalvo, "Infrastructuring and the Formation of Publics"; Erling Björgvinsson, Pelle Ehn, and Per-Anders Hillgren, "Design Things and Design Thinking: Contemporary Participatory Design Challenges," *Design Issues* 28, no. 3 (2012): 101–16, DOI: https://doi.org/10.1162/DESI_a_00165; Erling Björgvinsson, Pelle Ehn, and Per-Anders Hillgren, "Agonistic Participatory Design: Working with Marginalised Social Movements," *CoDesign* 8, no. 2–3 (2012): 127–44, DOI: <https://doi.org/10.1080/15710882.2012.672577>; Andrew Clement et al., "Probing, Mocking and Prototyping: Participatory Approaches to Identity Infrastructuring," in *12th Participatory Design Conference: Research Papers*, vol. 1 (New York: ACM, 2012), 21–30, DOI: <https://doi.org/10.1145/2347635.2347639>; Pelle Ehn, "Participation in Design Things," in *The 10th Anniversary Conference on Participatory Design* (Indiana University, 2008), 92–101, available at <https://dl.acm.org/doi/10.5555/1795234.1795248>.
- 95 Sheila Jasanoff and Sang-Hyun Kim, eds., *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power* (Chicago: University of Chicago Press, 2015).
- 96 Klaus Schwab, *The Fourth Industrial Revolution* (New York: Currency, 2017), 1.
- 97 Ibid.
- 98 Klaus Schwab and Nicholas Davis, *Shaping the Future of the Fourth Industrial Revolution* (New York: Currency, 2018).

The process aims at building capacity, rather than things. As numerous participatory and co-design scholars demonstrate, this infrastructuring process invigorates democracy, sustains participation and design-for-future-use at community and societal scales; and is necessary to move from ideas to action and implement change.⁹⁴ To enact it, designers need to draw from (and move fluidly between) diverse and divergent disciplines and world views. They must take a post-disciplinary approach to the application of the methods, frameworks, and theories that make design research a powerful force for imagining and spearheading real-world change. Educating design researchers with these skills will equip them to support the emergence of new *social imaginaries*—collective beliefs about how society functions—that can enable or disable societal transformation and are critical to its realization.⁹⁵ It will equip them to critically consider present imaginaries alongside lost or forgotten historical practices and existing infrastructure, and support participants from civil and civic society to understand, imagine, and work together towards transformative innovation that has real-world social, ecological, and policy impact.

Takeaways: Designers need skills in experimental participatory design and co-design methods. They must learn to draw from, and move fluidly between, diverse and divergent disciplines and worldviews as they apply methods, frameworks, and theories. They require facilitation and resourcing skills. And, they need fluency in all eight competencies identified by UNESCO: systems thinking, anticipation, normative competency, strategic competency, collaboration, critical thinking, self-awareness, and integrated problem-solving—in particular anticipation.

Revolution-izing Design

Our global challenges unfold in the context of the fourth industrial revolution. In 2016, the World Economic Forum positioned this revolution as the most intense and important challenge that humans must grapple with.⁹⁶ The first industrial revolution was the shift to fossil fuels for energy and mechanical power. The second (in the decades around 1900) brought breakthroughs in electricity distribution, wireless and wired communication, the synthesis of ammonia, and new forms of power generation. The third began in the 1950s, with the development of digital systems communication, advances in computing power, and new ways of generating, processing and sharing information. The fourth industrial revolution is the fusion of technologies that blur the lines between the physical, digital, and biological spheres. The velocity, scope, and systems impact—the sheer speed of current breakthroughs—of this industrial revolution has no historical precedent. It is disrupting almost every industry in every country, and is expected to transform entire systems of production, management, and governance.⁹⁷ This revolution is not without challenges.⁹⁸ As Rabeh Morrar, Hussam Arman, and Saeed Mousa stress, we need to create the conditions for the fourth industrial revolution and associated emerging technologies, in ways that bring new opportunities and benefits to people and society, and are

- 99 Rabeh Morrar, Husam Arman, and Saeed Mousa, "The Fourth Industrial Revolution (Industry 4.0): A Social Innovation Perspective," *Technology Innovation Management Review* 7, no. 11 (2017): 12–20, available at <https://timreview.ca/article/1117>.
- 100 William Gaver, "What Should We Expect from Research through Design?," in *CHI '12: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (New York: ACM, 2012), 937–46, DOI: <https://doi.org/10.1145/2207676.2208538>.
- 101 Nigel Cross, "Designerly Ways of Knowing," *Design Studies* 3, no. 4 (1982): 221–27, DOI: [https://doi.org/10.1016/0142-694X\(82\)90040-0](https://doi.org/10.1016/0142-694X(82)90040-0).

also sustainable. At the same time, we must remedy the damage to society caused by the last three revolutions.⁹⁹ To ensure innovations are societally relevant and also sustainably responsive to global needs and situated concerns requires the involvement of diverse stakeholders. I propose participatory research through design, guided by four pillars of practice, as a viable pathway to this end.

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Takeaways: For designers to be empowered actors in the fourth industrial revolution, they need to be skilled in physical, digital, and biological spheres. They require the capacity to respond to—and *shape*—rapid, even unexpected advances in technology that are sensitive to societal and environmental impact.

Principles in Practice

For the remainder of the article, I lay out the practices and principles that guide my pedagogical work, moving from the ultimate particular of research concerns to the broader dilemma of designing for what we do not understand. I describe my foundational methodology of participatory research through design; present four multi-faceted pillars developed to enable undergraduate and master's students to build a sophisticated research practice; and propose a work plan for building research capacity in a doctoral design school. The ideas are not groundbreaking. But my experience suggests that many research students are not assimilating them. Articulating them as a framework—pillars which frame the construction of research—is helpful. When applied consistently across an education, the methodology and pillars result in students who critically engage with twenty-first-century challenges in sophisticated ways, researching through design. I begin with the methodology.

Participatory Research through Design

Research through design (RtD) is a critical design practice that engages divergent ways of knowing, sensing, and being at the service of a research inquiry. It makes use of designerly activities as a way of approaching messy situations with unclear or conflicting agendas;¹⁰⁰ privileges synthesis and experimentation rather than studying a problem, to solve it.¹⁰¹ RtD opens new perspectives on a research object, and may lead to unexpectedly rich responses to an inquiry and to new questions. *Participatory RtD* extends RtD, by drawing on participatory design, co-design, critical and speculative design practices. In participatory RtD, the design researcher engages participants in a) critical reflection and social critique through everyday activities, and b) embodied engagement in creative play with research ideas and techniques—all while the research is in process. Participatory RtD thus affords participant-led (as well as designer-led) first-person perspective approaches to RtD, and thence the research object. It makes stakeholder engagement in discussions around possible futures, as well as consideration of broad potentialities of emerging propositions as they unfold achievable. It enables the

- 102 Elizabeth B.-N. Sanders and Pieter Jan Stappers, "Co-creation and the New Landscapes of Design," *Co-Design* 4, no. 1 (2008): 5–18, DOI: <https://doi.org/10.1080/15710880701875068>.
- 103 Elizabeth B.-N. Sanders and Pieter Jan Stappers, *Convivial Toolbox: Generative Research for the Front End of Design* (Amsterdam: BIS, 2012).
- 104 Viktor Shklovsky, "Art as Technique," in *Russian Formalist Criticism: Four Essays*, trans. Lee T. Lemon and Marion J. Reis (Lincoln: University of Nebraska Press, 1965), 3–24.
- 105 Wilde and Underwood, "Designing towards the Unknown."
- 106 Danielle Wilde and Ferran Altarriba Bertran, "Participatory Research through Gastronomy Design: A Designerly Move towards More Playful Gastronomy," *International Journal of Food Design* 4, no. 1 (2019): 30, DOI: <https://doi.org/10.1386/ijfd.4.1.3.1>; Markéta Dolejšová,* Danielle Wilde,* Ferran Altarriba Bertran, and Hilary Davis, "Disrupting (More-than-) Human-Food Interaction: Experimental Design, Tangibles and Food-Tech Futures," in *Designing Interactive Systems (DIS '20)* (New York: ACM Press, 2020, in press), *equal contribution.
- 107 Petra Baur and Sofia Wyberg, "Rehearsals — On the Politics of Listening," in *Feminist Futures of Spatial Practice: Materialisms, Activisms, Dialogues, Pedagogies, Projections*, ed. Meike Schalk, Thérèse Kristiansson, and Mazia Ramé (Baunach, Germany: Spurbuchverlag, 2017), 212.
- 108 Puig de la Bellacasa, *Matters of Care*.

researcher to expose early-stage ideas to public scrutiny, so they might be re-oriented to better reflect situated concerns and be fit for purpose. Further, it enables designers, research teams, and participating experts to experiment with where control is situated.

