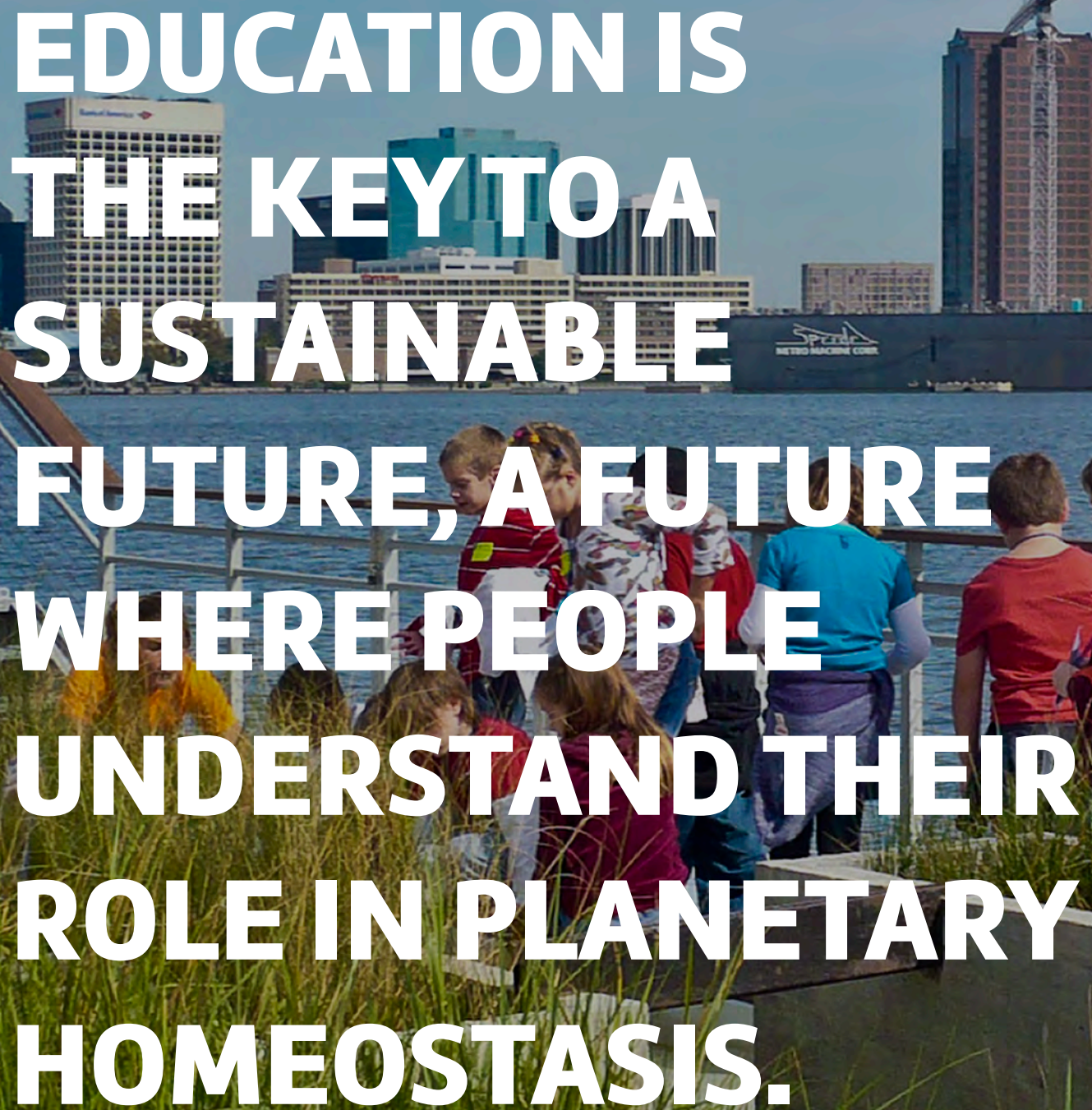# DIALOGUES

The Intersection of Emerging Research + Design for Learning

Jennifer Seydel PhD

Cynthia L. Uline PhD

Lisa A.W. Kensler EdD

Brian Dunbar, LEED Fellow

Dominique Hes PhD

Phoebe Crisman AIA

Richard Graves AIA

Lesley–Ann Noel PhD

EDUCATION IS THE KEY TO A SUSTAINABLE FUTURE, A FUTURE WHERE PEOPLE UNDERSTAND THEIR ROLE IN PLANETARY HOMEOSTASIS.

Jennifer Seydel PhD
Executive Director
Green Schools National Network

Research Subcommittee American Institute of Architects Committee on Architecture for Education

Dina Sorensen, Assoc. AIA, d.studio
Caroline Lobo, AIA, suoLL Architects
Co–chairs Research Subcommittee

With over 8,000+ architects and allied professional members, the American Institute of Architects–Committee on Architecture for Education [AIA–CAE] is a dedicated knowledge community committed to the quality and design of all types of educational facilities. The AIA–CAE Research Subcommittee is an established national interdisciplinary working group focused on research–informed learning environment design. Strategic research initiatives are made possible through the generous support of the CAE Foundation and allied partnerships.

The word school is a noun – defined as "a place where children are educated". But wait. What if we thought of *childhood*, instead. How would that change our concept of school and more importantly —the definition of school not only as a place, but also a time in one's life when wider–ranging interactions between social and ecological environment is considered for a holistic education—one of resilience.

To create an equitable and optimistic future for all children, school as a 'garden of learning', we must provide for learners to actively contribute to the dynamic balance of nature toward greater human resilience. Regenerating education to be more creative, more inclusive, more innovative than the current trajectory, is dependent on multiple layers of society. The environments learners are currently in, from the most intimate (home), to the larger school system, and then to the most expansive systems (including society and culture), are prescribed social influences in all aspects of the learner's experience. This prescriptive approach limits the vision of what education can be for a better world. A new approach focuses on regenerating education through an ecological framework to strengthen the connections between social and environmental ecologies, giving individual learners more agency to add to the balance of nature. In this issue, we boldly claim a greater vision for architecture and education to move toward a fully regenerative model as extreme climate adversity across the planet, puts more attention on the interactions between human nature and nature. With more learners and teachers immersed in natural environments, we have an extraordinary platform to open up young minds into areas we haven't even thought of, given the opportunity to influence a healthier future – young people will come up with extraordinary ideas. This theme – regenerating education – highlights the benefits of giving all learners the opportunity to be enmeshed in multiple points of view, to empower learners to think with all their senses – to play a role – and to act. It is in this encounter with different ecological environments and the linkages between them, that has the power to transform education and our world into one of human resilience.

