



Close reading plan

Lizards Undergo Rapid Evolution After Introduction To A New Home." U. Massachusetts, Amherst, Author Unknown

Created by Matt Taber, 2014 Connecticut Dream Team teacher

What makes this text complex?			
Text and Author	Lizards Undergo Rapid Evolution After Introduction To A New Home, Source: UMass, Amherst	Where to Access Text	ScienceDaily, 18 April 2008. <www.sciencedaily.com/releases/2008/04/080417112433.htm>
Text Description			
This is a summary of a large research report from the UMASS Amherst describing an experiment with lizard evolution on islands in the Adriatic Ocean near Italy. In 1971 scientists relocated 5 pairs of lizards from one island to another. In the early 2000's scientists visited the islands and observed clear evidence of evolution in the form of changes in body shape, metabolism and behavior.			
Quantitative			
Lexile and Grade Level	Grade 10, Lexile 1360	Text Length	665 words
Qualitative			
Meaning/Central Ideas		Text Structure/Organization	
The central idea is that rapid evolution can occur and can affect biological structure, function, and behavior. Data in the article support this central idea, but the connections are implied rather than explicit.		No graphics, no headings. The article is a brief summary of a much larger piece, and requires the learner to link evidence to central idea.	
Prior Knowledge Demands		Language Features	
This article requires basic knowledge of the principles of evolution.		Although the majority of words will be common to high school students, there are extensive quotations in the article that use a scientific tone that the students will find challenging. For example the second paragraph is as follows: "Striking differences in head size and shape, increased bite strength and the development of new structures in the lizard's digestive tracts were noted after only 36 years, which is an extremely short time scale," says Duncan Irschick, a professor of biology at the University of Massachusetts Amherst. "These physical changes have occurred side-by-side with dramatic changes in population density and social structure."	
Vocabulary			
Tier Two Words (General academic vocabulary)		Tier Three Words (Domain-specific words)	
<i>"Words that are far more likely to appear in written texts than in speech. [They] often represent subtle or precise ways to say relatively simple things—saunter instead of walk, for example." (CCSS ELA Appendix A)</i>		<i>"[Tier Three words]...are specific to a domain or field of study (lava, carburetor, legislature, circumference, aorta) and key to understanding a new concept within a text." (CCSS ELA Appendix A)</i>	
<ul style="list-style-type: none"> Abundant 	<ul style="list-style-type: none"> Browsing 	<ul style="list-style-type: none"> Evolutionary changes Genetically Morphology 	<ul style="list-style-type: none"> Population density Ecology Cecal valves
Potential Reader/Task Challenges			
This article is designed for a sophomore Biology course that has included a unit on evolution. If the students have not had such a unit, there should be additional instruction on evolution by natural selection and adaptations. Students will need a familiarity with biology domain specific vocabulary such as "evolutionary changes," "genetically," "morphology," "population density," and "ecology."			

Text-dependent questions		
Question	Standard alignment	Page of this document
Describe the experiment that the researchers performed. Include specific evidence from the text in your response.	<i>RST.9-10.2</i>	#4
Cite specific evidence from the text to describe the key difference between the two islands that caused the lizards to change.	<i>RST.9-10.1</i>	#7
Using information in the text, determine the meaning of the term, “morphology,” by describing how it changed in the lizards.	<i>RST.9-10.4</i>	#9
The author of the article refers to the changes in the lizards as evolutionary adaptations. Given that evolutionary adaptations are considered changes that improve fitness, explain why the changes in the lizards represent evolutionary adaptations.	<i>RST.9-10.2</i>	#11
The author makes the conclusion “What is unique about this finding is that rapid evolution can affect not only the structure and function of a species, but also influence behavioral ecology and natural history.” Based on the evidence from the text, do you feel that the author has fully supported this conclusion? Identify the evidence that supports this conclusion and any weaknesses in this conclusion that you can observe.	<i>RST.9-10.8</i>	#14
Target Standards		
<ul style="list-style-type: none"> • RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions • RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. • RST.9-10.4 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.9-10.8 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. 		

