

Module: Reading

Lesson Title: Understanding and Using Multiple Meaning Words: A Three-Part Lesson

Standards

Florida Adult Basic Education Reading Standards	Level Expectation
Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. (CCR.LA.ABE.4)	<p>NRS Level 4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases, choosing flexibly from a range of strategies.</p> <p>a) 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.</p> <p>b) Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., <i>audience, auditory, audible</i>).</p> <p>c) 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.</p> <p>d) Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary). CCRS.LA.ABE.4.4)</p>

Interpreting the Standard

1 Standards	2 Skills Included in the Standard	3 Concepts Included in the Standard	4 Through a Particular Context	5 Cognitive Demand/ Levels of Thinking	6 Sample Activity
Determine or clarify the meaning of unknown and multiple-meaning words and phrases, choosing flexibly from a range of strategies. (CCR.LA.ABE.4) a) Use context (e.g., the overall meaning of a sentence or paragraph; a word’s position or function in a sentence) as a clue	determine choose use	multiple meanings strategies for multiple meaning words context clues	sample applications riddles informational text	DOK 1 DOK 2 DOK 3/4	Have students use the dictionary to define multiple meaning words and respond to riddles using multiple meaning words. Have students create “nonsense” words using Greek and Latin roots and explain

1 Standards	2 Skills Included in the Standard	3 Concepts Included in the Standard	4 Through a Particular Context	5 Cognitive Demand/ Levels of Thinking	6 Sample Activity
<p>to the meaning of a word or phrase. b) Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., <i>audience, auditory, audible</i>). c) 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. d) Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary). (CCR.LA.ABE.4)</p>	<p>use</p> <p>consult</p> <p>determine/ clarify</p> <p>verify</p>	<p>Greek or Latin affixes and roots</p> <p>reference materials</p> <p>word meaning</p> <p>word meaning</p>		<p>DOK 2</p>	<p>the process leading up to the final product. Have students delineate the process of using context clues to define multiple meaning words.</p> <p>Create a concept map (word tree) for words derived from the same Greek or Latin root.</p>

Objectives of the Lesson

Students will:

- Use numerous word strategies as well as context clue strategies to define multiple meaning words.
- Use common roots and word parts derived from Greek and Latin to analyze the meanings of complex words.

Materials

- PowerPoint: What Are Multiple Meaning Words?
- PowerPoint: Using Clues To Determine the Meaning of Multiple Meaning Words
- Teacher Handout: Multiple Meaning Resource List for Teachers

- Student Handout: Common Latin Roots Chart
 - Student Handout: Common Greek Roots Chart
 - Student Handout: Common Prefixes Chart” (optional)
 - Student Handout: Common Suffixes Chart” (optional)
 - Student Handout: Word Tree Concept Map (optional)
 - Student Handout: Vocabulary Template
 - Student Handout: *Newsela* Articles
 - Grade Level 4: Scientists are trying to learn more about changes in the ocean
 - Grade Level 5: Scientists are trying to learn more about changes in the ocean
 - Grade Level 7: Researchers seek to better understand migratory patterns of blacktip sharks
- NOTE: For classrooms with computers, students create a free Newsela account at <https://newsela.com> and access the above-mentioned articles under the “Science” category, rather than work off the handouts.*

Instructional Plan

Overview

Multiple meaning words have different meanings depending on how, where, and in what context the words are used. The ability to understand multiple meaning words helps students access important information in informational texts.

Process

PART 1/DAY 1:

WHOLE GROUP ACTIVITY: Understanding Multiple Meaning Words

1. Show students the PowerPoint: *What Are Multiple Meaning Words?*
 - a. This PowerPoint defines “multiple meaning words” and emphasizes differences within the category of multiple meanings to include the following: different capitalization, different punctuation, different parts of speech, different tenses, and different degrees (literal vs. figurative). The PowerPoint also provides examples of usage/application of multiple meaning words.
 - b. Show students the video clip embedded in the PowerPoint which emphasizes the use of the dictionary when working with multiple meaning words.
 - c. There is a brief informal assessment/practice activity where students apply what they’ve learned by solving riddles featuring multiple meaning words. The three slides facilitate application of the gradual release model.

SMALL GROUP ACTIVITY: Exploring Words with Multiple Meanings

2. Divide students into groups. You may want to mix the groups up to include students at varying ability levels. Advise students that they will be using the dictionary (print or online) in order to look up various definitions of the provided multiple meaning words.
 - a. Allow a total of 20-30 minutes for this activity. Inform students that they will be allowed 5 minutes to find as many definitions as possible for each multiple meaning word. Select the words from the teacher resource: *Multiple Meaning Resource List for Teachers*.
 - b. Once the 5 minutes are up, have the groups share the definitions that they were able to find for the multiple meaning words. The group with the most definitions wins a point.

