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Closing the Science Achievement Gap for Latinx Learners

In US public schools, Spanish is the most common primary language spoken by English language learners.

ow can schools help their English language learners (ELLs) participate fully in science learning—interacting with classmates to meet performance expectations—while teachers are working to build toward and implement new science standards that, by the way, involve language-intensive practices?

Take heart. The three-dimensional teaching and learning approach at the core of the more demanding science standards provides an opportunity to enrich learning for all students, including those who are not yet proficient in English.

"Quality instructional materials should provide teachers with the resources to support learning among all students," David Heller, director of Curriculum Products and Development for Carolina Biological Supply Company, explains. "Providing supports for ELL students removes the additional language barrier, so that students' focus can be centered on content."



When supported appropriately, ... [ELLs] are capable of learning science through their emerging language and comprehending and carrying out sophisticated language functions ... using less-than-perfect English.

> Appendix D—All Standards, All Students: Making Next Generation Science Standards Accessible to All Students



G... student demographics are changing rapidly, as teachers have seen the steady increase of student diversity in the classrooms. Yet, achievement gaps in science and other key academic indicators among demographic subgroups have persisted.

Appendix D—All Standards, All Students: Making Next Generation Science Standards Accessible to All Students

The Spanish Challenge

¿Hablas Español?

Whether you speak Spanish or not, it's likely some of the students in your school do as their primary language. In fact, in most US states, ELLs who speak a Spanish dialect are a visible and growing presence in schools. In general, the US Department of Education reports that the percentage of ELLs in public schools increased from the fall of 2000 to the fall of 2016 in 43 states and the District of Columbia.⁴ For Spanish speakers specifically, this trend is expected to continue. The Pew Research Center projects that the share of US children who are Latinx will rise to 35 percent in 2050.5 So although numerous languages are spoken by ELLs in today's classroom, Spanish dialects are now and are projected to continue to be the most common.

Stats at a Glance

- * In the fall of 2016, there were 4.9 million ELLs attending US public schools—an increase of 1.1 million children since the year 2000.¹
- * While more than 400 different languages and dialects are spoken by ELLs in United States schools, Spanish is by far the most common.²
- * More than three-fourths of children designated as ELLs—about 3.82 million—spoke Spanish as their primary language in the 2015–16 school year.³

First, the good news regarding science education: a 2015 survey of Hispanic eighth graders found that the majority of those responding (74 percent) like science and 39 percent would like a job that involves science.⁶ However, in the classroom, Hispanic students are lagging behind. The National Assessment of Educational Progress for both public and nonpublic schools science scale scores showed that Hispanic fourth graders trailed their white counterparts by 27 points in 2015—an improvement over the 32-point achievement gap in 2009 but still statistically significant.⁷

"Young children are naturally curious about the world, which makes them ideal scientists," Heller says. "In order to take advantage of this natural curiosity, removing any barriers, such as language-specific vocabulary, that may impede their excitement and curiosity is essential."

Raising the Bar in the Science Classroom

What about your school—have new standards raised the bar for teaching and learning science? Chances are likely your answer to the question is a resounding albeit trepidatious yes. As of the end of the 2018–19 school year, 42 states and the District of Columbia had adopted the Next Generation Science Standards* (NGSS) or standards that are based on the National Research Council's *A Framework for K–12 Science Education*, affecting 84 percent of US students.⁹





<u>"Appendix D—All Standards, All Students"</u> recognizes that the NGSS presents learning opportunities and challenges to student groups that have traditionally been underserved in science classrooms, and that includes students who are English language learners.¹⁰ It states that "When supported appropriately, ... [ELLs] are capable of learning science through their emerging language and comprehending and carrying out sophisticated language functions ... using less-than-perfect English."¹¹

"NGSS-based science instruction allows students to share, engage, and build on prior knowledge and experiences to make sense of phenomena," Heller explains. "Providing Spanish components to support the English language materials, English language learners and speakers can work collaboratively to develop a richer set of ideas based on prior knowledge and shared experiences with handson investigations. For ELL students, this also allows them to strengthen their reading, writing, and comprehension skills."

Start with phenomena. Phenomena are learning opportunities. These naturally occurring events generate students' interest, motivating them to develop driving questions as they investigate, model, and explain the phenomena. Curricula should engage students in an investigative phenomenon through a variety of media, including videos that immerse students in the phenomena and spark their curiosity.

- * As students watch a phenomena-based video, teachers can reinforce language development by having students record questions and observations in notebooks.
- * Science terms along with the student-friendly definitions should be highlighted in the unit for the teacher to introduce, so both English speakers and learners share a common vocabulary from the get-go.
- * Teachers can assess prior knowledge of the phenomenon and link science to reading, writing, and math using class charts, science notebooks, interactive whiteboard activities, and small- and large-group discussions.



Heller notes that videos in <u>Building</u> <u>Blocks of Science™</u> <u>3D</u> units let the teacher choose the language: the video's audio and closed captioning are available in both English and Spanish. Spanish speakers can listen in English while they read the Spanish captions, or vice versa, so they're engaged and motivated to ask questions and share their ideas as they build toward the standards.

