

April 30, 2025

ISSN 1094-5296

Morales-Doyle, D. (2024). *Transformative science teaching: A catalyst for justice and sustainability.* Harvard Education Press.

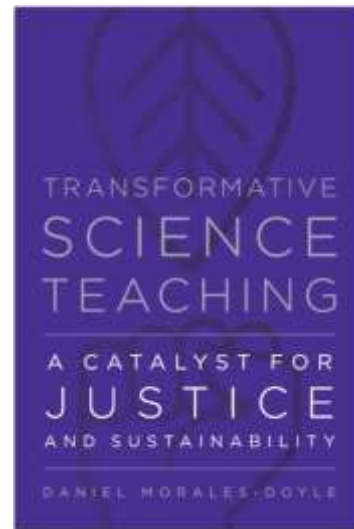
192 pp.

ISBN: 9781682538746

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Like biological organisms, American science education has continued to adapt and evolve under environmental pressures from political, social, and market forces. With new standards from the National Science Education Standards of the 1990s to the Next Generation of Science Standards of the 2010s, schools should “inspire future generations of scientifically literate students” (National Academy of Sciences, 2011, p. 2). Critics often see these reforms as simply a moving target that forces the schools to toss out the curriculum baby with the bathwater.

While standards provide a vision of science education, the necessary details for how to teach the new standards are frequently missing. Science reform is not only about what is wrong in our schools but also about how we can grow to better meet the needs of our students. It is with this optimistic mindset that Morales-Doyle’s *Transformative Science Teaching: A Catalyst for Justice and Sustainability* focuses on what might be missing in the science curriculum.



Morales-Doyle’s book is a love letter to science educators and shows the possibility of what happens when curricula address social justice science issues (SJSI). Morales-Doyle begins the book with a simple question: why do we teach science? He proposes that one should view a science curriculum as a statement of what the teachers, departments, and schools hold most dear. The author prompts us to ask ourselves what curricula we should prioritize if we hope to make our students scientifically literate and whether our curriculum truly reflects these values. Novice teachers might assume that the curriculum is only composed of content knowledge and pacing guides to ensure each student’s cup is filled with rote facts. What if our students fail to acquire what seems like a random, arbitrary collection of information loosely connected by textbooks and worksheets? Low test scores can initiate more punitive teaching practices by amplifying administrators’ pressure for direct instruction teaching practices that displace opportunities for authentic scientific inquiry (p. 5). Other implementations of science instruction have included science in STEM coursework with the promise of promoting equity. Morales-Doyle claims

many curricula overemphasize English language arts and mathematics to promote “workplace values” instead of focusing on meaningful inquiry (p. 5). These STEM pipelines, he argues, reinforce discriminatory systems of assigning and sorting students by their perceived workplace value rather than focusing on students’ funds of knowledge and life experiences.

Transformative Science Teaching challenges teachers to reflect on how science practices, such as inquiry, are approached in their science curriculum. Are students actually performing scientific inquiries that are meaningful to their own lives and communities? As Morales-Doyle explains, “Teaching through phenomena does little good if the end goal remains for students to repeat the same canned explanations that the previous generation of students read in science textbooks” (p. 68). Storylines that take students through linear paths with predetermined assessments and canned feedback should be critically examined by what kind of engaging activities students are allowed to participate in (p. 6). Does our curriculum see students as producers of knowledge and culture or as receptacles for the information that the teacher bestows on them? Morales-Doyle provides a design framework for empowering students to explore real problems that are persistent with systematic oppression in their communities. One example developed through student questions addresses the slogan “A Diamond Is Forever.” Typical interdisciplinary units might limit a science curriculum to its atomic composition or literature’s view of a diamond as a symbol of love and relationships. As students initially see diamonds as a symbol of wealth or status, as worn by celebrities, Morales-Doyle’s students’ questions led to researching both the diamond cartel and the De Beers corporation. SJSI asks if a diamond’s influence is due to its carbon structure chemistry or its connection to European colonialism and apartheid in Africa. While this task might seem daunting for teachers to accomplish by themselves, Morales-Doyle reminds the reader that the role of the student is as an active and essential partner. As Morales-Doyle explains, “Identities in SJSI is a process that recognizes that teaching and learning is always a reciprocal process with direction from the reader and agency by the students” (p. 71).