PART 2/DAY 2:

WHOLE GROUP ACTIVITY: Understanding Multiple Meaning Words

3. Now that students have had an introduction to multiple meaning words, it's time to provide them with strategies on how to identify Greek and Latin roots in words so that they are able to derive their meanings. Play the PowerPoint: *Using Greek & Latin Roots To Derive Word Meaning*.
 - a. This PowerPoint emphasizes the application of numerous strategies including context clues in order to determine the definition of multiple meaning words.
 - b. Types of strategies and context clues covered in this PowerPoint include the following: (1) learning the most common meaning, (2) using parts of speech to provide clues, (3) remembering multiple meaning words, (4) using synonym context clues, (5) using symbolism as a clue, (6) understanding homophones, (7) and understanding homographs.
 - c. There is a brief informal assessment/practice activity where students apply what they've learned by identifying and discussing the multiple meanings of words in the provided examples.

SMALL GROUP ACTIVITY: Exploring Words with Multiple Meanings

4. Assign students to work in small groups. You will want to ensure that you group students by varying ability levels for this activity. Advise students that they will be participating in a fun activity which will consist of creating nonsense words using Latin and Greek roots.
 - a. Provide students with the handouts: *Common Latin Roots Chart* and *Common Greek Roots Chart*.
 - b. Advise them that they will be creating "nonsense" words using Latin and Greek roots.
 - c. Provide students with the following examples"
 - The Greek root "dyna" means "power."
 - The Greek root "graph" means "writing."
 - The Greek root "logy" means "study of."
 - The newly created nonsense word "dynagraphology" means "the study of powerful writing."
 - d. Each group must create at least one nonsense word.
 - e. At the end of the activity, the groups will explain how they created their nonsense words and what the word means.

PART 3/DAY 3:

WHOLE GROUP ACTIVITY: Understanding Multiple Meaning Words

5. Now that students have a basic understanding of multiple meaning words, it's time to provide them with strategies that will help them define these words. Play the PowerPoint: *Using Clues to Determine the Meaning of Multiple Meaning Words*.
 - a. This PowerPoint emphasizes the application of numerous strategies including context clues in order to determine the definition of multiple meaning words.
 - b. Types of strategies and context clues covered in this PowerPoint include the following: (1) learning the most common meaning, (2) using parts of speech to provide clues, (3) remembering multiple meaning words, (4) using synonym context clues, (5) using symbolism as a clue, (6) understanding homophones, (7) and understanding homographs.

- c. There is a brief informal assessment/practice activity where students apply what they've learned by identifying and discussing the multiple meanings of words in the provided examples.

SMALL GROUP ACTIVITY: Exploring Words with Multiple Meanings

6. Assign students to work in small groups. You will want to ensure that you group students by ability. Advise students that they will be assigned to read a *Newse1a* article based on their Lexile reading level. Students will work together within their group to identify words that may be multiple meaning words.
 - a. Students read the article together and identify the multiple meaning words.
 - b. Each student in the group will take a word or two and will create a Frayer vocabulary model using the provided student handout.
 - c. Conduct an open discussion after all groups have completed this activity so that students may reflect on the clues used to determine the meanings of the unfamiliar words.

Sample Debriefing Questions

- How can a reader determine the correct meaning of a word that has more than one meaning?
- Why would a reader need specific skills in order to determine the meaning of words with multiple meanings?
- How can you use context clues to determine the meanings of words with multiple meanings?
- How can you apply knowledge of Greek and Latin roots in order to define new words?

Modifications for Different Levels

The above activities provide opportunities for grouping students by ability as well as opportunities for creating mixed ability groups.

Assessments/Extensions

PART 1/DAY 1:

1. There is an informal assessment activity embedded in the PowerPoint: *What Are Multiple Meaning Words?*
2. Students will be assessed for successful completion of the designated small group activity for this day.

PART 2/DAY 2:

3. There is a brief informal assessment/practice activity where students apply what they've learned by identifying and discussing the multiple meanings of words in the examples provided in the PowerPoint: *Using Greek & Latin Roots to Derive Word Meaning.*
4. As an extension activity, the teacher can assign each student a root or two and have him/her create a word tree. These can later be used to create a word wall in the classroom in order to reinforce learning. Students may use the provided handout *Word Tree Concept Map* to complete this activity.

PART 3/DAY 3:

5. The Frayer vocabulary model created for this activity can serve as an assessment tool for student understanding and application of benchmark.

Common Greek Roots

Greek Root	Definition	Example
anthropo	man; human; humanity	anthropologist, philanthropy
auto	self	autobiography, automobile
bio	life	biology, biography
chron	time	chronological, chronic
dyna	power	dynamic, dynamite
dys	bad; hard; unlucky	dysfunctional, dyslexic
gram	thing written	epigram, telegram
graph	writing	graphic, phonograph
hetero	different	heteronym, heterogeneous
homo	same	homonym, homogenous
hydr	water	hydration, dehydrate
hyper	over; above; beyond	hyperactive, hyperbole
hypo	below; beneath	hypothermia, hypothetical
logy	study of	biology, psychology
meter/metr	measure	thermometer, perimeter
micro	small	microbe, microscope
mis/miso	hate	misanthrope, misogyny
mono	one	monologue, monotonous
morph	form; shape	morphology, morphing
nym	name	antonym, synonym
phil	love	philanthropist, philosophy
phobia	fear	claustrophobia, phobic
photo/phos	light	photograph, phosphorous
pseudo	false	pseudonym, pseudoscience
psycho	soul; spirit	psychology, psychic
scope	viewing instrument	microscope, telescope
techno	art; science; skill	technique, technological
tele	far off	television, telephone
therm	heat	thermal, thermometer

