

## Module 4 Viva la Difference! (MS/HS)

# Teacher Guide – Viva la Difference Audio-Visual Presentation



Audio-visual presentation and all related activities, including answer keys with NG SSS, can be found on this website:  
<http://plants.ifas.ufl.edu/education>

**Overview:** This 20-minute audio-visual presentation is the core lesson for Module 4 of our education series. Basic water quality characteristics are used to introduce the trophic state classification system along with a discussion of why Florida waterbodies are so unique. Students learn the connection between trophic state and biological productivity and the water quality parameters used for determining the four trophic state categories. They are also introduced to natural and human-induced influences that can change trophic state. Lake ecology and food webs are discussed with impacts invasive aquatic plants have on trophic state.

The presentation culminates with a look at the different ways waterbodies are used in Florida and the potential for conflict among user groups. Final take home message: The more we know about our freshwater systems, the better management decisions we can make, while also protecting our unique waters and wildlife.



### Key Questions:

- What are basic characteristics used to describe a lake?
- What is the trophic state classification system?
- What are the four trophic state categories (*oligotrophic, mesotrophic, eutrophic and hypereutrophic*)?
- How does trophic state relate to a lake's biological productivity?
- What nutrients are important to biological productivity and how are they measured?
- What other parameters are used to determine trophic state?
- Why is there an abundance of aquatic plants in Florida?
- How do invasive plants affect the trophic state classification of a waterbody?
- Why is it important to understand the trophic state classification system?

**Subject:** Biology, Life Science, Environmental Science, Social Studies, Language Arts

**Grade Level:** upper elementary-*advanced* (UE), middle school (MS), high school (HS)

**Time Estimate:** 60 minutes – 15 minute review of vocabulary; 20 minute presentation; 25 minute discussion

### Learning Objectives:

- Explain the trophic state classification system
- Identify differences between eu-, meso-, oligo-, hypereu-trophic states
- Identify characteristics used to measure and determine trophic state
- Explain the impact invasive plants have in Florida waterbodies and determining trophic state
- Explain why it's important to know the trophic state of a waterbody

**Science and Language Arts Standards:** See suggested state standards at the end of this document.



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**Vocabulary:** (Note: Keyword chart and definitions provided in separate document.)

algae, aquatic, attributes, biological productivity, bottom sediment, classification system, ecosystem, emerged plants, eutrophic, floating plants, floating-leaved plants, food web, human induced, hypereutrophic, invasive plants, land use changes, limnologist, macrophytes, mesotrophic, microscopic, natural, non-native plants, nutrients, oligotrophic, parameters, periphytic algae, planktonic algae, Secchi disk, storm water, submersed plants, total chlorophyll, total phosphorous, total nitrogen, transparency, trophic state, vegetation, water clarity, water color

**Lesson Summary:** Distribute the Guiding Questions and review keywords and definitions before viewing the 20-minute audio-visual presentation. Depending on grade level and available class time, the video can be shown in segments. (Refer to outline on next page.) Students use Guiding Questions for reference during the presentation. Answers are checked at the end as part of the discussion. Talking Points are also available for the teacher/instructor, providing additional background knowledge.

*Note: It is recommended that students watch Silent Invaders AV presentation prior to this lesson for an understanding of native, non-native and invasive species terminology.*

**Materials Needed:** Classroom computer/projector with internet access to the Florida Invasive Plant Education Initiative website (<http://plants.ifas.ufl.edu/education>) or computer with DVD of presentation, available upon request from the UF/IFAS Center for Aquatic and Invasive Plants Information Office ([caip-education@ufl.edu](mailto:caip-education@ufl.edu)).

**Additional Resources:** All other activities and lessons for Module 4 are designed to compliment this presentation. Lessons and Activities are available as PDFs from this website: <http://plants.ifas.ufl.edu/education>.

**Part 1 – Lakes can be described in a number of ways; the trophic state classification system is one system commonly used by scientists and lake managers.** (slides 3-14)

**Keywords:** attributes, biological productivity, classification system, limnologist, nutrients, transparency, trophic state, vegetation, water color

**Key Points:**

- Classifying a lake by trophic state is similar to assessing the amount of trees and vegetation in a forest (and the nutrients available in the soils).
- Trophic state refers to the biological productivity of a waterbody.

