Educational institutions play an instrumental role in social and political change, and are responsible for the environmental and social ethics of their institutional practices. The essays in this volume critically examine scholarly research practices in the age of the Anthropocene, and ask what accountability educators and researchers have in ‘righting’ their relationship to the environment. The volume further calls attention to the geographical, financial, legal and political barriers that might limit scholarly dialogue by excluding researchers from participating in traditional modes of scholarly conversation. As such, Right Research is a bold invitation to the academic community to rigorous self-reflection on what their research looks like, how it is conducted, and how it might be developed so as to increase accessibility and sustainability, and decrease carbon footprint. The volume follows a three-part structure that bridges conceptual and practical concerns: the first section challenges our assumptions about how sustainability is defined, measured and practiced; the second section showcases artist-researchers whose work engages with the impact of humans on our environment; while the third section investigates how academic spaces can model eco-conscious behaviour. This timely volume responds to an increased demand for environmentally sustainable research, and is outstanding not only in its interdisciplinarity, but its embrace of non-traditional formats, spanning academic articles, creative acts, personal reflections and dialogues. Right Research will be a valuable resource for educators and researchers interested in developing and hybridizing their scholarly communication formats in the face of the current climate crisis. 

Cover image by Leanne Olson, The Clay at Ryley, CC-BY-NC-ND Cover design by Emilie St-Hilaire.
The following chapter discusses how teaching design through the process of systems thinking, as derived from the disciplines of both ecology and biology, is the best path forward to prevent the worst-case scenarios of climate change. Systems thinking is a process that can help designers to uncover the root cause of a problem and how it connects to the larger picture: people, profit and planet (and everything in between). The conditions of the Anthropocene mean that designers must be able to identify the social, political and environmental repercussions of their work—and take responsibility for them. This process empowers designers to evaluate and shift the emphasis of their outcomes to consider the demand put on our natural resources: where and how we get materials to produce our projects, who and what is affected by our decisions and what will happen to the project after it is implemented. The systems thinking process explored in this chapter is a four-step model (determine project goals, map out the design problem, brainstorm design outcomes and evaluate each possible design outcome) as set forth in the 2017 book *Design to Renourish: Sustainable Graphic Design in Practice*. The authors, who are based at the University of Illinois at Urbana-Champaign, taught this systems thinking model over two years in three different courses to test its effectiveness and make improvements.
to the process, methods, tools and resources from one academic term to the next.

Introduction

The Anthropocene is the current geological epoch in which human activity has ‘negatively’ impacted not only individual ecologies but the entire system of our environmental interactions.¹ We have ignorantly pushed Earth out of the Holocene epoch in which agriculture, sedentary communities and, eventually, socially and technologically complex human societies developed.² The scope, scale and complexity of the self-imposed ecological issues we face today—like global warming, decreasing biodiversity and species extinction, and air, soil and water pollution—have led environmental scholars to suggest the worst is yet to come for our civilization and planet. In fact, a 2019 Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) report from the United Nations (UN) details how the Anthropocene will eventually bring humanity to its knees. The UN study found that ‘75% of land environment and some 66% of the marine environment “have been significantly altered by human actions”’ and ‘up to 1 million of the estimated 8 million plant and animal species on Earth are at risk of extinction—many of them within decades’.³

Designers and design educators are therefore forced to now confront the fact that they should have acted proactively decades ago (as Victor Papanek prophesied in his 1971 book, Design for the Real World: Human Ecology and Social Change) to help prevent the worst from our current

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potentially dystopian epoch. Additionally, educators must act collectively to realize that furthering the current status quo design instruction will not create a viable response to today’s eco-crises. The development of ephemera and artifacts using our historically taught linear processes (cradle to grave) ignores the natural systems of our planet entirely. This antiquated approach to design education will only hasten the speed of our current downward spiral through the Anthropocene, from which, once we reach the bottom, we may not be able to recover.

