English learners

Five principles helped the Lawrence Hall of Science's curriculum developers design instructional sequences that would support the unique needs of English learners and their teachers. These principles, along with our lesson-specific differentiation strategies, are research-based and were thoroughly reviewed by Dr. Pamela Spycher and her team of WestEd experts.

- Principle 1: Leverage and build students' informational background knowledge.

- Principle 2: Capitalize on students' knowledge of language.

- Principle 3: Provide explicit instruction about the language of science.

- Principle 4: Provide opportunities for scaffolded practice.

- Principle 5: Provide multimodal means of accessing science content and expressing science knowledge.

Enacting the five principles in the curriculum

Many of the best practices for supporting English learners are also helpful for all students, because even students whose primary language is English are also long-term English learners.

Some of these best practices include providing clear directions, building the curriculum as a coherent set of ideas that build on one another, allowing time for reflection, and providing explicit instruction in the practices of the disciplines. These best practices form the foundation of the Amplify Science California curriculum. For students who need additional support, there are specialized instructional approaches, activities, and resources provided that take into consideration the English learner's level of language proficiency. Language support for English learners is included throughout the program in two ways:

1. **Embedded instructional design:** Many scaffolds are embedded within the instructional plan and are presented to teachers through the digital teacher materials and to all students as activities within the unit. Throughout the process of designing the curriculum, these scaffolds and supports were planned, tested, and refined to provide rigorous yet accessible science instruction.

2. **Additional support:** Additional activities and specific methods for supporting English learners are provided for use as needed, especially in the Teacher Support notes within the lessons.

These best practices form the foundation of the Amplify Science California curriculum and make it possible for teachers to:

- Bolster English learners' ability to develop a deep understanding of science content.

- Decrease language demands in the classroom without diluting science content.

- Allow students to more fully engage in disciplinary literacy practices.

Tips and strategies for differentiation, along with additional supports and scaffolds, are embedded within the instructional design and are delivered to teachers through the **Differentiation** section of each Lesson Brief.

Additional support in the form of activities and specific methods for supporting English learners are provided for use as needed, and can be found in the Teacher Support notes within the lessons.

How does the program directly support English learners?

The following is a list of all instructional supports for English learners that are embedded within the curriculum. Supports are classified according to their main instructional purpose, but many supports can be said to address more than one principle.

Principle 1: Leverage and build students' background knowledge

- **Partner discourse routines:** Throughout the program, students often discuss ideas with a partner. The purpose of this is to allow for more student-to-student talk and allow the space to practice using science vocabulary. Often, these discussions are designed to allow students to share their initial ideas about a topic or discuss experiences they have had related to a topic or idea.

- **Warm-Ups:** The brief written Warm-Up at the beginning of each session is designed to be accessible for all students and often allows students to reflect on what they already know or have just learned in order to prepare them for what they will learn in the coming session.

- **Active Reading:** Active Reading encourages students to ask their own questions and make connections between what they read and what they already know. This process helps students use their background knowledge to understand what they are reading and generate questions that can lead to new understandings.

- **Anticipation guides:** With an anticipation guide, students learn how to activate their background knowledge, focus their reading, and support statements with textual evidence. An anticipation guide may help English learners engage with and reflect on key ideas before, during, and after reading.

- **Additional discussions of prior knowledge:** Sometimes teachers have the option to provide an additional activity that helps students activate prior knowledge.

Principle 2: Capitalize on students' knowledge of language

- **Science word chart:** The teacher leads the class in associating a science vocabulary term with an everyday approximation that students already know. The class discusses how the everyday term and the scientific term are similar but not exactly the same, and the teacher highlights the need for using more precise and specialized language in science to explain ideas. The running list in the classroom serves as a quick reminder for students to use scientific terms in place of everyday ones in their talking and writing.

- **Leveraging native language:** At strategic points in the instruction, a Teacher Support note suggests that teachers invite students to share observations in English or their native language during informal conversation.

- **Cognates:** The teacher provides instructions about cognates, and students are prompted to look for these as they read and use them for help understanding the text.