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Editorial Guest

Jennifer Seydel PhD
Executive Director
Green Schools National Network

2020 has been a year of moving from one crisis to another. Each of these, wildfires, the pandemic, earthquakes, locust swarms, racial unrest, is a harbinger of a global system that is out of balance.

"The Chinese use two brush strokes to write the word 'crisis.' One brush stroke stands for danger; the other for opportunity. In a crisis, be aware of the danger—but recognize the opportunity."
– John F. Kennedy

Because these crises are happening across the world, and not just in one location, many people are beginning to understand that something needs to change.

The articles in this issue of Dialogues provide a beautiful vision of hope for those of us who believe education is the key to a sustainable future, a future where people understand their role in planetary homeostasis. Homeostasis is when a biological system creates conditions that are optimal for survival. When homeostasis is successful, life continues. If not, balance crumbles and disease and extinctions occur within the system. To create a planetary homeostasis, we have to develop an educational system that is more resilient.

As a leader in the green schools movement, I am fully aware we need a shared vision for what is possible. We continue to build a bridge from our current reality into the future. All the while, the leaders of the early green schools movement are forging a new and greater vision that sets a course from whole–school sustainability to a fully regenerative system. It has been an honor to convene these thought leaders and visionaries to see what they are thinking now.

Each of these articles provide a glimpse of what is possible. In combination, they provide a vision for an educational system that suggests the necessity for young people to spend time in a variety of learning environments to help think outside of the box while transforming education.

Cynthia Uline and Lisa Kensler leverage the concept of ecological restoration as they share their vision for embracing learning as an innately natural process facilitated by healthy learning ecosystems.

Brian Dunbar and Dominique Hes leverage the concept of regeneration to challenge us to think about generous schools that help students learn to live in partnership with Earth's systems.

Richard Graves shares his Social – Ecological design process to help us understand how to use regenerative design thinking in relationship to creating learning environments to rethink school design.

Phoebe Crisman shares her direct experience designing learning environments to help us expand our understanding of the necessity for schools that use the whole community as their classroom.

Lesley–Ann Noel challenges us to use an emancipatory worldview to rethink design education as we prepare the next generation of architects and designers.

CRITICAL PEDAGOGY IS AN APPROACH TO TEACHING AND LEARNING THAT FOCUSES ON TRANSFORMING OPPRESSIVE RELATIONS OF POWER, EMPOWERING AND HUMANIZING LEARNERS.

Lesley Ann Noel PhD
Associate Director, Design Thinking for Social Impact
The Taylor Center for Social Innovation and Design Thinking
Tulane University

Educational Restoration: Restoring Educational Ecosystems for Learning

Cynthia L. Uline, PhD
Executive Director
San Diego State University
National Center for the 21st Century Schoolhouse

Lisa A.W. Kensler, EdD
Endowed Professor
Educational Leadership
Auburn University

To embrace the notion of schools as living systems, comprised of living beings who are deeply interdependent and embedded in local and global (glocal) socio-ecological systems, educators must learn new habits of thought and practice.[1] The challenge is that industrialized systems and metaphors have influenced the design and management of our schools for more than a century.[2] For most of us, it's all we've ever known. Factory-like facilities, rigid schedules, ability grouping, and unnecessary curricular narrowing in response to learning standards, along with many other examples, remain pervasive across too many schools, even as educators acknowledge the need for system redesign in order to provide students with 21st century learning experiences. As an alternative to repeating reform of an outdated system, we advance the concept of educational restoration as a means to accomplish this fundamental redesign. Educational restoration necessitates a clear conception of learning as an innately natural process facilitated by healthy learning ecosystems (Figure 1). Figure 1 conveys our basic conception of 21st century learning ecosystems, grounded in mind, brain, and education sciences[3] as well as emerging sciences related to nature-based learning.[4]

Educational Restoration

Ecological restoration, a scientific field within the ecological sciences and about four decades old, has garnered powerful lessons applicable to industrialized educational systems that have over engineered learning, a natural system. The aim of ecological restoration is not to return an ecosystem to a past, static state, but rather to remove barriers to its healthy functioning; examples of barriers include engineered obstructions to natural water flow, poorly thought through practices, and even policy. Similarly, educational restoration seeks to unleash the power of our educational system to heal itself. Educational restoration, as proposed here, situates natural systems at the center of learning ecosystems, both to improve the quality of learning for students and to better align educational practice with the social, economic, and environmental needs of our time. First, we must acknowledge schools as living systems, made up of living beings. Next, we must trust that, as living systems, schools have the capacity to change from within, according to a vision that emerges from the system itself, similar to all other living systems. Finally, we must take time to ask the right questions by scrutinizing the current conditions of schools using holistic learning ecology frameworks. As Jackson, Lopoukhine, and Hillyard (1995) explained, ecological restoration begins with making judgments of need before setting corresponding goals. Educational restoration requires we take time to ask the right questions about what needs to change, why, and by whom, in order

to better identify integrative, whole-system solutions from policy to state to district to classroom levels.[7]

Learning Ecosystems

A full description of our model for educational restoration extends beyond the limits of this article.[8] Here we describe how living-systems-minded leaders take this first important step in assessing the ecological conditions of their educational systems before moving on to the uniquely local tasks of clarifying values, engendering commitment, and defining the specific leadership strategies for change.[9] Jackson, Lopoukhine, and Hillyard (1995) called for an appraisal of the circumstances of ecosystem health, from irreversibly degraded to fully healthy functioning. We identify three primary circumstances, or conditions, associated with schools:

1. the outdoor environment and the degree to which it provides safe, engaging, and accessible learning spaces;
2. the built environment and the degree to which it provides healthy, responsible, and accessible learning spaces; and
3. the social networks and their degree of healthy interconnectedness both within the school community and beyond school walls.

