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As my northwestern New Jersey school district enacts a second delayed opening this fall for rain (for rain!), it's clear that climate change is no longer something that exists as an amorphous future danger somewhere else, but, instead, as a force that is here, now, and creating disruption to our daily lives...which is, of course, not to say that things won't get worse. The reality is that things will get more disruptive at best - and more deadly at worst.

Our students today, unfortunately, are not unfamiliar with deadly threats and upended lives. According to the CDC, the Covid-19 pandemic has brought death to the front doors of more than 140,000 children across the United States ("The Hidden U.S. Covid-19 Pandemic: Orphaned Children"). And, as with climate change, in the best-case scenarios, it has merely disrupted the entirety of their lives for the last year and a half. That's a pretty negative upside, to say the least.

As English teachers, many of us have opened our classrooms, online and in-person, to be places where students can wrestle and reckon with all that they've lost during the pandemic. As a result, we English teachers now have a model for how we might open our classrooms up for explorations of climate change as well, and do so for the same reasons we knew we had to give students the time and space to address Covid: it's weighing on their minds and messing up their lives; they need to think through what these new realities and their potential for catastrophe mean for them as students, as children, and as citizens who will inherit larger and larger burdens caused by this global problem.

And, of course, as writers, our work should necessarily contend with life's most pressing issues, problems, and emotions. As author Lauren Groff states, stories should ask difficult questions (Brady), and climate change is raising big and frightening questions for young people, who are largely wrestling with their fears without the support and guidance of their teachers (Kamenetz).

In my classroom, one of the ways that I invite students to contend with, think about, and write about climate change is through "cli-fi" narratives. "Cli-fi" (short for "climate fiction," and a reimagining of "sci-fi") is a genre that is exploding in popularity these days, in both young adult and adult fiction. On the YA side of the publishing house, students may have read *Orleans* by Sherri L. Smith or *Dry* by Neal Shusterman, or *American War* by Omar El Akkad. In adult fiction, Kim Stanley Robinson's *The Ministry for the Future* and N.K. Jesimin's *The Fifth Season* have been published to critical acclaim and popular success. Also in adult fiction, there has been a whole spate of novels recently published that involve a protagonist wrestling with climate anxiety, as a kind of white noise amidst her more personal problems of work, love, friendship, and childrearing - novels like *The Life of the Mind* by Christine Smallwood, *Weather* by Jenny Offill, and *Beautiful World, Where Are You* by Sally Rooney, just to name a few.

While these aren't specifically cli-fi, they do address climate change within the diegesis

of their plots in a way that might have felt futuristic just a short time ago.

So why shouldn't our students also have the chance to imagine a future reality informed by climate knowledge? One might even argue that narrative writing that fails to address climate change, at least tangentially, doesn't feel relevant and timely anymore, as increasingly, we're seeing the impacts of climate change in our own backyards (Renkl).

I usually begin the cli-fi unit by giving students time to scroll through *The New York Times* "Year in Climate" from the previous year. Just perusing the headlines helps students come to grips with the wide implications climate change has and does so without yet asking them to delve into details, which enables them to begin with the "big picture" before we drill down to specifics. After giving students time to scroll through headlines and skim articles on climate change, they post to a Padlet and explain the climate change impacts they learned about. They also cite the articles they read that taught them about these impacts. This Padlet offers students not only an overview of the potential impacts of climate change, but it also offers them a rich and succinct resource for potential ideas when they begin drafting their cli-fi stories.

Then, each day thereafter, we spend time reading infographics on climate change during the first part of class (Nediger). "Infographics" are an increasingly popular medium that news outlets are using to convey information succinctly and impactfully. Because most students need to develop background knowledge before writing cli-fi, infographics provide them that knowledge base. It's also a great opportunity to teach students how to read and interpret infographics, a genre they recognize, as it's fairly ubiquitous online, but haven't formally studied. And, as Penny Kittle says, "If you bring in really interesting information, kids want to write from it" (Marchetti).

The writer's notebook is a key training ground and playground for students to think about information and the ways in which information can fuel their creative energies. While we don't always need to tie our notebook writing to a current unit of study, Allison Marchetti advises us to think of the writer's notebook as a series of invitations for students to write, and one way to do that is to "[c]hoose invitations that correspond to the current unit of study with the thought that students might be able to generate work during this time that could feed their current writing" (Marchetti). Infographics work beautifully as exactly that kind of invitation to write, and writer's notebooks are also a great place for students to begin the process of analyzing data and building their media literacy skills as they simultaneously fire up their narrative writing skills.

