



Educational and Developmental Psychologist

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rdvp20

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To cite this article: David Long, Joseph Henderson & Kevin Meuwissen (2022) What is climate change education in Trump Country?, Educational and Developmental Psychologist, 39:1, 132-145, DOI: 10.1080/20590776.2021.2013713

To link to this article: https://doi.org/10.1080/20590776.2021.2013713



Published online: 16 Dec 2021.



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What is climate change education in Trump Country?

David Long^a, Joseph Henderson^b and Kevin Meuwissen^c

^aDepartment of Middle and Secondary Education, Morehead State University, Morehead, KY, USA; ^bEnvironment and Society Department, Paul Smith's College, Paul Smiths, NY, USA; ^cDepartment of Teaching and Curriculum, Warner School of Education, University of Rochester, Rochester, NY, USA

ABSTRACT

Objective: Research in social psychology and the learning sciences indicates that political ideologies shape how learners and teachers engage climate change science. Because conservative worldviews prioritize the maintenance of existing social hierarchies—specifically race, class, and gender—conservative learners often engage in motivated reasoning by minimizing cognitive dissonance when learning climate change. Social and psychological research on climate change denial affirms that these hierarchies influence how individuals engage, generating a socially situated identity-protective effect vis-à-vis status quo maintenance. What kinds of educational projects might be capable of mitigating resistance to climate change science among political conservatives?

Method: This paper uses cases from rural New York and rural Kentucky to illuminate pedagogical interactions around climate change science in conservative communities as bases for considering alternative educational projects.

Results: We argue that teaching about climate change in conservative contexts demands specificity to particular cultural-psychological conditions, including historical legacies related to patterns of natural resource extraction. These broader shifts in rural political and cultural economy shape ethical-cultural conceptions of teacher and learner identities at geographic scale. **Conclusion:** In light of these findings, we discuss pedagogical pathways for overcoming such challenges—some actionable today, others requiring more development—relative to broader conversations in the climate change education literature.

KEY POINTS

What is already known about this topic:

- (1) There is a dearth of effective pedagogical approaches for climate change education in conservative communities.
- (2) Effective climate change education faces overcoming motivated reasoning.
- (3) There is a need to further develop climate change pedagogies for conservative communities.

What this topic adds:

- (1) Climate change education is possible in conservative geographies by attending to local values and epistemologies.
- (2) While research on effective climate change pedagogies is undeveloped, cases presented within provide salient starting point examples.
- (3) Problem based learning is an effective pedagogical approach to positively motivate student interest in conservative communities.

Introduction

This paper explores the potential to achieve climate change education and related forms of social and ecological action in rural, politically conservative parts of the United States. By examining cases in New York State and Kentucky, we show the challenges of transforming current climate change discourses and action into substantive educational change, given our present neoliberal and politically polarized society. For better or worse, large rural areas of Republican leaning states like Kentucky, and remote rural regions of Democratic leaning states like New York have come to shape the public imagina-

tion, especially after the years of the Trump presidency, as

"Trump Country" (Galofaro, 2017; Lowery, 2014). Where

political liberals are few and far between, the public

imagination for mitigating climate change is stunted at

ARTICLE HISTORY

Received 25 June 2021 Accepted 30 November 2021

KEYWORDS

Climate change; rural education; conservatism; identity by catering to ecotourists as service-sector employees. In the historically coal-dependent mountain region of Eastern Kentucky, jobs that provided a living wage generally were found in the mining industry. In both contexts, tied together by critical relationships to the carbon production cycle, resource dependence shaped what came to be valued as good work. Also in both contexts, valuing extractive industries as pathways towards a "good life" came into conflict with internal assumptions of the neoliberal economic order and its increasingly metropolitan and coastal home. This process has occurred along gender lines, too, as traditionally "manly" extractive industry jobs have been replaced by "womanly" service sector employment opportunities, producing a crisis of both political economy and of masculinity. Scott (2010) and Winant (2021) have documented how shifts in political economy are related to broader shifts in gender identity as the economy moves from industrial extractivism and towards care-based service work. Herein, we examine the inherent challenges in teaching for climate change understanding in educational settings that are sometimes hostile to enacting such messages due to perceived threats to political and cultural identity. Pathways to overcoming such challenges - some actionable today, some requiring more development - are discussed.

We advance our argument in three parts. First, we situate climate change education within broader political and economic realities to describe how ideologies influence both learning and educational justice projects. We then develop two pedagogical vignettes to highlight how we proceed with climate change education in conservative geographies and with conservative students. We conclude with considerations for those developing climate change educational projects that take conservatism seriously in their curricular and pedagogical models. Our overarching argument in this paper is that current forms of climate change education are inadequate due to their normative assumptions and that climate change education needs a better understanding of how to navigate the political contexts that shape teaching and learning.

How politics shapes climate change teaching and learning

At a basic level, climate change involves humans removing carbon from the ground, lighting it on fire, and releasing it into the atmosphere where it warms the planet by trapping heat like a blanket. It is obviously more complex than this, but simplistic forms of climate change science education often present climate change as *merely* a disruption in the global carbon cycle (Henderson, 2019). The more interesting and accurate understanding of anthropogenic climate change is that *some* humans are accumulating natural resources and extracting carbon, often at the expense of *other* humans, as a form of social and material advantage (Hickel, 2020).