However, instead of creating a beautifully kerned apocalypse, design educators could empower their students to create what we want our future to be. Instead of continuing with the current model that increases environmental and consequent social destruction, design educators could use their skills to provide our students with the creative toolkit to regenerate what we took from our Indigenous brothers and sisters, land and waterways. This concept of imagining and creating the future we want will result in what scholars call the ‘Ecocene’. Rachel Armstrong coined the term in 2015, having proclaimed at the Urban Ecologies design conference in Toronto: ‘there is no advantage to us to bring the Anthropocene into the future. The mythos of the Anthropocene does not help us. We must reimagine our world and enable the Ecocene’.

We argue that the best way forward to enable the Ecocene is to change our professional practice and teaching to use the process of systems thinking derived from the disciplines of both ecology and biology. Systems thinking is a process that can help designers to uncover the root cause of a problem and how it is connected to the larger picture—people, profit and planet (and everything in between). The conditions of the Anthropocene mean that designers must be able to identify the social, political, and environmental repercussions of their work—and take responsibility for them. This process empowers designers to evaluate and shift the emphasis of their outcomes to consider the demand put

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on our natural resources, where and how we get materials to produce our projects, who and what is affected by our decisions and what will happen to the project after it is implemented.

In this chapter, we will illuminate how teaching systems thinking to design students can help them handle a larger degree of complexity and make more responsible outcomes for their projects by considering value creation within a long-term timeframe involving a larger network of stakeholders. This chapter will also reflect how systems thinking in design is different than using more traditional Human-Centered Design (HCD) methods for complex problem solving in design education. We will also discuss how teaching systems thinking to designers encourages a better and more responsible interaction between humanity and the environment (as opposed to, in HCD, where designers are concerned about how to solve only a particular user need).

Our Systems Thinking Process

The systems thinking process we used in our courses is grounded in that described extensively in Chapter Two, ‘The Hawk, the Squirrel, and the Oak Tree’, of the 2017 book Design to Renourish: Sustainable Graphic Design in Practice. In their book, Eric Benson and Yvette Perullo divide their systems thinking process into four phases that weave back in forth (circular) to avoid the linear design process (cradle to grave) that has helped place us squarely in the Anthropocene. The process described in the book is uniquely adapted for designers from previous research, namely that by Donella Meadows’ Thinking in Systems: A Primer and Fritjof Capra and Pier Luigi Luisi’s The Systems View of Life: A Unifying Vision.

Each of the four Design to Renourish phases are written using a language that designers can understand, describing systems thinking as similar to Gestalt theory (the whole is greater than the sum of its parts) and the Charles and Ray Eames’ film Powers of Ten (1968; rereleased in

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Gestalt theory and Powers of Ten are common topics taught in design foundations and design history courses, and therefore already in the vocabulary of a young design student, making a complex topic like systems thinking easier to understand. Both the term Gestalt theory and Powers of Ten demonstrate for the designer how it is best to zoom in and zoom out of an issue to see not only the granular details, but also the larger connected reasons why the issue might exist in the first place. Systems thinking teaches us that (as environmentalist John Muir stated): ‘(w)hen we try to pick out anything by itself we find that it is bound fast by a thousand invisible cords that cannot be broken, to everything in the universe’. In other words, everything is connected on our planet.

The four phases within the systems thinking process were embedded in each of the two projects in our fall 2017 Design Methods course, taught as an exploratory testing ground to introduce the topic to design students. The phases within the Design to Renourish process are (in order): determine project goals, map out the design problem, brainstorm design outcomes and evaluate each possible design outcome. The general concept of titled phases mimic those used within the design thinking and HCD communities, and therefore can be better understood by designers and disciplines outside of the design community as well. However, one of the biggest differences from design thinking is that the goals within a systems thinking process is that the outcomes should be circular (like our natural systems) and create zero waste. We define this as sustainable design, where there is a net zero environmental (and carbon) impact.