These three primary ecological conditions equate to three points of entry into assessing, and eventually restoring, educational systems for learning: *outdoor environments, built environments, and social networks*. We identify those who do this work as educational restorationists.
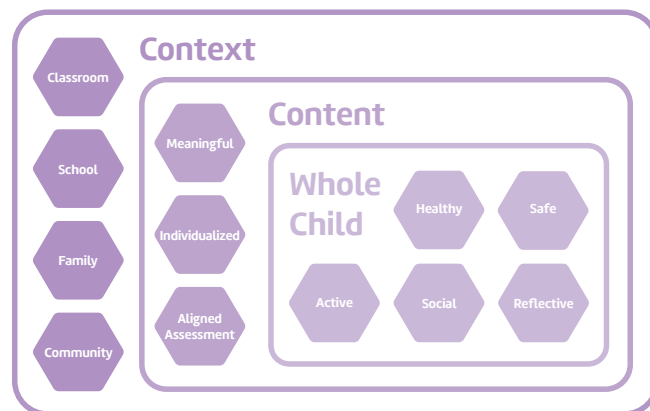
Outdoor Environment

Educational restorationists assess the degree of separation between students and nature. Enabling students to engage with natural systems, with all their sensory complexity, fosters several co-benefits for learning and health. Educators are wise to tap these responses as motivators and sources of improved attention to learning.[10,4] In fact, time in nature presents a valuable opportunity for students to learn complex concepts and develop important academic skills.[11] Nature promotes students' overall health and well-being, including specific aspects of social/emotional, physical, and cognitive well-being, all of which are foundational to students' engagement in learning.[4] Educational restorationists will ask questions and seek strategies for more intentionally integrating nature into learning and learning into nature.

Built Environment

Educational restorationists assess the built learning environment to identify the degree to which properties of healthy natural systems permeate these spaces. In all aspects of design, maintenance, and management, there are opportunities to improve human experience,

To embrace the notion of schools as living systems, comprised of living beings who are deeply interdependent and embedded in local and global (glocal) socio-ecological systems, educators must learn new habits of thought and practice.[1]

health, and well-being while also eliminating negative environmental impacts and even regenerating and revitalizing ecosystems as a fundamental aspect of educational restoration. The emerging field of biomimicry informs this work.[12] Biomimicry applies lessons from nature to design.[13] There are a vast array of design choices affecting both learning and environmental impact.[1] The good news is that each acts in service to the other. Welcoming natural light and nature views into learning spaces improve learning conditions while also reducing energy consumption associated with artificial lighting.[14] Other examples include environmental factors such as acoustics, thermal comfort, indoor air quality, cleaning and managing waste.[1]

Social Networks

Natural systems, within which humans are an integral part, are characterized by interdependence and interconnectedness, not separation and isolation. Educational restorationists assess the presence of social silos, in all their forms, throughout their schools and districts and deconstruct these barriers to learning through new systems of connection and collaboration. For example, popular strategies associated with professional learning communities (PLCs) aim to deprivatize teaching and fuel learning[15] by designing collaboration into teachers' workdays.[16] Deconstructing these individual curricular silos, along with deeper awareness of built environment factors, opens opportunities for holistic learning ecosystems to include physical contexts as three-dimensional textbooks[17] with engaging opportunities to teach both basic concepts and 21st century skills.

Concluding Thoughts

Efforts to restore learning ecosystems, in ways that better serve human and planetary well-being, as well as students' love of learning, are happening across the U.S. and around the world. The work is particularly visible within green schools and school districts, those that embrace whole-school sustainability practices.[1] Trailblazing principals, superintendents, and facility professionals confront the same fundamental concerns facing all other school leaders, concerns related to instructional effectiveness, equitable access to rigorous and relevant curriculum, the establishment of inclusive and engaging learning cultures, and the achievement of excellent learning results for all students.[1] These living systems-minded school leaders, whom we call educational restorationists, do so in ways that revolutionize student experience, student well-being, and the well-being of our planet. For these leaders, and others who wish to adopt living-systems-minded practices, educational restoration offers a framework for restoring the natural capacity of educational systems to better cultivate learning, while also serving glocal socio-ecological needs.

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Kong, S.Y., Rao, S.P., Abdul-Rahman, H. & Wang, C. (2014). School as 3-D textbook for environmental education: Design model transforming Physical Environment to Knowledge Transmission Instrument. Asia-Pacific Journal of Teacher Education, 23(1), pp.1–15. Available at: doi:10.1007/s40299-013-0064

Healthy, Generous Schools
A Model for Whole–School Regeneration

"The future belongs to those who give the next generation hope." — Teilhard de Chardin

Brian Dunbar, WELL AP, LEED Fellow
Institute for the Built Environment
Colorado State University

Dominique Hes, Ph.D.
Principal Researcher
Beyond Zero Emissions

Angelica Rojas–Gracia
PhD Student and Designer
The University of Melbourne and IncluDesign

The Green Schools movement can reach its ultimate potential with a repositioning, a refresh, and the articulation of a compelling vision for the planet and all its inhabitants. From pre–kindergarten through higher education, a fresh vision with an unwavering mindset shift toward healthier, more generous communities will advance beyond merely "greening" our schools.

Sustainability Isn't Enough – Why Regeneration – Why Generous

Many people[1] are calling for a shift in how we see our role on Earth, not just to cause less harm or to simply sustain, but to be contributive—to foster new life, strength, and vigor. In part, to relearn what many of our ancestors inherently knew to live in productive partnership with Earth's systems. Using this vision as a basis of our schools, we can begin to imagine how to support the next generations to join us in this journey, a journey of regeneration. The regenerative approach is one of co-creative partnership with the living world based on strategies of adaptation, resilience, and regeneration.[2] Regeneration is an active part of the living world and is especially evident as plants come to life each spring, as new vegetation emerges after a forest fire, and as our cells work to mend a broken arm or another bodily injury. Regeneration evokes a hopeful mindset and behavioral responses; a sense of agency through collaboration, abundance, and prosperity rather than a focus on scarcity, loss, and trauma.

Regeneration is a process by which people, institutions, and materials evolve the capacity to fulfill their inherent potential.[3] In "Thriving Beyond Sustainability," Edwards[4] explains that regenerative development enhances the quality of ecosystems and human settlements by improving (not merely sustaining) the sociological, cultural, and economic health of a place. The root word of regeneration, gener (birth, bring on), is also present in the word generous. To be generous is to be marked by abundance, to be bountiful, unselfish, of noble spirit.

Shifting Our Mindset Toward Healthy, Generous Schools

The greatest lever for creating change is to shift mindsets.[5] Shifting away from a machine mindset[6] begins with creating new, vibrant narratives of place to manifest our innate potential to generate creativity and innovation.[7] Generous schools require a regenerative mindset that sees humans as part of the living, natural world. The LENSES (Living Environments in Natural, Social, and Economic Systems) framework (see Diagram 1) guides an individual to see "living" potential and prompts teams to envision regenerative places, creating a common understanding of potential for all stakeholders.[8]

To infuse "life" into new or existing school facilities, the collective, hopeful "whole–school regeneration" mindset must be present—a "place that loves you back."[9] Numerous studies point to the significant short–term and long–term benefits when children are directly exposed to nature.[10] When natural elements, fresh air, and daylight pervade our school buildings and schoolyards, sickness rates decrease, fitness and gross motor development improve, and increased alertness and imagination are evident. Janine Benyus,[11] co–founder of the Biomimicry Institute, calls it "creating conditions conducive to life" when the built and natural environments are naturally rich, healthy, and engaging. Imagine engaging students, designers, facilities staff, and trustees in devising features and activities that could create such a mutually beneficial environment. According to Carol Sanford,[3] people are most alive when they can see their actions create benefit for something beyond themselves.