Climate change results from the uneven development of human societies around the globe as countries in the Global North develop and become wealthy by dispossessing those in the Global South of their resources (Mitchell, 2009; Parenti, 2011). Climate change is thus a wicked socio-ecological problem and is the result of ongoing processes of colonialism, extractive global capitalism, and human technological supremacy over nature (Sultana, 2021). These processes are inherently political, for they involve power imbalances and struggles over resources. We have found (e.g., Drewes et al., 2018) that climate change *science* education tends to avoid such topics due to their political nature.

A growing body of scholarship shows that how people think about climate change is directly related to their political identities, with politically conservative white males more likely to reject the findings of climate change science due to a kind of motivated cognition that allows them to minimize cognitive dissonance in the service of status quo maintenance (Kahan et al., 2007; McCright & Dunlap, 2011). Political conservatism as an organizing ideology is fundamentally about preserving hierarchical social arrangements (Robin, 2017), which are directly related to the aforementioned structures and processes that produced climate change in the first place. As the effects of climate change become more widely experienced by those in the Global North, we are witnessing the rise of authoritarian and ecofascist movements within conservative parties that increasingly resort to violence to maintain these status-guo power and resource arrangements (Daggett, 2018; Gilman, 2020). Adequately adapting and mitigating the worst aspects of climate change means that educators need to deal with the implications of these political power dynamics in their work.

Scholars working at the intersection of the learning sciences and social psychology also have shown that political ideology influences how individuals interact with scientific findings. Specifically, learners engage in a kind of motivated cognition by minimizing dissonance when presented with information that violates deeply held ideological priors and threatens their identities (Festinger et al., 1956/2017). The more psychosocially committed one is to a particular worldview, the more disconfirming evidence is resisted, producing a kind of backfire or boomerang effect (Kahan et al, 2012; Nyhan & Reifler, 2019). One observes this phenomenon with Christian fundamentalists related to evolution (Long, 2012), with liberals as they interact with genetically modified organismsand nuclear power (Washburn & Skitka, 2018), and with neoliberal responses to vaccine mandates (Reich, 2014).

In the case of climate change science, we know that the strongest forms of denial exist among political conservatives, and among hierarchical and individualist conservatives specifically (Hoffman, 2015). Climate change is fundamentally a collective action problem, and solutions will necessarily demand collaborative and communal politics, which is why hierarchical individualists struggle with its ideological implications (Klein, 2015). Working together across cultural and geographic differences in ways that potentially disrupt status quo power dynamics is ideologically antithetical for hierarchs who benefit from the maintenance of such social and material arrangements (Daggett, 2018). This reality presents challenges for educators concerned with addressing the justice implications of climate change in educational settings and animates our key concern here: what is the educational justice project for those who may be ideologically primed to reject climate change education?

Climate change (not) in schools

Teachers and students are not blank slates; they inhabit educational settings with their own working political and cultural beliefs about the world. Schools are often sites of social contestation as teachers and students navigate concepts that often provoke identity threats such as in Long's (2011) work with creationists reckoning with evolutionary theory in educational settings. Creationism, though, is but one "contested curricular site", as Binder's (2009) work on both creationism and Afrocentrism makes clear. Consider, for example, how fraught the current discourse in the United States is around the educational role of critical race theories (e.g., Sawchuck, 2021). Historically, challenges to status quo power arraignments by subaltern and oppressed groups are met with reactionary conservative countermovements (Anderson, 2016; Paxton, 2007). Powerful actors similarly resist shifts in scientific knowledge, and climate science is no different in this regard (Oreskes & Conway, 2010). Organized misinformation and disinformation campaigns have targeted climate change education spaces in recent years (Farrell, 2016).

Research suggests that it is possible to negotiate climate change science with conservative learners,

although doing so is difficult. Relative to teaching about anthropogenic climate change amidst conservative pressures to downplay or misrepresent it, Colston and Vadjunec (2015) found that educators in Oklahoma subverted censorious state policies by weaving climate change education into their classrooms explicitly through the teaching of social controversy around the topic. This approach aligns well with the pedagogical use of problem-based learning approaches to teaching (Hmelo-Silver, 2013). Walsh and Tsurusaki (2018) found that teachers were able to negotiate conflicting worldviews by embracing, not eliminating, controversy as part of meaningful dialoque and complex problem solving with conservative students. And, finding youth less susceptible to political polarization influences than their elders, Lawson et al. (2019) suggest that teaching daughters specifically about climate change science may influence their conservative fathers' conceptions and identities via intergenerational learning.

Teaching climate change explicitly, like evolution before it, requires anticipating the potential of ideological push back from parents, school leaders, and fellow teachers. The ideological rifts in the general population are present to varying degrees within schools and influence climate change education (Colston & Vadjunec, 2015).