Question 1

Question #1	Describe the experiment that the researchers performed. Include specific evidence from the text in your response.	
Standard(s) covered:	RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.	
	Example response that meets standard	Look-fors
	<p><i>In an experiment researchers manipulate one variable and then look at the effects on one or more other variable. The manipulation in the present experiment was that researchers moved 5 pairs of lizards from one island to another in the Adriatic Sea in 1971. To examine the effects of this manipulation, thirty years later researchers returned to the islands to look for changes in the lizards. The researchers looked at head shape and found that the heads were wider and stronger. The researchers looked at the lizards' genetics and found that the genes were identical to the original lizards. The researchers looked at the lizards' digestive tracts and found that the lizards had evolved cecal valves in their stomachs to accommodate for eating plants. The researchers looked at social structure and found that the population density of the lizards had risen, and that the lizards did not demonstrate territoriality. Therefore, in this experiment we can see that the researchers changed the location of the lizards and this caused adaptations in the lizards' morphology, their digestion, and their behavior.</i></p>	<ul style="list-style-type: none"> • Accurately identifies how the lizards were manipulated (the independent variable) • Accurately identifies the effects of the manipulations (the dependent variable)
If students are struggling to answer the text-dependent question, use this follow-up plan for modeling and practice:		
Objective	In this lesson you will learn to trace the text's explanation of a complex process by locating and paraphrasing phrases in the text that reveal the process.	
Prior knowledge to review	Provide an accurate summary of the text distinct from prior knowledge (RST.6-8.2). Recognize that experiments include a manipulation by the experimenter (the independent variable) and a measurement or measurements (the dependent variable(s))	
Steps to achieve objective	Think aloud for direct instruction	

<p>1) Reread the text and highlight text references that address the question.</p>	<ul style="list-style-type: none"> • When I look in the first few paragraphs of the article, what words do I see that correspond to researchers performing a biological experiment? I should highlight these words. • I should look at all of the actions described in the article; do I see others that might fit a description of an experiment? I should highlight these also.
<p>2) Ask yourself, “What are the steps identified by the highlighting?”</p>	<ul style="list-style-type: none"> • When I look at the highlighted actions, do these seem like a set of steps such as I would see in an experiment? Can I put them in an order that looks like an experiment? • I recall that experiments have two key parts, the independent variable which is what the researchers are manipulating, and the dependent variable which is what the researchers are measuring. • The researchers moved the lizards, so their location must be the independent variable. • The researchers assessed head dimensions, genetic changes, changes in the lizards’ digestive systems, and behavior, so these assessments probably make up the dependent variables.
<p>3) Paraphrase the steps, and draw a conclusion to answer the question.</p>	<ul style="list-style-type: none"> • First I need to paraphrase the steps of the experiment by restating them in my own words. • Now I need to construct a response which describes these steps in the form of an experiment. • I should start with an introductory sentence and then I should include my paraphrase of the highlighted information. • Finally, I should conclude with a summary that clearly restates the information in the form of an experiment.

Extension and practice

- If a student is having trouble identifying actions by researchers, ask them to identify actions described in the article, and then identify who is performing those actions.
- If a student is having trouble understanding the steps of an experiment, review experimental design including independent and dependent variables.
- If a student is having trouble being appropriately specific in his or answer, identify one key difference between the student's summary and the action described in the article. Ask the student to review the other actions and determine if similar differences exist.

What next?

For additional practice, with students or for students' independent work, apply this learning objective and set of steps to non-fiction texts describing experiments (RST.9-10.1)

Objective: In this lesson you will learn to trace the text's explanation of a complex process by locating and paraphrasing phrases in the text that reveal the process.