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Common Latin Roots

Latin Root	Definition	Example
ambi	both	ambiguous, ambidextrous
aqua	water	aquarium, aquamarine
aud	to hear	audience, audition
bene	good	benefactor, benevolent
cent	one hundred	century, percent
circum	around	circumference, circumstance
contra/counter	against	contradict, encounter
dict	to say	dictation, dictator
duc/duct	to lead	conduct, induce
fac	to do; to make	factory, manufacture
form	shape	conform, reform
fort	strength	fortitude, fortress
fract	break	fracture, fraction
ject	throw	projection, rejection
jud	judge	judicial, prejudice
mal	bad	malevolent, malefactor
mater	mother	maternal, maternity
mit	to send	transmit, admit
mort	death	mortal, mortician
multi	many	multimedia, multiple
pater	father	paternal, paternity
port	to carry	portable, transportation
rupt	to break	bankrupt, disruption
scrib/script	to write	inscription, prescribe
sect/sec	to cut	bisect, section
sent	to feel; to send	consent, resent
spect	to look	inspection, spectator
struct	to build	destruction, restructure
vid/vis	to see	televise, video
voc	voice; to call	vocalize, advocate

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Common Prefixes

Prefix	Definition	Example
anti-	against	anticlimax
de-	opposite	devalue
dis-	not; opposite of	discover
en-, em-	cause to	enact, empower
fore-	before; front of	foreshadow, forearm
In-, im-	in	income, impulse
in-, im-, il-, ir-	not	indirect, immoral, illiterate, irreverent
inter-	between; among	interrupt
mid-	middle	midfield
mis-	wrongly	misspell
non-	not	nonviolent
over-	over; too much	overeat
pre-	before	preview
re-	again	rewrite
semi-	half; partly; not fully	semifinal
sub-	Under	subway
super-	above; beyond	superhuman
trans-	across	transmit
un-	not; opposite of	unusual
under-	under; too little	underestimate

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Common Suffixes

Suffix	Definition	Example
-able, -ible	is; can be	affordable, sensible
-al, -ial	having characteristics of	universal, facial
-ed	past tense verbs; adjectives	the dog walked, the walked dog
-en	made of	golden
-er, -or	one who; person connected with	teacher, professor
-er	more	taller
-est	the most	tallest
-ful	full of	helpful
-ic	having characteristics of	poetic
-ing	verb forms; present participles	sleeping
-ion, -tion, -ation, -ition	act; process	submission, motion, Relation, edition
-ity, -ty	state of	activity, society
-ive, -ative, -itive	adjective form of noun	active, comparative, sensitive
-less	without	hopeless
-ly	how something is	lovely
-ment	state of being; act of	contentment
-ness	state of; condition of	openness
-ous, -eous, -ious	having qualities of	riotous, courageous, gracious
-s, -es	more than one	trains, trenches
-y	characterized by	gloomy

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MULTIPLE MEANING RESOURCE LIST FOR TEACHERS:

Resource: http://sb058.k12.sd.us/multiple%20meanings/multiple_meaning_answers.htm

Here are some examples of each of the multiple meaning words used as a noun and a verb. This list is taken from: http://sb058.k12.sd.us/multiple%20meanings/multiple_meaning_answers.htm