Reconsidering categorical imperatives in climate change education

To elaborate on the limitations of a climate change education that does not account for the aforementioned factors, it is important to consider present conditions both ontologically and practically. From Kant's original framing (1785/1993) of social obligations to act towards universal moral outcomes through today, efforts to draw upon categorical imperatives for which groups or individuals must take rational (and revolutionary) action generally have gone unrealized by human beings. In terms of political action, Klandermans (2014) and Mason (2018) identify superordinate problems and goals as those that affect and are shared by everyone, across group boundaries marked by geographic, social, cultural, economic, and political differences. Mitigating global environmental degradation and climate change would be one such superordinate goal. Superordinate goals require that people from different groups accept some disadvantages in pursuit of common welfare, trusting that others also will take their needs and interests into account. But anthropological research in human cognition and social interaction suggests that cultural group membership shapes how both individuals and communities engage

with climate change or not (Norgaard, 2011). Climate change only "comes to matter" (Callison, 2015) when groups create meaning in ways that are culturally and contextually significant.

Just as "social justice" imperatives have not generated a unified, revolutionary movement towards political and economic equality, the present climate change education playbook likely cannot fully overcome social, cultural, and political constraints to action in the name of the common good. Fundamentally plaguing philosophical debates of exactly what constitutes justice imperatives (including climate justice imperatives) is the "justice for whom, and to what ends" question-a question central to 20th-century debates between Rawls (1971) and Nozick (1974). Climate justice, pragmatically, is a matter of which community values are prioritized and who accepts what disadvantages. Philosophers such as MacIntyre (1988) have long pointed out this kind of incommensurability of competing worldviews and their differing moral commitments. The educational project to address this requires pedagogies that resonate within particular communities and attend concurrently to the domains of science and politics.

At the same time, many countries are moving towards increasingly polarized and partisan political environments (Mudde, 2019). Unfortunately, climate science largely is enveloped by that polarization, generating divisiveness rather than unity around the problem (Pew Research Center, 2016). In the United States, this polarization is embodied by a "red state/blue state" political geography, with additional cultural and ideological sorting by urban areas, where liberals increasingly tend to live, and rural spaces, where conservatives increasingly tend to live (Tam Cho et al., 2013). This geography is further exacerbated by differences in worldview towards climate change by religious identity across these landscapes (Pew Research Center, 2020).

Our seeming inability to act as a unified social body regarding climate change may be exacerbated by a social media landscape that posits competing modes of outrage at social and environmental ills alongside cat videos in an onslaught of cultural stimuli as recent whistleblowers within the Facebook corporation have shown (Timberg, 2021). Enough has been written about our dwelling in this media landscape (e.g., Brown & Duguid, 2017; Turkle, 2011) to point out that we are not well suited to dealing with competing messages that compel moral imperatives to act. The irony, and perhaps part of the malaise felt amidst these conditions, is that there are often few consequential, practicable actions to accompany a discourse that constantly presents categorical imperatives in high-stakes language to increasingly divided and divisive social and cultural groups. People tend to retrench in their already held convictions rather than entertain change (Kahan , 2012).

The failure to act morally and politically in response to global problems has precedent beyond our hyperpolarized and technologically connected present. For example, Western political leaders' feeble response to the 1994 Rwandan genocide was starkly disproportional to the categorical imperative to stop and further prevent the mass murder of black lives. While seemingly less gruesome and less proximal than seeing televised images of dismembered bodies afloat in the Kagera River, we suggest that geopolitical shifts now underway due to climate change will pose similarly large-scale superordinate problems. It is a sad but instructive exercise to think about the limits of social change under the guise of categorical imperatives. On a large scale, it seems like national and global political leaders are susceptible to partisan incentives and ill-equipped to creatively and fundamentally bend conditions towards the common good. On a small scale, it seems like individual citizens lack power to affect superordinate problems within the material-cultural and political systems where change happens. Living through the COVID-19 pandemic illuminates these concerns. A global pandemic-a seemingly superordinate problem that demands collective, cooperative, and equitable action-has calcified political differences, misunderstandings, and distrust and exacerbated pathological behaviour, thereby reinforcing and reinscribing existing status quo social and material conditions.

As Dahl et al. (2019)rightly point out, social, political, and economic activity in response to a changing climate almost certainly will not proceed equitably, respective of human dignity across racial and class boundaries. In our current reckoning with climate change, business as usual consists of attempts to commodify action as marketable "green" behaviour choices rather than systemic policy change efforts that consider the needs of all people, regardless of social markers (Henderson, 2014). Cultural, political, and educational discourses too often presume that a categorical imperative is the appropriate warrant for change, and that we are simply bad actorssome worse than others. We question this presumption. Socially and culturally, we do not act directly in response to such imperatives, and it is a political and educational dead end to dwell in such spaces. What animates us is a lack of orientation in climate science education towards how people in communities meaningfully

contribute to averting natural resource depletion, environmental degradation, and disaster. Practical, actionable policies and practices towards these ends will have to be tooled such that changes are culturally salient in most communities. How is this to be done?

We offer some thoughts on this question via two pedagogical vignettes: one in the timbering country of New York State's Adirondack Mountains, and one in the historically mining-centred communities of Eastern Kentucky. Both provide helpful examples for thinking about the aims and practical challenges associated with affecting change in people's thinking, interactions, and actions related to natural resource use and environmental degradation. We offer these examples as starting points to more clearly understand the nature of the problem we face away from the more politically left-leaning geographic centres that dominate climate mitigation discourses. Views from these settings offer the potential for designing educational strategies that better serve their endemic students, respective of the places they are and the values they already hold.

