

# Build

Connecting scientific concepts  
with academic vocabulary

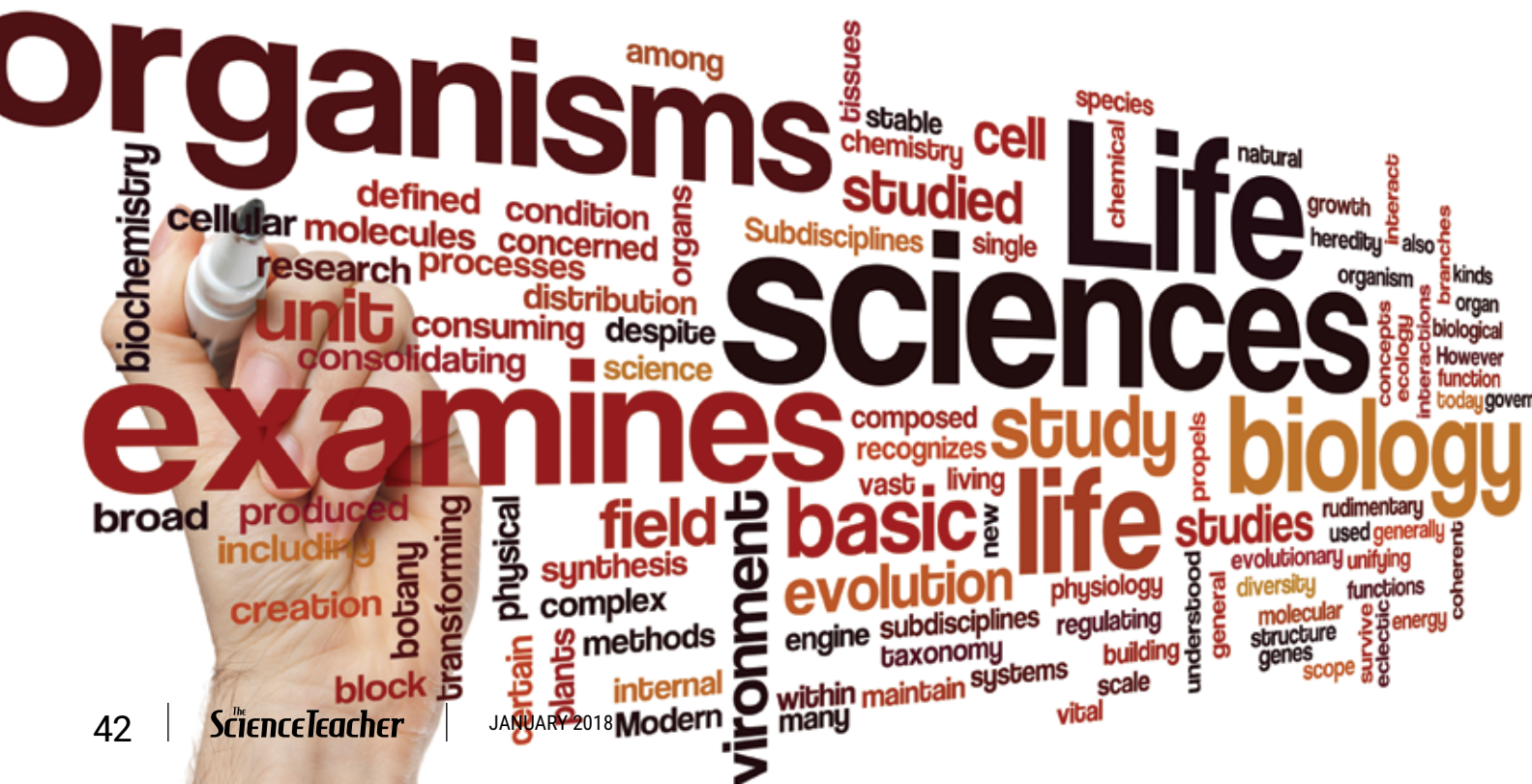
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# Interactive

# Word Wall

Word walls visually display important vocabulary covered during class. Although teachers have often been encouraged to post word walls in their classrooms, little information is available to guide them. This article describes steps science teachers can follow to transform traditional word walls into interactive teaching tools. It also describes a vocabulary review tool that can help teachers select vocabulary for their word walls.



