

Six principles for embracing gender and sexual diversity in biology classrooms

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Embracing gender and sexual diversity in biology classrooms

- Despite advancements in recent decades, LGBTQIA2S+ (lesbian, gay, bisexual, transgender, queer, intersex, asexual, two spirit, and other sexual and gender minorities) communities face considerable inequity in scientific culture
 - Undergrads belonging to sexual minorities are less likely to complete their science degrees than their heterosexual peers¹
 - Many LGBTQIA2S+ scientists consider quitting their jobs due to workplace climate²
- To help correct inequities, science instructors often strive to make their classrooms more inclusive spaces. While efforts have traditionally focused on racial diversity and women in science, gender and sexual minorities have received less attention.
- In biology classrooms, course content is inseparable from norms about human bodies and behaviours, and ideas about what is “natural”. **Together, instructors and students can challenge harmful preconceptions, leading to a more accurate and inclusive understanding of biology.**

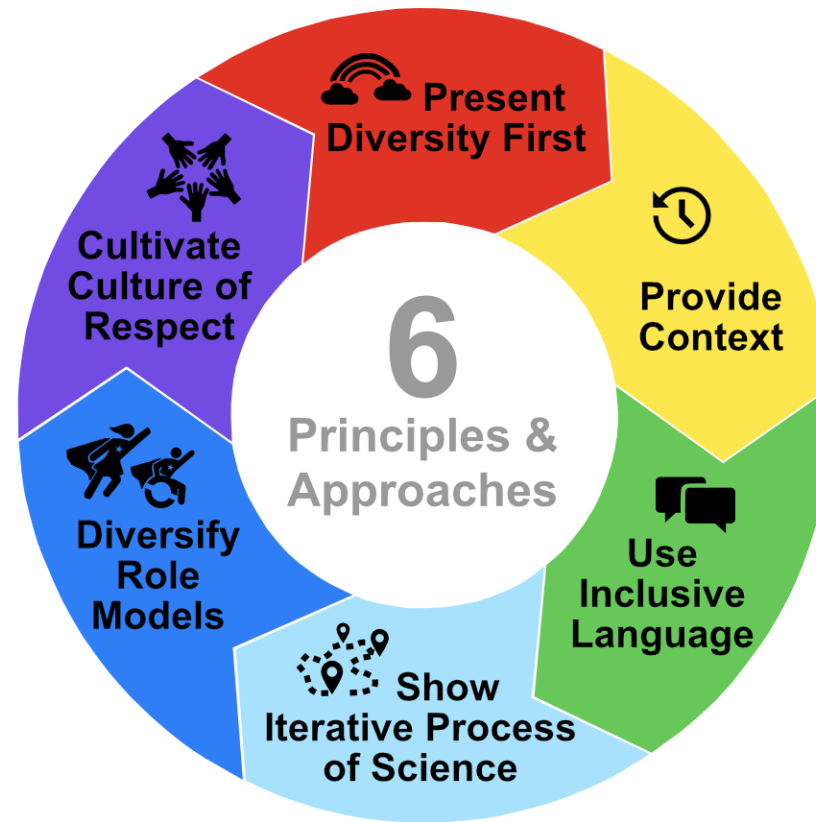
¹ Hughes, B. E. (2018). Coming out in STEM: Factors affecting retention of sexual minority STEM students. *Science advances*, 4(3)

² Gibney, E. (2019). Discrimination drives LGBT+ scientists to think about quitting. *Nature*, 571(7763), 16-18.

Omission, simplification & generalization: Teaching strategies to be used with care

- To help students process the large amount of information introduced in biology courses, instructors often rely on omission, simplification, and generalization. These strategies, while often necessary and helpful, can act as barriers to teaching inclusively and accurately.
 - **Omission**, which is the avoidance of certain information, can remove important biological or social context.
 - **Simplification**, which is the tendency to rely on binary thinking or ignore complexity, can obscure the fact that sex, sexuality, and gender are better described by spectrums rather than prescriptive binary categories.
 - **Generalization**, which is when a group is treated as homogenous and variation is ignored, can erase the diversity of the natural world as well as the identities and experiences of many people.
- We propose six principles to help instructors introduce the field of biology inclusively and accurately by selectively reducing their use of omission, simplification, and generalization.