Method and results

To begin to think about effective climate change education in "Trump Country", we examine interactional dynamics in the rural, mostly white, and politically conservative contexts of the United States where we work as educators and scholars. We conduct an exploratory conceptual analysis through the presentation of pedagogical vignettes to explore our unique educational contexts and draw out themes between sites accordingly. This is a kind of collective instrumental case study method (Stake, 1995). By conducting a comparative analysis across two conservative geographic spaces, we hope to develop "petite generalizations" (Stake, 1995, p. 7), thereby illuminating social conditions and pedagogical challenges relevant to others in similar contexts.

We present two detailed vignettes based on our own reflections of pedagogical practices in politically conservative geographic contexts. Pedagogical vignettes provide avenues for connecting research with practice "to bring about transformative experiences by practitioner researchers" (Skilling & Stylianides, 2020, p. 541). We perform a close examination of our own practical and embodied pedagogical knowledge via phronesis (Flyvbjerg, 2006). This kind of Aristotelian self-analysis functions as a practical check on whether our attempts as instructors to educate our students as to the reality of an anthropocentrically changed climate functions well within the cultural milieu that we work. Student ambivalence towards climate change is not a tenable outcome for us, so as we improve our efforts, they must make cultural sense within our students' communities and commitments.

We have found in past scholarship (Henderson & Duggan-Haas, 2014) that such pedagogical stories can help elucidate some of the broader conceptual issues at play in contentious educational spaces. We draw from specific educational artefacts in the construction of our vignettes. In Henderson's case, syllabi, lesson plans, course assignments, and student essays from over four years of undergraduate and graduate classes were analysed to see how course and assignment design influenced student idea development as expressed in both written and spoken class discourse. We paid particular attention to if and how students expressed threats to political identity and towards which normative projects. In Long's case, student project notes and drafts of final project assignments submitted to a course management software platform were analysed to see the degree to which attitudes towards practical, actionable climate solutions emerged within students. These notes and final project presentation materials were collected from the ten prior sections taught over the past five years. Each was analysed for dominant climate mitigation solutions, and the degree towards which students chose future policy pathways retaining high carbon dioxide and other greenhouse gas emissions over more renewable options (see case study below). This analysis animates Long's vignette.

Post-extractivist pedagogies in the Adirondack Park

Paul Smith's College is a small, private institution located in the rugged, rural, 6.1-million-acre Adirondack Park in Upstate New York. The Adirondack Park is the largest state park in the United States and the largest legally protected landscape in the lower 48 states. It is also a unique case study in public/private land use, as around half of all land in the Park is privately managed. Paul Smith's College was founded in 1946 as a two-year vocational school to prepare labourers for the Park's primary industries: forestry and hospitality. A class-based tension between tourism and resource extraction has existed among residents for generations (Dewbury, 2019). The Adirondacks comprise a large part of New York's conservative 21st Congressional District, currently represented by Elise Stefanik, one of the most powerful Republican House members in the United States Congress. Once a swing political district, NY-21 is now steadily trending rightward, thus exhibiting the broader conservative

trajectory in rural areas during the Trump presidency (Rodden, 2019).

The college has evolved over time by slowly shedding its two-year technical training programmesand moving closer to a four-year liberal arts college with a new and very small graduate programmein natural resource management. The school is predominantly white, drawing students from New York and other northeastern states, although the racial and geographic composition has diversified slightly in recent years. Such demographic shifts reflect the need among small colleges to expand enrolment as economic pressures on tuition-dependent colleges become more intense (Churchill & Chard, 2021). The college also has a high percentage of first-generation students (>50% in any given year) and is also consistently rated one of the best schools in the country for military veterans.

I (Henderson) am a faculty member in the Environment and Society Department, where I teach a number of courses that deal directly with the human implications of climate change: sustainable development, ecological change and society, and protected landscapes. A majority of my students are white, firstgeneration college students from rural, conservative, and working-class backgrounds. One of the biggest challenges in teaching controversial subjects like climate change to this population is the relatively parochial life experiences they bring to the classroom setting. Many lack lived exposure to diverse cultures of people in more racially and politically diverse geographies. Given the rural nature of our campus and programming, many come with identities forged primarily in white, rural, and politically and culturally conservative spaces.

For these students, my courses typically are one of the first times they have engaged in a scholarly way with topics such as environmental racism, climate colonialism, violence against indigenous peoples, critiques of global capitalism, and the gendered aspects of environmental destruction, among other topics related to unequal power dynamics. Given our college's political and racial demographics, I had expected explicit pushback from students on the subject matter of my courses; but after several years of teaching, that expectation simply has not materialized in any serious way. Rather than demonstrations of intensely ideological motivated reasoning in the face of conflicting information (Kahan et al., 2007), I instead have found students who simply have not been exposed to complex topics and cultures due to their life trajectories. Most of these students are not overtly hostile to learning about things that might make them uncomfortable, although this discomfort does emerge and is something that we navigate together.