Explore through home-school connections. Relating science lessons to their homes and communities helps English language learners approach science through the lens of their current life experiences. <u>"Appendix D—All Standards, All Students"</u> affirms this: "Through NGSS, students can engage in scientific and engineering practices, crosscutting concepts, and disciplinary core ideas by connecting school science to their out-of-school experiences in home and community contexts."¹²

Take-home science activities investigations students do at home with their families to support concepts learned in science class help connect school and home by validating science knowledge and inviting interaction with students' families. To address the student population who speak a Spanish dialect at home, making materials such as student investigation sheets



and literacy readers available in Spanish helps strengthen students' academic vocabulary in their native language, further connecting school and home experiences.¹³



An effective curriculum can also encourage family participation in learning through topic-specific activity sheets with directions for the parent, simple background information, and a space for students to record observations and data, Heller says. He cites the digital interactive student investigation sheets that let the teacher choose the language by toggling between English and Spanish in <u>Building Blocks of Science[™] 3D</u> lessons as examples. The teacher can then provide the sheets to ELLs who speak Spanish in their home language.





By focusing on students' collaborative engagement in science practices, we can leverage the power of sense-making to drive language development, helping students learn how to talk science while they do science.

"Rethinking Language Goals in Science with Three-Dimensional Learning" Emily C. Miller and Rita MacDonald

Collaboration is key. As students work together to explain a phenomenon, they need to communicate to present evidence as they share and develop their observations. As stated in the blog post "Rethinking Language Goals in Science with Three-Dimensional Learning," coauthors Emily C. Miller, a lead writer for the NGSS Diversity & Equity Team, and Rita MacDonald, an academic English language researcher at the Wisconsin Center for Education Research, note that this collaborative exploration and students' shared ideas drive development and sensemaking for both English speakers and learners.¹⁴

In the classroom, teachers can cultivate collaboration by using age-appropriate, interactive, hands-on materials that provide opportunities for students to interact as they work in pairs, in small groups, and/or at learning centers. A curriculum's resource for teachers should offer guiding questions to foster group discussions and informal teacher-student talks as well as provide assessment opportunities of student progress. Then through their own observations, kinesthetic activities, and ensuing discussions, students can develop explanations of the concept or topic they are studying, supporting their claims with evidence and reasoning.

Digital simulations of a phenomena are effective tools that let students manipulate and visualize new concepts, Heller says. Manipulating simulations can drive understanding for all students, but it's particularly beneficial for ELLs to be able to switch between English and Spanish as they build language skills while working with classmates to make sense of the phenomena.

Engineer it. When students actively investigate and explain real-world phenomena, they are acting as scientists. They then, as engineers do, engage in scientific engineering and design to develop solutions to problems.

In engineering practices, communication is crucial as students design models for possible solutions, develop solutions, and improve their solutions through hands-on testing and analysis. This provides an optimal opportunity for classroom teachers to partner with an ELL specialist to reinforce science learning and vocabulary as students apply the science knowledge they have acquired to engineer a solution to the problem.

Guides for the teacher. With challenging new standards for science teaching and learning, teacher's guides that introduce the academic vocabulary of science coupled with a Spanish translation are now more than ever a classroom essential. A version of the teacher's guide in Spanish can be especially helpful for bilingual educators who teach in a Spanish immersion or dual-language classroom, Heller notes, allowing them to move easily between languages. With access to guides in both English and Spanish, these teachers can have at their fingertips the pertinent language needed to introduce lessons to both English speakers and learners as well as anticipate student questions that may contain less familiar Spanish phrases.

Choose the right curriculum. Reports from the National Research Council note that "provided with equitable learning opportunities, students from diverse backgrounds are capable of engaging in scientific practices and meaning-making in both science classrooms and informal settings."¹⁶ As a curriculum specialist, Heller is all too aware of the tendency for nondominant groups to be less likely to have access to high-quality learning environments. However, "Appendix D—All Standards, All Students" advises that "School resources are likely to have a greater impact on the learning opportunities of non-dominant students who have traditionally been underserved in science education."¹⁷

"In order to provide high-quality science instruction for all students, as emphasized by the *Framework* and NGSS, it is essential to provide resources for teachers to support diverse learners," Heller explains. "The Spanish language supports we've created in Building Blocks of Science 3D for both students and teachers help to achieve this goal."







