Children First
IDRA
Transforming Education

Celina Moreno, J.D.
President & CEO

September 30, 2020

Re: Recommendations for Texas Essential Knowledge and Skills for Science

Dear Members of the State Board of Education,

IDRA (Intercultural Development Research Association) is an independent non-profit organization with the mission of ensuring all students have access to excellent and equitable public schools that prepare them for success in college. A critical part of preparing students for success is teaching curricula that accurately portray the contributions of the diverse individuals and communities that are part of our collective story. As you consider revisions to the Science Texas Essential Knowledge and Skills (TEKS), we urge you to include the scientific achievements of women and people of color – groups that are conspicuously and shamefully absent from the current standards. We also urge you to confront social justice issues head-on – name them clearly, identify the scientists and scientific theories that have addressed or exacerbated injustices, and help students to see science as a way to solve persistent social and systemic inequities.

Currently, every scientist named in the K-12 Texas TEKS is a white male. There is not a single contribution from a woman or scientist of color in the science standards for the State of Texas, where students of color make up about 72% of the public school population.

A recent study found that only 8% of scientists represented in textbooks (aligned to the standards) were people of color, resulting in a "significant underrepresentation" of Asian and Latina women, and no representation of Black women or Indigenous people[1]. This portrayal of our scientific history is patently inaccurate and extremely troubling.

As you know from your work on the Mexican American Studies and African American Studies course standards, it is important for students to see themselves and their communities reflected in their coursework. And it is critical to equip teachers with the

[1] Wood, S., Henning, J.A., Chen, L., McKibben, T., Smith, M.L. Weber, M., Zemenick, A., & Ballen, C.J. (June 24, 2020). A Scientist Like Me: Demographic Analysis of Biology Textbooks Reveals Both Progress and Long-Term Lags, Proceedings of the Royal Society.

standards and materials to do their best work. Students and teachers are most successful, and schools are safer, when there are culturally sustaining and truthful curricula and pedagogy.

As is true in every subject, research indicates that all students benefit from learning about diverse scientists who reflect their identities. These benefits include:

- Increased feelings of belonging in the science classrooms and in science fields[2];
- Increased identity and interest in the subject area, cultural knowledge and academic self-concept[3]; and
- Increased agency and civic engagement that connect to the science content in more meaningful ways[4].

IDRA leads the IDRA EAC-*South*, one of four federally-funded equity assistance centers that provide training to schools, education agencies and teachers on issues related to race-, gender-, religion-, and national origin-based discrimination. We also coordinate the IDRA Texas Chief Science Officers (CSO) program, which empowers student leaders to connect with their communities and other CSO programs around the world to create a diverse pipeline of STEM leaders. Additionally, many IDRA staff are former educators with a keen understanding of the need for comprehensive TEKS that teachers across the state can build on to develop their curriculum.

From these vantage points, we have observed students struggling with making connections to the science content and the field. The current canon of white male scientists in the curricula makes it difficult for students, who are increasingly culturally and linguistically diverse, to see themselves as scientists. When students cannot see themselves as scientists, they do not pursue careers in the sciences, and we are all denied the benefits of their creativity and brilliance.

As of 2019, only 17% of students in Texas selected the STEM endorsement and an even smaller number are graduating with this endorsement[5]. Changes are immensely needed to strengthen the Texas K-12 STEM pipeline and students' overall success and trajectory in STEM. This work begins with cultivating students' STEM identities in K-12 classrooms. When students do see themselves in their coursework and can envision a path in the sciences, they thrive and become leaders in their communities.

In order to disrupt the current status quo and make explicit efforts to move toward equity and dismantle the systemic barriers our students continue to face, we must revise our K-12 science standards.

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[2] Garcia, S. (2019). Pre-service Elementary Teach ERS Enacting a Critical Race Curriculum in Science: A Multi-case Study, doctoral dissertation. University of Texas at San Antonio.

[3] Moore-Mensah, F. (2020). A Need for Anti-Racist/Abolitionist Science Teaching, presentation.

[4] Byrd, C. (2016). Does Culturally Responsive Teaching Work?, *Educational Psychology.*

[5] TEA. (June 2020). Scientific and Engineering Practices Work Group Recommendations. Austin, Texas: Texas Education Agency.

Below are IDRA's recommendations for revisions to the K-12 science TEKS:

- **Directly confront social issues, such as racism and sexism, that exist in Texas' science standards and are present in today's STEM field**. It is not a secret that social inequities are very present in science (historically and currently). Examples include medical research (unethical research that oppresses marginalized communities); men taking credit for women's contributions (the many "Hidden Figures" in science history); and people being denied rights because of their DNA (race, gender, ability and more). We recommend that the SBOE consult with an advisory group to collect feedback from communities and other experts about the contributions of historically marginalized groups.
- **Create curricular connections to social issues to broaden students' understanding and increase authentic learning.** Research shows that "a direct focus on race and culture in the classroom is beneficial" and avoiding this "promotes mistrust of the education system for students who are already aware of discrimination and leaves the others unprepared for the world outside of school."[6] Middle and high school students have the cognitive ability and capacity to understand social inequities as they relate to the science field.[7] We do them a serious disservice when we deny them the opportunity to learn about those inequities. IDRA recommends professional development for teachers to use to build their capacity to facilitate these conversations in science classrooms, making deliberate and authentic connections to science content.
- **Do not remove interdisciplinary connections, such as history, from our science standards**. It is greatly beneficial to incorporate multiple disciplines and perspectives in a subject matter.[8] These connections leverage opportunities to incorporate culturally responsive practices and help students make meaningful connections to the curriculum, thus increasing academic performance.[9] These connections also help to broaden perspectives and challenge the dominant ideology that science is only for white men.
- **Explicitly name those who have valuably contributed to the science field.** Merely adding the word "diverse" to the eighth grade Science and Engineering Practices[10], for example, is not an acceptable revision. There are many female scientists of color[11] who can be incorporated in our science TEKS. This should not

