ROUTLEDGE ADVANCES IN CLIMATE CHANGE RESEARCH

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Teaching Climate Change in the United States

Edited by Joseph Henderson and Andrea Drewes

"Climate change is not just the greatest crisis we face, it's also a prism through which to understand the world: politics, economics, psychology, you name it. That's why, as this book makes clear, this can be an exciting if solemn moment for educators willing to take on the real meaning of our moment."

—***Bill McKibben**, author of* Falter: Has the Human Game Begun to Play Itself Out?, *USA*

"Classroom teachers and educators of all types have long understood that teaching climate change can't stop at the science. Young people are hungry for action. *Teaching Climate Change in the United States* is the first-of-its-kind effort to show the breadth and depth at which true climate education – education that engages and empowers young people to take on the defining crisis of our time – is already happening across our country. This is a book to encourage and inspire climate educators of all types to know that they are not alone, but are instead one piece of a growing and vital climate education and action community."

—***Rebecca Anderson**, Director of Education, Alliance for Climate Education, USA*

"It is encouraging to see a US-based collection address how education can challenge forms of climate denial which limit our collective capacity for action. Research recognizes that climate change education needs to go beyond scientific literacy to also engage learners in psycho-social and behavioral understanding. This book brings this alive through practical examples from settings across the US."

—***Marcia McKenzie**, Director, Sustainability and Education Policy Network, Canada*


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TEACHING CLIMATE CHANGE IN THE UNITED STATES

This book highlights best practices in climate change education through the analysis of a rich collection of case studies that showcase educational programs across the United States.

Framed against the political backdrop of a country in which climate change denial presents a significant threat to global action for mitigation and adaptation, each case study examines the various strategies employed by those working in this increasingly challenging sociopolitical environment. Via co-authored chapters written by educational researchers and climate change education practitioners in conversation with one another, a wide range of education programs is represented. These range from traditional institutions such as K-12 schools and universities to the contemporary learning environments of museums and environmental education centers. The role of mass media and community-level educational initiatives is also examined. The authors cover a multitude of topics, including the challenge of multi-stakeholder projects, tensions between indigenous knowledge and scientific research, education for youth activism, and professional learning.

By telling stories of success and failure from the field, this book provides climate change researchers and educators with tools to help them navigate increasingly rough and rising waters.

Joseph Henderson is a lecturer in the Department of Environment and Society at Paul Smith's College of the Adirondacks in Upstate New York, where he teaches courses in the environmental social sciences. He is trained as an anthropologist of environmental and science education, and his research investigates how sociocultural, political, and geographic factors influence teaching and learning in emerging energy and climate systems. He completed a PhD at the University of Rochester, where he conducted ethnographic analyses of science learning, sustainability education, and educational policy. His post-doctoral work at the University of Delaware examined the emerging field of climate change education from a learning sciences and educational policy perspective.

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Teaching Climate Change in the United States
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For Ellie and Will. You deserve a beautiful and humane future. – Dad

For Tanner and his cousins Amelia and Nora. Thank you to my family for the inspiration and support – A.D.


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TEACHING CLIMATE CHANGE IN THE UNITED STATES

Joseph Henderson and Andrea Drewes

> "We don't know how this movie is going to end, because we're in the writers room *right now*. We're making the decisions *right now*. Walking out is not an option. We don't get to give up."
>
> – *Mary Annaïse Heglar, September 2019*

> "Avoiding climate breakdown will require cathedral thinking. We must lay the foundation while we may not know exactly how to build the ceiling."
>
> – *Greta Thunberg, April 2019*

Our home is on fire

It's a weird feeling to work on climate change education in the United States these days. Each waking day brings some kind of fresh horror juxtaposed with glimmers of hope and the steady emergence of previously unimaginable forms of social solidarity. We write this introduction shortly after millions of school children around the world conducted an educational strike, drawing political inspiration from Greta Thunberg, a previously unknown Swedish teenage activist who just sailed across the Atlantic Ocean to support her American counterparts. Meanwhile, a revanchist and increasingly fascist Republican Party controls most federal government institutions and is actively hostile to any kind of political action that might mitigate the effects of climate change. And so it goes: the society tacking back and forth between the intentional rollback of carbon pollution regulations and the emerging green shoots of a youthful countermovement fighting for a chance at a flourishing future. Meanwhile, physics does what physics does and the earth continues to warm.