Significantly, in participatory RtD, the designer is not *the* expert. Instead, they acknowledge other stakeholders' expertise and capacity to contribute to a design response that is rich and democratic. Participatory RtD brings differing perspectives to bear on creative decision making; and enables researchers to navigate tensions of difference, articulate more precisely and realistically what might be meaningful for stakeholders with divergent values, and identify which benefits to aim for.¹⁰² In practice, participants engage with and prototype artefacts, ideas, practices, and experiences to collectively and critically reflect on research questions and emergent responses. Throughout these processes, designers draw on participant feedback in a hermeneutic cycle of creativity and self-reflection—information and findings are used to find ways forward and also revisit previous considerations. In this applied action-reflection approach, making, testing, and experimenting serve as a form of negotiation of emergent ideas. As a research technique, participatory RtD assists people in bringing into language things that they may not previously have reflected on or tried to articulate. It makes use of design research methods such as generative toolkits¹⁰³ and thinking through moving, making, and (often situated) doing to critically engage with present conditions; it leverages estrangement¹⁰⁴ to open participant stakeholders to exchange unfiltered views and surface new possibilities.¹⁰⁵

If we take the example of food-related research: experimental, participatory RtD activities might include eating, foraging, using food to visualize data, co-developing dining experiences, or otherwise enjoying convivial activities that prompt people to constructively reframe, reconsider, and reconceptualize a problem space—and thence build more complex, situated understandings.¹⁰⁶ Food is personally meaningful, and culturally, politically, and ecologically charged. It also acts like social glue. Further, as Petra Bauer and Sofia Wiberg remind us, "Cooking is such a simple thing to do together, and the roles can be overturned in who has knowledge, who has power in a specific situation, and who knows what."¹⁰⁷ Food provides a familiar and potent context through which to negotiate understandings of the present, and partial visions of possible futures.

Whatever form the participation takes in participatory RtD, the process draws from related research; incorporates situated concerns; uses critical reflection and social critique through everyday activities; and deploys embodied engagement with creative play to prompt expanded consideration of the subject of study and give rise to new possibilities for action.

As a methodology, participatory RtD is made fit for purpose by colliding participatory, collaborative, speculative, and critical design with anticipation studies, science and technology studies, sustainability science (discussed above), and a feminist ethics of care.¹⁰⁸ Doing so connects the designer to an evolving and growing effort to rework the role of the humanities and their relation to science, technology, art and contemporary society. It responds to the need for more-than-human humanities, engaging with

- 109 For example, see Anna Lowenhaupt Tsing et al., eds., *Arts of Living on a Damaged Planet: Ghosts and Monsters of the Anthropocene* (Minneapolis, MN: University of Minnesota Press, 2017); Neimanis et al., "Four Problems"; Cecilia Åsberg, "Review of *A Feminist Companion to Posthumanities* by Cecilia Åsberg and Rosi Braidotti," *NORA: Nordic Journal of Feminist and Gender Research* 16, no. 4 (2008): 264–69, DOI: <https://doi.org/10.1080/08038740802441071>; Rosi Braidotti, "A Theoretical Framework for the Critical Posthumanities," *Theory, Culture & Society* 36, no. 6 (2018): 31–61, DOI: <https://doi.org/10.1177/0263276418771486>; Cecilia Åsberg and Mariette Radomska, "Why We Need Feminist Posthumanities for a More-than-Human World Transformative Humanities," in *Transformative Humanities KTH Blog*, Vol. 8 (Stockholm: KTH Royal Institute of Technology, 2019), <http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-263290>.
- 110 Danielle Wilde and Jenny Underwood, "Designing towards the Unknown: Engaging with Material and Aesthetic Uncertainty," *Informatics. Special Issue on Tangible and Embodied Interaction* 5, no. 1 (2018): 13, DOI: <https://doi.org/10.3390/informatics5010001>; Danielle Wilde and Ferran Altarriba Bertran, "Participatory Research through Gastronomy Design: A Designery Move towards More Playful Gastronomy," *International Journal of Food Design* 4, no. 1 (2019): 30, DOI: <https://doi.org/10.1386/ijfd.4.1.3.1>.
- 111 Braidotti, "A Theoretical Framework"; Manuel DeLanda, "Material Complexity," in *Digital Tectonics*, ed. Neil Leach, David Turnbull, and Chris C. Williams (Hoboken, NJ: Wiley, 2007), 14–21, available at <https://www.scribd.com/document/183889119/DeLanda-Material-Complexity>; Bruno Latour, *Reassembling the Social: An Introduction to Actor Network Theory* (Oxford, UK: Oxford University Press, 2007).
- 112 Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham, NC: Duke University Press, 2010), 3.
- 113 Nick J. Fox and Pam Alldred, *Sociology and the New Materialism: Theory, Research, Action* (London: Sage, 2016), 27.
- 114 "Exploring Food as a Form of Data Expression," *Data Cuisine*, accessed October 1, 2018, <http://data-cuisine.net/>.
- 115 Yvonne Jansen et al., "Opportunities and Challenges for Data Physicalization," in *CHI '15: Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (New York: ACM, 2015), 3227–36, DOI: <https://doi.org/10.1145/2702123.2702180>.

critical developments in environmental humanities and anthropologies of the Anthropocene.¹⁰⁹ The result is research that is informed by theories of practice; practice; philosophies that destabilize and thereby move the thinking- and research-in-practice forward; and real-world considerations of how humans live and connect with each other and our natural ecosystems. Participatory RtD positions the designer and designed in the context of the fourth industrial revolution, bringing mindful attention to social and ecological sustainability as critically intertwined concerns.

The theoretical underpinnings of participatory RtD, and how the theory plays out in practice, is unpacked at.¹¹⁰ What is important to note here is that participatory research-through-design acknowledges that capacity for agency extends beyond human actors to include human, non-human and inanimate materials and relationships.¹¹¹ It opens research-assemblages to new forms of reading, so that materials can be evaluated by their capacities to affect.¹¹² This reorientation assists design researchers to radically destabilize how they might otherwise support and read participant actions in a co-design context. Instead of focusing solely on the reactions of human participants, design researchers can bring focus to all of the forces (or affects) operating at the level of actions or events, including those in which the human collaborators play a relatively minor role.¹¹³

Take the example of food and data physicalization¹¹⁴—the practice of bringing data into three-dimensional, material form.¹¹⁵ Eric Baumer and his colleagues¹¹⁶ argue that to achieve nuanced reflection, data must be synthesized by a person, not simply encountered. Such synthesis requires reflecting on the complex relationships that exist between the person's felt experience—their understanding of what feels right, as well as right for them—and the systems view of what has been measured and how those measurements are represented. By virtue of their physicality, data physicalizations enable exploration and synthesis of data representations through all of the senses and sensorimotor capacities. The body thus becomes an active agent in understanding—people can literally, as well as intellectually and emotionally, "feel" the data, self-reflect, and thereby arrive at nuanced understandings about these relationships, the data, and themselves. Food affords complex interactions between bodily senses through its richly varied, sensorially stimulating material qualities. It resonates personally, socio-culturally, and politically; and as people engage with food it transforms—through physical and chemical interactions while cooking, eating, and digesting; and through multi-species engagement as it perishes, grows, and moves.

By flattening the hierarchy between these human, non-human, and inanimate materials and relationships, we can arrive at a new materialist ontology, wherein there are "no structures, no systems and no mechanisms;" "instead, there are 'events;' an endless cascade of events comprising the material effects of both nature and culture that together produce the world."¹¹⁷ This way of thinking opens the path to responsively craft the human and non-human elements in a research process. By taking 'things' seriously, designers and design researchers can "recognize more fully how these [things] come to be constituted and thought in and through particular

- 116 Eric P.S. Baumer et al., "Reviewing Reflection: On the Use of Reflection in Interactive System Design," in *DIS '14: Proceedings of the 2014 Conference on Designing Interactive Systems* (New York: ACM, 2014), 93–102, DOI: <https://doi.org/10.1145/2598510.2598598>.
- 117 Fox and Alldred, *Sociology and the New Materialism*, 7.
- 118 Myra J. Hird and C. Roberts, "Feminism Theorises the Nonhuman," *Feminist Theory* 12, no. 2 (2011): 115, DOI: <https://doi.org/10.1177/1464700111404365>.
- 119 Kristina Lindström and Åsa Ståhl, *Patchworking Publics-in-the-Making: Design, Media and Public Engagement* (PhD dissertation, Malmö University, 2014), 55, available at <http://muep.mau.se/handle/2043/16093>.
- 120 Ibid., 56.
- 121 DiSalvo, "FCJ-142 Spectacles and Tropes"; Carl DiSalvo, "Design, Democracy and Agonistic Pluralism," in *Proceedings of the Design Research Society Conference*, ed. David Durling (Montreal, Canada: Université de Montréal, 2010), 366–71, available at <http://www.drs2010.umontreal.ca/data/PDF/031.pdf>.
- 122 Chantal Mouffe, *The Democratic Paradox* (London: Verso, 2000).
- 123 Björgvinsson et al., "Agonistic Participatory Design."
- 124 Tobin Siebers, *Disability Theory* (Ann Arbor, MI: University of Michigan Press, 2008).

worlds in which 'we humans' are but one nominated set of players."¹¹⁸ According to Kristina Lindström and Åsa Ståhl, such an approach "means not only to open up the body, but also to open up ... materials that are related in somewhat stabilized ways, but which can be rearranged."¹¹⁹ Doing so pays "attention to the discursive and material, in one move." It recognizes relationality and co-constitution of agency, and enables the designer to go beyond only considering the concerns of the user.¹²⁰ Designers can expand their focus to consider socio-cultural, physical, digital, and biological interactions writ large.