1. Reread the text and highlight text references that address the question.
2. Ask yourself, "What are the steps identified by the highlighting?"
3. Paraphrase the steps, and draw a conclusion to answer the question.

Question 2

Question #2	Cite specific evidence from the text to describe the key difference between the two islands that caused the lizards to change.
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Standard(s) covered:	RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
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Example response that meets standard	Look-fors
<p>Paragraph 3 tells us that Pod Kapiste is a “barren island” where the lizards fed mostly on “mobile prey” or “insects.” This is where the lizards originated, then they were moved to Pod Mrcaru. Pod Mrcaru “offered them an abundant supply of plant foods, including the leaves and stems from native shrubs.” Therefore the key difference between the two islands is that the primary food on Pod Mrcaru is insects and the primary food on Pod Kapiste is plants.</p>	<ul style="list-style-type: none"> • Pod Kapiste should have a mention of being “barren” and having “mobile prey” or “insects.” • Pod Mrcaru needs to have a mention of “abundant supply of plant foods.” • The key difference should refer to food supply.

If students are struggling to answer the text-dependent question, use this follow-up plan for modeling and practice:

Objective	In this lesson you will learn how to support the analysis of an article by locating evidence in the text and determining whether the evidence is sufficient to answer the question.
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Prior knowledge to review	No prior knowledge is required for this question.
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Steps to achieve objective

Steps to achieve objective	Think aloud for direct instruction
1) Reread the text and highlight evidence to answer the question.	<ul style="list-style-type: none"> • I know from the first sentence that there are two islands, Pod Kapiste and Pod Mrcaru. I realize that I am looking for references to the characteristics of these two islands throughout the article. I reread the article looking for these references.

2) Ask yourself, "Is this evidence sufficient to answer the question?"	<ul style="list-style-type: none"> • I reread the question and begin to construct an answer in my head. • I want to be sure that my answer has references to both islands. • If my answer does not seem complete, I will reread the text again, and try to find more details to complete my answer. • Upon re-reading, I determine that there are no more details in the text to support my response, so my response seems complete.
3) Construct a response using evidence from the text in your own words.	<ul style="list-style-type: none"> • I know that I should now review the highlighted sections for the first island and construct a sentence listing the characteristics. • I see that these characteristics include the terms "barren," "mobile prey," and "insects." • Then I realize that I should the highlighted sections for the second island, and construct a sentence listing those characteristics. • I see that the key characteristic is "abundant supply of plant food." • My third sentence should be a summary response that identifies the key difference between the islands.

Extension and practice

- If a student is distracted by the unfamiliar terms in the article, such as the latin names for the lizards, or the use of the term "pod" for island, then recommend to the student that he/she cross out those terms, as they do not affect the reading of the article.
- If the student is still struggling, tell them to focus on paragraph 3 and emphasize the need to identify one clear difference.
- For students who are able to answer the question easily, ask them to imagine a third type of island in which the only food available are small fish that live in tidal pools. Ask them to identify what structural and behavioral adaptations might occur in lizards moved to that island.

What next?

For additional practice, with students or for students' independent work, attend to precise descriptions in texts with complex terminology (RST.9-10.1).

Objective: In this lesson you will learn how to support the analysis of an article by locating evidence in the text and determining whether the evidence is sufficient to answer the question.

1. Reread the text and highlight evidence to answer the question.
2. Ask yourself, "Is this evidence sufficient to answer the question?"
3. Construct a response using evidence from the text in your own words.

