

## Letter

# A response to Fagundes and Coyne’s “Strategies for promoting effective and inclusive biology education”

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In their response to our (2022) article “Six principles for embracing gender and sexual diversity in postsecondary biology classrooms” entitled “Strategies for promoting effective and inclusive biology education,” Fagundes and Coyne employ the naturalistic fallacy as an argument against a diversity-first model for inclusive biology education. In particular, Fagundes and Coyne argue that the naturalistic fallacy should be elevated to a primary principle of inclusive biology education, whereas our diversity-first framework should be avoided. We disagree with their portrayal of our article and their suggestions, and we wish to respond with three points.

First, Fagundes and Coyne acknowledge but largely disregard our discussion of the naturalistic fallacy. We point Fagundes and Coyne to our original article, where we discuss the naturalistic fallacy and its importance in teaching biology (the second line of our abstract and in paragraph 11). In these sections of our article, we anticipate, address, and disarm the major argument brought up by Coyne and Fagundes. For example, in discussing the diversity-first approach to teaching, we state:

“A second potential concern is that this principle, if it is simplistically applied, will perpetuate the appeal-to-nature fallacy—that is, the argument that anything found in nature is inherently good (Tanner 2006). This is problematic, because it can suggest that students need examples of specific behaviors or biologies in nature to validate human experiences or, alternatively, that anything found in nature is justified in humans. We emphasize that presenting diversity first should only demonstrate that we should expect diversity, including among humans, but this does not present a value argument. Rather, it combats the incorrect assumption that nonbinary categorizations, intersex characteristics, same-sex sexual behavior, transgender identities, gender nonconforming presentation and behavior, and so on are unnatural, which is, itself, often used against LGBTQIA2S+ people in an appeal-to-nature argument (e.g., Newman and Fantos 2015).”

Therefore, our article is in alignment with the need to avoid the naturalistic fallacy, which we argue can be effectively done in conjunction with a diversity-first model of teaching. Second,

Fagundes and Coyne misunderstand our article as arguing that educators should make moral arguments based on the natural world in an effort to combat the perception that LGBTQIA2S+ students are morally wrong. In fact, we argue that educators should use a diversity-first model not to combat the perception that sexual and gender diversity is morally wrong but the perception that it is “unnatural.” We are concerned that traditional biology education models can lead students to infer their bodies or experiences are not part of the natural world, that they are an anomaly or something biological science cannot explain. As such, biology education should aim to impress on students that diversity and variation are the norm in biology, not to teach them about “good” (or “bad”) diversity.

As we state in our original article, in biology, course content provides opportunities to challenge harmful preconceptions about what is “natural” while avoiding the notion that anything found in nature is inherently good (the appeal-to-nature fallacy). A risk in biology education is that LGBTQIA2S+ students will feel unnatural, erased, or invisible or that they will be unable to align their realities with their understanding of biology (Amarati Casper et al., 2022).

Third, Fagundes and Coyne suggest that instructors should teach students that “they do not need to find examples in nature to affirm their genders or sexual identities. Instead, their identities should be respected based on human rights.” Although, of course, identities should be respected on the basis of human rights, our article specifically addresses the need for an inclusive and accurate biology education, which goes beyond the bare minimum of providing for the human rights of students and into providing the conditions needed for students to learn, flourish, and be inspired as scientists. As we discuss in our article, the need for inclusive science education for LGBTQIA2S+ students is increasingly clear:

“Despite advancements in recent decades, sexual and gender minorities face considerable obstacles and inequities in scientific culture. Undergraduate students belonging to sexual minorities are less likely to complete their STEM degrees than their heterosexual peers (Hughes 2018). Many LGBTQIA2S+ scientists consider quitting their jobs because of harmful

workplace climates (Gibney 2019) and are more likely to intend to leave STEM altogether than are their peers (Cech and Waidzunus 2021)."

Unfortunately, LGBTQIA2S+ students are not granted universal human rights, often under the premise of "basic biology." As such, the inaccurate portrayal of the science of sex and gender by media and politicians requires educators and scientists to highlight accurate information on these topics in the classroom. As we discuss in our article, "As students grow and move into society, becoming doctors, business people, politicians, parents, teachers, and so on, this misconception [that LGBTQIA2S+ people are against nature or 'basic biology'] can be perpetuated and weaponized." Omitting or decentralizing these topics ignores the context of societal misinformation (Bazzul and Sykes 2011) and is therefore counterproductive to promoting human rights in society. Finally, although students may not need to find examples in nature to understand their own biology—they are already valid because they exist—they can benefit from such examples. We have found that, without relying on the naturalistic fallacy, showing students examples from biology can give some students comfort, curiosity, and joy by illustrating they are part of a universal pattern of biological diversity.

Ultimately, the purpose of biology classes should be for students to learn biology. This includes both accurately representing biology (including the ubiquity of diversity in biology) and creating an effective and inclusive environment for students of diverse identities to learn. That is why we stand by our suggestion to teach diversity first: It is both inclusive and biologically accurate. We as instructors have a responsibility to teach students in an equitable and accurate way. Sacrificing inclusive practices because of easily avoidable misconceptions about the naturalistic fallacy is a clear mistake.

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