What, then, is the role of education during a time of climate emergency? Education itself has become a cultural and political battlefield, as the struggle

between a carbon-soaked status quo and a more equitable and sustainable future plays itself out in the halls of learning. We have witnessed well-funded oil-y "think tanks" flood public schools in this country with propaganda explicitly designed to spread confusion among teachers (Dunlap and Jacques, 2013). We see climate change science standards challenged in conservative statehouses around the country in order to cultivate the ignorance of their citizens (Colston and Ivey, 2015). Social scientists have documented a well-funded and organized campaign of disinformation and misinformation aimed at both the nation's educators and the news media with the goal of sowing doubt in the population (Oreskes and Conway, 2011; Farrell, 2016a, 2016b). The agents of the carbon-dependent status quo are clearly not giving up without a fight, but as climate writer Mary Annaïse Heglar (2019) reminds us, acquiescing is not an option for the rest of us.

While stories of the outright climate science denial machine abound in the literature, there's an additional and more pernicious form of denialism at work in the culture: the apathy and malaise of those who accept climate change science but who have yet to actually do anything of consequence to address the issue. We see this inaction across the educational domain too, from the professional communities that have been slow to take up climate change as a priority issue (Henderson et al., 2017) to average citizens who continue about their days knowing that something is amiss, but doing little about it because acknowledging the totality of climate change would mean resurfacing much of how they currently structure their lives (Norgaard, 2011). This is a book primarily for the latter crowd.

We're not really interested in addressing the outright climate science deniers anymore given their dwindling numbers and decreasing influence (Hamilton et al., 2019). The climate science community has wasted too much time and energy trying to convince an increasingly marginalized and minor subset of the overall population on the implications of climate science. We see, over and over again, that their denial is not driven by principled differences or by honest skepticism. Rather, it is driven by the need to maintain social and material power at all costs (McCright and Dunlap, 2011; Henderson, 2019). While it is important to understand the contours of the climate countermovement and its impediments of change, we simply acknowledge in this book that there are far greater numbers of people – including Republicans – who accept climate science and want to make change (Hamilton et al., 2019).

Nor is this a book *merely* about climate literacy. While we collectively celebrate broad attempts to teach people about the principles of climate change science (e.g., United States Global Change Research Program, Climate Literacy: The Essential Principles of Climate Science, 2009), we are most interested in education that will shift social and material conditions in ways that lead to a tangible decline in carbon emissions and toward increased forms of resilience and flourishing for both humans and the more-than-human world. As one of the authors in this book put it to us recently, "An education 'about' is an education of mere acquaintance. An education that draws down CO_2 is an education of, by, and for the wresting of power for a more just and verdant world" (P. Buckland, personal communication,

October 19, 2019). A growing body of research acknowledges the limits of climate science literacy education, as it turns out that it is possible to know a great amount of knowledge about climate change while still acting in ways that perpetuate the problem (Kahan et al., 2012; Moser and Kleinhückelkotten, 2018). Climate change education must be able to affect change at a scale commensurate with the problem.

Actually shifting the social and material conditions of climate change means confronting entrenched systems of power on the one hand while also working to stimulate calcified and ambivalent educational institutions that – while sympathetic – continue to promulgate milquetoast responses inadequate to the scale of the problem. You will notice that many of the chapters in this book do not focus their educational activities on small scales of action. Instead, they recognize that climate change is a collective-action problem only solved by educational interventions capable of shifting institutions, professional organizations, policy, law, systems, and the overarching discourse that currently supports an unsustainable status quo. The days of small-scale climate actions, while important, are over. This is not a book about using fewer plastic straws. This is a book about confronting calcified historical practices and entrenched power – of both the hostile *and* ambivalent kinds – and shifting structures accordingly.