Question 3

Question #3	Using information in the text, determine the meaning of the term, “morphology,” by describing how it changed in the lizards.	
Standard(s) covered:	RST.9-10.4 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.	
	Example response that meets standard	Look-fors
	I think morphology means size and shape. Paragraph 3 uses the term “head morphology” and paragraph 2 describes changes as “striking differences in head size and shape,” so these ideas seem to be closely related. In addition, the changes in head size and shape are described as being “longer, wider, and taller,” which are characteristics of size and shape. From these observations, I conclude that morphology refers to size and shape.	<ul style="list-style-type: none"> • Identify the phrase “size and shape” from paragraph 2. • Include a reference to “longer, wider, and taller” from paragraph 3 which may be a direct quote or a summary.
If students are struggling to answer the text-dependent question, use this follow-up plan for modeling and practice:		
Objective	In this lesson you will learn to determine the meaning of key terms by analyzing the context in which they are used in a complex scientific text and using evidence from the text to make inferences.	
Prior knowledge to review	Students should be able to determine the meaning of key terms from a text (RI 8.4)	
Steps to achieve objective	Think aloud for direct instruction	
1) Reread the text and highlight all uses of the key term.	<ul style="list-style-type: none"> • I know the term that I am looking for is “morphology,” I should find this term in the text and highlight it. • I probably should not stop when I find the term used once, as it will be helpful if it is used more than once. 	

<p>2) Ask yourself, "What context clues can I find to determine the meaning of the key term?"</p>	<ul style="list-style-type: none"> • I should look for any phrases that include the term "morphology" and determine what those phrases are referring to. • This article contains the phrase "head morphology," so that gives me an idea that morphology has something to do with the heads of the lizards. • I should look in the article and make a list of the characteristics of the lizards' heads. • I should reread the question to see if it has clues about how to determine the meaning of the term. I see that it mentions changes, so perhaps I should look for descriptions of changes in the lizards' heads. • I check my list of characteristics of the lizards' heads to see if it contains references to changes. If it does not, I should probably reread the article to find references to changes and add them to my list.
<p>3) Construct a definition of the key term using the clues to meaning that you identified.</p>	<ul style="list-style-type: none"> • I should look at my list of characteristics and summarize them in my own words. • I then craft a definition that is specific and complete as I can from the list of characteristics. • Next, to answer the second part of the question, I should summarize how the shape of the lizards' heads changed as they adapted to the new island using the highlighted information.

Extension and practice

- If the students are not confident in their answer, have them look up the term morphology and compare their definition to the formal definition.
- For additional practice, have the students follow the same steps and determine the meaning of the term Pod from the article.

What next?

For additional practice, with students or for students' independent work, apply this learning objective and set of steps to grade relevant complex scientific texts to determine the meaning of key terms by analyzing the context in which they are used (RST.9-10.4)

Objective: In this lesson you will learn to determine the meaning of key terms by analyzing the context in which they are used in a complex scientific text

1. Reread the text and highlight all uses of the key term.
2. Ask yourself "what clues can I find to determine the meaning of the key term?"
3. Construct a definition of the key term using the clues to meaning that you identified.

Question 4

Question #4	The author of the article refers to the changes in the lizards as evolutionary adaptations. Given that evolutionary adaptations are considered changes that improve fitness, explain why the changes in the lizards represent evolutionary adaptations.	
Standard(s) covered:	<ul style="list-style-type: none"> RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. 	
Example response that meets standard		Look-fors
<p>The changes in the lizards represent evolutionary adaptations because they increased the lizards' fitness which refers to their ability to survive and reproduce in their new environment. To improve fitness in their new environment, the lizards had to adapt to their new food source, plants instead of insects. The associated adaptations included changes in "head morphology" and the development of "cecal valves" in their digestive systems. Because they were more successful at eating and digesting plants, the lizards showed improved survival and reproduction which confirms that these changes are evolutionary adaptations.</p>		<ul style="list-style-type: none"> Identification of plant eating as an important adaptation to the new environment Identification of changes in "head morphology" and "cecal valve" development (digestion) as physical adaptations to plant eating Accurately description that the physical changes lead to improved plant eating, which results in improved survival and reproduction Recognition that improved survival and reproduction are hallmarks of evolutionary adaptations
If students are struggling to answer the text-dependent question, use this follow-up plan for modeling and practice:		
Objective	In this lesson you will learn to trace a text's depiction of a complex process by identifying key components of the process within the text and compiling them into a response.	
Prior knowledge to review	Students need to be able cite specific textual evidence to support analysis of science and technical texts (RST.6-8.1).	
Steps to achieve objective	Think aloud for direct instruction	