**Suggested Resources:**

The following are available on the resource page of our website – <http://plants.ifas.ufl.edu/education>

- *Trophic State: A Waterbody's Ability to Support Plants, Fish and Wildlife* (pdf)
- *A Beginner's Guide to Water Management – the ABCs* (Florida LAKEWATCH Information Circular 101)



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### Part 2 – Specifics about the trophic state classification system and the four water quality indicators used to determine trophic state (slides 16 – 33)

**Keywords:** eutrophic, hypereutrophic, mesotrophic, oligotrophic, parameters, Secchi disk, total chlorophyll, total nitrogen, total phosphorus, water clarity

**Key Points:**

- There are four basic categories in the trophic state classification system and they can be defined using the root words oligo-, meso-, eu- and hypereu-.
- Four main parameters are used to determine trophic state (biological productivity) in freshwater systems: total chlorophyll, total phosphorus, total nitrogen and water clarity.

**Suggested Resources:**

The following are available on the resource page of our website – <http://plants.ifas.ufl.edu/education>

- Trophic State Classification Table
- *A Beginner's Guide to Water Management – Water Clarity* (Florida LAKEWATCH Info Circ 103)
- *A Beginner's Guide to Water Management – Nutrients* (Florida LAKEWATCH Info Circ 102)

### Part 3 – Why is trophic state important? (slides 34-46)

**Keywords:** algae, bottom sediment, food web, human-induced, land use changes, microscopic, natural, planktonic algae, storm water, zooplankton

**Key Points:**

- Becoming familiar with the trophic state of a waterbody tells us how much biological productivity to expect.
- Monitoring trophic state also helps determine if it's changing from natural or human-induced influences

**Suggested Resources:**

- *A Beginner's Guide to Water Management – Fish Communities and Trophic State in Florida Lakes* (Florida LAKEWATCH Info Circ 110)

### Part 4 – Large plants (macrophytes) are an important part of Florida's unique freshwater ecosystems and can influence trophic state. (slides 47- 66)

**Keywords:** aquatic, ecosystem, emersed plants, floating plants, floating-leaved plants, invasive plants, macrophytes, non-native plants, periphytic algae, submersed plants

**Key Points:**

- Florida lakes and ponds tend to be shallow. When combined with our warm climate, it results in an abundance of algae and aquatic plants (macrophytes).
- Like algae, macrophytes are a major influence on the trophic state (biological productivity) of lakes.
- Invasive aquatic plants can create an OVER-abundance of plant life and cause serious problems; they can even fool us into misinterpreting the trophic state of a lake.
- The more we know about our freshwater lakes, the more we'll be able to make better management decisions and help resolve potential user conflicts.

**Suggested Resources** (available on resource page of our website – <http://plants.ifas.ufl.edu/education>):

- *A Beginner's Guide to Water Management – Aquatic Plants in Florida Lakes* (FL LAKEWATCH Info Circular 111, Oct 2007)





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## Background Information

Many of the suggested resources for this Module were produced by Florida LAKEWATCH, one of the largest volunteer water monitoring programs in the country. LAKEWATCH is a program of the University of Florida/IFAS, Fisheries and Aquatic Sciences. For more information: <http://lakewatch.ifas.ufl.edu>.

The following is an excerpt from A Beginner's Guide to Water Management – Fish Communities and Trophic State in Florida Lakes (Florida LAKEWATCH Information Circular 110).

Trophic status is defined as “the degree of biological productivity of a waterbody.” Scientists debate exactly what is meant by biological productivity but generally it relates to the amount of algae, aquatic macrophytes, fish and wildlife a waterbody can produce and sustain.