- **Multilingual glossary:** A glossary is provided for students in grades 6–8 with content-area vocabulary available in ten languages (Spanish, Haitian-Creole, Portuguese, Vietnamese, French, Arabic, Mandarin, Russian, Tagalog, and Urdu).

Principle 3: Provide explicit instruction about the language of science

- **Language frames/Sentence starters:** Students are provided questions they can ask each other or ways they can begin their sentences in a discussion. Providing students with this language helps them get started expressing their ideas, yet leaves cognitive work for them to do as they complete the language frame.

- **Argumentation:** The emphasis of argumentation is on meaning-making, hearing and understanding the contributions of others, and communicating ideas to build understanding. Argumentation provides rich science language learning opportunities in which students are required to obtain, evaluate, and communicate information to refine their ideas and reach conclusions.

- **Modeling Active Reading:** Students are provided with examples of the types of annotations that they are expected to make during Active Reading. These come from fellow students and/or are demonstrated by the teacher using a think-aloud. Both help students understand the nature of the task of annotation and provide models of the type of language that they should use to make comments about and ask questions of the text.

- **Word relationships:** Students demonstrate how different vocabulary terms relate to one another, allowing English learners to understand the relationships between specific vocabulary and content.

- **Word banks:** Students may be provided with word banks to help them engage in discussions or express their ideas in writing. These include key science words that students have been learning, descriptive words and phrases for students to use when explaining their observations, comparative language, transition words to include in a scientific argument, and more.

- **Multiple-meaning words:** English has a large percentage of words that have more than one meaning. Terms in science often have meanings that are different from how they are used colloquially (examples: plate, energy, mold, property). Teachers are provided with information on words that have more than one meaning, in order to clarify which meaning is meant in science texts.

Principle 4: Provide opportunities for scaffolded practice

- **Gradual release:** Units are designed so that there is an emphasis on teacher modeling and direction at the beginning of the unit, with students gaining more independence as the unit progresses. This also applies to the program as a whole— the first Launch unit provides a great deal of scaffolded instruction on reading, argumentation, and other scientific practices, while subsequent units provide deeper forays into these practices.

- **Graphic organizers:** Graphic organizers help students collect their ideas and make connections between their background knowledge and new science concepts in order to synthesize information. These are used throughout the program as students collect data and make observations, organize arguments, and respond to questions.

- **Argumentation:** Argumentation instruction is designed so that students consider various aspects of making an argument throughout the course of the unit before engaging in a culminating argumentation experience (the Science Seminar) at the end of the unit.

- **Reflective writing:** Throughout sessions, students may be called upon to reflect on their understanding of the science content in a short writing activity. This allows students to reflect on and ask questions to clarify their understanding of the content.

- **Clear and concise instructions:** Instructions are tailored to students' learning needs so that they can understand the expectations quickly and easily clarify what is expected of them at any point during an activity. This includes the use of icons or illustrations for procedural directions when needed.

- **Language practice:** Before sharing in a group of four or with the whole class, students discuss their ideas with a partner. This provides students an opportunity to practice expressing their ideas and using the language of science in a low-stakes way before sharing their ideas with a larger group.

- **Creating and using models:** Scientific models require language use that builds conceptual understandings and refines student thinking. Models also provide an initially non-verbal way to express initial understandings and can support the development of student explanations.

- **Modeling tools:** Modeling tools allow students to use visuals to make sense of science content in a low-stakes environment. Modeling tool uses are often embedded as students construct or apply their understanding of science concepts to build a new explanation. These opportunities can help students build confidence with science concepts.

- **Differentiation days:** Based on the Critical Juncture Assessment results, students have the opportunity for extra practice in making sense of the key content they most need support with.

- **Strategic grouping:** Strategic partnering is essential for English learners as they interact and develop their understanding of new content. Opportunities for them to engage in conversations that are slightly above their language proficiency level can accelerate second-language learning and increase students' confidence engaging in science discourse. However, both homogeneous and heterogeneous partners can lend themselves to supportive and productive discourse opportunities. At times it may be helpful to allow students with similar native language proficiency to talk together; at other times it will be helpful to allow students with varied linguistic proficiencies to talk together.