A critical challenge for design in the context of global challenges is to bring together diverse stakeholders without compromising stakeholder perspectives or watering down experimental methods. DiSalvo suggests that designers need to be educated to recognize that consensus is not always possible or desirable.¹²¹ According to Chantal Mouffe, difference is essential for a pluralistic democratic society, and conflict—expressed as tension, friction, and dissension—defends against the erasure of difference.¹²² In complement, participatory design scholars stress that "defining what innovation is, who innovates, where and under what conditions innovation occurs is an important battleground within society."¹²³ Design education needs to equip designers to align different contexts and their representatives; to make visible, perform, and debate differences between current issues; and to practically explore how an alternative future might tangibly unfold today. This process must account for difference. It must acknowledge that first person perspective, embodied experiences are situated, and are central to forming worldviews. Embodied experiences can be invisible and socially constructed. As the preeminent disability theory scholar, Tobin Siebers, explains about disability: it is in part medically constructed, in part socially constructed; the economy between social representations and the body is not unidirectional or non-existent, but reciprocal and thus complexly embodied.¹²⁴ I propose that this notion of complex embodiment may be applied to all embodied experience, to afford more comprehensive recognition of difference.

Takeaways: Designers need the theoretical background to honor and value the experiences and epistemologies of stakeholders. They must be skilled in negotiating a lack of consensus. Further, they must be skilled in working with complex embodiment as the status quo.

Pillars of Practice

Undergraduate and master's students in particular need frameworks to conduct design research and scaffold post-disciplinary thinking and collaborative engagement with divergent actors—and to action the recommendations I make above. To this end, I articulate four multi-faceted pillars that intertwine research and practice as if indivisible (Table 2). Each pillar is a set of basic questions. I advise my students to cycle through these as they work, hermeneutically building their knowledge as their research unfolds. The research questions and literature review form the foundation for their research, even as these shift and take new forms as the research unfolds. On

- 125 Cross, "Designerly Ways of Knowing"; Lois Frankel and Martin Racine, "The Complex Field of Research: For Design, through Design, and about Design," in *Proceedings of The Design Research Society Conference*, ed. David Durling (Montreal, Canada: Université de Montréal, 2010), available at <http://www.drs2010.umontreal.ca/data/PDF/043.pdf>; Gaver, "What Should We Expect?"; Wolfgang Jonas, "Design Research and Its Meaning to the Methodological Development of the Discipline," in *Design Research Now: Essays and Selected Projects*, ed. Ralf Michel (Basel, Switzerland: Birkhäuser, 2007), 187–206.
- 126 Ann Light and Yoko Akama, "The Human Touch: Participatory Practice and the Role of Facilitation in Designing with Communities," in *PDC '12: Proceedings of the 12th Participatory Design Conference: Research Papers*, vol. 1 (2012), 61–70, DOI: <https://doi.org/10.1145/2347635.2347645>; Ann Light et al., "Participant-Making: Bridging the Gulf between Community Knowledge and Academic Research," *The Journal of Community Informatics* 7, no. 3 (2011), available at <http://ci-journal.net/index.php/ciej/article/view/804>.

Table 2 Four pillars used to guide design research and practice.

1. **WHY, WHERE and for WHOM** are you doing what you are doing? What is your context of action? Acknowledge the specificity and diversity of sociocultural, political, geographic, and other situated contexts, attitudes, mindsets, bodies, and entanglements. Further, recognize that diversity is often invisible, and people are experts in their own experience.
2. **HOW** are you developing your design outcomes? What are your methods and methodology, for research, practice, and dissemination?
3. **with WHOM** are you conducting your research and development? Who are the experts you collaborate with, and seek out for their professional or personal expertise (and who carry both)?
4. **WHAT** are you developing? What new material and interaction aesthetics, and new (social, technological, fashionable, embodied, wearable, ingestible...) imaginaries does your work bring forth? What role does it play in the journey from speculative futures to "implementable nows"?

this foundation, the pillars slowly come together in a unique form, providing strength and structure to the research outcomes. The whole thus serves as an emerging structure on which students can hang their understandings as their targets shift and move; and ensures they attend to critical aspects of research in practice. The Four Pillar Framework enables novice researchers and designers to develop sophisticated work—to ground critical inquiries, whether via research through design, for design, with design, about design, or any other concatenation thereof.¹²⁵

The first pillar, **WHY, WHERE and for WHOM ...** encompasses two research foci: i) the problem, tension point, or area of concern; and ii) the focus within this—the boundaries of the inquiry. It invites the student researcher to consider the context of the design (artifact, system, practice, and so on) in development, from two distinct vantage points: within and without. The view from within constitutes the first-person, situated, embodied experience of the user of the design, and includes their phenomenological experience of the design itself, and of the world, as mediated by the design. In complement, the view from without constitutes the environmental context for the design experience, and the perspective of others. Critically, "others" is a shifting target that encompasses the human and non-human things engaging with the design. These can be active or passive, willing or incidental participants, interested or indifferent observers; they may also shift and change over time, as might the circumstances of use. This pillar demands specificity and is crucial in avoiding designs for non-representative, normative ideals. Participatory design research holds a commitment to honoring and valuing the experiences and epistemologies of all stakeholders through theory and practice.¹²⁶ This pillar assists the researcher to uphold this commitment. Further, queering their practice will enable them to deepen their engagement with issues of identity, discourses

- 127 "Queer Theory," Oxford Reference, accessed May 23, 2020, <https://www.oxfordreference.com/view/10.1093/oi/authority.20110803100358573#>.
- 128 Jacob (Jenna) McWilliams, "Queering Participatory Design Research," *Cognition and Instruction* 34, no. 3 (2016): 259–74, DOI: <https://doi.org/10.1080/07370008.2016.1172436>.
- 129 Carman Neustaedter and Phoebe Sengers, "Autobiographical Design in HCI Research: Designing and Learning through Use-It-Yourself," in *DIS '12: Proceedings of the Designing Interactive Systems Conference*, June 2012, 514–23, DOI: <https://doi.org/10.1145/2317956.2318034>; Audrey Desjardins and Aubree Ball, "Revealing Tensions in Autobiographical Design in HCI," in *DIS '18: Proceedings of the 2018 Designing Interactive Systems Conference*, June 2018, 753–64, DOI: <https://doi.org/10.1145/3196709.3196781>.
- 130 Wilde et al., "Embodied Design Ideation Methods"; Wina Smeenk, Oscar Tomico, and Koen van Turnhout, "A Systematic Analysis of Mixed Perspectives in Empathic Design: Not One Perspective Encompasses All," *International Journal of Design* 10, no. 2 (2016): 31–48, <http://www.ijdesign.org/index.php/IJDesign/article/viewFile/2543/736>.
- 131 Ilpo Koskinen et al., *Design Research through Practice: From the Lab, Field, and Showroom* (Amsterdam: Elsevier, 2011).
- 132 Danielle Wilde, "Embodying Material Ideation," in *Proceedings of PIN-C 2015. Participatory Innovation Conference* (The Hague, NL, 2015), 386–93.

of power, and epistemology. To "queer" is to deconstruct sexuality and gender; see it as a discursive social construction, fluid, plural, and continually negotiated, rather than natural, fixed.¹²⁷ In relation to participatory design, Jacob (Jenna) McWilliams explains,¹²⁸

"queer theory [is] a framework committed to highlighting and challenging prevailing assumptions about how sexuality and gender shape experiences, identities, and learning. Queer theory has been embraced in some academic disciplines ... as a powerful lens through which to interrogate the functions of power, discourse, and the ways in which identities shape and are shaped by social norms around sexuality and gender.... Queer theory is an epistemological and ontological shift; embraced fully, it demands resistance to or rejection of dominant assumptions about who people are, what learning looks like, and how educational design can and should be undertaken."

As I explain to my students, "that buff white guy" is not in the room. They need to observe real-world diversity, look beyond assumptions, prejudices and stereotypes, and be specific about the many, varied things with which their design engages.

The second pillar, **HOW ...** concerns questions of methodology. It requires students to determine what methods they will use, why these methods, how they will use them, and why in that way. It demands they consider dissemination, and thus the type(s) of contribution that might emerge from their inquiry. It prompts them to (re)consider their experiential thinking around who should care and why. Who they are designing for, and whether they expect to make scientific, methodological, cultural or designerly contributions. One expects a designerly contribution from design research. When consciously engaged with, (re)consideration of the other types of contribution can open up thinking about the work and who may benefit from learning about it.

The third pillar, **with WHOM ...** brings focus to expertise. It concerns expert stakeholders with personal and professional expertise, and considers everyone expert in their own experience. It thus encompasses experimental ethnography, autoethnography, and autobiographical research;¹²⁹ methods that allow the design researcher to engage with first-person perspectives;¹³⁰ and "research labs in the wild" — participatory events that conflate lab, field, and showroom¹³¹ — to expose early-stage ideas to the scrutiny of diverse publics, so they might be refined to better align with situated concerns before being scaled up and deployed with stakeholders in later stages of the research study.¹³²

The fourth pillar, **WHAT ...**, is oriented towards the design object — be it system, practice or artifact — utilized within, or emerging as a product of, the participatory experiments. This pillar invites the student researcher to consider the material and interaction aesthetics of the research objects they develop. It requires cycling back to the first pillar, and considering the phenomenological experience of participants, the relationships between the object and other "things," and the environment or context of use. It, further, prompts consideration of how research experiments might be bringing forth new social, technological, fashionable, embodied (etc.) imaginaries, and assisting with the journey from speculative futures to real-world change.

