Challenging and Supporting English Learners in STEM Learning at a Distance

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IN THIS BRIEF

▸ Key characteristics of quality learning of mathematics and science for English learners;

▸ Examples of teacher practices critical for this kind of instruction;

▸ A range of options for supporting English learners in hybrid and online learning environments;

▸ The role of formative assessment practices in informing instructional decisions for English learners;

▸ How to support equity by monitoring the LCAP; and

▸ Questions governing board members can ask to encourage these teacher practices and systemic coherence.

Introduction

Beginning in March 2020, schools across the United States closed campuses to in-person instruction in response to the COVID-19 pandemic. During the 2020–21 academic year, many schools in California continue to employ a distance learning approach for at least a portion of the time.[1] California schools have been forced to adapt to significant disruptions to learning in the past, though rarely at the statewide level. While the current causes of learning disruption are different than those of the past, any interruptions to in-person instruction have a disproportionate effect on certain student groups, including English learners.

As of the publication of this brief, some schools and districts have returned or are planning to return to in-person instruction soon. Distance learning considerations, however, remain relevant because:

▸ Many newly reopened schools are using (or will use) hybrid instructional models, where students learn both at home and at school, making distance learning a continuing reality;

▸ Many districts are bringing younger students into classrooms for in-person learning, but plan for secondary students to continue engaging in distance learning; and

▸ A number of families will opt to keep their students at home for the duration of the school year, and districts will need to accommodate those families' needs.

Early analyses suggest that English learners have been disproportionately impacted by implementation of distance learning.[2] Learning disruptions have had a more adverse impact on English learners, particularly in the critical early grades.[3] In October 2020, Californians Together, a statewide coalition focused on English learners, reviewed a sample of California school districts' Learning Continuity and Attendance Plans. The organization found that 40 percent of those districts' plans contained little to no explanation of how they were providing English language development. Additionally, nearly a third of district plans did not indicate their approach to communicating effectively with English learners' families.[4]

Given these disparities, districts must provide additional supports to ensure English learners have equitable access to the curriculum, including in the STEM subjects (science, technology, engineering, and mathematics). Small changes in outreach and enrollment practices, such as direct encouragement, can have large impacts on English learner participation in advanced STEM coursework.[5] Governing board members can play a key role in that messaging, and more generally in guiding local efforts to provide English learners access to quality STEM education through distance learning (including the distance portion of hybrid instruction). Board members can better establish policies that support English learners in their districts when they are aware of major barriers and best practices to accessing STEM for English learners.

Coherent Systems to Support English Learners in Math and Science

Coherent, effective education systems are an important factor in supporting English learners in math and science. Coherent systems:

- Offer English learners access to technology and instruction;
- Engage English learners in quality learning experiences; and
- Support educators of English learners in professional capacity building.

This brief primarily focuses on the second category: engaging English learners in quality learning experiences. While some of the practices in this brief describe ways to support English learners in all four STEM disciplines, this brief focuses most closely on math and science learning. The questions below are designed to help board members explore how their local educational agency (LEA) supports English learners.

WHAT TO LOOK FOR: QUALITY DISTANCE LEARNING FOR ENGLISH LEARNERS

Does the system provide equitable access to technology and instruction for English learners?

- Are English learners placed in challenging courses, where they received appropriate supports to provide full access to the curriculum?
- Do English learners have devices to access instruction?
- Do English learners have sufficient broadband access to participate in learning?
- Do district online learning platforms efficiently facilitate English learners' development?

Are English learners' learning experiences of high quality?

- To what extent are English learners engaging with important math and science ideas and practices?
- To what extent are English learners engaging in quality interactions with their peers about math and science?
- To what extent are English learners developing an understanding of how language works in math and science?

Does professional capacity-building focus on English learners?

- To what extent does professional learning connect educators' knowledge, practice, and reflection?
- To what extent does professional learning address design of online learning? To what extent do educators have opportunities to develop, share, and refine practices collectively?

Look for: English learners developing deep understandings of math and science ideas and practices

English learners need to connect core ideas to achieve a deep understanding of math and science. In the Next Generation Science Standards, such learning focuses on what the standards refer to as three dimensions, connecting disciplinary core ideas (e.g., engineering design, energy) with cross-cutting concepts (e.g., cause and effect, structure and function) and science and engineering practices.[6] In mathematics, students need to balance procedural fluency (e.g., ability to solve equations) with conceptual understanding (e.g., ability to understand how and when equations are equivalent).[7] For English learners, engaging in both ideas and practices is possible when learning is challenging and supportive.[8, 9, 10, 11]

Science Teachers Can:[12]

- Embrace ELs' assets and support them as full participants in STEM learning.
- Engage ELs in science and engineering practices.
- Engage ELs in meaningful interactions with other students and teachers.
- Provide scaffolding, or accessible entry points, as a way of supporting students' engagement and comprehension of challenging content.
- Provide an explicit focus on how language functions in science and engineering.