Purano Jhangajholi Education Centre—A Generous School, Holding a Nepal Community Safe After an Earthquake

After the 2015 earthquake, a Nepal school was uninhabitable. Before redesigning the school, the project team ran a series of "enabling" events to understand the community's needs and aspirations. The aim was to support healing and nurture the existing place potential by co–creating stories that illustrated the school's potential in healing the community and regenerating the place.[12] The LENSES framework guided the design workshops, supported the design process, and enabled regenerative visioning and planning.[8]

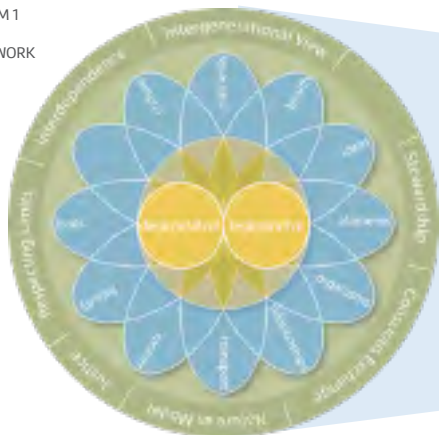Together with the school community, diverse disciplines and volunteers set out to address how the school and project could:
1) be of service to community healing
2) generate ecological abundance

Celebrations to reunite the community after the earthquake were organized. Children, parents, community members, and teachers engaged in activities that helped to cultivate and nurture important relationships. The community created activities to stimulate the agency of the children, acknowledging that their voices are vital.

Significant outcomes from the collaborative, generative process include:
+ **Design:** The design built upon an infinity symbol inspired by the children's drawings, which engineers, architects, and teachers around the table refined.
+ **Design elements:** Cultural and spiritual assets, such as a certain tree's spiritual significance, became central to the story of the place and, thus, an important design driver.[13]

DIAGRAM 1
LENSES
FRAMEWORK

DIAGRAM 2
WHOLE SCHOOL
SUSTAINABILITY FRAMEWORK

+ **Curriculum:** The workshop began developing a curriculum supporting deep connections through
1) being (connecting with self)
2) relating (connecting to others), and
3) doing (through co–creation), with emphasis on integrating local wisdom, agricultural practices, creating space for intergenerational learning, and developing new local initiatives.

Through the regenerative design process, the planned Purano Jhangajholi Education Centre naturally links place, education, space and site planning, generational considerations, and community programs and resources.[12] More information about the project can be found at fona.org.au/programs/education/
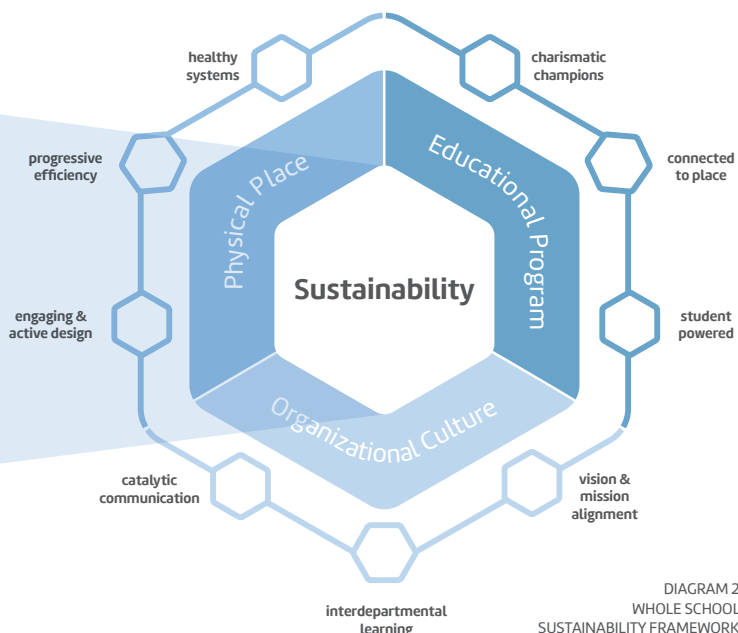
Regenerating Education and Creating Healthy, Generous Schools

Creating a culture of regeneration will result in a more optimistic worldview with significant societal and environmental benefits to better address resilience to climate changes, health pandemics, and racial and religious division, as well as to positively impact the health of our communities, economies, and ecosystems. Of critical importance is that teachers, administrators, and school board members see how each discipline, from art to composition to math and the sciences, contributes to a healthy, generous society.

The use of a guiding framework,[14] such as the Whole–School Sustainability framework (Diagram 2), refined with a central focus of regeneration, can serve to guide schools, districts, and communities toward healthy, generous school makeovers, renovations, and new facilities.

A Hopeful Future with Healthy, Generous Schools

To discover the potential for a world of healthy, generous schools calls for a new paradigm, a new mindset, and a focus on creating conditions conducive to life. When people can see themselves in relationship with all that lives around them, they open up to possibilities of abundance that are inherent in the patterns of life: giving rise to new life, and the striving of all living things to flourish and become more.[15] The largest hurdle will involve creating the widespread trust and understanding necessary to establish a collective regenerative mindset. Beyond showcasing the growing number of sustainable schools, the key drivers to propel the potential of healthy, generous schools are a new vision and hope. The acclaimed book "Designing for Hope"[16] provides examples, frameworks, and a strong, positive message: Life can be better, and the world can be richer, more abundant, and more beautiful when we dare to hope for a better future.

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Regenerative Design for Environmental Education

Phoebe Crisman, AIA
Professor of Architecture
Director of Global Studies
University of Virginia

Designing places for students to think outside the box, literally the school box, is essential for experiential learning about urgent environmental challenges and climate action. Can architects regenerate education, communities, and ecosystems together? How can educational venues foster intertwined human and ecological resilience in the face of climate change and rising seas? My research explores these questions through the design of sustainable buildings and landscapes for environmental education—ranging from barges to buildings to parks. As didactic devices, they teach through their design while housing educational programs. The theoretical foundations for this work are described in my essay "Environmental and Social Action in the Studio: Three Live Projects Along the Elizabeth River," in *Agency: Working with Uncertain Architectures*.[1] A commitment to public-interest design and resilient strategies allows one to imagine a more sustainable and just future for all species on our planet.