1. Attack: William had a heart attack. The army will attack the enemy.
2. Beach: Let's go to the beach. The whale will beach himself on the beach.
3. Bend: We went around a bend in the road. Don't bend the card.
4. Block: Jayden ran around the block. In football, you need to block.
5. Blossom: The blossom is a pretty pink. The flower will blossom soon.
6. Board: The man sawed a board. Board up the windows for the hurricane.
7. Bomb: A bomb blew up the federal building. We will bomb our enemies.
8. Bound: I am bound for California. The kidnapper bound the child with rope.
9. Bowl: Put the ingredients in the bowl. Gary will bowl tonight.
10. Break: The employee took a break. Dusty will try not to break his new toy.
11. Brush: I bought a hair brush. You should brush your teeth every day.
12. Burn: Terry got a 3rd degree burn on his arm. Tara will burn the candle.
13. Camp: Adam went to scout camp. We camp on weekends in our camper.
14. Chain: Put the chain around the tree. Chain Kassie up to the tree.
15. Color: Green is my favorite color. Tony will color in her coloring book.
16. Corner: The car went around the corner. The hyenas will corner the lion.
17. Course: I took a course on Spanish. I went to the golf course. Of course, I will go. I went through the obstacle course.
18. Court: The judge wanted order in his court. The team played basketball on the court. In the olden days, a man would court a woman.
19. Cover: Put the cover on the box. Please cover the meat so it won't spoil.
20. Crack: Open the window just a crack. Tam will crack the nuts.
21. Crash: I had a car crash. Tom will try not to crash into the pole.
22. Crowd: There was a crowd at the mall. Try not to crowd in line.
23. Crown: The queen is wearing her crown. The king will crown his son.
24. Cry: Mason heard the cry of the hawk. Riley will cry when his mom leaves.
25. Cure: I hope they find a cure for cancer. Can you cure my hiccups?
26. Cut: Bill has a cut on his finger. Tam will cut out the pictures.
27. Dance: The middle school will have a dance. I will dance the jitterbug.
28. Degree: I drew a 80 degree angle. I earned my college degree. It is 70 degrees outside.
29. Diet: I need to go on a diet. I diet by eating fruits and veggies.
30. Digest: My stomach will digest the meal I ate. I have to digest this information for my science test.
31. Disguises: The children wore their disguises to the costume party. He disguises himself by wearing a mask.
32. Display: I will display the clothes in the window. The display of hand painted eggs was in the art gallery.
33. Doctor: Kristen went to the doctor. The nurse will doctor your injury.
34. Dread: My dread of birds causes me problems. Marla dreads taking tests.
35. Dream: Last night I had a dream. Sometimes I dream about you.
36. Dress: Katie bought a new dress. Tina will dress her doll in a bathing suit.
37. Drill: Gary used a drill to make the hole. Can you drill a hole in this board?

38. Drug: Don't take drugs. The doctor will drug his patient before surgery.
39. Farm: We bought a farm. The farmer will farm 150 acres of corn.
40. Fence: They put a fence around the yard. The vet will fence in his back lot.
41. Field: The farmer planted his field. The 2nd baseman will field the ball.
42. Fight: There was a fight in the parking lot. He will fight for his life
43. Fire: We will build a fire and roast marshmallows. The boss will fire him.
44. Fish: Bill caught a 10 lb. Fish. He likes to fish for walleyes.
45. Fit: I feel physically fit. The 60 year old can still fit into her wedding dress.
46. Float: Missy made a root beer float. The duck can float on the water.
47. Flood: There was a flood, in Madison, in 1993. Every spring it floods.
48. Fool: What a fool he is for smoking. Jerry tried to fool his teacher.
49. Grave: I visited my grandma's grave. The man was in grave condition after the accident.
50. Grin: The model has a nice grin. Wipe that grin off your face.
51. Guard: The guard policed the prison. Guard your valuables on a trip.
52. Guess: My guess is 129 jellybeans. Guess how old I am?
53. Hammer: Tom bought a new hammer. Try to hammer the nail in the wood.
54. Harm: The tornado did a lot of harm. Smoking harms your lungs.
55. Help: Do you need any help? Katie will help you with math.
56. Hit: The boxer took a hit to the face. That house got hit by a tornado.
57. Hold: Grab a hold of the line. The mother will hold her baby to nurse.
58. Hope: Our hope is that you will get well. Adam hopes he will get a pickup.
59. Jerk: He is a real jerk. The fish will jerk your line.
60. Joke: The comedian told a joke. Don't joke about someone's health.
61. Junk: Katie likes to collect junk. I will junk this old bike.
62. Lasso: The cowboy used his lasso when herding the cattle. Cowboys lasso the baby calves for branding.
63. Light: Turn on the light. This candle will light our way.
64. List: Make a list of things you need at the store. Matt will list the items here.
65. Lounge: Look in the teacher's lounge. Can we lounge around today?
66. Love: My love for you grows every day. Tom and Tam love each other.
67. Map: Karrie bought a map of the USA. Now we can map out our trip.
68. Mark: You made a mark on the wall. Mark where you are in your book.
69. Master: Slaves worked for their master. Mason will master his numbers.
70. Might: He has a lot of power and might. I might go to the movies.
71. Minor: Kids under 18 are considered minors. I had a minor accident.
72. Mission: It was the army's mission to capture the terrorists. The monk slept at the mission.
73. Mistake: Everyone makes mistakes. People mistake me for Tam.
74. Name: What is your name? What will you name your baby?
75. Notice: Put the notice on the bulletin board. I notice you have a new dress.
76. Nursery: I took my child to the nursery at church. I bought a tree at the nursery.
77. Oil: Our car needs an oil change. Chad will oil his bike chain.
78. Pack: The wolf pack killed the zebra. Jeff has to pack his suitcase.
79. Paint: She chose was blue paint. Now she will paint her house.
80. Paper: I bought a ream of white paper. We will paper the bathroom.
81. Patch: Mary put a patch on her shirt. Ann will patch her jeans.
82. Paw: My dog's paw is big. The horse will paw at the snow to find grass.
83. Pay: You will get your pay every 2 weeks. Shane will pay his bills.
84. Peddling: I am peddling my bike. The peddler was peddling his wares.

