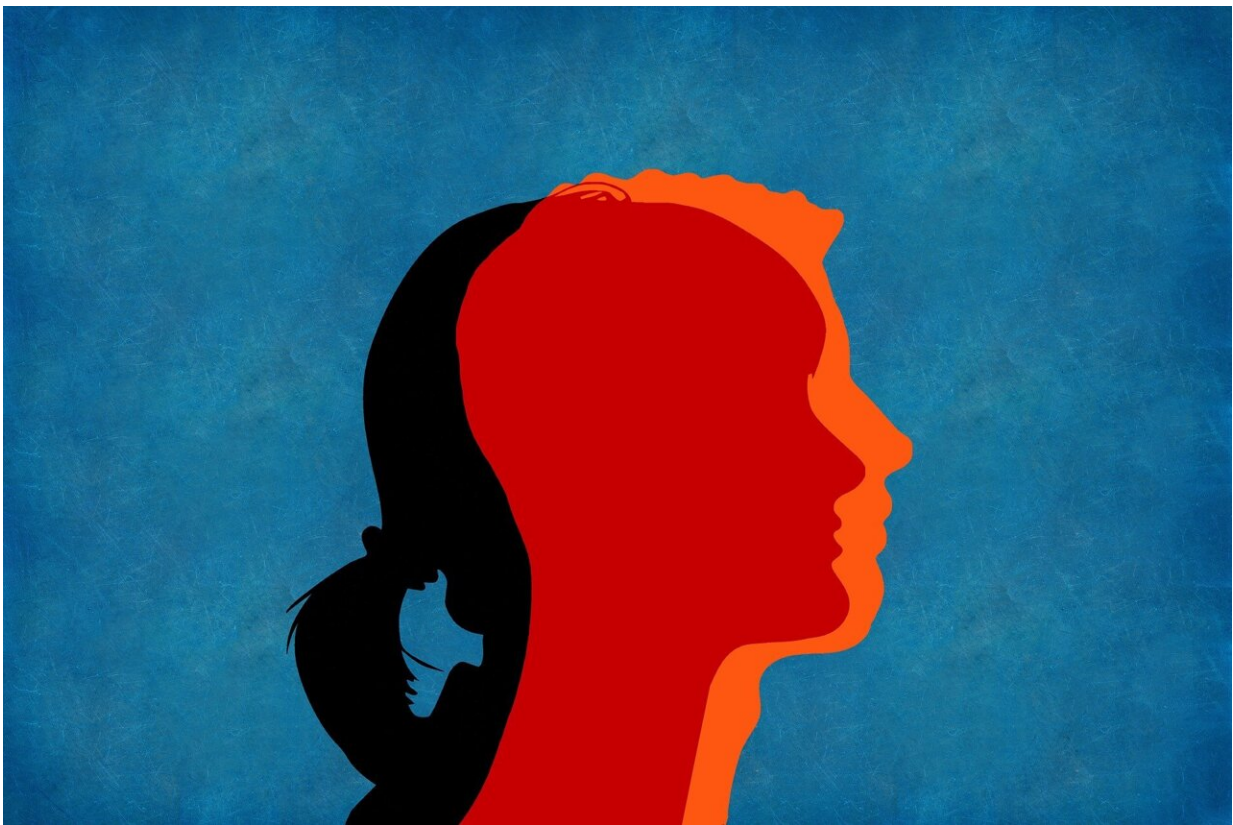


Trans students benefit from gender-inclusive classrooms—so do the other students and science itself, says researcher

August 31 2023, by Sarah Eddy



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Across the U.S., legislators are debating how and when sex and gender should be discussed in the classroom and beyond. Specifically, [these bills](#)

are considering whether anything beyond male or female can be included in library books and lesson plans. These bills are part of a larger debate on how to define and regulate sex and gender, and there are no immediate answers that satisfy everyone.

Many of the bills draw on science to make claims about sex and gender. For example, [Florida House Bill 1069](#), which legislates pronoun use in schools, assumes that all of a person's sex markers—listed as sex chromosomes, "naturally occurring" [sex hormones](#) and internal and external genitalia at birth—will align as female or male "based on the organization of the body ... for a specific reproductive role." The bill claims that "a person's sex is an immutable biological trait and that it is false to ascribe to a person a pronoun that does not correspond to such person's sex."

Invoking biology is a way to sound objective, but it's not so simple. Science itself is still grappling with the nature of sex and gender.

My co-author Sam Long and I are [high school](#) and [college science educators](#) who research how to [increase student motivation, interest and retention in biology](#). Our work and that of our colleagues show that teaching sex and gender more accurately in classrooms benefits not only gender-diverse students but all students and the field of science.

Science of sex and gender

Bills like Florida's define sex as a binary set of biological traits. But scientists know that sex is far more complicated.

In nature, there is a [huge diversity](#) in how sexes are arranged within bodies. For example, the sex of some organisms is classified by the size of their gametes, or sperm and eggs. Some species produce both gametes in one body. Some change whether they produce sperm or eggs over

their lifetime. Others technically don't have a sex at all.

Sex in humans is actually an [amalgamation of many traits](#), which include the type of gametes a person produces as well as their reproductive tract anatomy, hormone levels and secondary sex characteristics like hair growth and chest shape. These traits are determined not just by a few genes on the X and Y chromosomes but also by a [myriad of genes](#) on other chromosomes as well as the [developmental environment](#). When [many genes](#) contribute to a trait, it appears as a continuum.