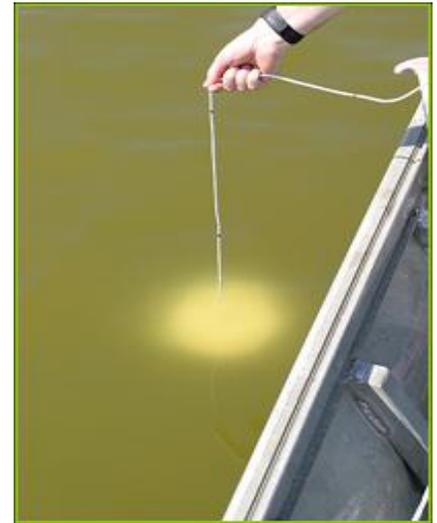
Waterbodies are traditionally classified into four groups according to their level of biological productivity. The adjectives denoting each of these trophic states, from the lowest productivity level to the highest, are:

- oligotrophic
- mesotrophic
- eutrophic
- hypereutrophic

Aquatic scientists assess trophic state by using measurements of one or more of the following:

- total phosphorus concentrations in the water
- total nitrogen concentrations in the water
- total chlorophyll concentrations – a measure of free-floating algae in water
- water clarity, measured using a Secchi disc
- aquatic plant abundance

Florida LAKEWATCH scientists base trophic state classifications primarily on the amount of chlorophyll in water samples. Chlorophyll concentrations have been selected by LAKEWATCH as the most direct indicator of biological productivity, since the amount of algae actually being produced in a body of water is reflected in the amount of chlorophyll present. In addition, Florida LAKEWATCH professionals may modify their chlorophyll-based classifications by taking the aquatic macrophyte abundance into account.



**One of the most commonly used measurements for water clarity is Secchi disk depth** (pronounced SEHK-kee).

The Secchi disk is a simple and inexpensive device used by both citizens and scientists for measuring water clarity.

The device generally consists of a 20-centimeter (8-inch) disk made of wood or plastic. Some are painted with alternating black and white quadrants, or they can be solid white. A non-stretching piece of rope or light chain is attached through the center; the rope is marked in increments of feet or meters. A small weight is attached beneath the disk so that it will sink quickly and the line will remain taut while measurements are being made.

The disk is lowered below the surface until it just disappears from view; that depth is referred to as the Secchi disk depth.





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### **Oxygen and Biological Productivity**

Over the years, there has been extensive research conducted to document the relationship between the biological productivity of a lake and the amount of oxygen in the water. As a result, there are a few generalizations that can be made. For example, oligotrophic lakes seem to experience relatively small changes in oxygen concentrations over a 24-hour period. This can be attributed to the fact that lakes with low productivity experience less photosynthetic activity and also less respiration, due to the smaller number of aquatic organisms within the waterbody. On the other end of the spectrum, more productive waterbodies, such as eutrophic and hypereutrophic lakes, have been found to experience large fluctuations in oxygen concentrations over a 24-hour period.

This can be explained by the fact that lakes with lots of aquatic plants and animals tend to experience high levels of photosynthetic activity and respiration; there is lot more going on within the system. These waterbodies also happen to have the greatest potential for oxygen-related problems.

The take home message from this Module: Lake science helps us understand and protect our unique aquatic resources and wildlife. For more information, see:

- *Trophic State: A Waterbody's Ability to Support Plants, Fish and Wildlife* (Florida LAKEWATCH pamphlet)
- *A Beginners Guide to Water Management — Oxygen and Temperature* (Florida LAKEWATCH Information Circular 109 1<sup>st</sup> Edition / 2004)
- *A Beginner's Guide to Water Management – Aquatic Plants in Florida Lakes* (FL LAKEWATCH Information Circular 111, Oct 2007)
- *Florida LAKEWATCH Data – What Does it all Mean?* (Florida LAKWATCH pamphlet)





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### Next Generation Sunshine State Standards

**Note:** The standards listed in *italics>* are touched on briefly and can be more fully developed by the teacher.

#### 6<sup>th</sup> Grade

SC.6.L.15.1: Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.

#### 7<sup>th</sup> Grade

SC.7.E.6.6: Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.

SC.7.L.17.1: Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.

SC.7.L.17.3: Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.

#### 8<sup>th</sup> Grade

SS.8.A.1.2: Analyze charts, graphs, maps, photographs and timelines; analyze political cartoons; determine cause and effect.

SS.8.G.5.1: Describe human dependence on physical environment and natural resources to satisfy basic needs in local environments in US

SS.8.G.5.2: Describe impact of human modifications on physical environment and ecosystems of the United States throughout history.

