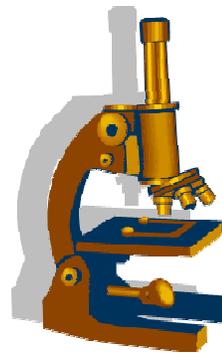


Using the WordBuild Vocabulary Development System™ to Improve Student Performance in Science



Dynamic™ Literacy



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By design, the *WordBuild Vocabulary Development System™* can **unite** direct vocabulary instruction from a Language Arts classroom with contextualized Content Area Vocabulary, particularly in Science.

Concept: WordBuild™ as the Bridge to Content Area Literacy

The *WordBuild Vocabulary Development System™* can unite your direct vocabulary lessons in Language Arts with contextualized Content Area Vocabulary based on two important unique concepts:

- **Weekly word study is focused around root families rather than lists of words that are unrelated, or concepts that are not generalizable beyond the Language Arts classroom**
- **Students are expected to learn how to deconstruct words and approximate meanings for words within root families that are not specifically presented in the Language Arts classroom**

Content Area Literacy, or “reading to learn”, is possible when students possess the knowledge to comprehend the language and words used to deliver content area instruction.

Put another way, students must understand the meanings and connotations embedded in science vocabulary before they can begin to understand the scientific ideas that written text and word problems present.

Background on Content Area Literacy

In 1925, the reading scholar William S. Gray first introduced teachers to the critical concept of **content area literacy**, or “reading to learn” in the content areas:

“[Reading] is essential in every content subject, such as history, geography, arithmetic, science, and literature. In fact, rapid progress in these subjects depends in a large degree on the ability of pupils to read independently and intelligently.”

Further research by Thorndike (1916) and Betts (1948) led to the widely accepted classification system used to determine whether students possess the requisite skills to understand and absorb content area concepts through independent reading. This classification table is shown on the Page 3.

This research-based classification system shows that if students do not understand the meanings of at least 90% of the words they encounter in written text, **they will be unable to absorb content area material from written text through independent reading.**

Student Reading Classification	Word Recognition Level ¹	Text Comprehension Level	Impact of Student Reading Level on Content Area Literacy
Independent Level Reader	99%	90%-100%	Student is capable of learning content area concepts through written text
Instructional Level Reader	95%	75%-90%	Student is capable of learning content area concepts through written text with classroom support and reinforcement
Frustration Level Reader	Less than 95%	Less than 75%	Student will rely solely on classroom support and reinforcement to learn new content area concepts

As described in the sidebar, Content Area Literacy, particularly in science, is dependent on word comprehension. Students must understand at least 75% of the written text in their science books in order to learn new science concepts...**even with direct vocabulary instruction in the classroom.**

What is a “Science Word”?

Surely, words such as “gravity”, “conductor”, “hypothesis”, and “fertilization” are involved in developing literacy in the science content areas. But what about words like “affinity”, “supposition”, “interdependence”, and “inference”?

It is equally important that students understand the words that accompany new concepts in science. In addition, words such as these are likely to surround scientific word problems on standardized tests.

The *WordBuild Vocabulary Development System™* teaches students a critical thinking skill that is essential to comprehending words like these, **even if these words have not been specifically covered in classroom vocabulary instruction.**

¹ Word Recognition Level is determined by the number of pronunciation errors in 100 consecutive words in written text. For example, an independent reader is expected to pronounce correctly 99 of every 100 words of written text.

Students must understand at least 90% of written text in order to learn new concepts in science through independent reading.

Students must understand at least 75% of written text in order to learn new concepts in science through reading, even with direct vocabulary instruction in the classroom.

Students that understand less than 75% of written text are unlikely to learn new concepts in science through reading.

If we want to increase Content Area Literacy, we must teach our students the strategies to learn the meanings of words to which they have not been directly exposed.

This guide contains all of the materials and instruction necessary for *WordBuild™* to be used effectively in the Science Content Area.

Practice: Using WordBuild™ in the Science Content Area

This section will show you how:

- **The WordBuild Vocabulary Development System™ can be used to teach vocabulary in the context of science instruction**
- **Teachers in departmentalized school settings can quickly collaborate on vocabulary instruction with minimal preparation**
- **Your school can seamlessly implement a consistent and logical vocabulary lesson plan across content areas**

The strength of *The WordBuild Vocabulary Development System™* is that its lessons are based on a logical and consistent framework. Consisting of weekly root study segments, lessons can be easily extended into the content areas with minimal preparation. Gone are the disparate vocabulary word lists that must be forced into science lesson plans whether or not the words have a clear relation to science area content.

Because it is based on a central root family rather than a finite list of words, each weekly lesson plan provides the teacher with the **opportunity to teach within the week's integrated framework while focusing on different words**, the ones most applicable to science within the central root family.

No matter whether you are in a self contained or departmentalized school setting, it is important that vocabulary be integrated among all content areas. Perhaps even more critically, vocabulary must be integrated in a consistent way by multiple instructors in a departmentalized setting, and this is where *WordBuild's™* root-based framework is most useful.