Over the past 15 years and through a dozen intertwined projects, I have collaborated with communities, schools, NGOs, and government agencies to produce sustainable models for synergetic cultural and environmental ecologies.[2] This research focuses on Virginia's Hampton Roads region—featuring more than 1.7 million residents, one of the most degraded rivers in the US, and sea levels rising faster than anywhere else on the East Coast.[3] With 53 percent of the US population living near the coast and 11 of the world's 15 largest cities located along coasts or estuaries,[4] research addressing coastal resilience and coupled social-environmental ecologies is critical. By creating knowledge through educational design, the public realm is enriched, and students can effectively engage the complexities of climate change, sea level rise, and ecosystem restoration.[5]

The Learning Barge was conceived as a crucial component of the EPA-funded *Money Point Sustainable Revitalization Plan* for the toxic Elizabeth River.[6] The plan integrates ecological regeneration and industrial activity, benefits a disenfranchised African American community and provides public education via a floating field station where students learn about ecological degradation and restoration, coastal resilience, and stewardship.

Launched in September 2009, this off-the-grid traveling barge was created through a four-year, grant-funded research and design/build process with my students at the University of Virginia and Crisman+Petrus Architects. Powered entirely by onboard solar and wind energy, the 32'x120' Learning Barge contains an indoor classroom and six outdoor learning stations. Rainwater is collected and filtered for handwashing. Graywater is cleaned by native plants in a series of constructed wetland basins. Composting toilets decompose waste, and solar thermal panels heat water. Recycled and sustainable materials were used throughout. Highly visible as it travels to restoration sites along the Elizabeth River, the Learning Barge and its curriculum create coupled human-environment systems literacy among the K–16 and adult populations of Hampton Roads. Up to 200 students a day, and more than 100,000 students over the past 10 years, have learned onboard during school field trips. Summer teacher training and major public events educate the community.

The Learning Barge has sought to reinvent environmental education—telling the story of inextricable links between water and land, coastal resilience and human activity, local ecosystems and planetary boundaries. A recent New York Times article, "Teaching Resilience in the Face of Climate Change," noted the lasting impact of the Learning Barge on youth resiliency education.[7]

The Wetland Learning Lab and River Academy are located within Paradise Creek Nature Park, which is a 40-acre constructed wetland park located amid contaminated industrial sites in an economically disadvantaged and racially diverse urban neighborhood in Portsmouth, Virginia. The Wetland Learning Lab is an outdoor classroom for school field trips and a place of respite for park visitors. The steel and concrete material palette of nearby industrial structures combines with wood roof framing and a brightly painted artifact wall to store and display educational materials. Rainwater collected by the
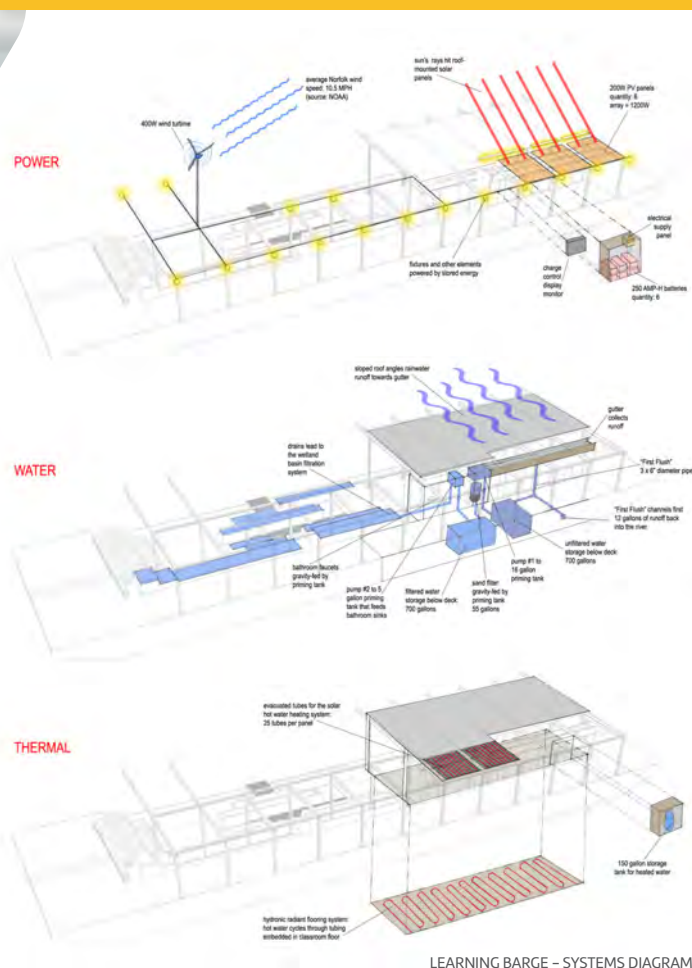
LEARNING BARGE – SYSTEMS DIAGRAM

dynamic butterfly roof is filtered in a native plant garden. The River Academy contains a classroom and public exhibits and restrooms for park visitors. Crisman+Petrus Architects oriented the building to optimize solar income and integrated sustainable systems, including natural ventilation, daylighting, solar power, rainwater collection, and a graywater treatment garden, to educate through design.

These projects are informed by evidence-based research in medicine, psychology, and sustainability that identify green space, daylight, and other sustainable features as essential to promote human health, wellness, and effective learning environments. Scholarship on ethics and aesthetics linking human thriving to regenerative environments is equally important. For instance, authors in *The Hand and the Soul: Essays on Aesthetics and Ethics in Architecture and Art* connect beauty, form, and sensory pleasure with ethical obligations to human communities and the natural world.[8] Others theorize these vital aspects as life-fulfilling functions,[9] socio-cultural fulfillment,[10] or cultural ecosystem services—defined by the Millennium Ecosystem Assessment as "the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences."[11]

Regenerative design for education cannot be conceived apart from specific places and communities. Architects have an ethical responsibility for our buildings—whose construction and operation consume vast quantities of energy, water, and materials while producing daunting environmental degradation and CO_2 emissions. Along with these considerations, however, an intersectional approach must address social, economic, and aesthetic aspects. "Designing with nature...disciplines human intentions with the growing knowledge of how the world works as a physical system. The goal is not total mastery but harmony that causes no ugliness, human or ecological, somewhere else, or at some later time. And it is not just about making things, but rather remaking the human presence in the world in a way that honors life and protects human dignity."[12] That is why the imaginative, sustainable, and ethical design of schools and places of education in the field are essential to our collective future.