<p>1) Reread the text and highlight text associated with the process identified in the question.</p>	<ul style="list-style-type: none"> • The question is asking me to look for evidence of evolution. I know that evolution is change over time that improves fitness. • I should look for changes in the lizards that can be considered as improvements in fitness. Fitness means survival and reproduction so I should look for changes in the lizards that would increase their survival and reproduction on the new island. • I know feeding is an important component of survival so I should look for changes that increase feeding. • I see changes associated with head shape and jaw strength, so these probably help feeding. • Another part of feeding is digestion, and I see there is a reference to change in the lizards digestion, so I should include that. • I should probably keep track of these by highlighting or creating a list.
<p>2) Ask yourself “How can I use the information that I have identified to explain the process described in the question.”</p>	<ul style="list-style-type: none"> • I know the key components of evolution are change over time, development of adaptations, and improved survival and reproduction; have I captured these components in my highlighting? • Perhaps I should make a table. I will list how each characteristic changed between the two islands and how that characteristic improved survival on the new island. • I review my table and confirm that the changes that I have identified represent adaptations that improve survival and reproduction of the lizards
<p>3) Construct an explanation using the textual components that you identified.</p>	<ul style="list-style-type: none"> • Now I should write an answer to the question. First I should identify that the changes in the lizards do correspond to evolutionary adaptations to directly answer the question. • Then, I should provide evidence for this answer by explaining how each of the observed changes represents an adaptation. • Finally, I should conclude by explaining that the changes in the lizards led to improved survival and, therefore, can be considered evolutionary adaptations.

Extension and practice

- If students are struggling with the concept of evolutionary adaptations, ask them to read the “How Stuff Works” entry on “How evolution works: the simplest example of evolution.” Ask them to identify the changes in the bacteria that increase their survival.
- If students are struggling with the cause and effect aspect of evolutionary adaptations, ask them to review “Darwin’s Finches” in a standard Biology textbook. Have them identify three different adaptations shown by the finches and create a table of the cause, effect, and adaptation for each.
- For students who were able to answer the question easily, ask them to read the opening chapter of Darwin’s Origin of Species. Ask them to explain how Darwin might have included the lizard evolution as additional evidence for evolution by natural selection.

What next?

For additional practice, with students or for students' independent work, apply this learning objective and set of steps to complex scientific texts relevant to grade 9/10 material and trace the depiction of a complex process

Objective: In this lesson you will learn to trace a text’s depiction of a complex process by identifying key components of the process within the text and compiling them into a response.

1. Reread the text and highlight text associated with the process identified in the question.
2. Ask yourself “How can I use the information that I have identified to explain the process described in the question.”
3. Construct an explanation using the textual components that you identified.

Question 5

Question #5	The author makes the conclusion “What is unique about this finding is that rapid evolution can affect not only the structure and function of a species, but also influence behavioral ecology and natural history.” Based on the evidence from the text, do you feel that the author has fully supported this conclusion? Identify the evidence that supports this conclusion and any weaknesses in this conclusion that you can observe.
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Standard(s) covered:	RST.9-10.8 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.
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Example response that meets standard	Look-fors
<p>The author fully, supports the conclusion that “...rapid evolution can affect not only the structure and function of a species, but also influence the behavioral ecology and natural history.” The author clearly demonstrates that rapid evolution can affect structure and function of a species. In a short time period of around 35 years, the lizards showed significant changes in both structure and function. Regarding structure, the researchers showed clear support for evolution of head shape and digestive system structure. Regarding function, the lizards went from being predominantly insect eaters to plant eaters. The authors also support the argument that behavioral ecology was affected. On the new island, the lizards showed increased population density, and “had given up defending territories,” In addition, the functional, structural, and behavioral changes can be considered the natural history of the lizards, so the author supports that natural history was influenced as well. In conclusion, the author successfully supports the conclusion that “...rapid evolution can affect not only the structure and function of a species, but also influence the behavioral ecology and natural history” by successfully supporting all four parts of the conclusion.</p>	<ul style="list-style-type: none"> • Identification that the author successfully supports the conclusion. • Identify that the conclusion contains subcomponents that are each supported by the author. • Identification of the subcomponents of structure, function, behavioral ecology, and natural history