#### 9<sup>th</sup> - 12<sup>th</sup> Grades

SC.912.L.14.53: Discuss basic classification and characteristics of plants. Identify bryophytes, pteridophytes, gymnosperms, angiosperms.

SC.912.L.17.2: Explain general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, temperature.

SC.912.L.17.5: Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.

SC.912.L.17.8: Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.

SC.912.L.17.9: Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.

SC.912.L.17.20: Predict impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

SS.912.G.5.4: Analyze case studies of how humans impact the diversity and productivity of ecosystems.

## Common Core State Standards

#### 6<sup>th</sup> Grade

| Common Core Code | FL Common Core Code | Common Core Standard  |
|------------------|---------------------|---|
| RI.6.1           | LAFS.6.RI.1.1       | Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.   |
| RI.6.2           | LAFS.6.RI.1.2       | Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.             |
| RI.6.4           | LAFS.6.RI.2.4       | Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.   |
| RI.6.10          | LAFS.6.RI.4.10      | By the end of the year, read and comprehend literary nonfiction in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range. |
| W.6.2d           | LAFS.6.W.1.2d       | Use precise language and domain-specific vocabulary to inform about or explain topic.   |
| W.6.9            | LAFS.6.W.3.9        | Draw evidence from literary or informational texts to support analysis, reflection, and research.   |



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|             |                   |   |
|-------------|-------------------|---|
| W.6.9b      | LAFS.6.W.3.9b     | Apply grade 6 Reading standards to literary nonfiction (e.g., “Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not”).  |
| SL.6.1      | LAFS.6.SL.1.1     | Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others’ ideas and expressing their own clearly. |
| SL.6.1c     | LAFS.6.SL.1.1c    | Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion.  |
| SL.6.2      | LAFS.6.SL.1.2     | Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.  |
| L.6.3       | LAFS.6.L.2.3      | Use knowledge of language and its conventions when writing, speaking, reading, or listening.  |
| L.6.4       | LAFS.6.L.3.4      | Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 6 reading and content, choosing flexibly from a range of strategies.  |
| L.6.4a      | LAFS.6.L.3.4a     | Use context (e.g., the overall meaning of a sentence or paragraph; a word’s position or function in a sentence) as a clue to the meaning of a word or phrase.   |
| L.6.4b      | LAFS.6.L.3.4b     | Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., audience, auditory, audible).   |
| L.6.4c      | LAFS.6.L.3.4c     | Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech.                   |
| L.6.6       | LAFS.6.L.3.6      | Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.                |
| RST.6-8.1   | LAFS.68.RST.1.1   | Cite specific textual evidence to support analysis of science and technical texts.  |
| RST.6-8.2   | LAFS.68.RST.1.2   | Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.  |
| RST.6-8.4   | LAFS.68.RST.2.4   | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.                            |
| RST.6-8.7   | LAFS.68.RST.3.7   | Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).                                 |
| RST.6-8.8   | LAFS.68.RST.3.8   | Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.   |
| RST.6-8.10  | LAFS.68.RST.4.10  | By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.   |
| WHST.6-8.2d | LAFS.68.WHST.1.2d | Use precise language and domain-specific vocabulary to inform about or explain topic.   |
| WHST.6-8.9  | LAFS.68.WHST.3.9  | Draw evidence from informational texts to support analysis reflection, and research.  |

## 7<sup>th</sup> Grade

|         |                |  |
|---------|----------------|--|
| RI.7.1  | LAFS.7.RI.1.1  | Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.  |
| RI.7.4  | LAFS.7.RI.2.4  | Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.  |
| RI.7.10 | LAFS.7.RI.4.10 | By the end of the year, read and comprehend literary nonfiction in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.  |
| W.7.2d  | LAFS.7.W.1.2d  | Use precise language and domain-specific vocabulary to inform about or explain the topic.  |
| W.7.9   | LAFS.7.W.3.9   | Draw evidence from literary or informational texts to support analysis, reflection, and research.  |
| W.7.9b  | LAFS.7.W.3.9b  | Apply grade 7 Reading standards to literary nonfiction (e.g. “Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims”). |