REFERENCES

- "English Language Learners in Public Schools," The Condition of Education, US Department of Education, National Center for Education Statistics, Common Core of Data. (website) Updated May 2019. <u>https://nces.ed.gov/ programs/coe/indicator_cgf.asp.</u>
- "English Learners (ELs) Who Are Hispanic/Latino," Office of English Language Acquisition. August 2018. <u>https://ncela.</u> ed.gov/files/fast_facts/FastFacts-HispanicELs-2018.pdf.
- "English Learners (ELs) Who Are Hispanic/Latino," Office of English Language Acquisition. August 2018, <u>https://ncela.</u> ed.gov/files/fast_facts/FastFacts-HispanicELs-2018.pdf.
- "English Language Learners in Public Schools," The Condition of Education, US Department of Education, National Center for Education Statistics, Common Core of Data. (website) Updated May 2019. <u>https://nces.ed.gov/ programs/coe/indicator_cgf.asp</u>.
- Passel, Jeffrey S.; Cohn, D'Vera. "U.S. Population Projects: 2005–2050." Pew Research Center, Hispanic Trends. (website) February 11, 2008. <u>https://www.pewhispanic.org/2008/02/11/us-population-projections-2005-2050/</u>.
- National Assessment of Educational Progress, 2015 Science Assessment, US Department of Education, National Center for Education Statistics, Table 223/25. Retrieved January 13, 2017. <u>https://nces.ed.gov/programs/digest/d17/tables/ dt17_223.25.asp</u>.
- Digest of Education Statistics, 2017, US Department of Education, National Center for Education Statistics (NCES 2018-070). (website) Accessed June 7, 2019. <u>https://nces.ed.gov/fastfacts/display.asp?id=515</u>.

- "Appendix D—All Standards, All Students: Making Next Generation Science Standards Accessible to All Students." Next Generation Science Standards: For States, By States. April 2013. (pdf) Page 1. <u>https://www.nextgenscience.org/sites/default/files/Appendix%20D%20Diversity%20and%20 Equity%20-%204.9.13.pdf.</u>
- "About the Next Generation Science Standards." National Science Teaching Association. Accessed June 28, 2019. <u>https://ngss.nsta.org/about.aspx</u>.
- "Appendix D—All Standards, All Students: Making Next Generation Science Standards Accessible to All Students." Next Generation Science Standards: For States, By States. April 2013. (pdf) Page 3. <u>https://www.nextgenscience.org/sites/default/files/Appendix%20D%20Diversity%20and%20</u> Equity%20-%204.9.13.pdf.
- "Appendix D—All Standards, All Students: Making Next Generation Science Standards Accessible to All Students." Next Generation Science Standards: For States, By States. April 2013. (pdf) Page 5. <u>https://www.nextgenscience.org/sites/default/files/Appendix%20D%20Diversity%20and%20</u> Equity%20-%204.9.13.pdf.
- "Appendix D—All Standards, All Students: Making Next Generation Science Standards Accessible to All Students." Next Generation Science Standards: For States, By States. April 2013. (pdf) Page 9. <u>https://www.nextgenscience.org/sites/default/files/Appendix%20D%20Diversity%20and%20</u> Equity%20-%204.9.13.pdf.
- Miller, Emily C. "How Can Science Teachers Use the NGSS to Support English Language Learners' Construction of Knowledge?" *NSTA Blog.* Accessed June 5, 2019. <u>http:// blog.nsta.org/2014/10/10/how-can-science-teachersuse-the-ngss-to-support-english-language-learnersconstruction-of-knowledge/.
 </u>





REFERENCES continued

- 14. Miller, Emily C., MacDonald, Rita. "Rethinking Language Goals in Science with Three-Dimensional Learning." *Colorín Colorado* (blog). Accessed June 5, 2019. <u>http://www.</u> <u>colorincolorado.org/article/rethinking-language-goals-</u> <u>science-three-dimensional-learning</u>.
- 15. Miller, Emily C., MacDonald, Rita. "Rethinking Language Goals in Science with Three-Dimensional Learning." *Colorín Colorado* (blog). Accessed June 5, 2019. <u>http://www.</u> <u>colorincolorado.org/article/rethinking-language-goals-</u> <u>science-three-dimensional-learning</u>.
- 16. "Appendix D—All Standards, All Students: Making Next Generation Science Standards Accessible to All Students." Next Generation Science Standards: For States, By States. April 2013. (pdf) Page 1. <u>https://www.nextgenscience.org/sites/default/files/Appendix%20D%20Diversity%20and%20</u> Equity%20-%204.9.13.pdf.
- "Appendix D—All Standards, All Students: Making Next Generation Science Standards Accessible to All Students." Next Generation Science Standards: For States, By States. April 2013. (pdf) Page 7. <u>https://www.nextgenscience.org/sites/default/files/Appendix%20D%20Diversity%20and%20 Equity%20-%204.9.13.pdf</u>.

ABOUT CAROLINA

Carolina Biological Supply Company is a leading supplier of science teaching materials. Headquartered in Burlington, North Carolina, it serves customers worldwide, including teachers, professors, homeschool educators, and professionals in health- and science-related fields. Carolina is the exclusive developer, publisher, and distributor of the Building Blocks of Science[™] 3D curriculum.

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Building Blocks of Science[™]3D is a hands-on, phenomena-based curriculum developed to establish a solid foundation in elementary science while addressing the NGSS. It provides all students with multiple opportunities to engage in three-dimensional learning anchored in phenomena. As an inquiry-based science curriculum, it inherently supports the needs of ELLs but includes components in Spanish to specifically address the growing number of Latinx students.



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