Designing places for students to think outside the box, literally the school box, is essential for experiential learning about urgent environmental challenges and climate action.

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Moving Beyond Green: Regenerative Design Thinking for Culture Change

Richard Graves, Associate Professor
Director of the Center for Sustainable Building Research
School of Architecture | College of Design
University of Minnesota

Introduction

Over the past 25 years, the world of sustainable architecture for education has witnessed many significant changes. At that time, the U.S. Green Building Council [USGBC] and green rating systems like Leadership in Energy and Environmental Design [LEED] did not yet exist. Building sustainably and linking environmental education to concerns over basic natural resources and impact on community environment was not yet part of everyday discourse or practice. However, incremental green design is insufficient to meet our social and environmental challenges or inspire students, teachers, and designers. More than 25 years ago, I was introduced to the concept of whole-system, living design while working on my master's at Rice University. Immersed in the writings of Gregory Bateson, John Tillman Lyle, Donella Meadows, Bill McKibben, Fritjof Capra, and others has proven over time that **regenerative design is not an evolution of green sustainable design—it is a different way of thinking.**

One of the founders of regenerative design thinking was Austrian architect Rudolf Steiner. In 1924, a group of farmers concerned about the degrading health of their farms and the reduction in productivity requested Steiner's advice. After analyzing the farms and investigating their processes, he developed an approach called "Biodynamic Farming." The farm was seen as a living organism in the biodynamic approach and therefore should be a self-sustaining system using "waste" as fertilizer and food for other biodynamic processes on the farm. Steiner's work was a precursor to the organic farming movement.

Regenerative Design Thinking

In architecture and design, Bill Reed and Regenesis, John Tilman Lyle, Ray Cole, Sim Van der Ryn, and others have theorized how regenerative thinking can integrate living systems into design and practice. The foundation of regenerative design is built upon the belief that humanity and "nature" are one interconnected system.[1,2] Regenerative design considers the role of designers as integrators of social, ecological, and technological systems to achieve the potential of a community and to provide a healthy environment for all people and living systems now and in a dynamic future of climate change, social upheaval, and technological disruption. Regenerative design favors a social-ecological view of design, not a mechanistic one.[3] A social-ecological view of the role of design does not separate design, development, and architecture from an idealized nature, but integrates buildings and neighborhoods with living systems in 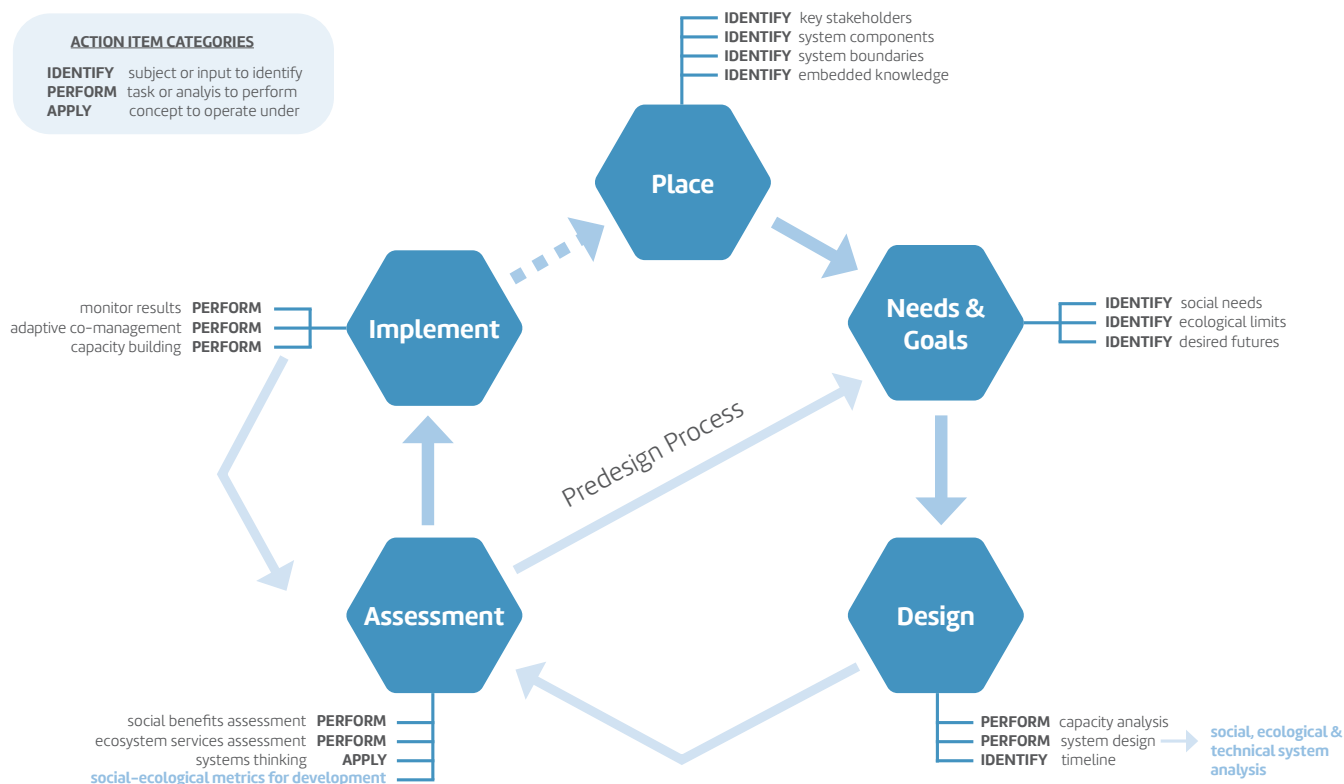time and space. The process involves not only designing systems of resource flows to be self-renewing, but also understanding a new way of social, ecological, and technological systems thinking for design.

A number of design processes have been developed to guide regenerative design translation into normative practice, education, and further research. The common goal is to provide communities with a process to empathize, reveal, learn, adapt, and co-evolve with the living systems in which they are a part. (See examples: The Story of Place, Regenesis[4] or A Social-Ecological Design Process, Graves et al.[5]) Through the regenerative design process, the built environment serves as contextual agency for social and ecological relationships to flourish. A successful process includes place-based analysis of living processes nested at different scales: microbe to organism to family to school to neighborhood to watershed. When social and ecological systems are made visible, the community can use that knowledge to discover opportunities for the co-evolution of future health as a community practice. This turning point for the participatory design process is its rooting in place while community stakeholders engage in a commitment to build "eco-literacy" and the capacity to add value to the living systems of a place over time.