The concept of community is where the strength of SJSI excels. It is understandable for the reader to assume Morales-Doyle refers to the community as the local families and businesses who live near the school. Community is an inclusive term that equally applies to classroom learners, who are allowed the agency to explore interesting topics and are empowered to mentor and critique one another to build a better understanding. Their learning is driven not by what is next but by what they find important. The work is shared because the power is shared between the student and the teacher. In this reimagining of science education, teachers guide the students through meaningful practices and reflection.

While that vision is wonderful in theory, what is the value if it is not applicable and replicable? What does an SJSI curriculum actually look like? Make no mistake, *Transformative Science Teaching* is not a step-by-step curriculum that dictates specific labs and readings that will transform the reader’s class. Morales-Doyle clearly points out that his curriculum is not a plug-and-play guidebook, as if his lessons could easily be applied to Anytown, USA. He teaches in a Chicago Public Schools high school; *his* curriculum works for *his* students at *his* school at this time specifically because of his students’ personal lives and community values. His students’ views of structural

systems of the inequities, exploitation, and oppression that they continuously face inform their SJSI. Just as their challenges might be unique, their curriculum must also be. His process of providing students with a framework to investigate personal and community issues systematically is the transferable commodity that is the storyline of his book.

School curricula are seldom measured by the inclusion of student cultures. Instead, they are typically assessed by standardized test scores making teachers leery of adopting SJSI. But the choice between traditional content and social justice issues is a false one, as if the curriculum can only be rigorous or culturally based rather than both (Duncan-Andrade, 2009, p. 186). Morales-Doyle outlines how SJSI has created a vision of justice for his students' local communities, not simply a picture of their suffering (pp. 81–82). Throughout the book, the author bolsters his case with an abundance of education theory and research to tip the scales in favor of his approach for any readers still uncertain. From critical race theory and queer theory to culturally sustaining pedagogy (CSP), Morales-Doyle connects research to practice that supports the need and urgency of SJSI. His theme of critical hope requires teachers to have a deeper understanding of their community and culture and how they connect to science-related values. Just as the teaching of environmental sciences has led to environmental victories, students must explore issues of inequity and oppression within science and the opportunities to be agents of change.

If we are to be honest with ourselves, SJSI can be a scary cliff to stand on as teachers will need to question their own teacher identities. Traditional teaching often values systems of amassing knowledge, a task at which many have excelled. With SJSI, teachers can often find themselves working without the proverbial net since unanswerable questions and difficult conversations are the norm. Uncertainty can be just as joyous as it might be scary. Confronting this fear of failure and the unknown provides teachers the opportunity to be vulnerable as learners themselves. We are rarely provided the opportunity to model humility to our students. We should see failure as only a momentary setback in our pursuit of equity.

The reality of a modern classroom that Morales-Doyle fails to address is the political and market forces and the level of oversight by state and district mandates. In a world of *Don't Say Gay* and canned curriculum with high-stakes testing, not all teachers have the agency to change their curriculum. Often, teachers find safety in creating a politically sterile classroom to avoid the wrath of families who assume their children are being indoctrinated. Some may argue that we should not ambitiously embrace social justice in our schools right now. With our current federal administration, there is a fear of losing federal funding or being the tall blade of grass ready to be cut down by what is left of the Department of Education. Strangely, SJSI might seem like a topic whose time has already passed or that its proponents are advocating for too much too soon. Instead, I would argue that *Transformative Science Teaching* should be considered a primer in science education programs. If the purpose of science education is for “all students [to] have some appreciation of the beauty and wonder of science,” then we must address how it contributes to profound social injustice (National Academy of Sciences, 2011). If we are to prepare our students for the world that they will inherit, then it is essential to provide the tools necessary to make meaningful change.

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About the Reviewer



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