It certainly helps that my educational trajectory is like many of theirs: originating in a white, workingclass, politically conservative, and traditionally patriarchal upbringing in rural Upstate New York. Whenever a controversial issue arises in class, I always make a point to speak about my own identity trajectory visa-vis that issue, with the goal of modelling a kind of educational becoming (Pinar & Pinar, 1998) via modelling openness to experience (Sibley & Duckitt, 2008). As a first-generation college student, I too had to negotiate increasingly diverse educational spaces; and I speak often about what it was like to overcome conditions that were often uncomfortable. Relatedly, my course writing assignments regularly press students to perform a kind of "mirror and window" analysis of social issues relative to their own positionalities. Mirrors allow students to centre themselves as parts of broader social patterns within those issues, and windows force them to consider the positions and experiences of others in social structures or phenomena. Mirrors and windows are both locally and globally applicable metaphorical tools, equally relevant to discussions about resource depletion in the extractive industries of the Adirondacks as they are to investigations of power dynamics in the global North and South.

I am careful when teaching complex and controversial topics to explain Hume's (2003) "is/ought" distinction, thereby discursively and pedagogically separating questions about the nature of the world ("what do we know, and how can we claim to know it?") from the normative dimension of possible solutions to problems ("what should we do, and on what grounds should we do it?"). We still engage with the development of their own normative projects, but even then I sometimes find myself saying things like "it's up to you to figure out what to do about these issues". Rather than imposing my own normative projects onto students, I instead try to open space for them to consider the broader complexity of issues that they might not otherwise have considered. By opening a dissonant space (Walsh & Tsurusaki, 2018), I use assignments to expand their world while minimizing threats to their identity that may preclude broader engagement with the subject matter. I am trying to avoid the backfire effect (Nyhan & Reifler, 2019) in the face of dissonant information.

There are clear limitations to this approach, as I have encountered students with strongly held anti-social and increasingly fascist ideologies that mirror the broader right-wing radicalization happening in American politics (see Miller-Idriss, 2020; Mudde, 2019). These few students – always young white men from petite bourgeois families – are the ones that I worry the most about. My pedagogical techniques seem to fall flat with these students, perhaps because they have such strongly developed normative projects already? I continue to wonder what to say to the Boogaloo boy convinced he was going to be part of a coming race war. Or to the neo-fascist student who thought the answer to climate change was a neo-colonial white ethnostate where he and those like him controlled all the resources by meting out violence against non-white others. Interestingly, both students accept the science of human-caused climate change but took it towards ecofascist "avocado" politics (Gilman, 2020). What to do in these situations? I do not know, and that gap animates my current scholarship on environmental education and rising threats from ecofascism (J. Henderson, 2021).

From a psychosociological perspective, many of my male students are navigating changing narrative conceptions of themselves relative to broader changes in political economy and the related sociocultural shifts associated with such shifts. The post-Fordist American economy prioritizes feminized service and care labour in places once associated with masculinized manual labour (Cairns, 2013; Winant, 2021). These shifts are present in a protected landscape like the Adirondack Park, as extractivist industries like timbering and mining are slowly being replaced with ecotourism, education, and healthcare industries (Dewbury, 2019).

Post-extractivist pedagogies in rural Kentucky

Far southwest of the Adirondack Mountains' timbering industry, an analogue exists in the remnants of coal mining in central Appalachian Kentucky. Given its historical dependence on coal mining, Central Appalachia has seen boom and bust employment cycles over the past century. What was an extreme fringe of early American settlement in the 18th century came to have a small but important role in the greater industrial and agricultural infrastructure of the United States into the 1900s as coal became a fuel of industrialization.

The physical landscape is hard. While not the high peaks of the Rockies, Appalachian Kentucky's mountains range from around 1,000 to 4,000 feet. It's not the size that makes negotiating them difficult; it's their dissected, palmate nature, with hardly a straight line to be drawn by road or river. Moving around these hills is a time consuming, inefficient affair compared to the rapidity of transporting people, goods, and resources in more urban spaces. As such, the Appalachians – while not terrifically tall an obstacle – proved an early blockade to horizontal movement.

The regional economy, low in population, was not without gendered labour and class relations. Historically,

able-bodied men working in the mines provided the largest slice of a household's income, where women, for the smaller proportion of them employed outside of the home, often took up positions in care-oriented professions like nursing or teaching. That isn't to negate the minority of those who broke gendered (Tallichet, 2006) or racial lines (Lewis, 1987); they were always there. They just didn't add up to a notably large segment of the population. While Appalachia isn't purely a white population-having a number of more diverse enclaves drawn for the comparatively well-paying jobs in the mining industry – it was and is an overwhelmingly white part of the U.S. Appalachian Kentucky counties all range from the low to high nineties in percentage of Caucasian residents. A racially diverse place it is not.

Overlain on top of these specific dynamics of labour and gender is perhaps a bigger structural factor to understanding Appalachia – the role of the church. Largely cut off from the secularizing trends seen throughout the 20th century in bigger cities (Billings & Blee, 2004), Appalachian faith practices followed largely Southern Baptist and other non-denominational Christian traditions, remaining strong today. Such traditions historically placed great emphasis on small community and family ties, and were largely socially conserving of regional and local values. That said, for the most part, the role of the church was concomitant with patriarchy and patriarchal power. It was and is a socially conserving space.