Look for: English learners engaging with peers in quality interactions about math and science

Developing deep conceptual understanding and disciplinary practices requires English learners to experience meaningful interactions with peers. English learners need to engage in sustained talk — substantive contributions — that goes in depth about math and science. Beyond sustained talk, English learners also benefit greatly from reciprocal interactions with peers that enable them to challenge, build, and expand upon each other's ideas.[13, 14] Such meaningful interactions happen when classroom activities are carefully structured to invite and encourage English learners to participate with all of their classmates.[15] This type of instruction requires additional attention in a distance learning context, using a range of strategies such as break-out rooms for small group instruction and structured discussion prompts.

Look for: English learners developing an understanding of how language works in math and science

As English learners learn math and science, they will need to use language (both everyday and technical) for two connected purposes: 1) deepening understanding of ideas and concepts; and 2) engaging in math, science, and engineering practices.[16] Mathematical practices include making sense of problems and persevering in solving them, while science practices include constructing explanations and designing solutions. English learners also need to understand how language works in the STEM disciplines, such as in scientific laboratory reports and math proofs.[17] In both math and science, English learners will need to understand the purposes of communication, typical organizational features, and the use of a variety of elements, such as graphs and diagrams.[18, 19]

Math Teachers Can:[20]

▸ Embrace asset beliefs that position and support ELs as full participants in mathematical learning;

▸ Engage ELs in meaningful interactions and discourse with others; and

▸ Provide support for ELs to engage in mathematical practices.

Supporting Quality Learning at a Distance

In their brief focused on English learners in California, WestEd researchers Elsa Billings and Rachel Lagunoff identified how educators can enact key quality practices across three learning formats[21]:

▸ Synchronous (real-time/live) online

▸ Asynchronous online (e.g., recorded lessons, self-paced interactive online modeling)

▸ No online or digital access (No-tech)

In distance and hybrid learning models, English learners will benefit if each of these formats is well integrated to support their participation in making sense of and deeply learning math and science. Some sample considerations are outlined in the following table, focusing on synchronous and asynchronous options, given the state's guidance that every LEA offering distance learning provide access to technological devices and connectivity. This table aligns with the goal of having English learners engage in quality interactions with their peers.

Key characteristic: English learners engage with peers in quality interactions about math and science

Synchronous online ⊘

▸ Use break-out rooms or other small-group live sessions for English learners to interact with their peers.

▸ Maximize the use of whole-class live sessions by planning activities in which English learners can interact — both before the live session as they prepare ideas and after as they apply what they have learned.

▸ Encourage English learners to respond in the text-chat function or participate in polls and other interactive features.

Asynchronous online ⊘

▸ Create digital bulletin boards where English learners may interact with short audio or video responses to prompts.

▸ Use learning management systems to maximize English learners' interactions with each other through writing.

▸ Group students strategically and consistently during asynchronous assignments to develop deeper relationships with one another.

Using Formative Assessment Practices to Support English Learners in Learning Mathematics and Science

To support English learners during distance and hybrid learning, teachers need to be able to adapt instruction to students' needs. Formative assessment is a valuable strategy in gauging student understanding and tailoring instruction accordingly.

Formative assessment is a process, rather than an event, and has been defined as "the process used by teachers to recognize and respond to student learning, in order to enhance that learning, during the learning."[22] Unlike summative assessment, which focuses on end-of-unit or end-of-term mastery, formative assessment is used as part of instruction.

In the context of the COVID-19 crisis in California, formative assessment practices will be particularly important because:

▸ Many schools will be missing state testing data;

▸ Educators must not conflate language proficiency with understanding of content knowledge; and

▸ Instruction needs to help students expand their knowledge and abilities.

Three leading scholars in English learner education identified the following formative assessment practices (below). These practices offer English learners critical support and are paired here with suggested distance learning actions.[23]

Formative Assessment Practices	Distance Learning Actions
Sharing learning goals and success criteria	Educators can create detailed instructions, including voice recordings, to explain learning goals and to offer examples of quality work. Success criteria can be embedded into asynchronous platforms.
Using classroom talk as a source of evidence	Educators can observe students' live small-group or whole-class interactions closely. English learners can contribute to digital bulletin boards in which they create short voice or video recordings about what they are thinking and learning.
Giving feedback to move learning forward	Educators can provide detailed written feedback to students' assignments completed asynchronously. English learners can participate in one-on-one or small-group feedback sessions with the teacher to receive feedback and revise or refine work.
Involving students through self-assessment and peer assessment	Educators can clearly model on asynchronous platforms the rubrics. Using learning management platforms, small groups of students work with each other regularly to offer each other feedback while also assessing their own growth over time.