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Figure by Alex Webster

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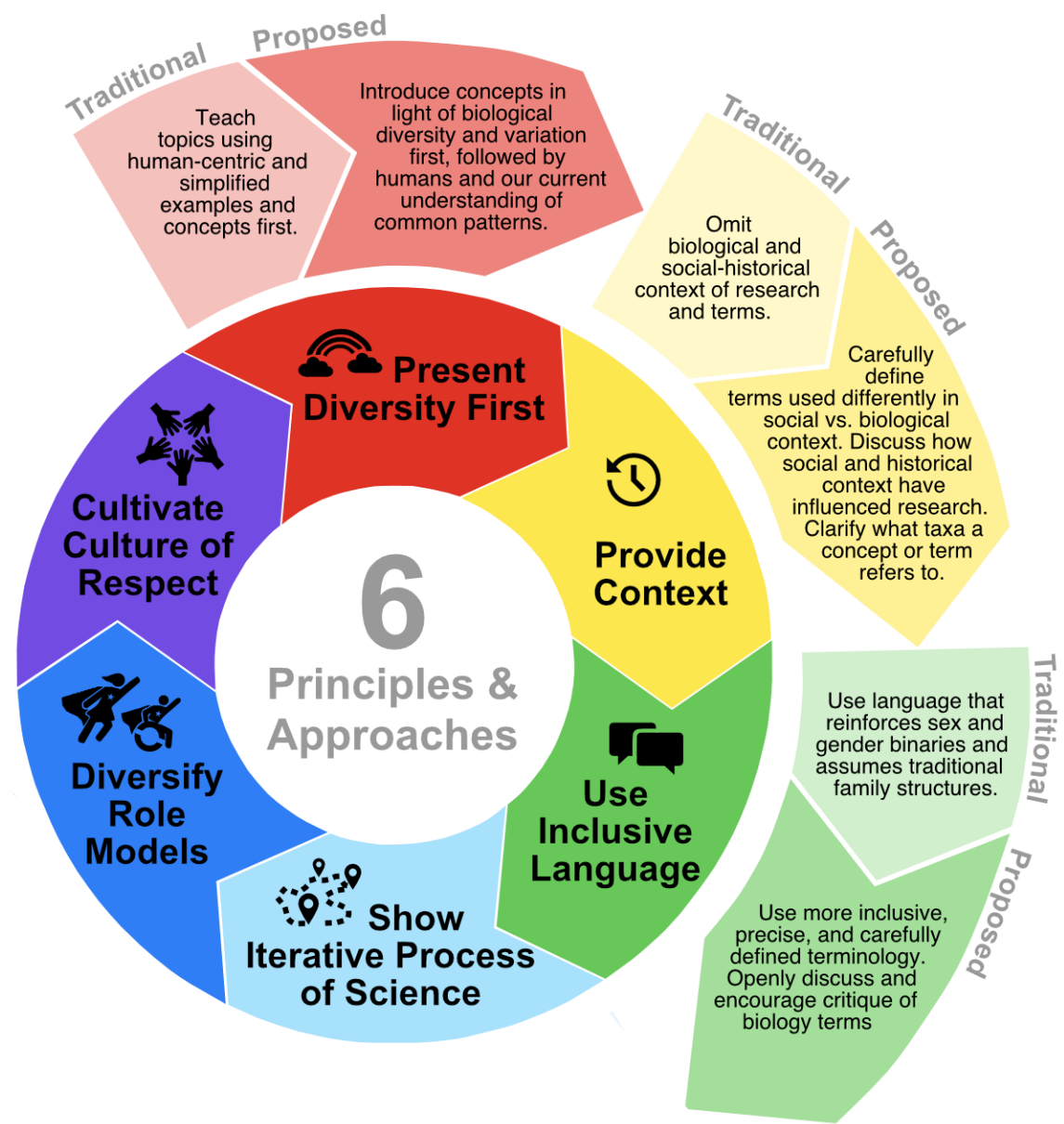


