Teacher Guide – Concept Map Activity

ESSENTIAL QUESTIONS: If asked to "map" the main concepts and ideas from the presentation, *Why Manage Invasive Plants?...*

1) How would you do it?
2) What would it look like?
3) How could this activity be useful to you?

SUBJECT: Botany**,** Biology, Environmental Science, Life Science, Integrated Science

GRADE LEVEL: MS/HS

CONCEPTS: A "**concept map"** is a visual representation of relationships among concepts and/or main ideas, used for organizing and understanding knowledge and relationships between concepts. These diagrams usually include brief blocks of text that describe the concepts and/or ideas, enclosed in circles or boxes of some type; and connecting lines illustrating and linking the relationships between important concepts.

TIME ESTIMATE: 60 minutes total

LEARNING STYLES: visual, auditory, kinesthetic

VOCABULARY: Refer to the Module Guide for DVD presentation*, Why Manage Invasive Plants?*

LESSON SUMMARY: While prevention is the best way to keep invasive plants out of Florida's natural areas, there are already a number of non-native, invasive plant species (i.e., more than 100 plant species) that have been introduced and require constant management to protect our native habitats as well as keep our waterways, bridges and flood control devices working properly. A cartoon character, Otto P. Stump-Jumper, a plant management specialist, takes viewers on a brief tour of the situation in Florida. Viewers find out what it means to 'manage' plants and the reasons why we need to do so along with information on the techniques being used today, which are based on years of research and testing. After watching the presentation, students will be challenged to summarize what they've learned by creating/drawing concept maps.

Students may work together in small groups or individually.

STUDENT LEARNING OBJECTIVES: Students will be able to:

- Identify important key points from a reading passage and/or presentation..
- Organize and connect key ideas and concepts from a presentation, text or other material. Demonstrate ability to use visual techniques to explore the relationships between the main concepts of a lesson/presentation/text.

MATERIALS:

- Paper and pencil (Legal size paper or 11" x 17" paper works best)
- Post-it notes or index cards. *(Note: Using small Post-it notes encourages students to think in terms of "key words" or "key phrases." Also, they work well for concept maps because they can be moved easily as students look for patterns.)*
- Smart board or overhead projector would be helpful to illustrate how to do a concept map.

ADVANCE PREPARATION:
Prepare computer connection for projection (i.e., online viewing) of *Why Manage Invasive Plants?* http://plants.ifas.ufl.edu/education . *Note: Or obtain DVD disk with Why Manage Invasive Plants? Presentation, as PowerPoint™ show, available by contacting the UF/IFAS Center for Aquatic and Invasive Plants: caip-education@ufl.edu)*

PROCEDURE AND DISCUSSION QUESTIONS WITH TIME ESTIMATES:

1. Watch the presentation, ***Why Manage Invasive Plants?*** (Viewing time: 25 minutes with 10 minutes of discussion).

2. Discuss the idea of using a "map" to organize key concepts either from the presentation (or other lessons/reading materials, etc,). Practice creating a concept map with the class. Estimated time: 10 minutes.

3. Ask students to write the ideas/concepts they remember from the presentation on Post-it notes (or index cards). Each idea/concept should be written individually on each note/card.

4. Ask students to arrange their notes with key concepts along the left side of their paper, with the most general ideas at the top and the most specific details at the bottom. *(Note: This process works differently depending on learning style, etc; some students will have a range of general concepts to specific details. Others will find they have mostly general ideas/concepts on their notes.)*

5. Ask students to rearrange their notes, if necessary, grouping the ideas/concepts in a way that makes sense to them. Refer to sample sheet. *(At this point, you may ask students to share with the rest of the class. Students will discover that each map is quite different. This helps emphasize the point that there isn't a "right" or "wrong" way to build a concept map because each student is constructing his or her own meaning from the process. In addition, individual student understanding of the relationships between concepts will change as the maps change.)*

6. Draw lines between the Post-it notes to show how the ideas/concepts on the Post-it notes are related. Write connecting sentences on the lines that explain the relationships between the ideas/concepts on the Post-it notes. These connections create meaning.

7. Instruct students to share their concept maps with their classmates. Discuss how this process could be used to help writers organize information, map out essays, or plan for a presentation they might give themselves.

ASSESSMENT SUGGESTIONS: The activity may be used to assess students' comprehension of various learning materials. However, you could follow up the activity with the following questions, to be turned in with the concept map:

- What surprised you the most about the process of completing your concept map?
- How could you use this process to help you in your other classes?
- Why do you think each student's map is different?

EXTENSIONS: Practice this activity with each of these Modules or other materials you are covering.