## Transitioning to interactive word walls

Interactive word walls help students build vocabulary knowledge, which is crucial to their academic success. Graves (2006) suggests that immersing students in a comprehensive vocabulary program can help bridge vocabulary gaps. Effective vocabulary instruction includes “both a definition of a word and the word in context, provides multiple exposures to the word, involves students in discussion and active processing of the word’s meaning, and helps them review the words in various contexts over time” (Graves et al. 2014, p. 335).

Brabham and Villaume (2001) suggest that “word walls will be effective only if we are willing to ask questions about their use,” and they wonder how word walls might be transformed to serve as “thoughtful, probing...visual and conversational scaffolds” for vocabulary instruction instead of “static, external devices that promote copying and memorization” (p. 702). That is why we replaced traditional word walls with interactive ones.

Interactive word walls showcase the main ideas of a topic or unit while organizing all the vocabulary associated with the main idea. They provide a dedicated space for vocabulary and definitions in context, 3-D artifacts from inquiry experiences, and color photos or student-created visuals that highlight connections between scientific concepts and academic vocabulary.

Evidence suggests that interactive word walls boost student learning. Figure 1 displays the state biology end-of-course exam results at a high school in central Texas. Students must pass this exam to graduate. When biology teachers planned and used interactive word walls to support instruction, satisfactory and advanced passing rates increased for limited English proficient (LEP), economically disadvantaged, and at-risk students.

Teachers plan the structure, select the vocabulary, and organize the sequence in which the word walls are built. Students complete interactive word walls in class, which gives them multiple encoun-

ters with new and familiar academic vocabulary as they actively process the word’s meaning and connect it to inquiry activities.

## Step 1: Planning

Selecting vocabulary to teach is challenging with little information available to guide teachers (Graves et al. 2014). We use a vocabulary planning tool (Figure 2, p. 44) to help us choose vocabulary to include in lessons and place on word walls. The tool is based on Graves’s (2006) four-part approach to vocabulary instruction:

- teach a few well-selected words,
- teach word-learning strategies and individual words,
- foster word consciousness, and
- provide rich and varied language experiences.

The vocabulary selected with this planning tool supports word wall organization, daily lessons, and a robust and informed vocabulary review.

## Teach a few well-selected words directly

Our selected vocabulary comes from our state’s science standards because “the words found in the science content standards are the *de facto* vocabulary curriculum” (Fazio and Gallagher 2014, p. 1410). This involves a close look at disciplinary core ideas and verbs to understand the depth of knowledge, rigor, and intent of the standard and to identify supporting vocabulary. First, we distinguish between familiar and new vocabulary. *Familiar vocabulary* refers to words students learned in prior grades and may have forgotten or words that should have been taught but were not. Determining familiar vocabulary involves looking at the previous grade-level science standards. These words will be taught via direct instruction.

FIGURE 1

### Texas state end-of-course (EOC) exam results.

	NUMBER OF STUDENTS TESTED	CAMPUS SCORE ON BIOLOGY EOC SATISFACTORY	CAMPUS SCORE ON BIOLOGY EOC ADVANCED	ECONOMICALLY DISADVANTAGED	CURRENT LIMITED ENGLISH PROFICIENT	AT RISK
High school campus (97.8% economically disadvantaged and 10.5% ELL; total enrollment: 1,270)						
<b>Year 3 Implemented interactive word walls</b>	237	89%	8%	89%	64%	86%
<b>Year 2 Implemented interactive word walls</b>	376	81%	4%	81%	63%	75%
<b>Year 1 Did not use interactive word walls</b>	375	57%	1%	56%	37%	44%