Systems thinking, of course focuses on people, as does the more commonly taught HCD approach. Systems thinking, however, is better suited to handle the complex concerns we face in the Anthropocene, as its process tasks the designer with visually mapping out the problem(s) in order to discover the root causes of an issue, instead of identifying solely the symptoms. Within this mapping, the designer not only considers people (the audiences), like in HCD, but also includes the Earth (water, land and air) as a key stakeholder in the process. All of these partners share equal weight and importance, forcing the designer to design circularly (zero waste) using our natural systems as a guide.

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Despite the limitations HCD has in solving the concerns we will face in the current Anthropocene, it contains very useful tools and methods that we taught alongside systems thinking strategies in each of our three courses from 2017–2019. For example, within the second phase of the Design to Renourish systems thinking process (map out the design problem) students learned how to use storyboards, surveys and user personas, while in the fourth phase (evaluate each possible design outcome) students studied SWOT (strengths, weaknesses, opportunities and threats) analysis to better choose the correct possible design direction.

Case Study One: Design Methods 2017

In the fall 2017, the authors each taught a section of a required hybrid studio/seminar HCD course directed toward forty total graphic designers, entitled Design Methods. We planned the entire course using the process defined in Design to Renourish. Each of the two challenges (as we called the assignments) tasked each team of students to follow our systems thinking design process: determine project goals, map out the design problem, brainstorm design outcomes, and evaluate each possible project outcome to solve a social or environmental issue that affects humanity. During the process, the students used HCD tools like storyboards, surveys, user personas, and a SWOT analysis to help make collective decisions and designed outcomes that embrace nature’s cyclical model. The goal of each challenge was to make the students capable of leading system change initiatives addressing complex sustainability, offering flexible access to the best learning experiences, tools and case studies.

Throughout this course we did not mention the topic of Anthropocene, despite it being implied in every one of the assignments. We hoped that if we focused on the future we wanted to have (Ecocene), we could limit apathy and paralysis in decision-making based on despair.

The course structure and lecture materials were exactly the same in both sections so we could get a larger consistent sampling of student feedback and outcomes to see how effective or ineffective the systems thinking process was. We organized the fifteen-week semester into three equal chunks. The first five weeks offered different viewpoints on design through readings/discussion, introduced systems thinking and sustainable design methodologies, and conducted workshops with
various tools and methods used by designers that focus on HCD and ‘Thinking Wrong’. The remaining ten weeks were broken into two five-week challenges that asked the students to use what they learned in the first five weeks to find and propose solutions to social and environmental challenges.

The two challenges stressed the importance of locality. Each proposed project by the student design teams must be, in the end, realized outside of the classroom on campus or in the community. We championed the local, so the student teams could more easily interview people, would know the area better and its issues, and could see the results (at the end of the project) in person. Most importantly, they could see themselves as part of the community they were designing for (and with) and feel greater agency throughout the process knowing that the final solution would hopefully also positively their lives as well.

The first challenge we assigned was entitled ‘Local Resources’, where each team was asked to pick one of the following four subtopics to explore: plastics, water, food or waste. We set fairly strict parameters in this first systems thinking project, allowing the teams access to only these four questions connected to the sub-topics provided: How can we reduce plastic consumption (on college campuses or in the local community)? How can we use design to eliminate contaminants in the local drinking water supply? How might we dramatically reduce waste by transforming our relationship with food in the community or on campus? How might we establish better recycling habits on campus?

The first challenge allowed the student teams to pick an area to explore. However, since this was the first time almost everyone in the studio had used systems thinking to design, we curated the questions in order to eliminate any extra confusion caused by a completely wide open prompt coupled with a new way of creating. But in the second challenge, we included a more open design prompt, since we felt that the experience with systems thinking in the first challenge would better prepare the students for a project of their choosing.