The continuum of human sex is illustrated by the experiences of intersex individuals. For nearly two out of every 100 people, a binary definition of sex [would not work](#). People who are intersex don't have chromosomes, hormones or internal and external genitalia that completely match cultural expectations of what males and females should look like. Under these bills, what pronouns would they be allowed to use? There is [no universal scientific rule](#) for pronoun assignment.

If sex is not binary, then gender—or personal perceptions of masculinity, femininity, a mix of both, or neither—cannot be either. A 2022 Pew Research Center survey found that roughly [1.6% of U.S. adults](#) describe their gender as not aligned with their sex assigned at birth, which can be captured by the terms transgender or nonbinary.

Overall, science [does not have a definitive answer](#) for how to define sex and gender in people that lawmakers can draw upon—science only indicates that these traits are nuanced and complex.

Limiting teaching on sex and gender affects everyone

Bills limiting how sex and gender are taught exacerbate the disproportionate obstacles that transgender students already face. The 2019 National School Climate Survey of over 16,700 students in the

U.S., conducted by national education nonprofit Gay, Lesbian and Straight Education Network, or GLSEN, reported that trans teens in [schools without gender-inclusive curricula](#) experienced more bullying, a decreased sense of belonging, poor academic performance and low psychological well-being.

Restrictive bills also discourage LGBT students from studying science. The 2013 GLSEN Network National School Climate Survey found that LGBT teens were [less interested in majoring in STEM](#) and the social sciences when the [high school](#) classes they took in those fields were not taught with inclusive curricula.

I and my colleagues found similar downstream effects on [college students](#): Trans and nonbinary students reported feeling isolated and uncomfortable in biology courses that teach sex and gender only as a binary. They felt they couldn't form relationships with their teachers or peers, and this lack of a supportive personal network prevented them from requesting letters of recommendation or getting involved in research. Some dropped out of STEM, and many others contemplated it.

Limiting gender-inclusive curricula in schools can ultimately have negative effects on all students. Children begin [developing and testing](#) their understanding of sex and gender starting as young as 2 years old. Erasing gender diversity even in elementary schools reinforces [inaccurate conceptions of sex and gender](#) that can last a lifetime. For example, a 2018 study of 132 [college students](#) found that those who read a paper emphasizing binary sex and typical gender roles exhibited [increased prejudice against transgender people](#). A 2019 study of 460 eighth through 10th grade students found that those taught an oversimplified and inaccurate definition of sex—as defined by [sex chromosomes](#)—had increased beliefs about the genetic basis of sex and in [stereotypes about men and women](#), including unchangeable sex differences in intelligence and scientific ability. These studies suggest

that teaching oversimplified narratives about sex and gender influences not only how students conceive sex and gender but also beliefs about their own and others' abilities.

The trans and nonbinary college biology students we interviewed suggest there is another long-term harm of oversimplifying sex and gender: [lack of preparation](#) for a future career in science or medicine. An oversimplified understanding of sex and gender does not train students to work with the diverse patients and clients they might encounter, and it can [worsen health disparities](#) for trans people.

Lack of exposure to a broader range of sex and gender roles also limits potential scientific discoveries. Being taught only binary sex and genders biases the research questions scientists consider and the way they interpret their findings.

The study of birdsong offers one example of how this bias can influence research. A common stereotype is that male birds are more competitive than female birds. Because competition occurs partially through song, researchers studied birdsong only in males for a long time. Some scientists recently challenged these beliefs about sex roles by finding that females sing in [about 64% of songbird species](#), opening doors to greater understanding of the function of birdsong.

What educators and scientists can do

When science is being misrepresented to justify oversimplified ideas about sex and gender in schools, scientists and science educators have an important role to play.

Sharing perspectives about gender diversity with school boards and elected officials can make a difference. Bringing conversations about sex and gender into the classroom can help all students feel seen and

reduce gender stereotypes. Through his work with educators, my co-author, Sam Long, knows it can be intimidating to get into these conversations, but they do not have to be fights about who is right or wrong. Encouraging curiosity about human variation and questioning the portrayal of any trait as pathological simply because it is different or uncommon can help students think critically about sex and gender in respectful ways.

Disability advocates offer an [inclusive approach](#) that focuses on changing the environment to fit the person rather than changing the person to fit the environment. Physical and mental variations do not inherently reduce a person's ability to thrive; instead, it is environmental and culture barriers that are limiting or disabling. Educators can pose questions that encourage students to explore this idea. For example, red hair is as rare as intersex traits. Of the two, why are only intersex traits often framed as a disorder? Likewise, human height varies across people. How are buildings, products and services designed to accommodate a spectrum of heights? Why haven't other physical variations been accommodated in the same way?

Initiatives like [Gender-Inclusive Biology](#), [Project Biodiversity](#), and [Welcoming Schools](#) offer additional resources to help adapt the curriculum to acknowledge and celebrate variation in the living world. My co-author Sam is a founding member of Gender-Inclusive Biology.

Encouraging students to think critically about the complexity of sex and gender will encourage everyone to pursue their passions regardless of gender stereotypes, promote creative thinking in science and medicine and support trans students. In this way, teaching about sex and [gender complexity](#) can benefit everyone.

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