Congratulations to John Coley (PI), Brian Helmuth (Co-PI), and Catie Nielson (Co-PI) on by the National Science Foundation, STEM Education Directorate (EDU), Education Core Research Program on their project: "Cognitive Foundations of Environmental Science Education: Exploring Impacts of Human Exceptionalism on Marine Social-Ecological Systems Thinking".

To learn about this project and what it will mean for the future of environmental science education, I met with John, Brian, and Catie to discuss their research.

This article has been edited for brevity and clarity.

What sparked your interest in the intersection of psychology and environmental science?

John: During the earlier years of my lab, most of our work was focused on science education and in particular biology education, and how the intuitive ways we have of understanding the world have implications for how we learn science and how best to teach it. It was originally a doctoral student in my lab, Nicole Betz, who suggested applying this approach to how people think about climate change. This became her dissertation work, and it was through this that I originally met Brian and I just got more excited about this angle and to work with people who appreciate the relevance of psychology for environmental solutions.

Brian: So, I'm coming from the environmental science and public policy side, and I have taught the introductory environmental science course at Northeastern for the last decade, both to majors and non-majors. In both cases, it really becomes obvious to people who study non-human organisms that when we come up with solutions to confront things like climate change, understanding how and why people care about nature, how they interact with nature, how they think about nature or not, is absolutely critical to implementing those strategies for policy. That's what drew me to John's lab, because you can come up with all the brilliant solutions you want to, but unless they're accepted and fit with people's perception of the world, they're not going to do any good at all.

Catie: I grew up in Utah, where I did a lot of hiking and outdoor activities, so I have always been interested in the natural world. When I was doing my PhD in Psychology at Northeastern with John, I was doing more work on science education that was not related to environmental science directly. John started focusing more on environmental science, which I became really interested in because it seemed like a way to apply my expertise in psychology to something that I already care about.

Can you explain Human Exceptionalism and why it is important?

Catie: Human exceptionalism is the idea that humans are more important, superior, and are separate from the rest of the natural world. This comes from Megan Bang, a professor at Northwestern University, who talks about seeing humas apart from instead of a part of the natural world. This concept has implications for marine environmental science, as a lot of the early campaigns were slogans such as, “Save the Polar Bears”, but at this point it’s more of, “Save the Humans, and everything else as well”. Human exceptionalism in environmentalism can make people feel separate from and superior to the environment, leading to less concern for its well-being. For our grant, we’re studying university students and their learning about ecosystems. If students don't understand that humans both affect and are affected by ecosystems, they miss a crucial part of the picture.

Brian: From the environmental science side, as Catie said, there’s been an evolution in thinking about how we study and find solutions. It’s moved away from this almost dominion approach of we must protect nature for intrinsic reasons to enlighten self-interest, to really shifting towards seeing humans as part of the ecosystem

Can you explain how the project will work and where it will occur?

John: Most of the studies that we propose are focused on undergraduate education in terms of starting to map out in some detail, relations between human exceptionalist beliefs and a socio-ecological system of understanding environmental science. Then we will look at how that changes as students move through the environmental science curriculum and how those ideas might be causally connected to each other. Another important piece of the grant research, and one that I’m excited about, is looking at elementary, middle, and high school students and seeing how these sets of ideas develop and change over time. This will provide context to see where the ideas that undergraduates share in the environmental science classroom come from.

Catie: Daria Healey is the graduate student leading this project and will be starting her first year in the newly established Human Behavior and Sustainability Sciences PhD program, pioneered by Brian and John. Although her official start is in the fall, she has already spent about a year and a half in the lab. Daria's research focuses on how students from coastal environments like her hometown in Hull, Massachusetts, which faces significant flooding and sea level rise, perceive and engage with environmental science. She is particularly

interested in understanding the impact of both informal experiences and formal education on students' environmental awareness, especially contrasting those from coastal areas with students from more inland regions such as Boston. Her study will explore how these experiences

shape students' understanding of environmental science from early childhood through high school, examining the trajectory of learning influenced by their lived environments and educational backgrounds.

Brian: The implications of this work extend beyond education, as highlighted by Catie and John. Recently, John and I were named as authors by the White House for the inaugural National Nature Assessment, an initiative overseen by the Office of Science, Technology, and Policy, which also handles the National Climate Assessment. This groundbreaking project aims to synthesize how Americans perceive nature and their role within it. John and I are contributing to a core chapter that examines these perceptions and their impact on decision-making and policy in the U.S. While this is a multi-year process, the insights gained will extend well beyond educational contexts.

Catie: Regarding the undergraduate students, we're currently focusing on Northeastern University students because they are a convenient sample for us. Our aim is to study trajectories across a broad spectrum, but we hope to expand our research to include individuals from diverse backgrounds, particularly those from lower socioeconomic statuses or with different educational experiences. John and I are writing a paper based on data collected from a community college in Queens, noting that 50% of STEM majors in the U.S. attend community colleges. This approach could extend our research to these populations and incorporate an environmental justice perspective.

What are your hopes for the results of this project?

John: I hope we learn a lot about the connection between human exceptionalism and how people learn about a systems perspective on environmental science. And I hope we learn about how best to intervene on human exceptionalist beliefs or teach environmental science in a way that circumvents this common intuitive way of thinking about the relations between humans and nature. Also, there are many undergraduate students who are involved in this research in my lab and other labs, from lots of different backgrounds and majors, along with doctoral students and co-op students.

Brian: John and I have co-taught several courses and have gained valuable insights by listening to our students' ideas on nature, environmental science, and solutions. The work we are embarking on is an expanded version of this, providing a platform to learn from their perspectives on a larger scale. I continue to be amazed by the high quality of our students and their insights.

Catie: I think my hope for this project is that it can really give us a foundation to build on towards answering some of these questions and expanding them to other populations of students.

What are you most excited about — what drives you to do this?

Catie: My excitement for this work stems from exploring how diverse lived experiences shape individuals' perceptions of nature and science. I aim to understand these perspectives in both undergraduate students and developmental samples and extend this understanding to other populations and potential interventions. By examining how people learn about and think about nature through an environmental science curriculum, we hope to refine educational approaches. Our project combines a large-scale, longitudinal study of developmental learning with a focused experimental study to identify causal relationships, providing both broad and detailed insights into environmental education. I also finished my PhD last year, so now I'm a postdoctoral researcher supported by this grant. This is the first grant that I've been a Co-PI on, thanks to Brian and John!

Brian: I'm excited to collaborate with this team because our work takes a unique step by focusing on the individual level rather than the broader social science or sociological perspective. To truly understand how someone's lived experience affects their views, we must examine them as individuals rather than just members of a demographic group. This approach allows us to gain deeper insights into personal influences on perceptions and behaviors. Especially with the advantage of having active research faculty in the classroom and our student involvement, this is collectively going to benefit all of us.

John: I'm excited about creating an interdisciplinary, collaborative community among sciences that don't interact regularly. This grant will allow us to support students and our new Human Behavior and Sustainability Sciences PhD program that we are launching in the fall. As Katie said, Daria Healey, a new student in that program will be supported on this grant. The other thing that I'm humbled and grateful for is that this level of support shows that the work we're doing is valued in the larger community. If NSF is willing to invest in what we're doing, that's a good sign that we're on the right track!