At the end of the first challenge, we took a portion of the following class period to debrief. We asked each class section the same questions about what they learned from using systems thinking in design and

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9 John Bielenberg et al., Think Wrong: How to Conquer the Status Quo and Do Work That Matters (San Francisco: Instigator Press, 2016).
what could be improved upon for the next project. Overall, the students
felt that using systems thinking when designing was incredibly
important. They were confused along the way—as it was very new to
them. However most confirmed that ‘confusion was good’. Discomfort
forced them not to fall into the trap of creating the same outcomes that
solved one problem but created many others. With understanding the
bigger picture of the design problem, they felt they could develop a
better and more sustainable solution. We used what we gleaned from
these two course conversations to make small and quick changes to the
second challenge to improve upon the overall class experience.

This second challenge was curated into four main topics: health,
education, democracy and the planet. We chose these areas as they are
all affected by and have helped create the Anthropocene epoch. To help
get the design teams thinking, we provided some example questions in
each of the four themes. For example, in health, we provided this example
project query, ‘How might we make the Emergency Department (ED)
waiting room more humane and user-focused?’ while in the democracy
issue, we furnished an idea asking ‘How might we design an accessible
election experience for everyone? How can we more engage people to
vote?’

The students produced some interesting solutions for each of the
two challenges in Design Methods that could be implemented with
the possible acquisition of further funding sources but did not make
tangible artifacts as they were lacking the time and monies to purchase
the sustainable materials needed to have a net zero impact. Instead,
the students turned in proposals in the format of digital presentations.
Most of the solutions, in general, involved a digital outcome like a
website or mobile application. These solutions were not necessarily
driven by the lack of money or avoidance of physical solutions (to
reduce environmental impact), but instead were based on a careful
consideration of the effectiveness of a digital solution (in comparison to
others brainstormed) after going through the entire four phase systems
thinking process as a team.

At the end of the fall 2017 semester, we collected written and verbal
feedback from the students to create an in-depth analysis of the project
outcomes in order to tweak the syllabus and general approach for the next
time the course (or similar class) was taught. The analysis verified how
much students understood about systems thinking and how and why they would include it in future school and professional design projects.

Specifically, this is the feedback that was most commonly given regarding the semester spent thinking in systems. In the first *determine project goals* step from *Design to Renourish*, it is important to suggest to the students to reach out to and speak with as many people connected to the design problem as possible. Many times, they didn’t locate an important expert or community leader until later in the project, changing the way they would have approached a solution at the outset. A more experienced systems thinking team of designers will learn to research better to avoid missing connections.

In the second *map out the design problem* step, we found after mapping out the design problem, it was smart to suggest to the students to invite fresh eyes to the map to locate opportunities and issues that the design team missed. The more details and information the map holds the better it will serve the design team in choosing a final solution(s). We also confirmed that using user personas was vital for properly understanding the people involved. Interviews with actual people and surveys helped develop the personas.

In the third *brainstorm design outcomes* step, we found that if we used a strategy from the book *Think Wrong* by John Bielenberg, Mike Burn, Greg Galle and Elizabeth Evitts Dickinson, the design team could really separate themselves from standard design outcomes and find solutions that could solve the problem in ways that followed nature’s cycle of ‘no waste’. Specifically, the *Think Wrong* ‘Moonshot’ exercise was incredibly valuable as a tool asking the students to not constrain themselves by self-imposed parameters. This exercise asked the students to put forward potentially crazy concepts to solve a design problem. This pedagogical strategy helped the students not continue in the status quo design concepts they are used to proposing for a standard design project. They thought in a creative childlike mindset, where they began to unlearn the outdated linear design process and gave them hope that the Ecocene was indeed possible. After the ‘Moonshot’ exercise, the design teams created storyboards of their ideas to further detail out their plans to find issues and strengths in their solutions.