The last few decades in central Appalachia have seen dramatic changes in the economy and the making of a livelihood. What started as a downturn in mining due to cheaper coal sources elsewhere (open bituminous and lignite strip mines of Wyoming for example) has been outstripped by the rapid and seemingly irreversible replacement of coal by the growth of natural gas extraction and the burgeoning photovoltaic solar and wind farm installations across the U.S. With the collapse of the mining industry, the tables have not so much turned as much as half the legs have been knocked out from under it.

At Morehead State University where I (David) am a faculty member, we matriculate about half of our student population from the central Appalachian region of Kentucky. While a college-going population is never quite politically representative of the general population, the background political affiliation of student families is more strongly conservative than the U.S.– both fiscally and culturally. That said, in general, college students are open to looking at the world anew and our students are no different than others in these regards. It's within this context over the past five years that I have developed a course that explicitly charges students with tackling climate change. This work is done in the context of an entry-level non-majors' physics department course-the type of course that science-phobic students often seek out to meet a general education requirement. The course, "Modern Issues and Problems in the Physical Sciences", is well suited to engage students in the carbon costs of energy production, while bland enough not to alienate potentially climate-phobic students from enrolling. Following the general pedagogical modelling of problem-based learning (PBL) (Hmelo-Silver, 2013), the physical science realities of energy production, consumption, and CO² outputs into the atmosphere are closely examined for their opportunities and threats.

Part of the superordinate narrative framing of this course is that students will have ownership of the future through modelling local decision making through social and economic institutions within which they might find themselves living and working. Following best practices of PBL instruction, the problem posed to students is to come up with energy policy for the Federal Office of Science and Technology Policy, as they take on the role of Science Advisor to a future President of the United States. The outcomes of the course require this ownership, and students must decide, based upon what they've learned during the term, what CO² reducing energy policies we shall have as a country to mitigate existing and future climate change.¹ This is achieved in conjunction with the Project Drawdown (Hawken, 2017) advice on the top 100 future climate solutions.

Importantly, identity and narrative matter a lot in this work. As a significant number of students in the course share a family history of with extensive work histories in the coal mines, it is extremely important to not prompt identity-protective cognition which might significantly turn off certain students from meaningfully engaging with the course. In this case, I (David) bring my own family history including stories of my father working in the energy generation business through work at a coal-fired steam electric station on the eastern side of Appalachia in Pennsylvania. This direct connection goes a long way to build a shared sense of identity surrounding this work which helped feed, clothe, and educate our families. This kind of carefully framed discussion shows the practical possibilities of avoiding motivated reasoning (Kahan et al., 2007). Rather, it permits students to learn about the constraints and affordances of the energy landscape and apply practical reasons to address the changing earth system conditions which they had no control in producing via the circumstances of their birth. While perhaps crude, this approach avoids all allusion to negative stereotypes of "environmentalists" that some of them carry with them into the class.

As in the Adirondacks case, even if perhaps a bit less so, a small number of (always) white male Morehead State students present themselves in class adorned with various types of neo-facist para-military and white supremacist shirts, hats, and other coded iconography that have burgeoned among the political right in recent years. While this has been a small but growing number of students, it is not without noting the coming trajectory of this identity presentation–especially considering the political insurrectionist actions in the U.S. Capitol on 6 January 2021.

As the course nears its conclusion, students will have produced an official "statement" on future energy policy to mitigate climate change which they present to the class, after which they take questions from an assembled "corps" of news and print media outlets which probe and poke at the strengths and weaknesses of the chosen policy suite. Students make up this "press corps" based upon their preparation as a news/media outlet from the "Media Bias Chart", (Ad Fontes Media, 2021). This inclusion in the course further introduces the students to the skills needed to be aware of and strategically think about where information about climate change is coming from, including whether such tools as the Media Bias Chart are usefully apolitical in their intent. To this day, only three have chosen energy policies which retain high CO² emissions, and even in these cases, the students have chosen natural gas as part of a larger suite of energy choices in what they describe as a pragmatic stopgap as we move away from carbon.

Discussion: towards cultural-psychologically situated climate change pedagogy in conservative contexts

While the two vignettes presented are by no means pedagogically or geographically exhaustive, they help us understand charged dynamics and interactions related to climate change and consider what pedagogies we might cultivate to increase the educational potential of those interactions. Cohen et al. (2003) suggest that pedagogy is born out in exchanges among teachers, learners, and subject matter, in imbricated environments – classrooms, geographic regions, cultures and societies – at particular times (see Figure 1).

Pedagogical reasoning about climate change education in conservative, rural areas requires reflection on the nature, coordination, and consequences of this model's



Figure 1. An interactional model of pedagogy.

numerous elements. In our cases, teachers, students, and climate science interact in classrooms where primarily local and regional populations of working-class whites, for whom the imperative of higher education is only one or two generations old, variably acknowledge that the extractive industries that once established an economic and sociocultural foundation for "good, honest living" are in decline and under scrutiny for their environmental impacts. These classrooms are situated in regional, national, and global contexts convulsed by climate change and its impacts. Broadly, while increasingly severe conditions compromise natural, agricultural, and infrastructural systems and intensify public health risks, people may perceive such conditions as inconsequential, or even mythological, in moderately affected places with strong orientations towards group-based social hierarchies and conservative-ideological dominance (Häkkinen & Akrami, 2014). In all of these overlapping environments, scientific and political communications about climate change and its consequences propagate, sometimes honestly and sometimes speciously.