FIGURE 2

### Vocabulary planning tool.

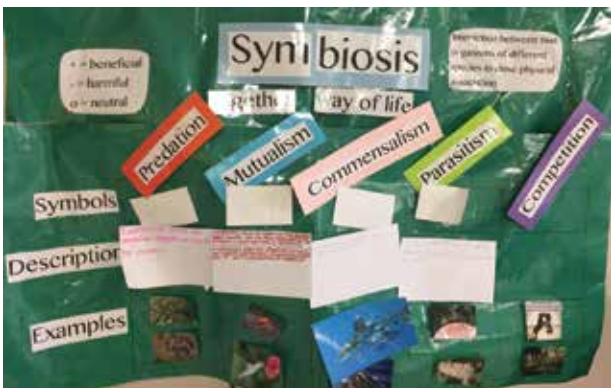
<p><b>Teach a few well-selected words directly</b></p> <p>Prior knowledge      Science practices Science tools</p>	<p><b>Teach word learning strategies</b></p> <p>Are there any affixes that should be taught? Words with multiple meanings? Cognates?</p>
<p><b>Provide “rich and varied” language experiences</b></p> <p>Word wall, sketch vocabulary strategies, vocabulary games and enrichment ideas</p>	<p><b>Foster “word consciousness”</b></p> <p>Student awareness of and interest in words and their meanings TARGET Vocabulary</p>

#### Teach word-learning strategies and individual words

We identify multiple-meaning words, affixes, and root words related to disciplinary core ideas. A lack of knowledge of these words and affixes can interfere with students’ vocabulary comprehension. Teaching a set of 20 prefixes and 14 roots unlocks the meaning of over 100,000 words (Gruber 2011). We also look for Spanish-English *cognates*, words from two different languages that have the same or similar etymological origins, meanings, spellings, and (sometimes) pronunciations. Figure 3 displays an interactive word wall that supports word-learning strategies. The Greek affixes *sym* (“together”) and *biosis* (“way of life”) are defined to help students process word meanings in context. *Symbiosis* is the interaction of two organisms living together.

FIGURE 3

### Symbiosis interactive word wall.



#### Foster word consciousness

We select target vocabulary (academic and domain-specific vocabulary) from our state science standards. Marzano, Rogers, and Simms (2014) created a list of domain-specific academic vocabulary emphasized in the *Next Generation Science Standards* (NGSS Lead States 2013). Teachers can reference this list to inform their vocabulary selections. Next, we plan how to support and use vocabulary during instruction in ways that teach the meanings of academic vocabulary. We try to represent the

FIGURE 4

### Cellular processes interactive word wall.



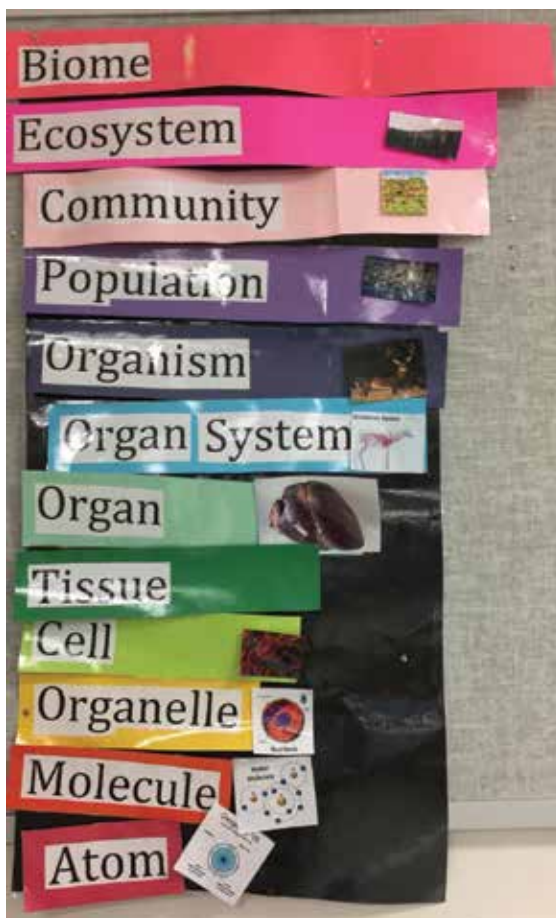
vocabulary with real objects (realia) if possible. If real objects are not available, we use color pictures, ask students to create illustrations, or use images found on the internet. Visual supports do not need to be elaborate; their purpose is to help students visually connect academic vocabulary to science inquiry experiences.