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|             |                   |   |
|-------------|-------------------|---|
| SL.7.1      | LAFS.7.SL.1.1     | Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.       |
| SL.7.1c     | LAFS.7.SL.1.1c    | Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.  |
| L.7.3       | LAFS.7.L.2.3      | Use knowledge of language and its conventions when writing, speaking, reading, or listening.  |
| L.7.4       | LAFS.7.L.3.4      | Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 7 reading and content, choosing flexibly from a range of strategies.  |
| L.7.4a      | LAFS.7.L.3.4a     | Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.   |
| L.7.4b      | LAFS.7.L.3.4b     | Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., belligerent, bellicose, rebel).   |
| L.7.4c      | LAFS.7.L.3.4c     | Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech. |
| L.7.6       | LAFS.7.L.3.6      | Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.                      |
| RST.6-8.1   | LAFS.68.RST.1.1   | Cite specific textual evidence to support analysis of science and technical texts.  |
| RST.6-8.2   | LAFS.68.RST.1.2   | Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.  |
| RST.6-8.4   | LAFS.68.RST.2.4   | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.                                  |
| RST.6-8.7   | LAFS.68.RST.3.7   | Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).                                       |
| RST.6-8.8   | LAFS.68.RST.3.8   | Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.   |
| RST.6-8.10  | LAFS.68.RST.4.10  | By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.   |
| WHST.6-8.2d | LAFS.68.WHST.1.2d | Use precise language and domain-specific vocabulary to inform about or explain topic.   |
| WHST.6-8.9  | LAFS.68.WHST.3.9  | Draw evidence from informational texts to support analysis, reflection, and research.   |

### 8<sup>th</sup> Grade

|         |                |   |
|---------|----------------|---|
| RI.8.1  | LAFS.8.RI.1.1  | Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.   |
| RI.8.4  | LAFS.8.RI.2.4  | Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.                         |
| RI.8.10 | LAFS.8.RI.4.10 | By the end of the year, read and comprehend literary nonfiction at the high end of the grades 6–8 text complexity band independently and proficiently.  |
| W.8.2d  | LAFS.8.W.1.2d  | Use precise language and domain-specific vocabulary to inform about or explain topic.   |
| W.8.9   | LAFS.8.W.3.9   | Draw evidence from literary or informational texts to support analysis, reflection, and research.   |
| W.8.9b  | LAFS.8.W.3.9b  | Apply grade 8 Reading standards to literary nonfiction (e.g., "Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced"). |
| SL.8.1  | LAFS.8.SL.1.1  | Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.   |
| SL.8.1c | LAFS.8.SL.1.1c | Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.  |
| L.8.3   | LAFS.8.L.2.3   | Use knowledge of language and its conventions when writing, speaking, reading, or listening.  |



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Page 8 of 11

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|-------------|-------------------|---|
| L.8.4       | LAFS.8.L.3.4      | Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, choosing flexibly from a range of strategies.   |
| L.8.4a      | LAFS.8.L.3.4a     | Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.   |
| L.8.4b      | LAFS.8.L.3.4b     | Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., precede, recede, secede).   |
| L.8.4c      | LAFS.8.L.3.4c     | Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech. |
| L.8.6       | LAFS.8.L.3.6      | Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.                      |
| RST.6-8.1   | LAFS.68.RST.1.1   | Cite specific textual evidence to support analysis of science and technical texts.  |
| RST.6-8.2   | LAFS.68.RST.1.2   | Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.  |
| RST.6-8.4   | LAFS.68.RST.2.4   | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.                                  |
| RST.6-8.7   | LAFS.68.RST.3.7   | Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).                                       |
| RST.6-8.8   | LAFS.68.RST.3.8   | Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.   |
| RST.6-8.10  | LAFS.68.RST.4.10  | By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.   |
| WHST.6-8.2d | LAFS.68.WHST.1.2d | Use precise language and domain-specific vocabulary to inform about or explain topic.   |
| WHST.6-8.9  | LAFS.68.WHST.3.9  | Draw evidence from informational texts to support analysis reflection, and research.  |