85. Pet: I have a golden lab for a pet. Sara and Jenna like to pet dogs.
86. Picture: I bought a picture for my house. Picture a rainbow in your mind.
87. Pin: Does anyone have a safety pin? I will pin up the hem on your jeans.
88. Place: Can you come to my place? Tom will place the glass on the shelf.
89. Plan: Teachers make lesson plans. Let's plan a party.
90. Point: The scissors have a sharp point. It's not polite to point.
91. Police: The police captured the criminal. Police the area for any litter.
92. Post: Gary pounded the post into the dirt. The teacher will post the grades.
93. Pump: My grandma had a water pump. She had to pump water daily.
94. Quarters: A football game has 4 quarters. There are 4 quarters in a dollar. I cut the apple into quarters. The soldier's sleeping quarters were crowded.
95. Racket: There was a loud racket out in the hallway. I bought a new tennis racket.
96. Raise: The employee would like a raise. On Memorial Day we raise the flag.
97. Recall: I recall the time we had a slumber party. The dog food was recalled due to rat poison.
98. Report: I wrote a report on AIDS. Please report to the principal's office.
99. Respect: Ryan has respect for his coach. Please respect your elders.
100. Review: Let's have a review for math. Bryan needs to review his work.
101. Roast: Tam made a roast for supper. Tom will roast the turkey in the oven.
102. Roll: Please pass the rolls. Jayden can roll over now.
103. Rub: I need a back rub. Try to rub the spot of the carpet.
104. Salt: Adam likes salt on his popcorn. Katie will salt it for him.
105. Scare: I had a scare when I fell. The storm will scare Bill.
106. Set: The couple got a set of dishes for a gift. Set the spiker in volleyball.
107. Shape: A diamond is a shape. Try to shape the clay into an animal.
108. Share: This is your share of the candy. Kristen will share her clothes.
109. Shell: Katie found a shell at the beach. Let's shell the peas.
110. Shine: The shine of the window caused a glare. I need to shine my shoes.
111. Shop: At the bridal shop, the girl bought a gown. I will shop for clothes.
112. Shot: The shot hurt. The hunter shot the deer.
113. Shout: Nick heard a shout for help. Please don't shout inside.
114. Shovel: Gary bought a new shovel. Adam shovels snow for the neighbors.
115. Signal: Stop at the signal. Signal when you are going to turn.
116. Skate: Katie got new ice skates. She will skate for 2 hours this Saturday.
117. Smell: Kids sweating have a smell. Sue can smell a skunk.
118. Snack: Mom made me a snack after school. Don't snack before supper.
119. Snap: My jeans have a snap on them. Jenna will snap her coat.
120. Snow: Last winter, we had 72" of snow. It will snow again this week.
121. Soil: The farm has fertile soil. Chad will soil his shirt digging in the dirt.
122. Spell: The witch will cast a spell on you. Riley can spell his name.
123. Spring: The spring on the mattress is sprung. Spring out of bed each day!
124. Spy: Larry hired a spy to solve the murder of his wife. I spy a butterfly.
125. Stamp: I bought a book of stamps. The teacher will stamp the paper "A".
126. Staple: We need to buy staples. Staple the papers together, please.
127. Station: The kids toured the fire station. Station yourself on lookout duty.
128. Stop: There is a stop sign. The policeman will stop the car for speeding.
129. Store: I need you to go to the store for me. I will store my toys in the box.
130. String: The guitar string broke. He has to string beads in preschool.
131. Swing: Susie put a swing in her back yard. Will you swing with me?

132. Talk: I heard talk of a robbery. Can we talk some time?
133. Taste: The taste of the candy was sour. I will taste the cookies.
134. Thunder: I heard thunder last night. Maybe it will thunder again tonight.
135. Tire: We had to buy 4 new tires for the van. The kids tire me out.
136. Touch: Hugs are a good touch. Please don't touch the wet paint.
137. Track: The train goes on a track. The detectives will track the criminal.
138. Trade: Painting is a trade. I will trade football cards with you.
139. Trap: My uncle set a trap to catch a raccoon. He likes to trap skunk, too.
140. Trick: The dog performed a trick. John will trick Tim into doing his work.
141. Trust: We put money in the trust fund. Parents want to trust their children.
142. Walk: Gary and I went for a long walk. Will you please walk the dog?
143. Wash: I did 3 loads of wash. Go and wash the van, please.
144. Whisper: Larry heard the whisper of the wind. Whisper the answer to me.
145. Whistle: The referee blew his whistle. Matt will whistle when he is ready.
146. Wiggle: That girl has a wiggle when she walks. Don't wiggle in your chair.
147. Wish: Make a wish and blow out the candles. He will wish for a football.

Scientists are trying to learn more about changes in the ocean

By Sun Sentinel, adapted by Newsela staff

Grade Level 4

03.11.15

Lexile Level 650L



Florida Atlantic University associate professor Stephen Kajiura implants a tracking device into a blacktip shark caught off the beaches of John D. MacArthur Beach State Park in North Palm Beach, Florida. Photo: Mark Randall/Sun Sentinel/TNS

FORT LAUDERDALE, Fla. — Science teacher Stephen Kajiura and three of his students were on a boat out in the ocean. They were hoping to catch sharks.