LITERATURE:

- Novak , Joseph D and D. Bob Gowen. *Learning How to Learn.* Cambridge University Press. 1984
- Ditson, Leslie A., Kessler, Anderson-Inma and Mafit. *Concept-Mapping Companion, 2nd Edition.* ISTE. 2001
- Margulies, Nancy and Maal Nusa. *Mapping Inner Space: Learning and Teaching Visual Mapping.* Zephyr Press. 2002

RESOURCES/REFERENCES:

- See Section 1 in http://plants.ifas.ufl.edu/manage for information on native and non-native aquatic plants
- See Section 2 in http://plants.ifas.ufl.edu/manage for information on dissolved oxygen and photosynthesis
- Florida LAKEWATCH Information Circular 109: http://lakewatch.ifas.ufl.edu/circpdffolder/Circ109_OxygenTemp.pdf
- Dissolved Oxygen for Fish Production: http://edis.ifas.ufl.edu/FA002

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BACKGROUND INFORMATION:

From http://en.wikipedia.org/wiki/Concept_map:

A concept map is a way of representing relationships between ideas, images or words, in the same way that a sentence diagram represents the grammar of a sentence; or a road map for the locations of highways and towns; or a circuit diagram for the workings of an electrical appliance. In a concept map, each word or phrase is connected to another and can be linked back to the original idea, word or phrase. Concept maps are a way to develop logical thinking and study skills, by revealing connections and helping students see how individual ideas form a larger whole concept.

History: The technique of concept mapping was developed by Joseph D. Novak and his research team at Cornell University in the 1970s as a means of representing the emerging science knowledge of students. It has subsequently been used as a tool to increase meaningful learning in other subjects as well as to represent the expert knowledge of individuals and teams in education, government and business. Concept maps have their origin in the learning movement called constructivism. In particular, constructivists hold that learners actively construct knowledge. Novak's work is based on the cognitive theories of David Ausubel (assimilation theory), who stressed the importance of prior knowledge in being able to learn new concepts: "The most important single factor influencing learning is what the learner already knows. Ascertain this and teach accordingly." Novak taught students as young as six years old to make concept maps to represent their response to focus questions such as "What is water?" "What causes the seasons?" In his book *Learning How to Learn*, Novak states that "meaningful learning involves the assimilation of new concepts and propositions into existing cognitive structures."

For more information, see: The Theory Underlying Concept Maps and How to Construct and Use Them (Joseph D. Novak & Alberto J. Cañas). Florida Institute for Human and Machine Cognition; Pensacola FL, 32502 www.ihmc.us. http://cmap.ihmc.us/Publications/ResearchPapers/TheoryCmaps/TheoryUnderlyingConceptMaps.htm

The following is a list of suggested standards that pertain to this activity. This list is provided as a reference to incorporate and expand upon as needed.

Next Generation Sunshine State Standards

4th grade
SC.4.E.6.6: Identify resources available in Florida (water, phosphate, oil, limestone, silicon, wind, and solar energy).
SC.4.L.17.4: Recognize ways plants and animals, including humans, can impact the environment.
SS.4.A.4.1: Explain the effects of technological advances on Florida.
SS.4.C.2.1: Discuss public issues in Florida that impact the daily lives of its citizens.
SS.4.C.2.2: Identify ways citizens work together to influence government and help solve community and state problems.
SS.4.G.1.1: Identify physical features of Florida.

5th grade
SC.5.L.15.1: Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.
SC.5.L.17.1: Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

7th grade
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.
SS.7.C.2.3: Experience the responsibilities of citizens at the local, state, or federal levels.
SS.7.C.2.13: Examine multiple perspectives on public and current issues.

8th grade
SC.8.N.4.1: Explain that science is one of the processes that can be used to inform decision making at the community, state, national and international levels.

9th-12th grade
SC.912.L.17.2: Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.
SC.912.L.17.6: Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.
SC.912.L.17.20: Predict impact of individuals on environmental systems; examine how human lifestyles affect sustainability.
SS.912.C.2.3: Experience the responsibilities of citizens at the local, state, or federal levels.
SS.912.C.2.4: Evaluate, take, and defend positions on issues that cause the government to balance the interests of individuals with the public good.
SS.912.C.2.8: Analyze the impact of citizen participation as a means of achieving political and social change.
SS.912.G.5.6: Analyze case studies to predict how a change to an environmental factor can affect an ecosystem.

Common Core State Standards

6th Grade

Common Core Code	FL Common Core Code	Common Core Standard
W.6.2d	LAFS.6.W.1.2d	Use precise language and domain-specific vocabulary to inform about or explain the topic.
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.6.1d	LAFS.6.SL.1.1d	Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.
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.6.6	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.6-8.4	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.6-8.9	LAFS.68.RST.3.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
WHST.6-8.2b	LAFS.68.WHST.1.2b	Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

7th Grade

W.7.2d	LAFS.7.W.1.2d	Use precise language and domain-specific vocabulary to inform about or explain the topic.
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.7.2	LAFS.7.SL.1.2	Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
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.6-8.4	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.6-8.9	LAFS.68.RST.3.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

8th Grade

W.8.2d	LAFS.8.W.1.2d	Use precise language and domain-specific vocabulary to inform about or explain the topic.
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.
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.6-8.9	LAFS.68.RST.3.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

9th – 10th Grade

W.9-10.2b	LAFS.910.W.1.2b	Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
W.9-10.2d	LAFS.910.W.1.2d	Use precise language and domain-specific vocabulary to manage the complexity of the topic.
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.
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.
WHST.9-10.2b	LAFS.910.WHST.1.2b	Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
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.9-10.4	LAFS.910.WHST.2.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

11th and 12th Grade

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.
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.11-12.2	LAFS.1112.RST.1.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
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.11-12.5	LAFS.1112.RST.2.5	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
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.
WHST.11-12.2a	LAFS.1112.WHST.1.2a	Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
WHST.11-12.2b	LAFS.1112.WHST.1.2b	Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.