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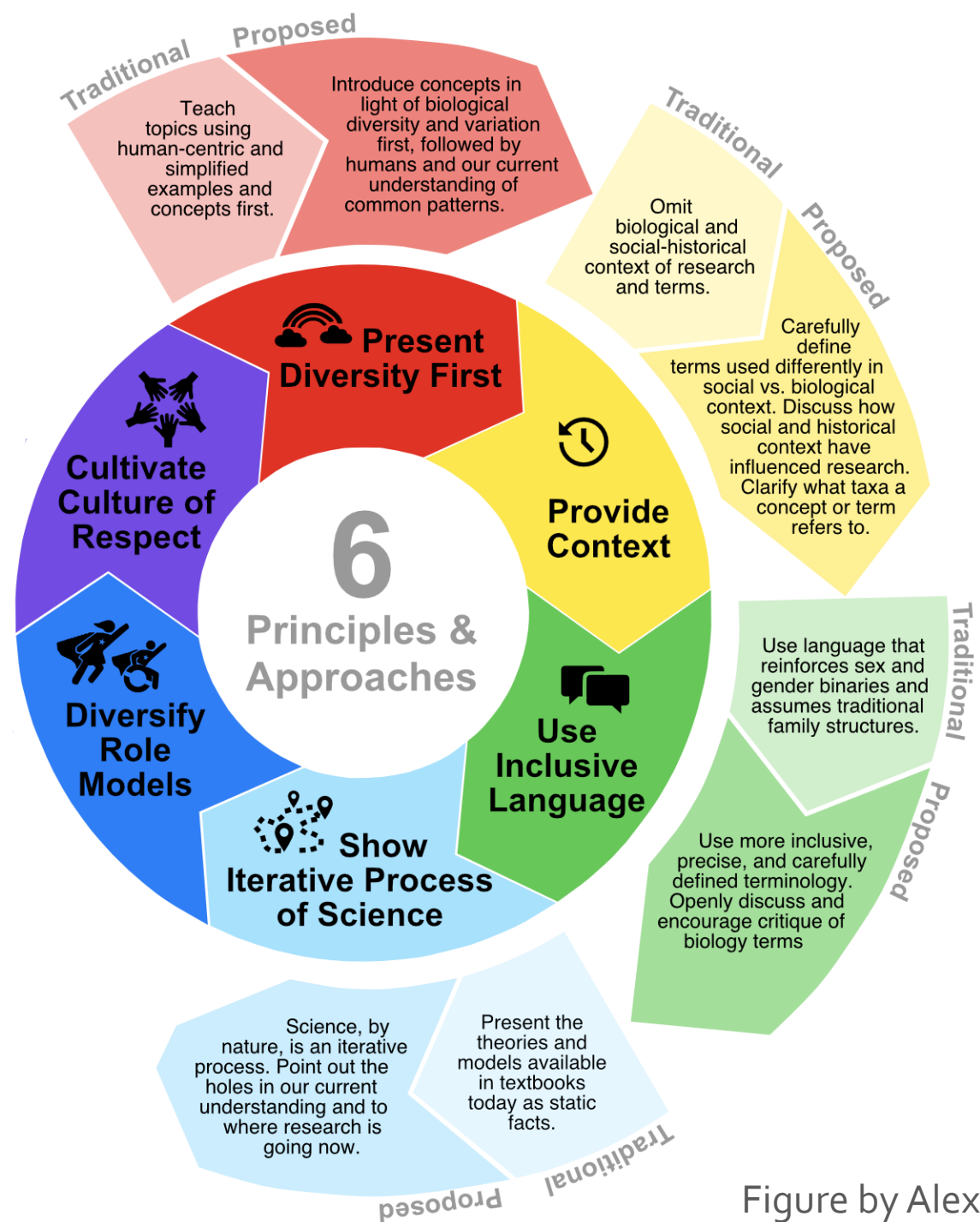