### Rich and varied language experiences

Next, we sketch a concept map to organize content and connect the vocabulary. To determine the best type of concept map to use, we ask ourselves about the nature of the disciplinary core ideas and related crosscutting concepts: Can the concepts be divided into categories and subcategories? Is it a cycle? Do the crosscutting concepts explore cause and effect or examine structure and function? Is there a hierarchy? This process ensures that interactive word walls visually illustrate the patterns and connections related to the disciplinary core vocabulary and crosscutting concepts.

FIGURE 5

### Interactive word wall displaying the levels of biological organization.



For example, flow concept maps could be used to illustrate the scientific explanations concerning the complexity of the cell or the theory of biological evolution. A web concept map could be used to show the effects of evolutionary mechanisms, including genetic drift, gene flow, mutation, and recombination. A tree map could structure comparing characteristics of taxonomic groups, including archaea, bacteria, protists, fungi, plants, and animals. Some disciplinary core ideas lend themselves to circle maps, continuum/time lines, Venn diagrams, or T-charts. The biological levels of organization, arranged from atom to biome (Figure 5), are an example of a hierarchy.

### Step 2: Build the word wall frame

The second step requires teachers to find a place for the word wall in their classroom. Wall space, room arrangements, and

FIGURE 6

### The word strips and pictures were attached to the word wall with Velcro.



FIGURE 7

### Student-created interactive word wall.



fire marshal regulations often determine the wall configuration and placement. Word walls may be arranged on bulletin boards, cabinet or classroom doors, classroom walls, chalkboards, whiteboards, chart paper, or tri-fold boards. Most word walls are built over time and finished as a unit nears completion. In one example (Figure 4), the sections for energy conservation and cellular reproduction are complete, but protein synthesis has not yet been taught. The missing section has been framed for later completion.

### Step 3: Students construct the word wall

The interactive word wall pictured in Figure 5 (p. 45) was planned by the teacher but constructed by students. The lesson began with a card sort activity where students worked in small groups to arrange the biological levels in order and match pictures with each level. Then they presented their ideas to the whole class as the teacher selected students to post word strips and pictures on the interactive word wall.

Each class built the word wall after completing the card sort, and students helped remove words and pictures from the word wall at the end of class. The teacher used Velcro to facilitate assembly during class and quick removal between classes (Figure 6, p. 45). The work from the last class period remained on the interactive word wall. Many teachers leave word walls focusing on foundational scientific principles, highly tested standards, or safety in their classroom as long as possible so students can reference them and use them as reflection tools.

Word strips containing key vocabulary terms can be pre-made and laminated before class (Figures 5 and 6) or simply written on sentence strips (Figure 4, p. 44). If there are time con-

straints, students can organize pre-made word strips, prepare or organize pre-made definitions, and create or organize illustrations. If there are no time constraints, students can make everything. In the student-created macromolecule interactive word wall (Figure 7), students made the labels, created definitions, selected examples of lipids, carbohydrates, and proteins, and drew an example of a nucleic acid. This example shows how an interactive word wall connects science concepts (biomolecules) and artifacts (food wrappers) from inquiry activities.

### Reaching every student

Most science classes include students with a broad range of abilities, which can make planning and teaching difficult. Interactive word walls scaffold learning and support all students, especially LEP, economically disadvantaged, and at-risk students. They organize previously taught content and provide visuals to illustrate academic vocabulary. They can also be used to review content when students miss class. Teachable moments are fostered when students contribute, reference, discuss, and use interactive word walls.

### Conclusion

Interactive word walls help all students learn and use the language of science. Now is the time to transform traditional static word walls into dynamic student-created interactive word walls. ■

### ACKNOWLEDGMENTS

Thank you Sara Elliott and Loretta Solliday at Killeen Independent School District, Killeen Texas, and Rose Narvaez, PhD (retired) at Edgewood Independent School District, San Antonio, Texas, for implementing interactive word walls and sharing your work.

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