In preparation for their cli-fi stories, students read infographics that either illustrate the nature and scope of climate change impacts or the solutions available to mitigate emissions, which is really key. With each infographic we read together, we write on and discuss the following questions, in order to help students develop their infographic literacy:

1. What do you notice about the structure/organization of this infographic? (Describe how it is set up.)
2. 2. What does the data say? (Explain the key takeaways or big picture this infographic conveys.)
3. What does the data NOT say? (Explain what information is related to this content but is not accessible on the infographic.)
4. What do you wonder after reading this infographic? (What questions does this data prompt you to ask?)

5. What writing might emerge from this data? (What potential plots or conflicts for a short story might be inspired by this data?) (Marchetti and O'Dell)

For the first few infographics, we work through these questions together in a whole-class discussion, so I can guide students through the questions. The first infographic we read together is from the University of California and focuses on what accounts for "emissions," so students have an understanding of the sources of the problem ("Where Do Greenhouse Gas Emissions Come from?").

In order to read infographics effectively, we need to be attentive to the relationship between words and images, which usually means noticing variables within the images, like color, size, and shape. In this first infographic on emissions, students often note that the infographic is structured as a circle, in which various portions of the circle are marked off in different colors that coordinate to different sources of emissions, and the length of the circle each color takes up tells us how much each sector contributes to global emissions. They note that the big picture is that different sources of emissions have varying degrees of impact, with electricity and heating as the largest source, since that yellow bubble and its corresponding component to the circle are the largest. Reading this infographic helps students come to the understanding that reducing emissions will mean transitioning our energy systems away from fossil fuels, which is a key takeaway from the infographic. Students often comment that the infographic doesn't tell us how these sectors create emissions—just that they do. One question they often have is the following: How does agriculture create emissions? (I'll give them a few minutes to search for answers to the questions they have, and this question is always a fun one when students discover not only how much oil is involved in industrial farming, but also that cow burps contribute large amounts of methane to the atmosphere!)

The last question is designed to prompt students to think through potential story ideas and see the ways in which writers get inspiration from their reading. Some of the ideas students have had in the past for story ideas inspired by this infographic are the following:

- A third-generation farmer begins the process of shifting her family to biodynamic farming and the conflict that creates with her grandfather
- A high school student discovers a way to power his truck with hydrogen fuel cells tells his physics teacher about the invention, and the teacher tries to take the credit
- A coal miner protests the shift to more renewables that will be necessary to reduce emissions from electricity, fearing for his family's livelihood

Once students have a handle on what accounts for emissions, they often want to know about countries that are responsible for these emissions, and this infographic from *The New York Times* is a useful way to address that question (Popovich and Plumer), as is this one (Carbon Brief), which displays emissions over time. Now that students have some familiarity with infographics and how they work, I ask them to spend some time reflecting on the infographics questions (above) in their writer's notebooks, and then we share out and discuss their ideas as a class. At this point, we still come together as a whole group to discuss their responses so that they can add ideas to their thinking during our discussion and deepen their understanding

with teacher guidance, as this kind of reading is still new to most students.

Once students have a sense of what an infographic is, they are really able to appreciate the ways in which interactive infographics work to give readers a fuller understanding of a problem. This infographic, also from *The New York Times* addresses what scenarios could reduce emissions enough to limit warming and is helpful in enabling students to understand why global cooperation is necessary to address climate change (Thompson and Ma). I like to give students time to play around and adjust the countries' pledges to see what impacts different countries' pledges have on the overall aim of eliminating emissions entirely. After only a few minutes, students come to the crux of this infographic's big takeaway: if we want to meet the Paris Agreement's emissions targets, every country needs to do quite a lot more. Students appreciate and understand the ways in which the experiential nature of the infographic effectively leads them into this understanding and helps them see why and how infographics can be so powerful. After some time to reflect on the infographic questions in their writer's notebooks, we come back together again to discuss their ideas and add onto our responses.