- 133 Wilde et al., "Embodied Design Ideation Methods."
- 134 Max Liboiron, Alex Zahara, and Ignace Schoot, "Community Peer Review: A Method to Bring Consent and Self-Determination into the Sciences," June 7, 2018, DOI: <https://doi.org/10.20944/preprints201806.0104.v1>.
- 135 Barbara Adams, "Crafting Capacities," in *Design as Future-Making*, ed. Barbara Adams and Susan Yalavich (London: Bloomsbury, 2014).
- 136 Oscar Tomico and Danielle Wilde, "Soft, Embodied, Situated & Connected: Enriching Interactions with Soft Wearables," *The Journal of Mobile User Experience* 5, no. 3 (2016), DOI: <https://doi.org/10.1186/s13678-016-0006-z>.
- 137 Danielle Wilde and Patrizia Marti, "Exploring Aesthetic Enhancement of Wearable Technologies for Deaf Women," in *Designing Interactive Systems (DIS)* (New York: ACM, 2018), 201–13, DOI: <https://doi.org/10.1145/3196709.3196777>.
- 138 Wilde et al., "Embodied Design Ideation Methods"; Kristina Höök and Jonas Löwgren, "Strong Concepts: Intermediate-Level Knowledge in Interaction Design Research," *ACM Transactions on Computer-Human Interaction (TOCHI)* 19, no. 3 (2012): 1–18, DOI: <https://doi.org/10.1145/2362364.2362371>.

When working with the pillars, student researchers must continually engage with diversity and ethics, and they must make use of defamiliarization (estrangement) as a strategy to remain off-balance and keep the work alive.¹³³ They must hold equity and access as guiding principles; balance environmental, economic and social justice with humility and solidarity; champion social justice, participation and collaboration; consider community peer review to bolster claims for societal relevance;¹³⁴ and enact the scientific method (observe, take notes, analyze) through design practices and experimental ethnography, **EVEN AS THEY PARTICIPATE** in the worlds they are making. In doing so, they continually cycle through the pillars, hermeneutically building knowledge through experimental means. The framework assists them to think in new ways about what constitutes a body, a technology, wearing, being worn, or undertaking whatever activity they are designing. It prompts them to play with scale, and to work with and against the scale of the body—the scale at which most people think and imagine. It asks them to take an expanded view of craft—see it as a fundamentally social way of working with people through the medium and intelligence of materiality.¹³⁵ It asks for an expanded view of materiality—flattening the hierarchies that can arise between bodies, contexts, and research materials.¹³⁶ Beyond these basics, the framework encourages the student researcher to extend the body—literally, metaphorically, materially, and relationally. To be intimate, startling. To see idiosyncrasy as an opportunity and divergence from norms as vibrant and enriching.¹³⁷ To design for all kinds of embodiment, not only human embodiment. Ask challenging questions. Critically reflect on how to leverage the rich capacities of bodies and imaginations. Actively consider the many, rich and varied ways of being embodied and present; how people might engage with the broad ecosystem impact of our actions, interwoven with, and through, the ecologies we move through.

In concrete terms, student researchers use embodied ideation methods to develop interim outcomes and intermediate knowledge.¹³⁸ The partial resolution of concepts and ideas destabilizes and shifts forward momentum in new directions, so they can surprise themselves and discover something new. These partially-resolved outcomes result in strong pivots: new ways of thinking about and designing for bodies, materials, contexts; new ways to imagine and then design. Students think through moving, making, and situated doing—prototyping emerging ideas in a three-step process. First, they work with materials that are not programmed or (at first glance) programmable: so-called “lo-tech” materials such as paper, woven and non-woven textiles, tape, and string. They then work with known, perhaps off-the-shelf, technologies and biologies: materials about which we have deep cultural experience and knowledge. Finally, they work with and prototype bespoke, emerging, or yet-to-be-imagined technologies and biologies. This pathway assists them in experimenting wildly and keeping their ideas open for as long as possible so that their creative process is not truncated, and it can give rise to new responses to the issues, dreams, and concerns with which they are engaging. Of course, this process must be carefully handled to ensure teams arrive at outcomes in the time required, and so project management becomes a foundational skill.

- 139 Stuart Firestein, *Ignorance: How It Drives Science* (New York: Oxford University Press, 2012).
- 140 Judith Butler, *Giving an Account of Oneself* (New York: Fordham University Press, 2009).
- 141 Linda Candy and Ernest Edmonds, "Practice-Based Research in the Creative Arts: Foundations and Futures from the Front Line," *Leonardo* 51, no. 1 (2018): 63–69, https://doi.org/10.1162/LEON_a_01471; For a rich, ongoing discussion, see the Art of Research conference series "Art of Research 2020 — at Aalto University," accessed 23 April 2020, <https://artofresearch2020.aalto.fi/>.

Staying in unknowing is not easy. Most people prefer to operate within their abilities—do what they know works, and thus avoid risking failure. Yet, according to physicist James Clerk Maxwell, "Thoroughly conscious ignorance is the prelude to every real advance in science."¹³⁹ Not knowing is fundamental to developing something new—a crucial skill with the global challenges we face. It is an ethical issue. Judith Butler tells us "we must recognize that ethics requires us to risk ourselves precisely at moments of unknowingness, when what forms us diverges from what lies before us, when our willingness to become undone in relation to others constitutes our chance of becoming human."¹⁴⁰ This approach to design research pedagogy attempts to support students to grapple with our need to redraw what it is to be human, living on this planet, today.

The final steps consist of (re)positioning the process and outcomes in relation to existing knowledge, and identifying future research directions. The entire process involves thinking through moving, making and doing, diverse forms of dissemination (the preparation of which is a form of thinking) and thinking through writing. It requires careful project management to afford the necessary curiosity-driven experiments.

Takeaways: Experimental ethnography, including auto-ethnography and autobiographical research, are critical methods should designers wish to develop sophisticated, context-sensitive work. Designers need to deepen their engagement with issues of identity, discourses of power, and epistemology, so they can honor and value the experiences and epistemologies of all stakeholders. They need skill in estrangement and the capacity to stay in a place of "not knowing" for as long as possible if they are to develop something new. They also need project management skills to support curiosity-driven exploration and ensure timely results.

Building Capacity: Doctoral Training for Design Researchers

In this section, I offer a concrete contribution to doctoral training: a work plan to build research capacity in an art and design doctoral school. Doctoral education differs from undergraduate and master's-level research training, in that its primary purpose is to train designers to become researchers—the focus is on developing (design) research skills, rather than design skills. Doctoral education is hardly new, so on the surface, this task may seem straightforward. However, in art and design—disciplines where practice is paramount and practitioners typically undertake research as a cornerstone of their work—this simple reality raises numerous challenges. Research practices and conceptions of rigor across art and design can diverge considerably. Research undertaken for academia is understood differently from research for practice. Practice-based doctoral training is relatively new, and understandings of how to conduct practice-based research are not agreed upon and continue to evolve.¹⁴¹ Unsurprisingly under these conditions, consistent evaluation criteria are difficult to define, and institutions can struggle to know how to support doctoral candidates.

- 142 John Langshaw Austin, *How to Do Things with Words*, vol. 88 (Oxford, UK: Oxford University Press, 1975).
- 143 Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham, NC: Duke University Press, 2007).
- 144 Donna J. Haraway, *Modest_Witness@Second_Millennium. FemaleMan@_Meets_OncoMouseTM: Feminism and Technoscience* (New York: Routledge, 1997).
- 145 Puig de la Bellacasa, *Matters of Care*.
- 146 Emma Felton, Oksana Zelenko, and Suzi Vaughan, eds., *Design and Ethics: Reflections on Practice* (London: Taylor & Francis Group, 2012), <http://ebook-central.proquest.com/lib/sdub/detail.action?docID=956922>.
- 147 Gretchen B. Rossman and Sharon F. Rallis, "Everyday Ethics: Reflections on Practice," *International Journal of Qualitative Studies in Education* 23, no. 4 (2010): 379–91, DOI: <https://doi.org/10.1080/09518398.2010.492813>.
- 148 A useful reference for detailed elements in the plan outlined in Table 3 is Gjoko Muratovski, *Research for Designers: A Guide to Methods and Practice* (Thousand Oaks, CA: Sage, 2015). Thomas Markusen and his colleagues (building on Eva Brandt and Thomas Binder) describe dynamic research sketching, see Thomas Markussen et al., "Dynamic Research Sketching: A New Explanatory Tool for Understanding Theory Construction in Design Research," in *Proceedings of the 8th International Design Research Society Conference* (Bangkok, Thailand: Chulalongkorn University, 2012); Eva Brandt and Thomas Binder, "Experimental Design Research: Genealogy, Intervention, Argument" (Paper presented at International Association of Societies of Design Research 2007, Hong Kong, China), available at <https://www.researchgate.net/publication/262037737>.