Questions about overlapping environments frame our curricular and pedagogical thinking and decision making. For example, how do we represent the consequences of climate change in ways that are proximal to our students and local communities, and that also acknowledge its impacts on others and their communities, and the relationships of those communities to our own? How do the cultural groups to which our students are committed, and the locations and activities of those groups, factor into motivations behind their proenvironmental or system-protective views – and in turn, into how we reinforce criteria for productive discourse and truthful claim-making in our classrooms? Answers to these questions might manifest quite differently across environments that vary in their economic and cultural dependencies on fossil fuels, from ours to the classrooms of wealthy, elite coastal universities to ecological research or vocational education sites in other parts of the world (Lübke, 2021).

Drawing upon our cases from here forward, we name some additional pedagogical elements, interactions, tools, and practices associated with our efforts to teach climate science in conservative spaces. We also identify some dilemmas that persist despite those efforts, suggesting that such dilemmas bear consideration for any researchers and educators working to understand and teach the science and politics of climate change in contexts like ours.

Focusing on teachers: disclosure and experiential modelling as pedagogical aims

By disclosure, we mean to what extent and in what ways educators share or withhold their worldviews, ethics, and politics in the classroom to avoid seeming prejudicial towards students with other stances. Questions of disclosure are long-standing in the political education literature. Kelly (1986), for example, differentiated disclosure roles by intent – i.e., representing an issue as open or closed and a position as

normatively or empirically valid, invalid, or neutral and by approach – i.e., excluding or encouraging political discourse, attending to or overlooking its nature, norms, and consequences, and/or upholding or avoiding committed positions on issues. Relative to these roles, Niemi and Niemi (2007) and Hess and McAvoy (2015) argue that educators' attempts to maintain neutrality and avoid disclosure are confounded by subtle or overt permeations of worldviews, ethics, and politics pedagogical interactions, particularly when students' comments, guestions, or challenges invite them. And Journell (2016) rejects the notion that neutrality is the most defensible disclosure stance, suggesting that ratifying some common truths and criteria for establishing them amidst potential danger or rejection generates more pedagogical benefits than perpetuating balance for "both sides'" sake.

The inextricability of the scientific and the political in work like ours demands a purposeful synthesis of disclosure and experiential modelling. Disclosure, in our cases, involves the clear articulation of epistemic and ethical commitments - for instance: (1) that climate science education and political action ought to converge upon mitigating the most devastating forms of environmental degradation, which pose the greatest and most inequitable risks to vulnerable people and ecologies; and (2) that it would be malpractice to suggest there are credible "alternative perspectives" to anthropogenic environmental degradation and climate change, or that there is such a thing as apolitical climate science. That said, it is worthwhile to target how experience and ideology affect people's conceptions of what kinds of scientific and political questions are open and closed, what ways of addressing those guestions are valid or not, and why.

In Henderson's case, such conversations are generated in the cognitive and sociocultural dissonance associated with juxtaposing potentially oppositional natural-environmental interactions and the kinds of cultural lives those interactions represent. Locally, commitments underlying the shared cultural value of "being outdoors" sometimes diverge considerably, as the economic impetuses and outcomes of extraction and construction potentially endanger those of conservation and healthful recreation. Globally, seemingly uncommon people from north to south all must contend with wicked juxtapositions via guestions like "how ought communities and governments respond when people flee increasingly inhospitable regions for safer ones, or when the wealthy few hoard and excessively deplete natural resources that we all need?" Henderson's modelling and regular use of mirrors and windows as metaphors for students to consider their own and others' social and cultural situations relative to such questions provides an accessible entry point and persistent framework for addressing normative, empirical, and experiential guestions, in concert. Relatedly, the shared histories and cultural identities engendered via Long's experiential modelling efforts are preconditions to studying and justifying policy approaches that acknowledge humanity's destructive effects on the environment as a baseline. Those efforts have two primary functions: to soften students' tendencies to simplistically associate opposing ideas with political-cultural outgroups, and to generate the trust needed to approach collective inquiry from a stance of openness rather than ideological protectiveness.

We do not disclose our experiences and epistemic and ethical commitments, then, for their own sakes, or to suggest that our authorities as educators warrant their adoption among students. Rather, disclosure serves a pedagogical function, reinforcing the idea that explicitly acknowledging and grappling with the nature and influences of our ideological priors *alongside* having to justify empirical and normative arguments by publicly responding to questions and counterclaims may motivate accuracy-seeking information processing and discourse. We find additional support for this idea in political and science education and communication literatures (e.g., Bolsen & Druckman, 2015; Crocco et al., 2018; Darner, 2019); and we attend next to enacting it as a pedagogical aim.