[6] Byrd, C. (2016). Does Culturally Responsive Teaching Work? *Sage Publication.* https://journals.sagepub.com/doi/pdf/10.1177/2158244016660744
[7] (Byrd, 2016)
[8] Garcia, S. (2019). Pre-service Elementary Teach ERS Enacting a Critical Race Curriculum in Science: A Multi-case Study, doctoral dissertation. University of Texas at San Antonio.
[9] Byrd, C. (2016). Does Culturally Responsive Teaching Work? *Sage Publication.* https://journals.sagepub.com/doi/pdf/10.1177/2158244016660744
[10] TEA. (June 2020). Scientific and Engineering Practices Work Group Recommendations. Austin, Texas: Texas Education Agency.
[11] Ignotofsky, R. (2016). Women in Science: 50 Fearless Pioneers Who Changed the World. Berkeley, Calif.: Ten Speed Press.

be an additive approach that only lists their names and briefly describes their contributions. There are authentic opportunities to connect their valuable work in the science field to our K-12 science content. It is not acceptable to erase their contributions from our science curriculum. When they see women and people of color in their science courses, our students will benefit and will be able to see themselves in these fields. We know that students' experiences in STEM coursework greatly impacts their STEM trajectories after high school, so this has great implications for broadening representation in STEM degrees and careers. [12]

There are many women of color scientists[13] who can be named in our K-12 science standards, including, but certainly not limited to, the following.

- Rosalind Franklin should be named in the biology standard because of her discovery of the structure of DNA [B.5A];
- Gladys West should be discussed in an eighth-grade science unit on earth science and topography, because she was instrumental in the development of the Global Positioning System [8.9C];
- Mae Jemison's story should be embedded in our sixth through eighth grade units on space science, because she was the first Black woman in space [6.11C, 7.9B];
- Katia Krafft was a famous geologist and volcanologist who documented how volcanic eruptions affected ecosystems and researched volcanic formations. This should be studied in elementary to high school science [2.7C, 4.7B, 6.10D, 8.9B];
- Helen Rodriguez Trias, the first Latina president of the American Public Health Association, helped to bring national attention to the HIV and AIDS crisis, earning the Presidential Citizen's Medal. Her story can be implemented in in a biology unit covering cell differentiation and disruption, or how ethical and social decisions are involved in science [B.4C];
- Marie Curie, a famous physicist and chemist, studied how unstable nucleus emit particles and release energy, calling it "radioactivity." She was awarded with a second Nobel prize in chemistry for her discovery of and research into polonium and radium. This needs to be in eighth grade science curricula about the properties of atoms [8.5B].
- Sally Ride was the first U.S. woman to fly to space. She also helped to develop a robotic arm to release satellites into space. Her contributions need to be included in middle school science [6.11C, 7.9A, 8.8C]
- Katherine Johnson applied her math skills to physics where she helped calculate the path for the first manned mission to the moon. She also worked on the space shuttle program and plans for the mission to Mars. This needs to be incorporated

[12] Johnson, P. (February 2016). STEM Pathways for Girls of Color – A Review of the Literature. *IDRA Newsletter* https://www.idra.org/resource-center/stem-pathways/
[13] Women You Should Know. (February 11, 2019). STEM Role Models Posters, *Nevertheless Podcast.*

into the history and future of space exploration in sixth and seventh grade [6.11C, 7.9A]

- Maria Sibylla Merian, a German entomologist, was the first to classify and understand insects, especially in dangerous rain and heat. This can be taught in science units covering the impact of environmental changes in third grade and all the way to high school lessons on dichotomous keys and classifying organisms [3.9C, 5.9A, 7.11A, B.8A];
- Wang Zhenyi, a Chinese astronomer, poet and mathematician, created an eclipse model to help prove her theories about how the moon blocks our view of the sun during an eclipse. This could be integrated in any third through ninth grade earth and space unit [3.8C, 4.8C, 5.8D, 8.7B]
- YouYou Tu is a famous Nobel Prize winner who created a drug to inhibit the malaria parasite, saving millions of people. This contribution can be discussed when describing the classification of parasites or how they can disrupt the health of other organisms [4.9B, 6.12D, B.11A];

Thank you for your work as you revise the Science TEKS. We urge you to keep in mind that erasure impacts all students in K-12 science classrooms, but "especially those who don't see their identities reflected in the curriculum."[14] This erasure also negatively impacts students' participation in STEM fields, to our collective detriment.

We look forward to working with you to expand access to equitable and excellent schools for all students, including our future scientists. Should you have any questions, please contact me at stephanie.garcia@idra.org.

Sincerely,

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Intercultural Development Research Association

[14] Carlisle, G. (2020). Promoting Justice in Science Education, *Medium*.