- **Promoting inclusion in discussions:** Many English learners may be hesitant to contribute to class or small-group discussions. There are several steps you can take to help English learners feel comfortable contributing and increase their participation in class discussions:

  - Before a whole-class discussion, give students an opportunity to practice telling a partner something they might want to share with the whole class.

  - Give students a heads-up about the topic of an upcoming discussion well ahead of time so that English learners have more time to consider and prepare for their contributions.

  - Make a suggestion about what a particular student might share in a coming discussion, saying something like, "I see that you and your partner observed _____. Would you be willing to share about that with the class?"

- **Extended modeling:** Teacher works with a small group of English learners while the rest of the class is engaged in reading. The teacher provides additional, more explicit modeling with the same text and gives students opportunities to practice with small sections of the text under the teacher's guidance. Teacher Support notes can direct teachers to provide brief individual coaching to English learners about strategies for Active Reading. These include engaging with the visual representations in a text first, chunking the text, previewing the text, and providing additional modeling of annotation.

- **Partner reading:** English learners may benefit from partner reading, rather than individual reading, during Active Reading sessions.

- **Hints:** Students have access to hints at different points during their independent work. These prompt students to think about particular ideas, provide further questions, or help students remember and understand concepts.

Principle 5: Provide multimodal means of accessing science content and expressing science knowledge

- **Multimodal instruction:** For each key concept, students Do, Talk, Read, Write, and/or Visualize the important ideas in at least three modalities. The chapter includes multiple exposures to and activities designed around the same concept. In units, a small set of key ideas are addressed in multiple ways, rather than covering a lot of territory without allowing for deeper understanding to develop.

- **Use of visual representations and images:** The visual nature of science is supportive of English learners (and all students) learning the language of science. The program capitalizes on this by strategically providing visual representations of vocabulary words, ideas, and concepts when needed.

- **Interpreting and creating visual representations:** The program includes instruction on interpreting and analyzing visual representations and does not assume that students will know how to interpret them just because they are visual. Students can express their understanding of science content by explaining or creating visual representations.

- **Use of physical and digital models:** Visually rich models, including the Sim, modeling tool, and physical models, allow students to show their thinking or make a visual claim. These are often embedded before discussion or writing.

- **Additional practice in other modalities:** Engaging in more extensive whole-class discussions about relevant ideas can support English learners before they write. Whole-class discussions can help less certain students finalize ideas as they listen to the ideas of their peers. Posting key vocabulary words or providing a word bank enables students to draw from discipline-specific vocabulary as they write.

- **Additional visual representations:** English learners can also access science content through visual representations. They build on this visual understanding by then engaging in the text.

- **Optional graphic organizers:** Because graphic organizers provide a visual framework for English learners to express their thinking, they grant students more time to focus on their understanding of essential science content. English learners may be provided with optional graphic organizers to help them collect, organize, and/or synthesize their ideas. Alternately, a graphic organizer provided to English learners may have some language included or may be partially completed to reduce the language demands of the task.

- **Response options:** When an extended written response is called for, it may be more appropriate for some English learners to express their understanding by using a combination of drawings/diagrams and words, rather than a purely written response.

- **Increased wait time for student responses:** English learners often need more time to process oral questions than teachers typically allow before calling on students. In addition to considering the content of a question, English learners are likely to need time to make sense of unfamiliar words or phrases and/or to mentally translate questions into their native language. Increasing wait time to ten seconds before calling on students will likely increase the participation of English learners in class discussions.

- **Student-created summaries:** Extended discussions or complicated instructions may be challenging for some English learners to understand. Hearing a summary in students' words can help them in these situations. After giving a set of instructions or after a period of class discussion, invite a student or several students to summarize the main ideas of the discussion or the steps of the instructions. If many of your English learners speak the same native language, you might invite students to summarize in their native language.