I propose a six-phase work plan to recognize these challenges and make moves to address them. It is designed to raise the performance of a doctoral school through close work with the doctoral committee, deans and research leaders (the leadership team), research supervisors, and candidates. Each phase is considered a performative act. Each act uses design methods to leverage the performativity of language, and the resulting speech acts generate consequences.¹⁴² All but the last act involve capacity-building workshops and convivial discussions. The workshops have a topic or theme, explored with the three stakeholder groups, together or in tandem, and result in tasks to be implemented and discussed in future acts. The discussions complement the workshops: small meetings that afford mentoring for individuals and study or research groups. This multi-pronged approach allows trickle-up and trickle-down of knowledge; it recognizes current approaches; supports existing strengths; creates space to respond to struggles; and paves the road to higher quality overall. The plan, as a whole, results in: evaluation guidelines; a framework for ongoing systemic change; and a series of actions to position the institution as a research leadership node, connecting art and design universities regionally and internationally.

The six acts build on each other over an academic year. Much of the work is group work, designed to stimulate participation and active learning. Rather than being silos of familiarity, groups are designed to afford cross-fertilization of disciplines and approaches, and cut across levels of research expertise. They provide a critical framework through which to engage with texts, theories, practices, and positions diffractively. They thus value and provide space for difference. As Karen Barad elaborates,¹⁴³ building on Haraway,¹⁴⁴ diffractive reading maps interference, rather than replication, reflection, or reproduction. It implies the possibility of divergent perspectives on the same material. It thus affords space to account for different disciplinary perspectives, practices, and values. It better positions researchers to challenge their assumptions and embrace other perspectives, and affords rapid and easy identification of research opportunities. Importantly, diffraction posits situatedness as a methodology and an ethics, and creates space for an ethics of care.¹⁴⁵ The ethical turn in design is relatively new¹⁴⁶ and must advance beyond the procedural moves required by the academy, to deep reflection on the practice of design, as well as the practice of the everyday.¹⁴⁷ Figure 4 illustrates the work plan process, and Table 3 unpacks each act into concrete actions.¹⁴⁸

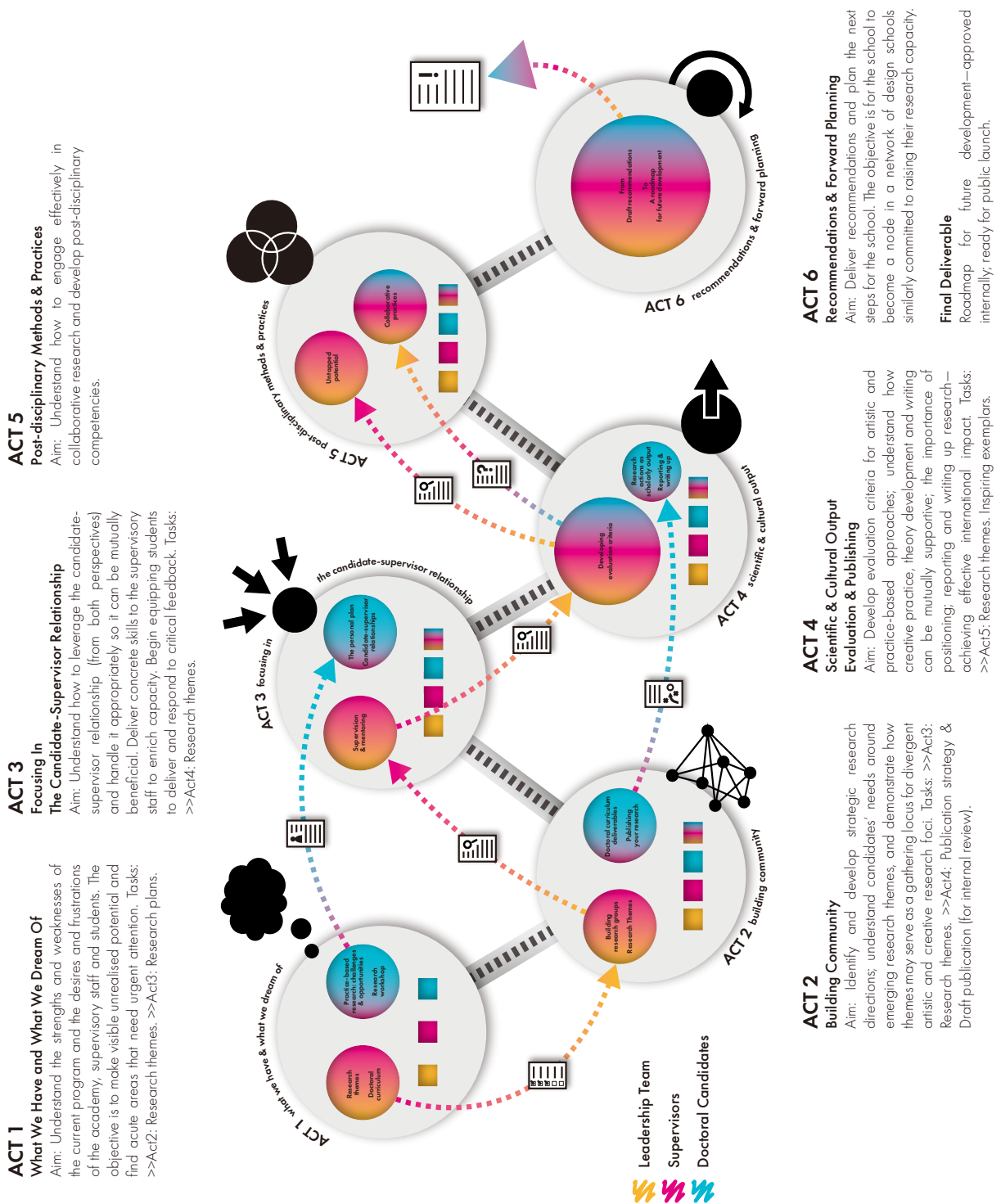


Figure 4

A Work Plan in Six Acts: Building research capacity in a design school. Drawn by Thomas Ritschel. © 2020 by Danielle Wilde.

Table 3 **A Work Plan in Six Acts: Transforming doctoral training and building research capacity in a design school.**

<p>KEY: <u>Stakeholder groups:</u> The Leadership Team (L); Supervisors (S); and Doctoral Candidates (D), across Art and Design.</p> <p><u>Workshops:</u> bring together the stakeholders in different configurations to build capacity (see Figure 4 for a process map).</p> <p><u>Discussion sessions:</u> conducted one-on-one or, from Act 2, within research theme groups and doctoral study groups.</p>	
<p>ACT 1: What We Have & What We Dream Of</p> <p>GOAL: Understand the strengths and weaknesses of the current program and the desires and frustrations of the academy, supervisory staff and students. The objective is to make visible unrealized potential and find acute areas that need urgent attention.</p>	
WORKSHOPS	<p>AIM: Map out the challenges and desires of the institution: commitment to advancing research performance; diverse interests, concerns and perhaps diverging conceptions of what constitutes research and research rigor.</p>
	<p>1.1 Research themes</p> <ul style="list-style-type: none"> • In preparation, RESEARCH LEADERS work with STAFF to identify complementary themes or groupings to focus the presentations and following discussions. • ALL provide a short (3–5min) overview of their area of practice and current activities. • Guided discussions identify research themes, or possible themes for thematically driven research programs that either consolidate disciplinary perspectives or cut across disciplines and areas of practice in powerful ways. This discussion builds on the morning presentations and will result in concrete TASKS to be delivered in Act 2.
	<p>1.2 Doctoral curriculum</p> <ul style="list-style-type: none"> • Mapping activities to collectively evaluate the doctoral program. Facilitator raises questions to drive the enquiry. Activity covers pedagogical intent and considers how well the current curriculum is serving the desires of the Doctoral School, as well as those of individual researchers. Where tensions arise, workshop new ways of thinking about how to deliver the program content, coherent with teaching, administrative, research, and study demands.
	<p>1.3 Practice-based research: challenges and opportunities (art & design)</p> <ul style="list-style-type: none"> • FACILITATOR presentation: raise usefully provocative questions related to divergent disciplinary approaches and modes of practice. Seek out personal perspectives on practice-based research and research rigor. • CANDIDATES: Short (3–5 min) presentations, grouped into disciplines or thematic concerns • Guided discussion, connecting the presentations to the provocations.
DISCUSSIONS	<p>1.4 Workshop</p> <p>i) The research question in practice-based research</p> <p>ii) Designing research and managing projects that emerge from practice</p> <p>ii) Success criteria</p> <p>TASK: (to be delivered in Act 3) candidates prepare a personal research plan, including: research question/s, Gantt chart, dynamic research sketch and 5-page text addressing the area of interest addressed by the thesis, covering: 1) Relevance: Why the [problem] is important? 2) Related work: How have others attempted to address it? 3) The research questions. 4) Approach/Methodology: How are you planning to address your research questions? 5) Evaluation plan: How will you measure your research actions and articulate their value? 6) Preliminary results: Do you have intermediate knowledge? Does it demonstrate that your approach is promising? 7) Implications: What are the theoretical, methodological and practical contributions of your work, and who should care? 8) What next/what could follow?</p>
	<p>One-on-one and small group discussions</p> <p>AIM: identify short-term needs and long-term goals; understand how to better foster connections between staff and candidate research, to meet the needs of the different stakeholders and move towards (or recalibrate) goals.</p>
	<p>L</p> <ul style="list-style-type: none"> • Goals related to the leader's professional role; balancing these with institutional, staff and candidate goals.
	<p>S</p> <ul style="list-style-type: none"> • How supervision fits with the other demands of their professional role; personal research; challenges, concerns and desires; how their topic and activities fit within the institution/the local research community; how their research and supervision activities align.
	<p>D</p> <ul style="list-style-type: none"> • How candidates see themselves and their topic within the institution; what they hope for in supervision, and from the institution; what they are struggling most with (identify acute tensions); thoughts and concerns about their research plan task.