Despite all the political chaos and social upheaval in the United States right now, it remains a social fact that the population is very slowly coming to the realization that our house is on fire and that perhaps we might consider sounding the alarm (Hamilton et al., 2019). Educators must capitalize on this fact, for there are now majorities of people in the country who are primed for action (Ballew et al., 2019). Our intention in writing and editing this book is to provide a kind of marker of where the climate change education community is at this critical juncture. Like many of you, we too find ourselves trying to make sense of the magnitude of the climate emergency while also trying to find ways of living that actually make a positive difference in our world and in the worlds of our students and colleagues. This is a book, then, for the educators who want to change the world.

The United States as educational context

This is a book about teaching climate change in the United States. We locate our descriptions and analysis in this context for a few reasons. First, it is where we live and where we have the most expertise in climate change education. We are heartened by the recent rise in scholarship on climate change education work around the world (e.g., Læssøe and Mochizuki, 2015; Trajber and Mochizuki, 2015; Bieler et al., 2017; Chang and Pascua, 2017) and hope this book adds something to this growing community of practice. Second, have you seen the United States lately? Let's just say that we are currently in the process of sorting out some things when it comes to climate change science. This is especially true after the 2016 presidential election and the subsequent assault on climate change science capacity in the federal government. Third, the United States has been, and continues to be, one of the largest carbon emitters in the world. We know that wealth is the primary driver of

carbon emissions (Oxfam International, 2015), and the United States is the wealthiest country in the world (Credit Suisse, 2018). While the causes of carbon pollution are not equitably distributed in our own population, we nevertheless have one of the highest levels of carbon pollution per person per year via the structures of our complex social existence (World Bank, 2019). Finally, the United States remains one of the most powerful geopolitical players on the world stage despite recent backsliding toward nationalism and related threats to the liberal international order (Ikenberry, 2018). Like it or not, we remain the global hegemon. For now.

The United States also continues to experience an organized, well-funded, and sustained political attack on teaching climate change in our public schools (Branch et al., 2016). Our educational system is really a patchwork collection of smaller state bureaucracies, an artifact of a federalist constitutional system that distributes power and control over education to individual state legislatures. For good or naught, what happens in schools is largely the purview of each individual state, including local community school boards who also exert some democratic control over the form and function of public schooling. Given that climate change science is enrolled in larger political contests (Dunlap et al., 2016), this means that more traditionally conservative geographies are less likely to teach climate change science and are more openly hostile toward efforts to include it in the curriculum (Colston and Ivey, 2015). As a result, the climate change education landscape in formal public schooling is a mishmash, with some places spending large amounts of educational time on it, and other places not teaching it at all (Plutzer et al., 2016).

The United States also has a small but powerful network of private schools from pre-K to undergraduate levels where students are educated outside the public system for a myriad of reasons, mainly related to religious beliefs or securing class advantage. Not much is known about the nature of climate change education in these places, although they are often schools with fewer state curriculum requirements and are sometimes more likely to innovate their curriculum in ways that take ecological issues seriously (Henderson, 2014). We also have approximately 2 million students who are home-schooled in the United States, again often for religious or ideological reasons (Murphy, 2012). Even less is known about the nature of climate change education in these contexts given the ethical complexities involved in studying intimate home life (see Lawson et al., 2019 for one strong example of quality research in these settings).

While many of the chapters in this book focus on formal schooling, there are many other sites of learning where Americans may or may not learn about climate change. We know from studies of informal learning that most human learning happens outside formal educational institutions anyway (National Research Council, 2009), and that informal settings (i.e., museums, summer camps, educational signage, television shows, the Internet, etc.) are influential educational contexts in shaping the broader public's understanding of issues. Many of the chapters in this book emerge from these settings, and you will find that the authors of these chapters have interesting things to say about teaching climate change to sometimes unknown and quite culturally diverse audiences.