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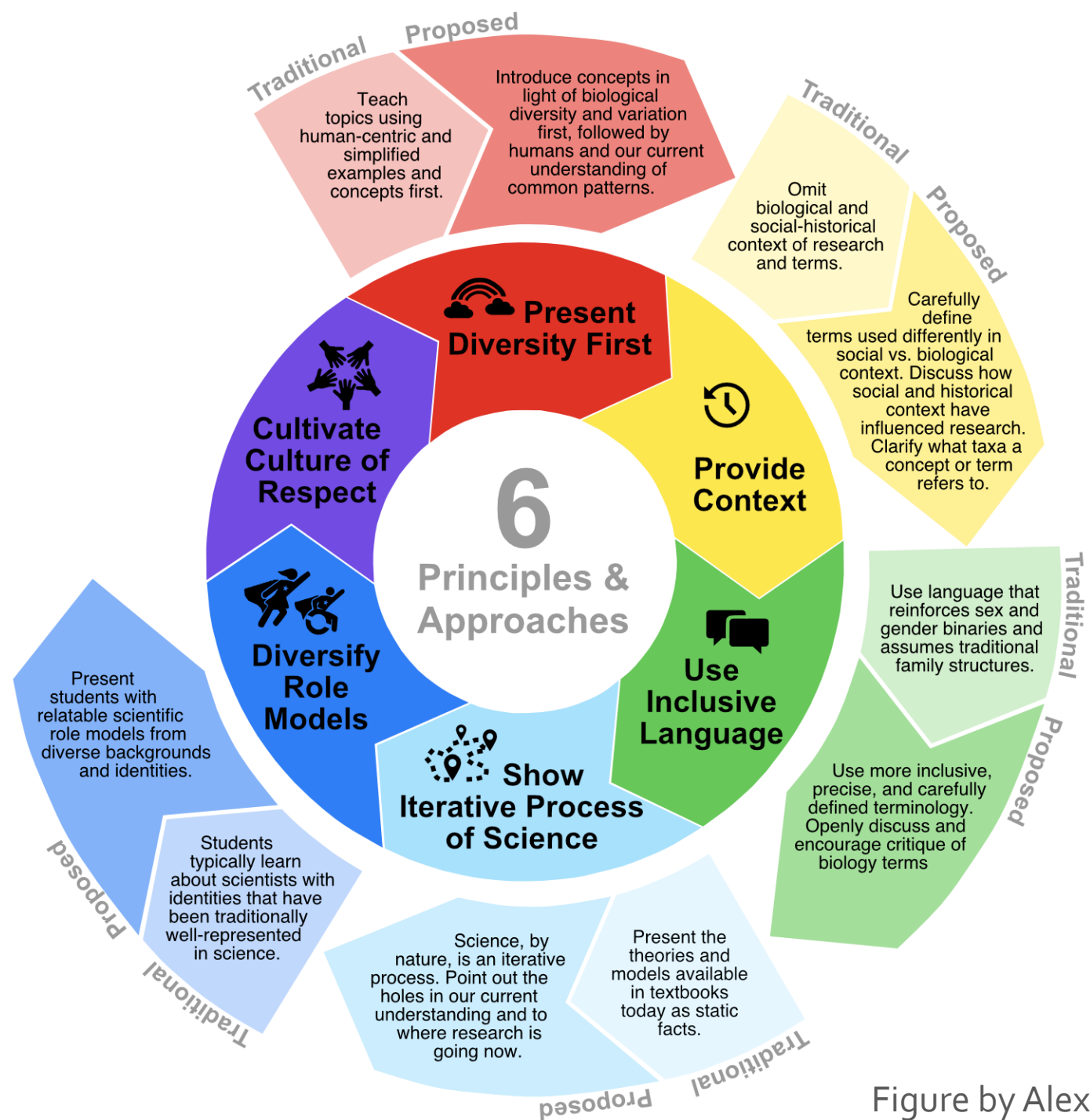