(Continued on next page...)

Table 3 (Continued)**ACT 2: Building Community**

GOAL: Identify and develop strategic research directions; understand the needs of the candidates concerning emerging research themes, and demonstrate how themes can serve as a gathering locus for divergent artistic and creative research foci.

WORKSHOPS	L+S	2.1 Building a research group Discussing the value of: bringing together senior, mid-level and junior researchers; recruiting into themes; interweaving: research themes, mentoring and publishing; publication and funding strategies.
		2.2 Research themes <ul style="list-style-type: none"> Update and discussion of interim outcomes based on actions brought forward from meeting 1.1. Workshop to develop themes: articulate concerns and foci of each theme; map relations within themes and between themes. TASKS: develop research themes, ready to discuss ideas & challenges in Act 3, 4 and 5.
	D (+S)	2.3 Doctoral curriculum deliverables (Timing of phases depends on the length of doctorates) <ul style="list-style-type: none"> Phase 1 (YR 1–2): Problems of the Specialty + individual plans. <ul style="list-style-type: none"> What are you doing? How are you thinking about your journey? Are you working alone or with others? consider complementarity to cover more ground; and the value of sharing the journey. Phase 2 (YR 3–4): Dissemination opportunities. <ul style="list-style-type: none"> What are you doing? How are you thinking about public presentations of work, lectures, exhibitions, publications? Are you working alone or together? Cohorts and co-authorship. Towards completion: What can we learn from the doctoral curriculum deliverables?
	D (+S)	2.4 Publishing your research <ul style="list-style-type: none"> Framing research output; making a contribution to knowledge at a world-class level; reading, writing, developing a practice and a strategy. Your career post PhD. Each student present their personal plan (brought forward from Act 2), reflect on how it has evolved; other students join collective reflection on strengths and weaknesses, alternate approaches and responses to challenges. Building a doctoral study group <ul style="list-style-type: none"> Using themes: topics, methods, methodologies Interweaving: research themes, peer-review, mentoring and publishing Funding research TASK: Publication strategy & draft publication Each candidate to develop their publication strategy, with topics for high-ranking venues. Develop an outline and the first draft of an article, to be submitted two weeks before Act 4. Drafts will be shared and collectively evaluated in Act 4.
DISCUSSIONS		One-on-one and small group discussions, mentoring: research projects, performance, actions brought forward from Act 1. From this point forward DISCUSSIONS may also be held within doctoral study groups and research theme groups.

ACT 3: Focusing In—The Candidate-Supervisor Relationship

GOAL: Understand how to leverage this relationship (from both perspectives) and handle it appropriately so it can be mutually beneficial. Deliver concrete skills to the supervisory staff to enrich capacity. Train students to deliver and respond to critical feedback.

WORKSHOPS	L+S	3.1 Supervision & mentoring <ul style="list-style-type: none"> Doctoral supervision: individual approaches, challenges and strategies group supervision Planning to scaffold support Buddying system to mentor between staff with differing experience levels
	D (+S)	3.2 The personal plan <ul style="list-style-type: none"> Each student to present their personal research plans (brought forward from Act 1) <ul style="list-style-type: none"> Collective reflection on strengths and weaknesses, alternate approaches and responses to challenges. This task is designed to build capacities for constructive critique, as well as for planning research.
		3.3 The candidate/supervisor relationship
DISCUSSIONS		one-on-one and small group discussions, mentoring: research projects, performance, actions brought forward from Act 2.

(Continued on next page...)

Table 3 (Continued)**ACT 4: Scientific & Cultural Output | Evaluation & Publishing**

GOAL: Develop evaluation criteria for artistic and practice-based approaches; understand how creative practice, theory development and writing can be mutually supportive; the importance of positioning; reporting and writing up research—achieving effective international impact.

WORKSHOPS	L+S+D	4.1 Developing evaluation criteria <ul style="list-style-type: none"> A major challenge in artistic and creative research is to do something that is not only new and original to the doctoral candidate, but that is new and original to the field. In this session we confront epistemological questions of art and design research, specifically: How do we know what we know, and how can we make claims for a contribution? Reviewing the literature, critical differences between art and design. Developing consistent, defensible evaluation criteria. <p>TASK: Collect examples of inspiring and/or troubling collaborative research and post-disciplinary practices to discuss in Act 5.</p>
	D (+S)	4.2 Research actions as scholarly output <ul style="list-style-type: none"> Managing emergent research The value of interim outcomes—exhibitions, interventions, presentations, participation From practice to theory 4.3 Reporting and writing up <ul style="list-style-type: none"> Building a regular writing practice Documenting your work and supporting your claims Management of citations and references Common challenges (building on facilitator review of outlines and draft submissions, brought forward from Act 2) Reading groups, writing groups, reviewing each other's work <p>GROUP WORK: evaluate and discuss outlines and draft paper submissions, create individual and group work plans for development</p> <ul style="list-style-type: none"> Useful publications and online support fora Co-authorship between students and supervisors—challenges and opportunities <p>GROUP WORK: share and discuss publication strategies (brought forward from Act 2), collectively assess and provide constructive feedback</p>
DISCUSSIONS		One-on-one and small group discussions; mentoring: research projects, performance, actions brought forward from Act 3.

ACT 5: Post-Disciplinary Methods & Practices

GOAL: Understand how to engage effectively in collaborative research and develop post-disciplinary competencies.

WORKSHOPS	L+S	5.1 Untapped potential <ul style="list-style-type: none"> Research themes: progress and challenges (brought forward from Act 2). What's working? What needs fixing? Where do you need help?
	L+S+D	5.2 Collaborative practices <ul style="list-style-type: none"> FACILITATOR PRESENTATION: divergent examples, best practices, challenges (+ guided discussion). PARTICIPANT PRESENTATIONS: personal examples for discussion. GUIDED DISCUSSION: Sharing methods and techniques to help you make it work.
DISCUSSIONS		one-on-one and small group discussions, mentoring: research projects, performance, actions brought forward from Act 4.

ACT 6: Recommendations & Forward Planning

GOAL: Deliver recommendations and plan the next steps for the Doctoral School

WORKSHOPS	L+S+D	6.1 Draft recommendations <ul style="list-style-type: none"> Presentation & Guided Discussion: To receive their doctorate, candidates must demonstrate the ability to conduct research that makes a significant contribution to knowledge. This not only means showing work in world-class venues, it also means framing the research contribution to a broad and interested audience. The draft recommendations will be designed to assist current stakeholders and build capacity in the school as a whole so that staff and future candidates have a strong support framework to ensure they can work together effectively and achieve these outcomes. This last meeting will deliver that framework.
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To conclude, recommendations are edited into a formal document of concrete actions that the leadership team and doctoral school can commit (and aspire) to.

- 149 Hausknost, "Tackling the Political Economy."
- 150 Friedman, "Design Education Today"; Meyer and Norman, "Changing Design Education," 15–16.
- 151 Light et al., "Creative Practice and Transformations."
- 152 Aalto University, "Design for Government. Advanced Studio Course in Aalto University's Creative Sustainability Master's Programme," DFG, accessed April 26, 2020, <http://dfg-course.aalto.fi/>.

Skills and Competencies

The grand challenge of design education appears to be twofold: 1) equip designers to innovate transformatively; and 2) ensure actors across society recognize the potential of design—beyond material and interaction aesthetics—so that designers may leverage their world-making skills towards profound and meaningful impact. My focus in this section is predominantly on the first challenge. In [Table 4](#), I collate the takeaways from my argument into a list of skills and competencies I believe are needed by design researchers if they are to contribute to global challenges constructively. This list—developed over several years, in diverse educational contexts—is a work in progress and is far from refined. My intention with this formal presentation is to invite discussion, reflection, and debate, so that as a community, we might consider my recommendations diffractively: from a variety of perspectives, highlighting difference rather than similarity, to arrive at a more pluralistic understanding of what is needed.

If we are to respond constructively to global challenges, people must be empowered to act. To collectively anticipate alternatives; shift the beliefs, attitudes, values and systems that guide, shape, and constrain our behaviors; and ultimately reorient cultures from a strong focus on consumption towards regeneration, and thereby interdependent personal, societal, and more-than-human—planetary—flourishing. Doing so may indeed require what Daniel Hausknost calls "creative destruction." As he argues in his address to the UN Sustainable Development Transformation Forum, achieving "a purposive and time-bound transformation entails non-linear, disruptive and by definition unpredictable forms of change and ... political institutions with the capacity, power, and legitimacy to make transformative decisions."¹⁴⁹ I propose that design research has an important role to play within this process. However, equipping designers to respond to problems of this magnitude remains a critical challenge.¹⁵⁰ Light and colleagues, in bringing focus to creative practice, make a strong move in response to this challenge.¹⁵¹ Aalto University's Design for Government course makes another strong move.¹⁵² Other institutions are making advances. More work is needed.