Thousands of blacktip sharks come to South Florida every winter. The animals travel from up north looking for warmer waters.

Kajiura has been catching some of these sharks. He is putting transmitters inside their bodies. A transmitter is a small machine that gives off sounds or other kinds of signals. Such signals allow scientists to track a transmitter.

Once Kajiura has put a transmitter in a shark, he sets the animal free. Scientists can then track where the shark is going.

The sharks come from as far away as North Carolina each year. They spend the winter in South Florida's warm waters. Then, they head back up north.

Bites Rarely Harm Humans Badly

Blacktip sharks typically grow to be 5 or 6 feet long. They sometimes bite people. These attacks usually are not that serious, however. The sharks sometimes grab a human hand or foot. Once they realize they have not caught a fish, they usually let go right away.

Last year, two people in South Florida were bitten by blacktip sharks: a man and a 9-year-old boy. Neither was badly harmed.

Kajiura said it is important to understand just where the sharks are going. It is also important to understand if they are changing where they go.

Sharks Help Keep Ocean Life in Balance

Sharks are good for South Florida's ocean waters, Kajiura said. Sharks eat a lot of fish. They help keep ocean life in balance.

There could be problems if the sharks stop coming. South Florida might end up with too many of certain kinds of fish.

Those fish eat other, smaller fish. Soon, there could be too few of the smaller fish. The smaller fish eat plants. Without enough of them, certain plants would become overgrown.

Since 2011, Kajiura has been studying where sharks go during the winter. He said they look for places that are just warm enough for them to be comfortable.

South Florida might not be their favorite winter spot for too much longer, though. Temperatures around the world are rising. Scientists say this is because of pollution. The rise in temperatures is known as global warming.

Warmer Water Might Change Shark Habits

Kajiura said blacktip sharks might change their habits as temperatures get warmer. The animals could start to spend their winters further north. They might no longer come down as far as South Florida. Then, certain kinds of fish could become too common.

On a Tuesday morning, Kajiura and his crew set out to catch a few sharks.

The team laid out 60 hooks. All were attached to a floating line. The scientists put hunks of mackerel and fish heads on the hooks so the sharks would bite them.

The team caught two sharks. Then things started to go wrong.

One shark escaped before they could put a transmitter in it.

They did manage to get a transmitter into the other shark. However, it died almost immediately. It was too upset about being caught.

“That’s very rare,” Kajiura said. Usually, “the sharks get away just fine. We’ve only lost a couple of animals ever.”

High-Pitched Pings Help Track Sharks

Kajiura has put transmitters into about a dozen sharks since December.

The transmitters give off pinging sounds. These pings are so high-pitched they cannot be heard by fish or other ocean animals.

Each transmitter's pings have their own pattern. Because of this, scientists are able to find each of the sharks.

“We’re interested in what these sharks are doing when they’re here,” he said. “Where are they going when they leave? How far up the coast do they go?”

Scientists focus on sharks to better understand marine environment

By Sun Sentinel, adapted by Newsela staff

Grade Level 5

03.11.15

Lexile Level 820L



Florida Atlantic University associate professor Stephen Kajiura implants a tracking device into a blacktip shark caught off the beaches of John D. MacArthur Beach State Park in North Palm Beach, Florida. Photo: Mark Randall/Sun Sentinel/TNS

FORT LAUDERDALE, Fla. — Science professor Stephen Kajiura and three of his students were on a rocky boat off of Singer Island. They were there to catch sharks.

Thousands of blacktip sharks come within yards of South Florida's beaches every winter. The animals migrate from up north in search of warmer waters. Kajiura is catching them and putting transmitters inside their bodies. The transmitters allow scientists to track the sharks once the animals are released back into the ocean.

The sharks come from as far away as North Carolina each year. They spend the winter in South Florida's warm waters, then head back up north.

Kajiura said it is important to understand just where the sharks are going, and if their routes are changing. Sharks play an important part in South Florida's waters, he said. They help keep ocean life in balance.

Things Can Go Wrong

Sharks are excellent hunters. They help keep the populations of various types of fish from getting too large.

When there are too many of a certain type of fish, things start to go wrong in the ocean. Those fish eat other, smaller fish and there end up being too few of the smaller fish. The smaller fish eat plants, and, without enough of them, certain plants become overgrown.

Kajiura has been studying shark migration since 2011. He said the sharks' movements can change by how warm or cold the water is.

Temperatures around the world have been rising. The rise in temperatures is known as global warming or climate change.

Sharks Might Move As Temperatures Rise

Blacktip sharks might start to spend their winters further north as temperatures continue to rise, Kajiura said. They may no longer come down as far as South Florida. The kinds of fish they eat might then become too common.