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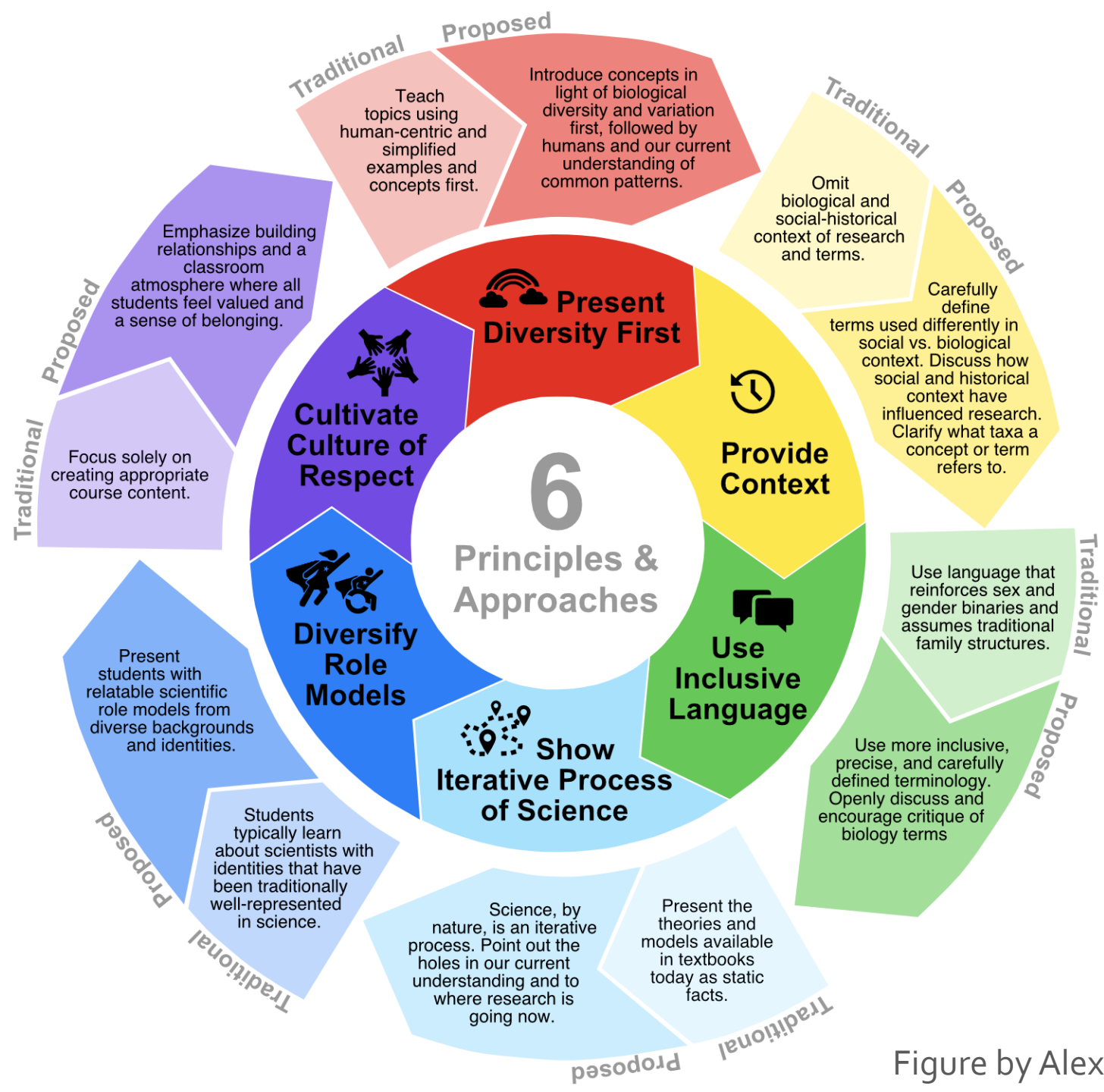
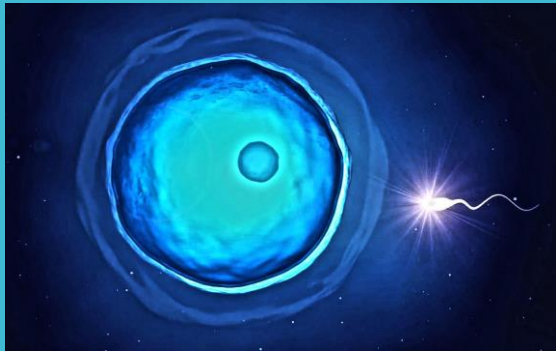