We must educate our students to reflect on the social and environmental impact of their design activities—the materials and processes they use; the artefacts and systems they create; the ways they engage with human and non-human stakeholders. We must teach them to consider how their actions impact our performance in relation to the social and planetary boundaries, and whether they position us within the safe and just operating space, described above. Our understanding of these benchmarks must be context-sensitive and continually evolving, as we empower the marginalized and respond to the particular within a global ecosystem. Design must be participatory; sensitive to first-person perspective, situated experience; and account for a plurality of voices. This move alone will go far in helping to transform design education, and make it fit for twenty-first-century concerns. The skills in [Table 4](#) will further assist this process. They represent the takeaways pulled from the text above.

Table 4 **Draft recommendations: skills design researchers need to grapple with global challenges.**

Skills and capacities needed by design researchers to grapple with global challenges:

- Skill in post-disciplinary practice.
- The ability to think and discuss design beyond the discipline itself; to forge new kinds of collaborative partnerships and engage with new kinds of knowledge, in an ongoing, self-reflexive, regenerative process.
- The capacity—including skills, knowledge, and strategic partnerships—to interlink situated concerns, planetary science, and governance.
- Familiarity with sustainability science, environmental humanities, economics, environmental politics, and governance.ⁱ
- The capacity to engage with divergent perspectives and situated understandings of value and challenge, and thus ensure a plurality of voices inform their work.
- Skill in creative practices, world-making, and bottom-up approaches to policymaking and infrastructuring; and the capacity to direct design actions towards aligning policy, techno-scientific research and creative engagement.
- Competencies in sustainability brokering and anticipation—to anticipate shocks, and support engagement and co-creativity; to conduct careful design and facilitation, informed by stakeholder-relevant research; and to make creative, cross-sector, cross-disciplinary decisions.
- Familiarity with design processes to sustain knowledge integration and build worldwide communities that cut across disciplinary divides.
- Advanced capacities for thinking through moving, making, and doing, and the ability to facilitate such embodied reflection.
- Skill in diverse forms of dissemination: to ensure impact and reach beyond collaborators and stakeholders, and to frame contributions as scientific, methodological, cultural, or designerly, and thus move beyond siloed understandings of the work.
- Skill in experimental participatory design and co-design methods and theories and experimental ethnography; and the theoretical background to honor and value the experiences and epistemologies of *all* stakeholders.ⁱⁱ
- The capacity to draw from, and move fluidly between, diverse and divergent disciplines and worldviews as they apply methods, frameworks, and theories.
- Skill in negotiating a lack of consensus, and with adopting complex embodiment as the status quo.
- Skill in the eight competencies identified by UNESCO: systems thinking, anticipation, normative competency, strategic competency, collaboration, critical thinking, self-awareness and integrated problem-solving, in particular anticipation.
- Skills in physical, digital, and biological spheres, and the capacity to respond to—and *shape*—rapid, even unexpected, advances in technology, sensitive to societal and environmental impact.
- Skill in estrangement, and the capacity to stay in a place of not knowing for as long as possible.
- Project management skills to support stakeholder engagement and curiosity-driven exploration, and ensure timely results.
- Competence with theoretical frameworks, such as participatory research through design, and the pillars of design research practice described here.

i Useful starting points are: Takeuchi, *The Journal of Sustainability Science*; Emmett and Nye, *The Environmental Humanities*; Bernstein et al., *The Journal of Global Environmental Politics*; Auerswald and Quadir, *The Journal of Innovations*.

ii As discussed in Light and Akama, "The Human Touch: Participatory Practice and the Role of Facilitation in Designing with Communities," 61.

- 153 IPBES, "2019 Global Assessment Report"; Josef Settele et al., "IPBES Guest Article: COVID-19 Stimulus Measures Must Save Lives, Protect Livelihoods, and Safeguard Nature to Reduce the Risk of Future Pandemics," IPBES, April 27, 2020, <https://ipbes.net/covid19stimulus>.
- 154 Wolfgang Knorr et al., "After Coronavirus, Focus on the Climate Emergency," *The Guardian*, May 10, 2020, available at <https://www.theguardian.com/world/2020/may/10/after-coronavirus-focus-on-the-climate-emergency>.
- 155 Jørgen Randers, *2052: A Global Forecast for the Next Forty Years: A Report to the Club of Rome Commemorating the 40th Anniversary of the Limits to Growth* (White River Junction, VT: Chelsea Green Publishing, 2012).
- 156 For a current discussion, see Figueres and Rivett-Carnac, *The Future We Choose*.
- 157 Birger Sevaldson, "Jørgen Randers: People Would Rather Go Shopping," *She Ji: The Journal of Design, Economics, and Innovation* 4, no. 3 (2018): 293–301, DOI: <https://doi.org/10.1016/j.sheji.2018.03.005>.
- 158 Ibid., 298.
- 159 For example, see Maike Halterbeck et al., "Impact of the COVID-19 Pandemic on University Finances: Report for the University and College Union" (London Economics, April 2020), 19, https://www.ucu.org.uk/media/10871/LE_report_on_covid19_and_university_finances/pdf/LE-reportoncovid19anduniversityfinances; and Alan Finkel, "Impact of the Pandemic on Australia's Research Workforce," Chief Scientist of Australia, Rapid Research Information Forum, May 8, 2020, <https://www.science.org.au/sites/default/files/rriif-covid19-research-workforce.pdf>.

Conclusion

On April 27, 2020, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) released an Expert Guest Article, "COVID-19 Stimulus Measures Must Save Lives, Protect Livelihoods, and Safeguard Nature to Reduce the Risk of Future Pandemics." The article states unequivocally,

"We have a small window of opportunity, in overcoming the challenges of the current crisis, to avoid sowing the seeds of future ones.... We need transformative change—the kind highlighted last year in the IPBES Global Assessment Report (the one that found a million species of plants and animals are at risk of extinction in coming decades): fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values, promoting social and environmental responsibilities across all sectors. As daunting and costly as this may sound—it pales in comparison to the price we are already paying."¹⁵³

Following, on May 10, 2020, in a letter to the *Guardian* newspaper entitled "After Coronavirus, Focus on the Climate Emergency," twelve leading climate scientists bluntly deliver their expert opinion. "It is time to acknowledge our collective failure to respond to climate change, identify its consequences, and accept the massive personal, local, national, and global adaptation that awaits us all."¹⁵⁴ Jørgen Randers, a co-author of *The Limits to Growth*, its 1992 and 2004 sequels, and author (in 2012) of *2052: A Global Forecast for the Next Forty Years*,¹⁵⁵ explains that we know what the problem is—climate change, short term thinking, an extractive relationship to the earth's ecosystem, and slow-moving mechanisms of governance—and we know what the solutions are.¹⁵⁶ The challenge is implementation. We need to convince people to think in the long(er) term, and make it profitable (I suggest beneficial writ large) to do the right thing, and we need a system that is capable of making big decisions quickly.¹⁵⁷ In response, Birger Sevaldson reminds us all that most "established sciences are 'sciences of what is.' Design has the potential to be the science of what ought to be."¹⁵⁸

Global challenges are vast and complex, and they play out very differently in different places and for different actors. They are further complicated by cause and effect being difficult to correlate empirically, let alone perceptually—the timescales of planetary change can be very different from those of human experience. COVID-19 is not more or less complex than other global challenges, but has created a more immediate and instantaneous need to transform how we work, socialize, manage healthcare, and deliver education. It is also demonstrating our capacity for rapid, radical change. I hope our education systems might learn from this example. Faced with the complications of COVID-19, students are deferring or cancelling planned study. Education and research financing models are in question.¹⁵⁹ In many places, restructuring has begun. Perhaps the dramatic and drastic situation of COVID-19 is the opportunity we need, to (re)consider and transform our educational structures? As we rebuild society, might we rethink what design research education is, to better account for global challenges?

Being a designer means being an optimist—to be designers, we must make proposals, and we base these proposals on the opportunities we

160 Manzini, "New Design Knowledge," 4.

161 Ibid., 8–9, emphasis in original.

162 See Note 69.

163 Waag, "BioHack Academy: BioFactory," Waag technology and society, accessed May 11, 2020, <https://waag.org/en/project/biohack-academy-biofactory>.

meet.¹⁶⁰ Global challenges are nothing if not an opportunity for design. As Manzini explains,¹⁶¹ "There is [at the time, emerging, now urgent] demand for sustainable solutions and for visions of sustainability." Feasible alternatives indicate *new qualities*, such as the quality of places, communities, commons, and time. In every country in the world there are cases of social, technological, and material innovation that could be seen as significant steps towards sustainability.¹⁶² But they do not always easily scale or map well to other circumstances. There is much to do and to learn for designers and design. However, design research education must transform if it is to equip designers to constructively respond.