If students are struggling to answer the text-dependent question, use this follow-up plan for modeling and practice:

Objective	In this lesson you will learn to determine the extent to which the evidence in a text supports an author's claim by examining the evidence presented for each component of that claim.
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Prior knowledge to review	RST.6-8.9: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
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Steps to achieve objective	Think aloud for direct instruction
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1) Identify and summarize the author's claim.	<ul style="list-style-type: none"> • First I need to reread the question and locate the quotation in the text. • Then I should summarize it in my own words. • It is a complex question with multiple parts so I need to be sure that I include all of the parts.
2) Create a list of the components of the author's claim	<ul style="list-style-type: none"> • Because the author's claim has multiple parts, I think I will need to assess the degree to which the author supports each one. I should make a list of these components to make them clear. • As I assess the claim, the first component I see is "function," I write this down. • I continue looking for other components. I see "structure," "behavioral ecology," and "natural history." I write these down as well.
3) Make a table to determine if the authors support each of the components of the claim.	<ul style="list-style-type: none"> • I look for the evidence to support change in structure. To keep track of the evidence, I should make a table that lists the evidence for each component on my list of claims. • Next I look for changes in function. I add those to my table of evidence. • Next I consider the term "behavioral ecology." I know this has to do with changes in the behavior of an organism in response to its environment, so I look for changes in behavior. I see that eating insects is one change in behavior, but I should also look for more and record them in my table. • Lastly, I consider the term "natural history." I know this is a general term that can refer to any observed aspects of a species, so the evidence that supports structure, function, and behavior also support natural history. I make a note of this.
4) Ask yourself "What is the extent to which the author supports each of the components of the claim."	<ul style="list-style-type: none"> • I refer back to the question now, and note that I need to determine "the extent" to which the claim is supported. I realize this means that I need to make a judgment about the about how well the claim is supported. • I realize if all of the subcomponents of the claim are supported, then I should conclude the overall claim is fully supported. • I look at my table and assess whether all components of the claim are supported. I realize that they are, and therefore the author's claim is supported. • Now I should address the last part of the question, as to whether I think there are weaknesses to these claims. I make a list of any weaknesses that I identify. • I use this information to construct my response.

Extension and practice

- If students are struggling to determine the degree to which an author supports a scientific claim with evidence, have the students read the article "The Fir is Flying" (Hartford Courant, November, 2009 <Courant.com>. Have them identify the author's primary claim and identify the supporting evidence for that claim. Create an outline or chart to summarize the evidence.
- If a student is able to answer the question easily, as an extension have them read the article "Bacterial Competition In Lab Shows Evolution Never Stops" and ask them to identify: 1. the researchers' primary conclusion 2. three supporting pieces of evidence and 3. whether the researchers fully support their conclusion.

What next?

For additional practice, with students or for students' independent work, apply this learning objective and set of steps to complex scientific texts that include an argument supported by evidence and assess the degree to which the argument is supported by the evidence

Objective: In this lesson you will learn to determine the extent to which the evidence in a text supports an author's claim by examining the evidence presented for each component of that claim.

1. Identify and summarize the author's claim.
2. Create a list of the components of the author's claim
3. Make a table to determine if the authors support each of the components of the claim.
4. Ask yourself, "What is the extent to which the author supports each of the components of the claim. ssess the overall degree to which the author's claim is supported."