Next, we look at this infographic on the impacts of one degree of warming to understand why something that seems so small actually really matters, in human terms ("A Degree of Concern"). For students who have more background knowledge about the Paris Agreement's pledge to limit warming to two degrees but aim for 1.5 degrees, this infographic on the difference in a half degree of warming can also be useful (Plumer and Popovich). Another useful infographic for visualizing climate change in human terms is this one, from the Research Program on Climate Change, Agriculture, and Food Security ("Big Facts on Climate Change, Agriculture and Food Security"). All of these infographics speak to the issue of climate change in human terms and detail the dangers for humans as a result of climate change. Understanding these human impacts helps students refine ideas for the cli-fi narrative that they will be writing, as they now see lots of potential settings and problems for their stories. By this point, students can reflect on the infographic questions in their writer's notebooks and debrief their ideas in small groups, helping one another to read and interpret the data.

Then we read this NASA infographic focused on sea level rise, since we're a coastal state, and this issue has real connections for students who spend time at the Jersey shore and love their beaches ("Infographic: Sea Level Rise – Climate Change: Vital Signs of the Planet"). This infographic is especially dense because it contains different segments. It's helpful for students to consider how the segments each work independently to convey information and also how they work together to convey the relationship between the causes of sea level rise, the impacts it could have, and the methodologies that scientists use to study the problem. Again, they can respond to the questions on their own and then come together in small groups to discuss their thinking.

Finally, and perhaps most importantly, we finish our infographic study by focusing on solutions. I want students to see that we have all of the technological innovations we need to mitigate emissions, and that the obstacles to change are more philosophical and political than technological. This understanding helps them to feel a sense of hope and a desire to be part of the solutions. It also helps them to understand how powerful literature and writing can be in impacting change. We read this infographic from *The Solutions Project* and look

specifically at New Jersey (Our 100% Renewable Energy Vision—the Solutions Project). These infographics from *Vox* on the public's support for renewable energy help students see that these green energy technologies are widely embraced by consumers (Roberts). By now, we can jigsaw the reading and analysis of the infographics and have groups share their assigned infographic with the class and explain their thinking in terms of the infographic questions we've used throughout the unit.

Once students have an understanding of the scope and severity of the crisis, as well as an understanding of the very real solutions available to us today, they are ready to see some mentor texts in the cli-fi genre. I've found Omar El Akkad's "Factory Air" and Helen Philips' "The Disaster Store" to be engaging and accessible for ninth graders if we read and discuss them together. We read these stories in chunks, so that we can review, after each reading chunk, narrative writing skills like characterization, dialogue craft, and how the writer navigates shifts in time.

One of the key lessons I've found students benefit from is studying the ways in which the writer allows readers to infer information rather than serving it all up on a platter to the readers. We discuss the way that, for example, in "Factory Air," El Akkad doesn't tell us exactly who Dr. Rahim is right away, but he gives us enough information that we can infer Dr. Rahim is probably a powerful figure in the company, likely the owner. When students begin drafting, they often dump tons of background information into their openings, and it's helpful to refer to these stories and remind them that good writers don't give away all of the details or readers would get bored and abandon the text. Instead, they give enough information that readers' brains engage in the narrative, making connections and figuring things out, which keeps readers hooked into the story. Good writers want their readers to have questions—questions that they want to know the answers to and that will propel them to continue reading to find out those answers.

At this point, the unit looks much like any other narrative writing unit. In order to enable students to focus on craft without getting bogged down in plot construction, I ask them to write only the opening to a cli-fi narrative. I find that this enables them to showcase their knowledge and ideas about climate change and its current and potential impacts as well as their narrative writing skills in a way that feels manageable and exciting without being overwhelming.

Before they begin drafting, students can look back at our class Padlet on climate impacts and flip through their responses in their writer's notebooks to get ideas for a setting and conflict. By this point, after reflecting on what writing might emerge from each infographic, students usually have a few potential ideas for their story's conflict and setting. Students' narratives often range from flooded cities to baking deserts or raging wildfires, and they often feature a protagonist who will play a role in fighting back against corrupt or simply indifferent governments, corporations, and communities. Cli-fi gives students the chance to imagine not only the potential for destruction but the potential for collaboration and commitment to a better future than the one currently on offer.

Given where things stand with regard to emissions, our best hope for a secure future, one that doesn't feel terrifying and inevitably destructive, rests in giving students room to imagine what is possible in the way of new ideas and new paradigms. It's that practice of imagining that builds in students the desire and know-how to, someday soon or further into the future, put their own imagined ideas into action as part

of the last generation who can solve this problem.

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