Using regenerative design thinking, schools can improve the health and well-being of students and teachers. What is so compelling about regenerative design and learning environments converging to impact teaching, learning, and place-based community practices, is the positive effect on people and place. A school building and grounds, seen through the regenerative lens, is a complex living system for co-evolution and a contributor to larger natural systems. As a home for quality teaching and learning experiences, a regenerative school "...becomes the context and environment in which we grow and develop relationships with others...It is our culture of place."[6]

Five key concepts of regenerative design thinking for culture shift:

+ **Empathy for Life:** Regeneration begins with understanding how natural systems work.
+ **Community Practice:** Regeneration continues through a community practice in which working together to engage in a specific place reveals the unique intelligence and beauty of interdependent relationships.
+ **Reveal Living Systems:** Regeneration communicates living processes and patterns by making them visible and tangible.
+ **Human Intervention:** Regeneration sees living systems as

ACTION ITEM CATEGORIES

IDENTIFY subject or input to identify
PERFORM task or analyis to perform
APPLY concept to operate under

IDENTIFY key stakeholders
IDENTIFY system components
IDENTIFY system boundaries
IDENTIFY embedded knowledge

Place

Needs & Goals

IDENTIFY social needs
IDENTIFY ecological limits
IDENTIFY desired futures

monitor results **PERFORM**
adaptive co-management **PERFORM**
capacity building **PERFORM**

Implement

Predesign Process

Design

Assessment

social benefits assessment **PERFORM**
ecosystem services assessment **PERFORM**
systems thinking **APPLY**
social-ecological metrics for development

PERFORM capacity analysis
PERFORM system design
IDENTIFY timeline

social, ecological & technical system analysis

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complex, intricate relationships. As a result, ecosystems and biophysical processes may not be amenable to human management. Designs and actions proceed with small–scale interventions and proven success before replicating at scale.

+ **Coevolution:** Regeneration is the inseparable relationship between people and nature as life–sustaining systems. As one living coevolving system, it is multi–layered and multi–dimensional and serves as a boundless source for teaching and learning.

The Bertschi School Science Wing, a Living Building in Seattle by KMD Architects, is a great example of the integration of regenerative design principles within a K–5 educational environment. As one student observed, "It really lets us connect with the environment. It also plays a large role in teaching us how to take care of the environment… ."[7]

The project demonstrates the relationship between living processes and invites children to engage in those natural processes, most powerfully through water ecologies. During the design process, the students asked for a "river to run through the building." When the rain starts to drizzle on the metal V–shaped roof, students hear it slowly build momentum through the metal downspout before filling the stream that runs through the concrete floor inside of the science lab. When the rain runs down the stream, adults and kids immediately drop to their knees to observe the flow of water as it makes its way from sky to roof to stream to cistern and into the rain garden outside. This example is more than just a water feature; it is a learning experience that strengthens the relationship between students and their local living systems to foster ongoing exploration and discovery while binding an awareness of place so essential to long–lasting regenerative stewardship.

Conclusion

Regenerative design and development augment learning environments because of shared vision and purpose. Connecting the community of learners with the beauty of a place using the architecture as a vehicle can happen in new and existing buildings and does not require additional budget. It requires the change of mindset to see living systems as physically and spiritually stimulating in education environments. Regeneration envisions learning environments that engage all of the senses and creates hands–on learning opportunities with design elements considered not only for their technological function, but also their ability to inspire students consciously and unconsciously with the beauty of life.

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A Time for Change – Reimagining Design Education

Lesley-Ann Noel, Ph.D.
Associate Director of Design Thinking for Social Impact
Phyllis M. Taylor Center for Social Innovation and Design Thinking
Tulane University

Introduction

The design community has made several calls to reimagine design education over the past few years,[1,2] and the dramatic events of 2020, including the COVID-19 pandemic and the protests in support of racial justice, make this year a perfect time to respond to the demands to overhaul design education and make it more inclusive and responsive to the needs of diverse audiences.

Many design curricula are based on curricula originating in the Bauhaus, developed by Walter Gropius in Germany in 1922, and/or the curriculum of the Hochschule Ulm, which was developed and iterated on over several years from 1953 to 1968. These curricula focused on the craft of design and were very tied to large industrial economies. More traditional design curricula born out of the Bauhaus and Ulm, focused on graphic and product or industrial design with a technocratic vision of the future. Today's designers, however, need a complex combination of skills as they apply their talents to a diversity of needs that might include, in addition to the design of products and graphics, the design of services and experiences.

Emancipatory Worldview: Design Education for Others by Others

As a Black woman, a non-American, and a design educator from a tiny island in the Caribbean, I challenge the idea that design education is only relevant to very large industrial economies.[1] My vision for reimagining design education is framed through an emancipatory and anti-hegemonic worldview. I have actively thought of and created design education for diverse audiences, from undergraduate and graduate students at elite, predominantly white institutions, to artisans in the Eastern Caribbean, children in rural Trinidad, and students in post-Hurricane Maria Puerto Rico.

When designing design education for the non-white, non-American, and non-rich, I have focused on different questions and approaches than when I've taught predominantly white, American students. When reimagining design education that will better serve people who feel excluded or are, for one reason or another, not well served by standard design curricula, I focus on themes like identity, resilience, agency, self-determination, world-making, imagining new futures, and creating cooperative environments. Here are three of the lenses that I use in developing emancipatory design education:

Critical and Empowering Design Education: A Freirean Model

Critical pedagogy is an approach to teaching and learning that focuses on transforming oppressive relations of power and empowering and humanizing learners. It promotes the idea of a fair society where people have political, economic and cultural control of their lives. These goals can only be attained by emancipating and empowering oppressed people and enabling them to transform their lives. Empowering education encourages students to become critically thinking citizens, change agents, and social critics.[4]

Critical and empowering design education would, inspired by Brazilian educator Paulo Freire, encourage students to acknowledge constraints that impact their lives and recognize that some man-made restrictions can be overcome.[5] An emancipatory and critical design curriculum would recognize the legitimacy of multiple discourses and narratives,[5] and place an emphasis on understanding problems from multiple perspectives and not merely the viewpoint of the dominant culture. Using a Freirean approach, the students, parents, and community would propose the content for the design challenges.

My critical design education (Figure 1) combines Critical Utopian Action Research, where participants reflect on what is wrong, where they want to go, and how they will get there, as well as Shor's framework for empowering education.