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10 “When to Use the Think Wrong Moonshot Drill.” Moonshot Drill, Solve Next, 2021, solvenext.com/moonshot.
In the fourth and final evaluate outcomes step, we found that using a more typical SWOT analysis tool was very useful in scrutinizing each possible solution to the problem. In combination with the SWOT analysis, the students had to also look at each solution in relation to the triple bottom line. They asked how each solution could create an experience that minimizes resources used and best use materials and vendors that were sustainable and used renewable energy. This was challenging of course, and many teams lacked experience or time to really locate the right materials. This was a clear opportunity for improvement in regard to what resources we provide to the students for this type of systems thinking project. Our thoughts headed into further courses, was to purchase a license to Life Cycle Analysis (LCA) software to help the designers visualize the actual environmental footprint of every material chosen in their design solutions.

This process of systems thinking defined by the book Design to Renourish was also tested in the fall of 2018 and spring of 2019 with two different design courses, with tweaks in the implementation learned from the fall of 2017 iteration.

Case Study Two: Fall 2018

Based on the students’ feedback from the previous semester, the Design Methods course in fall 2018 (composed of, this time, only twenty undergraduate students) was organized in a way to make students more comfortable with the circularity of the systems thinking process. Undergraduate students want a syllabus that describes every activity assigned during the semester in advance, which, we found, is not possible when working in a systems thinking approach. Appropriately, too many times, designers must stop, zoom in or zoom out during this circular process, making new work and research segues that are often unpredictable from the outset of the assignment. Therefore, students feel unprepared at times for what is coming next. It is important to include this fact on the syllabus and state it vocally in class.

This Design Methods course was again divided into two challenges. This time, Priscilla Ferronato decided to build upon the previous course iteration by including real world cases with community partners. They were the Krannert Art Museum (KAM) at the University of
Illinois at Urbana-Champaign and the Champaign County 4-H Club. The decision to collaborate with these organizations was an attempt to further demonstrate how to apply systems thinking in real world projects whose tangible outcomes can serve as an incentive to grow the students’ interest into systems thinking. The course followed the same structure as the previous semester in terms of the lectures’ topics and recommended readings. The biggest change was to shorten the introductory five weeks down and instead create two eight-week projects with the previous exercises from the initial five weeks embedded in the first assignment.

The goal of the first project was to redesign the communication experience of the Krannert Art Museum to the community. The students were required to present to the client at mid-term and, of course, at its completion deadline. The goal of the mid-term presentation was to collect feedback from the ‘clients’ including the Director and Marketing Department at KAM. However, as part of the systemic approach, the students also needed to identify who the other stakeholders were in connection to the museum. When the designers identified other stakeholders (such as members of the local community, tourists, students, employees and service providers), they began to zoom out to view the causes and consequences of the ‘identified problem’.

Not only human stakeholders were taken into consideration: during the stakeholder mapping activity it was necessary to identify other elements of the system that humans may interact with, like the planet. This was the most challenging of all the initial activities for the students, as they wanted to rush to create tangible solutions before measuring and evaluating the impacts on people and the ecosystem. Based on the Powers of Ten, students were asked to ‘zoom out’ ten times and expand their design problem and solution, and also ‘zoom in’ ten times to narrow it down. This exercise provided meaningful insights for the development of systemic solutions. (This was something new we added from the first Design Methods course.) It is important to mention that as soon as the students were able to map out the elements of the system (and especially their interactions), more sustainable solutions were developed. Everyone found that visualizing the connections between the many elements of the systems provides a way to make the opportunities tangible.
The second project, in partnership with Champaign County 4-H Club, followed the same structure as the first assignment. The students were asked to meet with the Director of the program both at the mid-term and final presentations. However, since the goal of this project was to design an experience to promote the 4-H program to increase the interest of children and teenagers in Science, Technology, Engineering, the Arts and Mathematics (STEAM), this project required a higher number of interactions with different stakeholders than the students initially thought. As soon as the students identified the different stakeholders and elements in the systems of interaction, it was easier to know who to contact and consequently understand their thoughts and opinions about the 4-H club and STEAM.