Finally – and zooming out toward the global educational context – we want to acknowledge the interplay between the United Nations Sustainable Development Goals (UN SDGs) programming and climate change education here in the United States. We recognize that the UN SDGs are important conceptual frameworks for many nations around the world. While some educators in the United States engage the UN SDGs, they simply do not have much purchase in our broader educational complex given the diffuse nature of educational policy under a federalist system of governance. Moreover, American culture contains a long-standing suspicion of the United Nations that sometimes borders on paranoia and conspiracy theorizing (Uscinski et al., 2017). Where the UN SDGs have been somewhat influential is in post-secondary higher education programming, perhaps as a result of a more cosmopolitan ethos in these places. But we are speculating now and cannot say for certain how UN climate change educational policies move into United States educational contexts. A small raft of comparative educational policy work (see Læssøe and Mochizuki, 2015; Aikens et al., 2016; Van Poeck et al., 2018) is beginning to examine these policy contexts, and we look forward to reading their findings when they are ready.

Anecdotally, we note that we almost never come across UN SDG language or programming in our climate change education work, and we suspect that this too is a result of the country's current role as global hegemon. The United States is a settler colonial nation established by violently seizing land from indigenous peoples and accumulating wealth by extracting both labor and resources from other places in the so-called "developing" world (Whyte, 2017). This includes carbon-based fuel sources that are used to power our society, what some scholars refer to as a petrostate (Haluza-Delay, 2012). Like other colonial nations in the "developed" world, life in the United States is soaked through and through with oil and coal. While climate change education has a decent history of teaching the physical mechanisms of climate change, it lacks much of an analysis of social or political power and is often unwilling to engage those crucial aspects of life (Drewes et al., 2018; Henderson, 2019). We welcome the chapters in this book that realize that climate change education must fundamentally address the inequitable social conditions that have produced the problem in the first place: namely settler colonialism and its intimate relationship with a model of economic growth that prioritizes continued growth over sustainable limits (Klein, 2015).

A diversity of educational approaches

Climate change is a collective action problem and needs to be dealt with by many different kinds of people working at various scales of influence (Ostrom, 2010). This book represents one such collective project for educators and educational researchers. As editors we see this book as a cultural artifact of a particular moment in American history as our nation continues to grapple with climate change in our educational structures and practices. The purpose of the book, then, is to highlight best practices in climate change education, as well as

explaining the ongoing challenges that hinder progress toward climate mitigation and adaptation.

We therefore present here a collection of unique educational case studies detailing a diversity of climate change education activities and programs from across the United States. Chapter authors are embedded in educational practices and programs that teach diverse audiences about climate change with a focus on informed action at various scales, from the individual and community levels to state and federal policies. Each case study is a co-authored venture, written by educational researchers and climate-change education practitioners in conversation with one another. We believe that good practice must be rooted in solid research and vice versa, and this book is our attempt to better connect these two educational communities in the field of climate change education.

We showcase a variety of educational programs, from formal institutions such as K-12 schools and universities, to informal institutions such as museums and environmental education centers, to nonformal environments like mass media and community-level educational initiatives. There are few other books in the emerging area of climate change education (e.g., Kagawa and Selby, 2010; Hung, 2014; Zabel et al., 2017), and those that do exist focus almost entirely on conceptual issues in climate change *science* education (e.g., Shepardson et al., 2017) or on other specialized disciplinary contexts (e.g., Siperstein et al., 2016; Young, 2018). We aim to provide a broader conceptualization of climate change education beyond merely scientific information literacy while also providing tangible examples of programs and practitioners who are using social science and educational research to inform their practice across a variety of settings.

This book does not assume a fair amount of specialist knowledge in climate change science or related educational research related to the topic. Rather, we bring research and practice into conversation so that the book is broadly accessible to both academics and practitioners who are interested in the subject, as educators of all kinds are increasingly integrating climate change concepts and topics into their courses, but uptake has been sluggish and uneven (Plutzer et al., 2016). Climate change education research is slowly emerging and lags behind other domains of social science research (Henderson et al., 2017). While climate change education research has been slow, climate change educational programming is starting to be more broadly incorporated at many levels and across diverse educational contexts.

The structure of this book

Climate change education is a broad and complex set of related concepts and practices. Imposing any kind of organizational scheme onto this work is difficult given the sheer number of issues involved (Zabel et al., 2017). Nevertheless, we have categorized chapters based on the nature of the educational context the authors are working within. Our chapters therefore fall into a few broad categories: formal K-12 educational settings, formal higher education settings, and informal educational settings. We draw inspiration here from the educational research in learning