Teacher Preparation:

In a departmentalized setting, the teacher using *WordBuild™* for general vocabulary development should provide his/her science colleague with a copy of this entire document including:

- **Supplement A: Reference Guide to the Most Common Affixes**
- **Supplement B: The WordBuild™ Science Vocabulary Correlation**
- **Supplement C: Suggestions for Integrating Root-Based Vocabulary in the Science Classroom**

It is helpful, but not necessary, for the science teacher to obtain or review a copy of the *WordBuild™* Teacher Manual. The *Science Vocabulary Correlation* and supplements were designed to provide science teachers with the reference materials necessary to integrate *WordBuild™* based lessons into their classrooms.

Collaboration in a Departmentalized School Setting

As with any productive collaboration, clear and concise communication is essential to success. It is the responsibility of the primary *WordBuild™* teachers to inform their science counterparts of the roots families included in their scheduled lesson plans. In most cases, teachers will progress sequentially through the root families listed on Page 115 of *WordBuild™*, Elements - Level 1.

The science teacher should be introduced to the *WordBuild™* concept of “*morphological problem solving*”. Students will be encouraged to identify the meaningful parts of words (morphemes) in words that are unfamiliar.

Science teachers should understand that *WordBuild™* will frame their students’ exploration of new words around a word family, generally one per week. Unlike other word study programs, this exploration will begin with *WordBuild™* exercises, but will not be confined to Language Arts.

Many schools have described *WordBuild™* as a viral program because inquisitive students have often brought their new-found curiosity about vocabulary into their science, social studies, math, and other classrooms. Science teachers should be prepared for these impromptu discussions, and should be encouraged to moderate these teachable moments using the *Science Vocabulary Correlation* and by referring to a dictionary with etymological definitions.

The Opportunity for Science Teachers

Unlike other vocabulary programs where words are memorized and thus constrained to a manageable 15-20 words per week, ***WordBuild™* students are encouraged and expected to identify and approximate the meaning of words that are NOT SPECIFICALLY presented to them in daily exercises.**

Termed “*morphological problem solving*”, *WordBuild™* typically creates teachable moments for science teachers to deliver content

Morphological Problem Solving is used when a student can look at an unfamiliar word and break it down into its constituent morphemes.

area vocabulary instruction to their students. Prior to each week, science teachers should consult the *Science Vocabulary Correlation* to:

- **Locate the root family that student will be exploring with the primary WordBuild™ teacher**
- **Identify the derivative words within that root family that are relevant to the science content area**
- **Take advantage of or create teachable moments for students to use those words within the context of science**
- **Allow and encourage students to practice morphological problem solving in the science classroom**

An example of these steps is shown in the gray shaded box below.

EXAMPLE FOR THE “FORM” FAMILY

Suppose that during a particular week, we know that students will be introduced to the root family “form”. Consulting the *Science Vocabulary Correlation*, we see a subset of words within the “form” family that are related to science.

Of these, we learn that the words “conformity, deformation, formalized, formulate, formulation, and uniformly” will not be *specifically presented* to students in their daily exercises by their primary *WordBuild™* teacher. One of these words, “uniformly”, is particularly relevant to the science content area. A suggestion for how to introduce this word in a science context is provided in Appendix A: “The particles of sand are uniformly distributed in the jar.”

The science teacher should create an opportunity for students to consider the meaning of “uniformly” in this context.

By this point, students should undoubtedly be familiar with the meaning of the root of the week “form”. However, they may or may not be familiar with the prefix “uni” or the suffix “ly”. (The meanings of these affixes are provided for the teacher in Appendix B.)

Students should be encouraged to use their developing *morphological problem solving* skills to define the meaning of these morphemes by considering words they already know. For instance, most students will understand the meaning of the morpheme “uni” in the word “unicycle”, and the meaning of the morpheme “ly” in the “smoothly”.

Continued on next page --->

EXAMPLE FOR THE “FORM” FAMILY (cont’d)

Finally, science teachers should lead students to the science connotations that arise with many words found in the science correlation. For instance, when asked to define the word “uniform”, students are likely to describe a “standardized dress code”. However, in science, “uniform” generally applies to things that are “evenly spread”, or “have one shape”.

Notes & Frequently Asked Questions

I've found a science relevant word that is not listed in the vocabulary correlation. Why isn't it listed?

The words listed in the *Science Vocabulary Correlation* are merely a sample selection of the science words that are found within each root family. By no means is this list exhaustive, and we certainly expect you will encounter additional science related words within each of these families. We encourage you to consult a good dictionary to locate the etymological definitions of any words that you do not find in the science vocabulary correlation or the *WordBuild™* teacher's manual.

I have a word that is pertinent to this week's science topic, but we have not yet covered that root family. Can I skip ahead?

We understand that in departmentalized school settings, perfect integration among content areas is desirable...but not always feasible. For this reason, we designed *WordBuild™* to be flexible in these situations.