Focusing on teacher-student-subject matter interactions: political-ecological reflection

Students' cultural commitments, their environmental views, and the ways in which they perform those things manifest in overlapping local and global contexts. These contexts are face to face and "on the ground", where mutual trust and civil discourse may be stronger and deeper, and online, where connections may be weaker but more plentiful, and where reflection on the nature, sources, and reliability of knowledge tends to be rare - in other words, under conditions that can generate conflict and are prone to identity-protective cognition (Kahne & Bowyer, 2017; Middaugh et al., 2017). And yet, we recognize that conflicted spaces host powerful scientific and political problems, and that conflict can motivate scientific inquiry and political participation. How, then, might educators acknowledge and use conflict around

climate change to encourage learning, in a way that students do not reject out of hand because it fundamentally threatens their identities and commitments?

One approach may be to name, discuss, and reinforce productive interactions related to that tension, defining the various role identities people embody (e.g., community and family member, scientist, citizen) and studying them alongside each other in culturally contextualized environmental systems (Kaplan & Garner, 2017). The political education literature includes extensive work on norming controversial issues discussions, with particular attention to openness and tolerance towards diverse identities and ideologies, evidence use in argumentation, and addressing disagreement directly and humanely (e.g., Hess & McAvoy, 2015; Kohlmeier & Saye, 2019; Parker, 2010; Sinatra & Lombardi, 2020). We would add that teaching about climate change in conservative contexts demands great patience and humility, explicit attention to how pretentiousness and disingenuity act as barriers to the aforementioned norms, and specificity to particular cultural-psychological conditions. For example, educators might ask students to affirm, challenge, extend, or otherwise critique and modify the following assumptions and values, and to generate discourse scenarios in which they would be especially consequential:

- There is no such thing as environmental science without environmental politics.
- We all use shortcuts to help us make sense of complicated scientific and political issues. Our shortcuts are made up of our identities, our worldviews and beliefs, and our commitments to people we trust and cultural groups we value.
- Our shortcuts can help us quickly make sense of complicated scientific and political issues, but they can also impede deeper understanding of those issues.
- The high stakes associated with protecting our identities, worldviews and beliefs, and social and cultural commitments in the face of conflicting scientific and political information makes us vulnerable to falsehoods and manipulation.
- It is important to seek out accurate scientific and political information and to develop accurate understandings because accuracy has consequences for me and the people I care about.
- There are no material or psychological benefits in our learning community of making bad arguments, sowing mistrust and misinformation, and sabotaging norms of constructive interaction.

These foundations enable a reflective discourse whereby science educators and students address not only natural resource use, environmental degradation, and climate change as subject matter, but also the ways in which people interact scientifically and politically around those things. Two domains of questioning may be particularly useful towards those ends. One relates to our ecologies, or the overlapping environments in which we co-exist - e.g., what parts of my identity are most significant and why; who matters to me, and what makes them matter; who do I trust, and why do I trust them; how do I define the values and boundaries of my communities, and what are my roles within them? Another relates to the implications of how people in different overlapping environments variably address the subject matter - e.g., how much do I care about the issues of natural resource depletion, environmental degradation, and climate change, and why; what do I, those who matter to me, and those who I trust stand to gain and lose; how should I engage with these issues as public problems; and how do our affectively polarized politics affect my and others' thinking, interactions, and actions related to environmental issues?

A pedagogical challenge: when identity-protective cognition and right-wing ideologies persist

To explicitly disavow sabotaging norms of constructive interaction, as a practice, acknowledges the existence of sabotage alongside the inexperience Henderson describes and the cultural performativity Long identifies. We argue that the role identities and cultural conditions underlying students' reasoning about climate change are important for educators to understand and engage; and thus, the difficult task of determining the degrees to which those identities and conditions are normatively "good" for or purposefully antagonistic towards human welfare is pedagogically significant (Kahan, 2017). Further, working to mediate identity-protective cognition as part of an inclusive climate science education necessarily involves inviting into the discourse those whose media consumption habits are misinformative, and whose social and cultural commitments perpetuate detachment from others who seek to mitigate environmental risk and degradation. An important guestion, then, is how climate educators in conservative spaces might marginalize blatantly false discourses and pathological practices while including people who contribute to them, in the hope that they might learn and change - at least until those people explicitly state and defend pathological intents.

This brings us to a bigger question about the ends of a pedagogical project like this, at a time when affective polarization and purposeful disinformation stymie convergence around the superordinate goal of environmental disaster mitigation (lyengar et al, 2019). Should that goal be framed relationally and deliberatively, grounded in the aims of helping experientially diverse people better understand others' relationships to natural resources and their environments, encouraging scientific inquiry and political humility, and pressing for consensus in conflict-laden scientific and political discourses? Should that goal be framed agonistically and hegemonically (Tryggvason, 2018), grounded in mobilizing social networks to use scientific and political tools as mechanisms of power, effectively ostracizing destructive influences and pursuing epistemic and political "wins" on empirical and normative grounds? Are these different ends or two sides of the same coin? Our cases elucidate questions like these and demonstrate the significant gap in our understanding, as a field, of how to teach for conceptual and cultural change, scientifically and politically, among conservative people in rural spaces.

Note

 While the course does examine additional contributors to positive radiative forcing such as methane and halogens etc., we focus on carbon dioxide production given its outsized role in adding CO² to the earth's atmospheric system.

Acknowledgments

The authors would like to thank Doug Lombardi for his guidance, as well as the anonymous reviewers who provided thoughtful feedback during the peer review process. We would also like to acknowledge our students for their willingness to engage the difficult issues.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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