The most important finding for the students was that after using systems thinking, they realized how complex a simple visual communications project should be. With all the important yet different stakeholders, the students and Ferronato felt the best path forward was to ‘design with not for’. Therefore, Ferronato decided to introduce the concept of participatory design as a method to also incorporate into systems thinking. Some of the design teams took this opportunity to develop co-design sessions with the stakeholder groups to improve the project outcomes. The design teams that ran co-design sessions received better feedback at their critiques from the 4-H Club and faculty than those who decided against running workshops.

Case Study Three: Spring 2019

Another goal of this research was to also test teaching systems thinking in a design course that did not include a component focusing on HCD tools and methods. We decided to use one section of the junior level required course entitled Ethics of a Designer in a Global Economy (EDGE) as another testing ground. The students in this ethics class were introduced to systems thinking in the fall 2018 Design Methods course, so we were interested to learn how much they remembered, how much of the process we would have to repeat and how much deeper in detail we could go if students were already on the right track. Benson taught this course with help from a teaching assistant (Miriam Salah) that also co-taught with Ferronato in the fall 2018 version of
Design Methods. The teaching assistant was therefore also aware of the subject matter and the systems thinking process, making the transition easier. Much like in the previously mentioned case studies, though the Anthropocene was an underlying theme, the course objectives were guided by the Ecocene model. We felt that an Ecocene approach that looks toward a hopeful future, rather than a fearful and catastrophic one, would better inspire students to seek out imaginative and creative design solutions.

This course was composed of eleven students and was divided into four projects that focused on ethics within the design field and also how designers connect to the current global issues facing humanity. In particular, we structured the course around ethical discussions and projects starting from our own personal values to how these values connect to a larger community and, consequently, the planet. This class organization led us to focus exclusively on environmental issues and climate change (different from the first two Design Methods courses).

The first two projects in EDGE were concerned with the individual students’ own personal code of ethics and how that would carry forward and affect the final two projects. The first project asked the designer to choose a breakfast, lunch or dinner recipe that carried a significant amount of emotional significance to them and cook or bake it for a class potluck the following week. At the meal, we discussed the ethics connected to organic food, vegetarianism, veganism and the carbon footprint of what we all eat. This conversation was infused with readings (consumed the night before) on food justice and ethics in general. After the potluck and discussion, the students were assigned with creating an information graphic (in a relevant format of their choosing) that demonstrated the carbon footprint of the transportation needed to make their recipe.

This project resulted in some stimulating outcomes and the topic of ‘personal values’ was the segue to the second project where the students wrote their own personal code of ethics and designed individual personal brands that represented what they stood for as a citizen and designer. The course was designed in this fashion, attaching one project to the next through a similar theme. Therefore, the third project focused on ethics from the standpoint of a community that depended on the actions of one’s personal value system (connecting it to both project one
and two). This third project asked the students to use systems thinking to reimagine a delivery mechanism for a sustainable product or service that was important to them. Here, the designers were introduced to the concept of a circular economy, where objects and services are created and distributed with zero waste and no carbon footprint (again, emulating nature’s model of function).

We re-read Design to Renourish’s chapter on ‘The Hawk, the Squirrel, and the Oak Tree’ to reinforce what this group of students had already learned in their previous Design Methods course and input an additional two readings and four informational videos visualizing and explaining the circular economy (that included case studies). The students used this prompt to research similar or inspirational examples of circular products and services to influence their own design. The end result of this project was a proposal in the form of a website mockup or animated video that explained their idea clearly and was, of course, visually interesting and convincing.

The fourth project that followed this circular economy assignment replicated a portion of the second challenge from the first version of the Design Methods course (2017) asking here for the students to focus on the theme of ‘the planet’ in an attempt to better connect the everyday American to climate change concerns. We asked the students to read both a portion of the philosophy and ethics book One World Now by Peter Singer and the seminal 1999 article on climate change by Dr. Michael E. Mann, ‘Northern hemisphere temperatures during the past millennium: Inferences, uncertainties, and limitations’ to locate opportunities (using a systems thinking process) for better communication of the clear and present danger that climate change poses to our civilization.