Blacktip sharks typically grow to be 5 or 6 feet long. It is not uncommon for them to bite people, but the attacks are usually not that serious. The sharks sometimes grab a human hand or foot, but once they realize they have not caught a fish, they will let go right away.

Last year, two people in South Florida were bitten by blacktip sharks — a man and a 9-year-old boy. Neither was badly hurt.

On the Lookout for Blacktips

On a recent Tuesday morning, Kajiura and his three students set out to look for sharks.

To catch the animals, they laid out 60 hooks. The hooks were attached to a line that was held up by floating buoys in the water. The sharks were lured into biting the hooks with hunks of mackerel and fish heads.

After an hour, Kajiura and the others began hauling up the line.

The team had caught two sharks, but the trip ended up being a failure anyway.

One shark escaped before they could put a transmitter in it.

They did manage to get a transmitter into the other shark. However, it swam away very weakly after being released.

Kajiura decided he should check on the shark. He put on flippers and a mask and dove into the water. After a minute or two, he swam toward the boat, pulling the shark with one arm. A few minutes later, it was dead. It had been killed by the shock of being captured.

“That’s very rare,” Kajiura said. Almost always, “the sharks get away just fine. We’ve only lost a couple of animals ever.”

Listening to Learn

Since December, Kajiura has fitted transmitters on about a dozen sharks. Their signals now can be picked up by undersea listening posts. There are hundreds of such posts along the East Coast.

The transmitters send pings through the water and let the scientists know where the sharks are. The pings are so high-pitched that they cannot be heard by fish or other ocean animals. Each transmitter's pings have their own pattern. Because of this, scientists are able to spot and track a particular shark.

“We’re interested in what these sharks are doing when they’re here, and we’re interested in their movements,” he said. “Where are they going when they leave? How far up the coast do they go?”

Researchers seek to better understand migratory patterns of blacktip sharks

By Sun Sentinel, adapted by Newsela staff

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Florida Atlantic University associate professor Stephen Kajiura implants a tracking device into a blacktip shark caught off the beaches of John D. MacArthur Beach State Park in North Palm Beach, Florida. Photo: Mark Randall/Sun Sentinel/TNS

FORT LAUDERDALE, Fla. — Science professor Stephen Kajiura and a crew of his students are on a rocky boat off of Singer Island. They are there to set out baited hooks for sharks.

Thousands of blacktip sharks come within yards of South Florida’s beaches during their winter migrations. Kajiura is catching them and implanting transmitters that allow scientists to track their movements.

The sharks migrate from as far away as North Carolina, coming to South Florida for the winter. Kajiura said it is important to understand the extent and range of their migrations. Sharks, he said, play an important part in South Florida’s marine environment by helping keep ocean life in balance.

Blacktips Are an Important Predator

Sharks are very effective predators and prevent the populations of certain types of fish from growing too large. When there are too many of the kinds of fish sharks eat, such as mullet, problems can arise. Mullet and other shark prey eat smaller, plant-eating fish. When there are too many of them, there can end up being too

few of the plant-eating fish. With too few plant-eating fish, algae can become overgrown and fragile coral reefs might be damaged.

Kajiura has been studying shark migration since 2011. He said it is closely tied to water temperature.

South Florida, Kajiura said, is now the endpoint of the sharks' annual migration. "As global temperatures continue to rise, their preferred temperature may be found not here but farther north," he added. "Maybe a decade or two down the road, we're not going to have these tens of thousands or hundreds of thousands of top predators cleaning out the reefs. What's going to happen then?"

Bites Rarely Life-Threatening

Since December, Kajiura has been flying in a small plane from the southern end of Miami Beach to Jupiter Inlet to survey blacktip numbers and locations. Based on what he has seen so far, the densest concentrations run from Dania Beach to Lighthouse Point and then from Boynton Inlet to Jupiter. Few sharks could be seen from Boca Inlet to Boynton Inlet.

Blacktip sharks typically grow to 5 or 6 feet. They are among the most-common species to bite people. These are usually non-life-threatening incidents, however. Typically, the shark clamps down on a hand or foot in murky water and quickly lets go once it realizes it has not bitten down on a fish.

Last year, during the late March migration, two people suffered bites: a man on a kiteboard off Delray Beach and a 9-year-old boy on a surfboard or boogie board off North Palm Beach. Neither bite was life-threatening.

On a Tuesday morning off John D. MacArthur Beach State Park, Kajiura and his three students set out to hook sharks and fit them with audio transmitters. Although the boat was rocking steeply, they successfully set out 60 hooks on a quarter-mile line held up by buoys. The hooks were baited with hunks of mackerel and fish heads. After an hour, they began hauling up the line.

The team had managed to catch two sharks, but the trip still ended up being a failure.

Losing a Shark Is Rare

Normally, when they catch a shark, they implant a transmitter immediately and send the animal on its way. But because the water was so rough, Kajiura decided to head to deeper, smoother water first. So they tied the two sharks to the bow and waited until they had hauled up the line before heading into deeper water.