### 9<sup>th</sup> – 10<sup>th</sup> Grade

|            |                  |   |
|------------|------------------|---|
| RI.9-10.1  | LAFS.910.RI.1.1  | Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.   |
| RI.9-10.4  | LAFS.910.RI.2.4  | Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).  |
| RI.9-10.10 | LAFS.910.RI.4.10 | By the end of grade 9, read and comprehend literary nonfiction in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 10, read and comprehend literary nonfiction at the high end of the grades 9–10 text complexity band independently and proficiently. |
| W.9-10.2d  | LAFS.910.W.1.2d  | Use precise language and domain-specific vocabulary to manage the complexity of topic.  |
| W.9-10.9   | LAFS.910.W.3.9   | Draw evidence from literary or informational texts to support analysis, reflection, and research.   |
| W.9-10.9b  | LAFS.910.W.3.9b  | Apply grades 9–10 Reading standards to literary nonfiction (e.g., “Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning”).   |
| SL.9-10.1  | LAFS.910.SL.1.1  | Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.  |
| SL.9-10.1c | LAFS.910.SL.1.1c | Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.  |
| L.9-10.3   | LAFS.910.L.2.3   | Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.   |



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## Module 4 Viva la Difference! (MS/HS)

# Teacher Guide – Viva la Difference Audio-Visual Presentation



Audio-visual presentation and all related activities, including answer keys with NG SSS, can be found on this website:  
<http://plants.ifas.ufl.edu/education>

|              |                    |  |
|--------------|--------------------|--|
| L.9-10.4     | LAFS.910.L.3.4     | Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, choosing flexibly from a range of strategies.   |
| L.9-10.4a    | LAFS.910.L.3.4a    | Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.   |
| L.9-10.4b    | LAFS.910.L.3.4b    | Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., analyze, analysis, analytical; advocate, advocacy).   |
| L.9-10.4c    | LAFS.910.L.3.4c    | Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology.  |
| L.9-10.6     | LAFS.910.L.3.6     | Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression |
| RST.9-10.1   | LAFS.910.RST.1.1   | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.   |
| RST.9-10.4   | LAFS.910.RST.2.4   | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.  |
| RST.9-10.7   | LAFS.910.RST.3.7   | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.   |
| RST.9-10.8   | LAFS.910.RST.3.8   | Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.  |
| RST.9-10.10  | LAFS.910.RST.4.10  | By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently   |
| WHST.9-10.2d | LAFS.910.WHST.1.2d | Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.  |
| WHST.9-10.9  | LAFS.910.WHST.3.9  | Draw evidence from informational texts to support analysis, reflection, and research.  |

### 11<sup>th</sup> – 12<sup>th</sup> Grade

|             |                   |  |
|-------------|-------------------|--|
| RI.11-12.1  | LAFS.1112.RI.1.1  | Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.   |
| RI.11-12.4  | LAFS.1112.RI.2.4  | Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).  |
| RI.11-12.10 | LAFS.1112.RI.4.10 | By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11–CCR text complexity band independently and proficiently. |
| W.11-12.2d  | LAFS.1112.W.1.2d  | Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.  |
| SL.11-12.1  | LAFS.1112.SL.1.1  | Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.  |
| SL.11-12.1c | LAFS.1112.SL.1.1c | Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.  |
| L.11-12.3   | LAFS.1112.L.2.3   | Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.  |



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Page 10 of 11

Module 4 Viva la Difference! (MS/HS)

**Teacher Guide – Viva la Difference Audio-Visual Presentation**



Audio-visual presentation and all related activities, including answer keys with NG SSS, can be found on this website:  
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|               |                     |   |
|---------------|---------------------|---|
| L.11-12.4     | LAFS.1112.L.3.4     | Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, choosing flexibly from a range of strategies.   |
| L.11-12.4a    | LAFS.1112.L.3.4a    | Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.  |
| L.11-12.4b    | LAFS.1112.L.3.4b    | Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., conceive, conception, conceivable).  |
| L.11-12.4c    | LAFS.1112.L.3.4c    | Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage.   |
| L.11-12.6     | LAFS.1112.L.3.6     | Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. |
| RST.11-12.1   | LAFS.1112.RST.1.1   | Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.  |
| RST.11-12.4   | LAFS.1112.RST.2.4   | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.  |
| RST.11-12.7   | LAFS.1112.RST.3.7   | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.   |
| RST.11-12.10  | LAFS.1112.RST.4.10  | By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.  |
| WHST.11-12.2d | LAFS.1112.WHST.1.2d | Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.  |
| WHST.11-12.9  | LAFS.1112.WHST.3.9  | Draw evidence from informational texts to support analysis, reflection, and research.   |



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