In this article, I make a case for praxis—research in action—that can assist this transformation. I propose participatory research through design as a foundational methodology; four pillars to enable undergraduate and master's students to develop sophisticated design research; a work plan to build capacity in a doctoral school; and a list of skills and capacities that design researchers will need if they are to respond constructively to global challenges. This list will never be exhaustive. Nonetheless, it provides concrete requirements to which design schools and universities can respond. Planting these seeds does not require new programs. The methodology, pillars of practice, and many of the skills can be inserted into existing undergraduate and master's curricula. The content of courses may have to change—perhaps radically in some cases—to ensure, for example, that skills in biodesign become commonplace. Or that students develop their capacities for engaging with scientists, negotiating relationships with diverse civil and civic society actors, making visible tension points, and fast-tracking transformative innovation.

At SDU (The University of Southern Denmark, Kolding campus) I developed our capacities in biodesign with a modest investment, a lot of good will, a partnership with a local biologist, and three formal mechanisms. These were Waag Technology and Society's Biohack Academy,¹⁶³ a flexible 10ECTS teaching module (IT Product Design Professional Research Apprenticeship); and the coordinated, distributed public events connected to Danish National Research Week (Forskningens Døgn). These mechanisms enabled me to gather and build equipment, skills, and community, and strengthen collaboration within the university and with diverse local, regional, and international actors from civil and civic society. These actors, today, collectively sustain interest in the idea of situated biohacking, in Kolding and beyond; and this new capacity laid a foundation for new research, partners, and revenue streams. Investment to make similar changes in another institution could also be approached iteratively and creatively, with significant impact. Whatever the capacities of the institution, teaching staff must be supported to develop experience and skills; afforded flexibility (and a certain amount of autonomy) when determining the content of their courses; and provided a budget for equipment, as possible, where needed. They must also be encouraged—not only with words, but with seed funding and workload redistribution where needed—so they can identify opportunities and build community in partnership with diverse civil and civic society stakeholders, including individuals, organizations and community groups that have enthusiasm and experience in the targeted domains.

- 164 Eduardo Mendieta, "Philosophy of Liberation," in *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta (Metaphysics Research Lab, Stanford University, 2016), available at <https://plato.stanford.edu/archives/win2016/entries/liberation/>; drawing on: Freire, *Pedagogy of the Oppressed*; Paulo Freire, *Education for Critical Consciousness*, vol. 1 (London: Continuum, 1974).
- 165 Manzini, "New Design Knowledge," 6.

Building research capacity at the doctoral level is perhaps not so different than at the undergrad level. It requires iterative surgery. The work plan I describe above is designed to intervene in an existing program: six performative acts in which an external facilitator works with the leadership team, supervisors, and current cohort of candidates. Through a guided process, these actors collectively diagnose and respond to existing strengths and weaknesses; build research and supervision capacities; and develop a roadmap to ensure ongoing impact. Implementing this work plan requires a commitment of resources — time, money, and effort. Many art and design institutions struggle to build their capacity, for a range of reasons. They already commit resources, either directly or indirectly, in trying to address this issue. The work plan will help them to (re)focus their efforts, and be more effective in this endeavor. It will lead to more robust supervision, research training, and practice, to the benefit of the candidates, the supervisors, the institution itself, and the broader research community.

Educational institutions are not famously flexible, but we live in curious times. The need to transform how we live, and the underlying philosophies that guide decision making and action in much of the world, cannot reasonably be disputed. Design, and thus design research education has an obligation to respond — just as we are part of the problem, we must, humbly and mindfully, be part of the transformation. As Brazilian educator Paulo Freire explains, if people are to overcome their dependence, they can only do so through their own agency, by becoming the subject of their own liberation. To become a subject of one's own liberation means to engage in a process of *conscientização*, or consciousness raising, through a pedagogy that rejects the notion of the learner as a passive receptacle and instead departs from the fundamental realization that learning is a dynamic process. Two key notions of Freire's pedagogical theory are that (1) teaching requires listening to the people; and (2) schooling means life, that is, learning is both indispensable to life and it takes place in the midst of living.¹⁶⁴ I propose design research, similarly, requires listening to the people, and as a praxis, is indispensable to life and takes place in the midst of living.

In the first half of this article, I raised the idea of designers as sustainability brokers. In 2008, Manzini suggested that if designers want to work as agents for sustainability, they need to better understand the contexts in which they are operating. He said that they must also understand change in progress, as well as how to re-orient that change towards sustainability. This is not easy. It requires generating system transformations such that "all social actors use new ways of thinking and acting with totally new artifacts, organizational forms and networks.... Designers, too, must rethink themselves, rethink how they operate and reshape their position in society."¹⁶⁵

The steps I propose here — the seeds I have planted — are designed to empower design research educators, and thence design researchers, to facilitate this process. To empower people, including themselves, to be the architects of our reconnection with nature and eventual whole-of-system flourishing. The objective in committing these ideas to print is to invite others to join me in asking what we might grow as we reflect on what designers and design researchers might rightfully expect from the academy if they are to

- 166 Manzini, *Design, When Everybody Designs*.
- 167 Karen Hao, "Live-Streaming Helped China's Farmers Survive the Pandemic. It's Here to Stay," *MIT Technology Review*, May 6, 2020, <https://www.technologyreview.com/2020/05/06/1001186/>.
- 168 Sean Murphy, "Sydney Inventor David Soo Can Grow \$600,000 Worth of Vanilla from His Smartphone," *ABC NEWS*, May 10, 2020, <https://www.abc.net.au/news/2020-05-10/high-tech-dome-grows-vanilla-from-smart-phone/12218902>.
- 169 "About BlueCity: An Incubator for Circular Entrepreneurs in Rotterdam," BlueCity, accessed May 13, 2020, <https://www.bluecity.nl/about-bluecity/>.
- 170 For example, see John Bell et al., "EU Ambition to Build the World's Leading Bioeconomy — Uncertain Times Demand Innovative and Sustainable Solutions," *New Biotechnology* 40 (2018): 25–30, DOI: <https://doi.org/10.1016/j.nbt.2017.06.010>.
- 171 Friedman, "Design Education Today."
- 172 Meyer and Norman, "Changing Design Education."

be fit to respond to global challenges through situated concerns. The aim is to equip designer researchers to assist in the building of bridges; to connect the desires, fears, and interests of everyday designers¹⁶⁶ and the latest scientific knowledge; and to facilitate a two-stage transformative innovation process. This entails 1) developing "anticipatory future imaginaries," and 2) backcasting to implementable nows and, through a collective, rigorous, and creative resourcing process, implement transformative innovation. The resulting innovations may be modest — novel applications of existing technologies, such as an app that connects farmers in rural China with people in the city, for meaningful exchange as well as commerce.¹⁶⁷ Or they may be technologically sophisticated, such as a custom technology set-up that enables an entrepreneur to grow vanilla beans locally and sustainably, with a small footprint, and control the system from his phone instead of traveling to politically unstable, remote locations in another country at considerable expense and personal risk to procure them.¹⁶⁸ Or they may be materially and relationally sophisticated, as they are at BlueCity¹⁶⁹ — a platform and accelerator for circular entrepreneurs situated in Tropicana, a former subtropical swimming oasis, complete with slides and hot tubs. At BlueCity, a restaurant's coffee waste is used by two co-located businesses to grow mushrooms (some of which go back to the restaurant) and mycelium for packaging materials; fruit waste from the port is turned into strong leather like material for bags and books; a slow fashion label recycles car and bicycle tires into accessories, with people who have a distance to the labor market; and another business turns corporate waste streams into consumer products. Any combination of the above might work.¹⁷⁰ What is important is that they make a profound difference.

Participatory research through design and the four pillars of practice support grounded planning, (re)configuring the research as it unfolds. Together, they ensure robust research decision making, and contextually relevant research outcomes. The work plan, in complement, bolsters the efforts of supervisors, doctoral candidates, and the leadership team, and focuses curriculum development to the benefit of all. The six acts that make up the work plan involve capacity-building workshops and convivial discussions, where "coffee and cake" combine with constructive critique. These activities are meant to be convivial — friendly, at times lively — and involve commensality. Commensality is the practice of eating together, leveraging the social and sensory aspects of food, as well as the nutritive. The inclusion of commensality reflects the need to maintain joy, in our determination, as we grapple with challenges large and small. This need is not specific to research into food systems. It is crucial to any topic of twenty-first-century complex design research.

Equipping design researchers to respond to global challenges is one of four challenges for design education identified by Friedman.¹⁷¹ The others — performance challenges, systemic challenges, and contextual challenges — do not sit apart, but are currently better served by design education.¹⁷² The moves I propose here respond to that gap. Through them, I hope to meaningfully contribute to a constructive transformation of design research education from within, and in doing so, seed regenerative futures

for the discipline. The overarching objective is to support civil and civic society actors—including designers, design researchers, and educators—to reorient our actions towards the environment and care more for our more-than-human selves, loved ones, and diverse fellow travelers; and to enhance our capacities for human-nature relatedness. I believe that doing so will assist us in developing the resilience we need to participate in our communities and ecosystems more constructively.

I find this vision of constructive participation in community particularly compelling as I sit in my glassed-in-balcony-cum-office, with a heater, a blanket, and a beach hat to shade my eyes, and closed in by lockdown, acutely aware of my privilege—feeling relatively safe (if extremely troubled) during the COVID-19 pandemic. I see the upset around me, and dare to hope it may finally serve as the impetus we need to take meaningful, broad-reaching, locally situated, planetary scale, action. In any case, I hope the seeds I plant here bear fruit and grow.

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