Decolonial and Pluriversal Design Education

Before design school, we have such strong identities, but the design school experience strips us of that identity, so work that comes from a "good design school" in Brazil, India, Copenhagen, and Boston looks the same. A pluriversal design education would not make people self-conscious of their identities. This education would make identities stronger, clearer, and bigger, creating space for people to show their differences and learn about exploring the differences of others, rather than try to hide them. The role of this design education would be to expand the center of the design world by allowing for the existence of multiple centers. Students and educators would confidently center their design practice in local ideals, questions, aesthetic qualities, and cultures, instead of self-consciously hiding these in favor of solutions imported from outside their communities.

Designing Our Own Utopias; Imagining New Futures

Toni Morrison said that all utopias are created by the excluded. In this approach, students focus on creating new futures and making new worlds. Design education could create a space for speculation about the future, and a platform for agency, empowerment, and self-determination. Students could reimagine worlds without
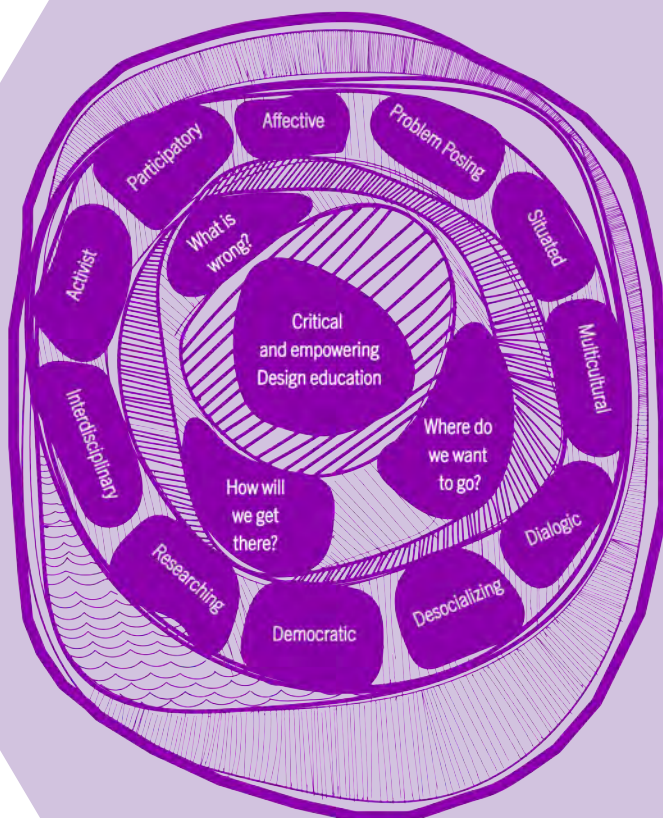
An emancipatory and critical design curriculum would recognize the legitimacy of multiple discourses and narratives,[5] and place an emphasis on understanding problems from multiple perspectives and not merely the viewpoint of the dominant culture

FIGURE 1

racism, oppression, or a climate crisis, and actively work on achieving these worlds. Dreaming about "where we want to go or be" creates a space for student activism. The optimism and belief that a solution exists is ingrained in design activity. Critical theory and discussions would support an awareness of social problems that is currently absent from some design education. Group work around social solutions is a concept of participation that involves participants in creating a social knowledge that is more significant and robust than individual knowledge and emphasizes commitment to action.

Conclusion
Might design education that is rooted in the experiences of more diverse populations lead to new ontologies and perspectives in design?

The design questions in my "experiments" in redesigning design for "people like me" focus on liberation, emancipation, equity, and supporting resilient people as they visualize and create futures that they want and make them reality. Those questions and experiences do inform the classes that I teach at a private predominantly white institution (PWI). This is what grounds the tools and methods that I have created that introduce critical theory and language into the design studio, such as the Designer's Critical Alphabet and worksheets and exercises that help students examine their own identities and how those identities show up in their work.

Here's my concluding challenge to design educators:
+ What if design education sought to not standardize and erase individual identities, but learn to better explore local cultures, identities, and questions?

+ How will you create a learning environment that allows people to contribute their diverse perspectives to the design process?

+ How can worldviews of others inform your own practice as a designer or educator?

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Creativity is as important as literacy.

Sir Ken Robinson

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Phoebe Crisman, AIA | Professor of Architecture and Director of the pan–university Global Studies program at the University of Virginia. In her practice with Crisman+Petrus Architects, she designs resilient and just communities through sustainable strategies, environmental restoration, and socio–economic revitalization. She is currently collaborating with indigenous communities in South Dakota and South Africa.

Brian Dunbar, WELL AP, LEED Fellow | Executive Director of the Institute for the Built Environment (IBE) and Professor Emeritus of design and construction at Colorado State University. Chairman of the Board for the Center for Living Environments and Regeneration, a non–profit established by Colorado State to help disseminate LENSES, a guiding framework for regenerative design.

Richard Graves, AIA | Architect and Director of the Center for Sustainable Building Research and Associate Professor in the College of Design at the University of Minnesota. As the former Executive Director of the International Living Future Institute, he led the operations and strategic efforts for the Institute's signature programs and the Living Building Challenge.

Dominique Hes, PhD | Principal Researcher at Beyond Zero Emissions. She received a science degree from Melbourne University in Botany, followed by a graduate diploma in Engineering and a Doctorate in Architecture from RMIT University, Melbourne. Author of the award winning book 'Designing for Hope: Pathways to Regenerative Sustainability', co–authored with Professor Chrisna du Plessis. She has edited and written several other books and over 100 papers.

Lisa A.W. Kensler, EdD | Emily R. and Gerald S. Leischuck Endowed Professor for Educational Leadership in the College of Education at Auburn University. Lisa's teaching, research, and outreach focuses on the leadership and learning required for transforming schools into vibrant places where the love of learning thrives.

Lesley–Ann Noel, PhD | Professor of Design Thinking at Tulane University. She practices design through an emancipatory and critical lens. Her teaching and practice focus on the experiences of people who are often excluded from research, and on building a greater critical awareness among designers and design students.

Jennifer Seydel, PhD | Executive Director at Green Schools National Network. Jenny has taught at grade levels from kindergarten to graduate school, worked in public schools and nonprofits, has been involved with starting numerous public charter schools, has extensive experience with at–risk children, and has worked with educators across the country and eastern Asia.

Cynthia L. Uline, PhD | Professor Emeritus of Educational Leadership at San Diego State University and former Director of SDSU's National Center for the 21st Century Schoolhouse. Cynthia studies the ways in which built learning environments support students' learning. Her most recent research explores green schools as healthy, vibrant, and environmentally responsible places for learning.

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