Supporting English Learners through LCAP Monitoring

In most years, LCAP refers to Local Control and Accountability Plans, but for the 2020–21 academic year, the traditional LCAP was replaced by Learning Continuity and Attendance Plans to acknowledge the specific context of providing education during the pandemic.[24] Among other elements, the template for 2020–21 included several opportunities to embed meaningful, research-driven supports for English learner students, including through:

▸ Making intentional efforts to gather feedback on the plan from families whose first language

is not English, through the local English Learner Parent Advisory Committee and other avenues;

▸ Creating specific, proven supports for English learners to succeed in both in-person and distance learning; and

▸ Identifying high-impact ways to use federal funds to accelerate and deepen learning for English learners.

Board members should request data and initiate regular conversations to understand the progress of these efforts on behalf of English learners. Equitable access to STEM instruction is important for English learners, regardless of whether it is provided in person or remotely. Given the unique contexts of distance and hybrid

learning, however, this brief has provided a series of considerations, sample questions, and resources for board members to strengthen supports for their students who are English learners.

Questions for Board Members to Consider

In addition to the questions in the textbox on page 2, board members may want to know the following:

▸ How are supports for English learners incorporated into your current LCAP and in the one being developed for the upcoming year? Are there specific math and science supports in place?

▸ How are math and science teachers integrating English language development into instruction?

▸ How are math and science teachers incorporating formative assessment practices in their teaching of English learners?

▸ How are English learners explicitly addressed in the LEA's distance/hybrid learning plans?

▸ What data do we have that can help us understand whether English learners have equitable access to rigorous and engaging STEM instruction?

▸ What efforts are in place to ensure that there is adequate outreach to inform English learners of their options to access advanced STEM instruction?

Resources

Supporting English Learners During School Closures: Considerations for Designing Distance Learning Experiences

This paper from WestEd focuses on four key practices for designing distance learning with English learners in mind. https://bit.ly/3dVD4y2

Resources from the U.S. Department of Education's Office of English Language Acquisition

▸ *Integrating Language While Teaching STEM: NCELA Teaching Practice Brief.* This brief focuses on five concrete steps STEM teachers can take to integrate language into their science instruction. https://bit.ly/3mHCHv1

▸ *Integrated Language and Science Content Teaching.* This podcast discusses recommendations for teaching STEM to English learners. https://bit.ly/3mKPWuH

Webinars about Teaching Math and Science with Secondary English Learners

▸ *Linking, Describing, and Critiquing in Secondary Mathematics: Supporting English Learners' Oral Language Development.* https://vimeo.com/426395967

▸ *Supporting Secondary English Learners in the Science Classroom.* https://vimeo.com/432332669

Focusing Formative Assessment on the Needs of English Language Learners

This brief from WestEd provides targeted guidance on supporting English learners through formative assessment. https://bit.ly/3sbFWff

Endnotes

1　California Department of Education (2018). *Distance Learning Frequently Asked Questions*. https://bit.ly/2PPjhZ9

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9　Galguera, T., Lemmi, C., & Martin, P. (2019). Investigating disease transmission: Engaging English Learners in a Phenomenon-based science lesson. In A. Walqui & G. Bunch (Eds.) *Amplifying the curriculum: Designing quality learning opportunities for English Learners*. (pp. 93-114). Teachers College Press.

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11　U. S. Department of Education, Office of English Language Acquisition (2020b). *Integrating language while teaching STEM (Math): NCELA teaching practice brief*. Not yet published.

12　See Endnote 10.

13　Walqui, A. & Heritage, M. (2018). Meaningful classroom talk: Supporting English Language Learners' oral language development. *American Educator*, 18-23,39

14   Chu, H., & Hamburger, L. (2019). Taking mathematics instruction to task: Applying Second Language Acquisition approaches to analyze and amplify learning opportunities for English Learners. *NYSTESOL Journal*, 6(2), 16-30.

15   U. S. Department of Education, Office of English Language Acquisition (2020a). *Integrating language while teaching STEM: NCELA teaching practice brief*. https://bit.ly/3e02FFN

16   Koelsch, N., Chu, H., & Bañuelos, G. (2014). Language for learning: Supporting English Language Learners to meet the challenges of new standards. *TESOL Quarterly*, 48(3), 642-650. https://doi.org/10.1002/tesq.181

17   See Endnote 9.

18   See Endnote 13.

19   See Endnote 10.

20   See Endnote 10.

21   Billings, E., & Lagunoff, R. (2020). *Supporting English Learners during school closures: Considerations for designing distance learning experiences.* WestEd. https://bit.ly/2QksDMl

22   Black P., & William, D. (1998). *Assessment and classroom learning. Assessment in education: Principles, policy, & practice*, 5(1), 7-74.

23   Heritage, M., Walqui, A., & Linquanti, R. (2015). *English Language Learners and the new standards*: Harvard Education Press.

24   California Department of Education. (2020). Learning Continuity and Attendance Plan Instructions. https://bit.ly/3mHOadJ