If you would like to introduce a new root family to your science students that they have not yet encountered, you may borrow the *WordBuild™* CD-ROM found on the inside back cover of the teacher manual from the primary *WordBuild™* teacher. Once installed on your desktop computer, this CD-ROM will allow you quickly to create exercises for all of the roots in our program. The process used to create an exercise is straightforward and a user's guide is provided in the teacher's manual.

The CD-ROM will enable you to customize several exercise templates in two ways:

- **Select any root family to teach from the top 100 most frequently- encountered roots in academic English**
- **Select from one of several different exercise formats**
- **Select the specific subset of words, science or otherwise, within each root family on which you want to focus.**

To get you started, at the end of this guide you will find sample exercises that were created from the CD-ROM for the roots "BIO" and "THES".

I'd like to teach a science word that does not contain one of the roots listed in the *Science Vocabulary Correlation*. What should I do?

First, consult a good dictionary with etymological definitions to be sure that you have identified the correct root word.

If your school purchased *WordBuild The Game™* for your computer lab, you may find this word's root family there. With *WordBuild The Game™* your students can explore over 200 root families, many of which have clear connections to science, in an interactive and enjoyable setting.

Magic Squares

Name

Select the best answer for each of the words in the 'bio, b, bi, be' family from the numbered definitions. Put the number in the proper space in the Magic Square box. If the total of the numbers is the same both across and down, you have found the magic number!

'bio, b, bi, be' means life

WORDS

- A. aerobic
- B. anaerobic
- C. antibiotic
- D. biodegradable
- E. biologist
- F. biological
- G. biotic
- H. microbe
- I. symbiosis

DEFINITIONS

- 1. related to a person's life story written by another
- 2. able to go down to basic living parts; able to decay organically
- 3. acting like a life force; a life form enhanced with electronics
- 4. related to writing about oneself's life
- 5. state of living with another; mutual benefit of different species together
- 6. a substance against living organisms; a medicine that destroys organisms like germs
- 7. a small living organism
- 8. living in the absence of air
- 9. a person who specializes in the study of life
- 10. living in air; related to oxygen consumption
- 11. the study of life
- 12. having to do with life
- 13. related to the study of life

Magic Square Box

A.	B.	C.
D.	E.	F.
G.	H.	I.

Magic Number _____

Magic Squares

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- 4. related to writing about oneself's life
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- 7. a small living organism
- 8. living in the absence of air
- 9. a person who specializes in the study of life
- 10. living in air; related to oxygen consumption
- 11. the study of life
- 12. having to do with life
- 13. related to the study of life

Magic Square Box

A. 10	B. 8	C. 6
D. 2	E. 9	F. 13
G. 12	H. 7	I. 5

Magic Number 24

***** ANSWER KEY *****

Magic Squares

Name

Select the best answer for each of the words in the 'thes, thet' family from the numbered definitions. Put the number in the proper space in the Magic Square box. If the total of the numbers is the same both across and down, you have found the magic number!

'thes, thet' means to place or put

WORDS

- A. hypotheses
- B. hypothesize
- C. photosynthesis
- D. synthesis
- E. synthetic
- F. thesis
- G. synthetics
- H. photosynthesized
- I. synthesized

DEFINITIONS

- 1. act or process of putting together; a combination or blend
- 2. something placed upon; a descriptive name used to characterize a person
- 3. things placed beside; marks placed before and after an insertion
- 4. put together; combined or blended
- 5. process of putting together with light; the procedure of utilizing light to compose food
- 6. put together with light; utilized light to compose food
- 7. to put up; to make a conjecture or supposition
- 8. put together; not natural or genuine
- 9. theories put up; conjectures or suppositions
- 10. something that puts together; electronic instrument that combines sounds together
- 11. things put together; materials that are not natural or genuine
- 12. something placed; a statement or argument put forth

Magic Square Box

A.	B.	C.
D.	E.	F.
G.	H.	I.

Magic Number _____

Magic Squares

Name

Select the best answer for each of the words in the 'thes, thet' family from the numbered definitions. Put the number in the proper space in the Magic Square box. If the total of the numbers is the same both across and down, you have found the magic number!

'thes, thet' means to place or put

WORDS

- A. hypotheses
- B. hypothesize
- C. photosynthesis
- D. synthesis
- E. synthetic
- F. thesis
- G. synthetics
- H. photosynthesized
- I. synthesized

DEFINITIONS

- 1. act or process of putting together; a combination or blend
- 2. something placed upon; a descriptive name used to characterize a person
- 3. things placed beside; marks placed before and after an insertion
- 4. put together; combined or blended
- 5. process of putting together with light; the procedure of utilizing light to compose food
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- 9. theories put up; conjectures or suppositions
- 10. something that puts together; electronic instrument that combines sounds together
- 11. things put together; materials that are not natural or genuine
- 12. something placed; a statement or argument put forth

Magic Square Box

A. 9	B. 7	C. 5
D. 1	E. 8	F. 12
G. 11	H. 6	I. 4

Magic Number 21

***** ANSWER KEY *****