In this third instalment of teaching systems thinking, we learned that the students had indeed unfortunately lost much of the knowledge gained about systems thinking from their previous Design Methods course. There was a real struggle in re-explaining the systems thinking process to the designers during each of the final two projects—where many only vaguely remembered reading Chapter Two from Design to Renourish and using the systems thinking process in their previous Design Methods challenges. We did not do as deep of a dive in collecting qualitative feedback in comparison to the first
attempt within the 2017 Design Methods course, as the sample size of eleven (compared to forty) was fairly small. We did, however, glean enough from the weekly desk critiques and one-on-one discussions, that there was a lack of information retained about systems thinking prior. It leads us to believe that systems thinking must be continually reinforced throughout the design curriculum, and not appear only in one class.

Conclusions

The results from each different course section demonstrated that systems thinking was initially a very foreign and overwhelming way to solve problems, causing confusion. It also ‘forced’ the students to work outside their comfort zones. However, students understood the importance of the process contrasted against the current and future global problems we all face. One of the key takeaways from the Design Methods course was to eliminate the five-week grouping of exercises and instead embed them into the two eight-week challenges. This worked more seamlessly and could also be implemented in the structure of the Ethics (or any) course as well in the next iteration.

Overall, the readings, lectures and project setups seemed to be understandable, interesting and challenging for the design students. And, as expected, the first team challenge from the 2017 Design Methods course was more confusing (and took longer) than the second, as they slowly became accustomed to this new way of thinking and working. Continually adding systems thinking into every design course in a department’s curriculum will help remedy the problems associated with initial confusion about the newer creative process and aid in the retention of the core materials and methods.

There were clear areas for improvement in teaching the topic and opportunities to add new tools, methods (like co-design) and exercises to the class. Moreover, the use of systems thinking encouraged students to think beyond the insights obtained through the use of the HCD methods. Although it is not possible to say that the use of systems thinking will alone be able to reverse the climate impact of our design activity, it can be considered a more responsible approach (as seen through the projects presented by the students in our classes and
The systems thinking process is a first step toward improving design education and potentially avoiding the worst-case scenarios in the Anthropocene, instead imagining a better future (or an Ecocene).

We must design using systems thinking, and teach systems thinking, now. We are racing against the clock to prevent the worst of the possible catastrophic environmental, social and economic outcomes driven by human-made climate change. The recent 2018 Intergovernmental Panel on Climate Change (IPCC) report demands for us to level our greenhouse gas (GHG) emissions by 2020 and cut them nearly in half by 2030 to avoid irreparable damage to the climate and ourselves. The Anthropocene is upon us and systems thinking through design is the best path forward to imagine a future we would all like to have.

Although the systems thinking curriculum we implemented with our students focused on net zero (sustainable) impacts on the planet, we believe the design solutions going forward should be regenerative in outcome. Regenerative design, by definition, encourages participation with living systems in ways that increase systemic vitality.11 As the IPCC report suggests that we must repair our climate, so too should we also clearly design in a way that helps give back to what has been stripped historically from nature to make our posters and toasters. To drawdown our greenhouse gas emissions, we must regenerate the Earth to revitalize its soil and plant life to help with the efforts to reach climate stability. This is an area for designers that is also ripe for exploration (like systems thinking) as it is an emerging research area, led by holistic scientist and designer Daniel C. Wahl.

We hope that this chapter is a valuable and useful case study for you to explore within your own design classroom. It is clear that due to global warming, overconsumption of our finite resources, and air/land/water pollution, design must change from a linear process to one that is circular. Instead of contributing to these problems, design and design education must become an agent for change to remedy these issues and renourish people and the planet instead.

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