Figure by Alex Webster

Case study 1: Sexual reproduction



- Reproduction is a key defining feature of life and a primary focus of many biology courses. Although sexual reproduction is often defined as the fusion of egg and sperm to form a zygote, this does not encompass the diverse mechanisms by which sexual reproduction is achieved. This generalization can lead students to think that binary sex is biologically universal and fixed.
- **Present diversity first:** Discuss species with a wide variety of reproductive systems, as opposed to focusing solely on anisogamous species with two sexes that reproduce via fertilization.
- **Provide context:** Explain that the term “hermaphrodite” has been used inaccurately as a derogatory term for intersex people.
- **Use inclusive language:** Our suggested definition of sexual reproduction: “reproduction involving meiosis, giving rise to offspring that have genetically unique combinations of genes.” Instead of referring to “mothers” and “fathers”, use terms that don’t assume specific family structures (e.g. egg-producer, sperm-producer, biological parent, etc.)
- **Cultivate a culture of respect:** Although some may be tempted use jokes to diffuse the potential awkwardness of discussing sex, be careful about the use of humour when discussing sensitive topics.

Case study 2: Sexual selection



- Generally, textbooks demonstrate the concept of “choosy females” versus “competing males” with a handful of highly sexually dimorphic species from few taxa and then provide students with a simplified model of sexual selection to explain these sex differences. This simplification implies that traditional heteronormative sex roles are the biological norm, which reinforces rigid gender roles and can make LGBTQIA2S+ students feel viewed as unnatural.
- **Present diversity first:** Present diverse examples of sex-associated phenotypes, including species with and without dimorphism, species with a variety of mating systems, and species with a variety of secondary sex characteristics.
- **Provide context:** Point out that, due to taxonomic bias and heteronormativity, significant avenues of research have historically been overlooked, including evolutionary explanations for the high frequency of same-sex mating and female-female competition
- **Show the iterative process:** Explain that many modern researchers have suggested that traditional, sex-specific models of sexual selection need to be modified in order to better explain diversity both within and across species.
- **Diversify role models:** Search a website such as diversifyeeeb.com or projectbiodiversify.org to find scientists that study sexual selection and choose a scientist to highlight in class.

Limitations & resources

- The principles we propose are intended to be applied by instructors at the scale of their classrooms.
 - For guidelines pertaining to academic biology more broadly, please see the recommendations of the Society for Advancement of Biology Education Research¹
- These principles may also be useful tools for high school science teachers, science communicators, and other educators.
 - Other tools are available for the K-12 level²
- Although these principles are good starting places for biology instructors, they are neither exhaustive nor immutable. Future research and the continued incorporation of a growing diversity viewpoints will undoubtedly build on and modify these principles.

¹ Cooper et al. 2020) <https://www.lifescied.org/doi/10.1187/cbe.20-04-0062>

² Gender Inclusive Biology www.genderinclusivebiology.com

Thank you!

- Corresponding author: shaun.turney@gmail.com
- Find Project Biodiversify's **"Inclusive and accurate methods for teaching sex- and gender-related topics"** workshop slides at www.projectbiodiversify.org/workshop-slides

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