One shark escaped. The other was successfully implanted with the transmitter but swam away so weakly after being released that Kajiura donned flippers and a mask and dove into the water to check on it. After a minute or two, he swam toward the boat, hauling the shark with one arm. A few minutes later, it was dead, killed by the shock of having been captured.

“That’s very rare,” Kajiura said. “Ninety-eight percent of the time, the sharks get away just fine — we’ve only lost a couple of animals ever.”

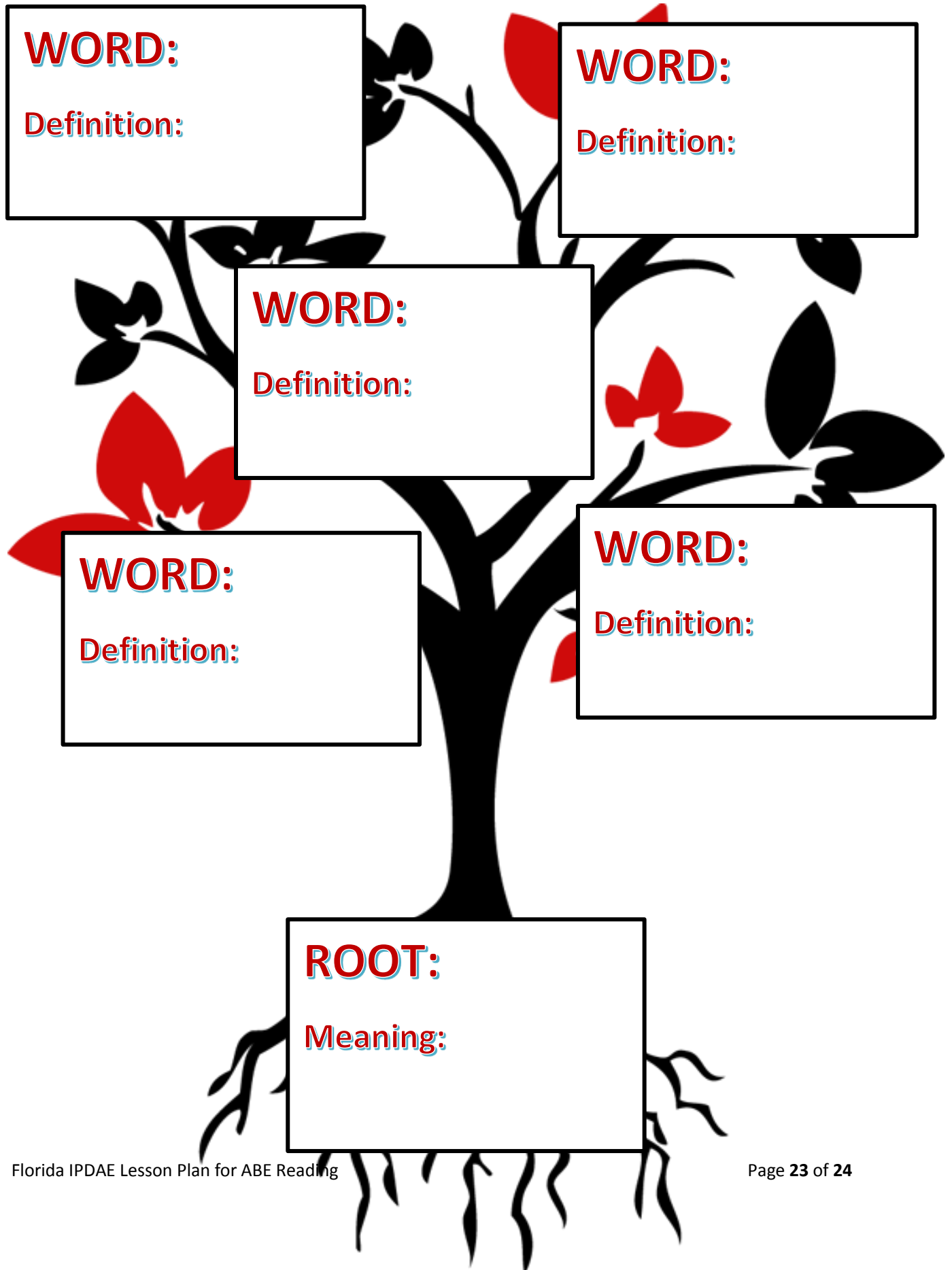
Since December, Kajiura has fitted transmitters on about a dozen sharks. Their signals now can be picked up by the hundreds of undersea listening posts situated along the East Coast.

Following the Pings

Kajiura's lab currently operates listening posts off Singer Island, Lake Worth and South Beach Park in Boca Raton. It will soon add new ones at Dania Beach and Juno Beach.

The pings the transmitters give off are so high-pitched that they are inaudible to the ocean's fish and marine mammals. Each transmitter's pings have their own unique pattern. Thus, the receivers are able to record the presence of a particular shark.

“We’re interested in what these sharks are doing when they’re here, and we’re interested in their movements,” he said. “Where are they going when they leave? How far up the coast do they go?”



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