

Science & Literacy Activity

ACTIVITY OVERVIEW

This activity, which is aligned to the Common Core State Standards (CCSS) for English Language Arts, introduces students to scientific knowledge and language related to animal body parts.

This activity has three components:

- 1. Before your visit**, students will read a content-rich article about the spiny pufferfish and the adaptations that protect it from predators. This article will provide context for the visit, and also help them complete the post-visit writing task.
- 2. At the Museum**, students will read and engage with additional texts (including printed text, digital and physical/hands-on interactives, videos, and models). This information will help them complete the post-visit writing task.
- 3. Back in the classroom**, students will draw on the first two components of the activity to complete a CCSS-aligned explanatory writing task about animal body parts.

Materials in this packet include:

For Teachers

- Activity Overview (p. 1-2)
- Article (teacher version): "Who Wants a Spiny Snack?" (p. 3-5)
- Answers to the student worksheets (p. 6-7)
- Essay scoring rubric (teacher version) (p. 8-9)

For Students

- Article (student version): "Who Wants a Spiny Snack?" (p. 10-12)
- Student worksheets (p. 13-14)
- Student writing task (p. 15)
- Essay scoring rubric (student version) (p. 16-17)

1. BEFORE YOUR VISIT

Overview

Students will read a content-rich article about the spiny pufferfish and the adaptations that protect it from predators. This article will provide context for the visit, and help them complete the post-visit writing task.

Preparation

- Familiarize yourself with the student writing task and rubric (p. 8-9, 15-17).
- Familiarize yourself with the teacher version of the article (p. 3-5), and plan how to facilitate the students' reading of the article.

Instructions

- Explain the goal: to complete a writing task about animal body parts.
- Tell students that they will need to read an article before visiting the Museum, and read additional texts during the visit (including printed text, digital and physical/hands-on interactives, videos, and models).
- Distribute the article, student writing task, and rubric to students.
- Review the rubric with students and tell them that it will be used to grade their writing.
- Read and discuss the article, using the teacher notes to facilitate.

Common Core State Standards

RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

RI.4.2 Determine the main idea of a text and explain how it is supported by key details; summarize the text.

New York State Science Core Curriculum

LE3.1a

Next Generation Science Standards

DCI: LS1.A: Structure and Function

Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

SEP 8: Obtaining, Evaluating and Communicating Information

- Obtain and combine information from reliable media to explain phenomena.
- Communicate scientific information orally and in written formats.

- Distribute the student worksheets (p. 13-14). Have students fill in the “spiny pufferfish” section based on what they’ve learned from the article. Tell them that at the Museum, they will complete the second worksheet about two other animals and their body parts.

2. DURING YOUR VISIT

At the Museum, students will read and engage with additional texts (including printed text, digital and physical/hands-on interactives, videos, and models). The information they’ll gather from these multiple sources will help them complete the post-visit writing task.

Preparation

- Review the educator’s guide to see how themes in the exhibition connect to your curriculum and to get an advance look at what your students will encounter. (Guide is downloadable at amnh.org/lal/educators)
- Familiarize yourself with the student worksheets (p. 13-14) and the map of the exhibition.

Instructions

- Explain the goal of the Museum visit: to read and engage with texts (including printed text, digital and physical/hands-on interactives, videos, and models), and to gather information to help them complete the post-visit writing task.
- Review the worksheet. Clarify what information students should collect.

Suggestions for Facilitating the Museum Visit

- Have students explore the exhibition in pairs, with each student completing his or her own student worksheet.
- Encourage student pairs to ask you or their peers for help locating information. Tell students they may not share answers with other pairs, but may point each other to places where answers can be found.

3. BACK IN THE CLASSROOM

Students will use what they have learned from the pre-visit article and at the Museum to complete a CCSS-aligned explanatory writing task about animal body parts.

Preparation

- Plan how you will explain the student writing task and rubric (p. 15-17) to students.

Instructions

- Review the writing task and rubric with students. Explain that they will use it while composing, and also to evaluate and revise what they have written.

Suggestions for Facilitating Writing Task

- Before they begin to write, have students use the writing task to frame a discussion around the information that they gathered at the Museum. They can work in pairs, small groups, or as a class, and can compare their findings.
- Referring to the writing prompt, have students underline or highlight all relevant passages and information from the article and from the notes taken at the Museum. Instruct each student to write down any useful information gathered by their peers.
- Students should write their essays individually.

Supports for Diverse Learners

This resource has been designed to engage all learners with the principles of Universal Design for Learning in mind. It represents information in multiple ways and offers multiple ways for your students to engage with content as they read about, discuss, view, and write about scientific concepts. Different parts of the experience (e.g. reading texts, or locating information in the Museum) may challenge individual students. However, the arc of learning is designed to offer varied opportunities to learn. We suggest that all learners experience each activity, even if challenging. If any students have an Individualized Education Program (IEP), consult it for additional accommodations or modifications.

Alternate Version of Article

Another version of the same article with a lower lexile level is available for download at amnh.org/lal/educators. You can use this same activity with that article.

ARTICLE: TEACHER VERSION

About this Article

- **Lexile:** 840
- **Wordcount:** 504
- **Text Complexity:** The Lexile level for this text falls in the middle of the 4-5 CCSS grade level band. This text is suitable as a read aloud for students in grades 3 and beginning of grade 4. Teachers should use their professional judgment and knowledge of students' independent reading levels regarding assigning this text for independent reading.
- **Note:** Assign partners prior to reading this text aloud with students and have them assign a "partner A" and "partner B."

Key for Teacher Notes

- **Green text**
specific strategies
- Regular text
instructions for teachers
- *Italicized text*
teacher's instructions to students
- Underlined text
important domain-specific words

Who wants a spiny snack?

Not many animals! How the spiny puffer stays safe in the ocean

A shark glides through the warm water, searching for its next meal. It spots an ordinary brown fish swimming slowly in the clear waters ahead.



© iStock Photo/GlobalP

But as the shark approaches, PUFF-PUFF-PUFF! The fish puffs out into a round, spiny ball. The startled shark swims away. The pufferfish is safe for now — at least until the next shark or big fish swims by.



© iStock Photo/FLaudGirl

The ocean can be a dangerous place for small fish like the puffer. Its waters are full of predators like sharks, squid, and bigger fish that eat small fish. But pufferfish have adaptations that protect them from predators.

All animals have adaptations to stay alive. An adaptation is a body part or behavior that helps an animal live in its environment. Predators have



© NOAA

A shark uses its sharp teeth to catch and eat prey.

Prompt to **think/pair/share**: *What do you think this text will teach us about?*

Listen in to student pairs. Repeat some of the good ideas that you heard, or pre-select one or two students to share out to the whole group.

Reread this paragraph aloud a second time. Prompt to **visualize**: *As I reread each sentence of this paragraph, close your eyes and visualize what is happening. When I tell you to **turn and talk**, tell your partner what you saw happening. You should be alternating so that each partner has a few turns to talk.*

*Optional for ELLs: Ask students to act out what is happening in the paragraph, with one partner playing the part of the spiny puffer, and one playing the part of the shark.

Before reading on, spotlight the two important terms that appear in this paragraph. Options:

If this is the first time students are encountering these words: Have students underline "predator" and "adaptation." Ask them to re-read the paragraph independently, and then try to determine what the words mean based on the context. Listen in and pre-select students to share out word meanings that are accurate, encouraging them to explain how they determined the meaning. If students need more support, guide them in determining the meaning of the words using the context. If you have several ELLs or SWDs, you may consider pre-teaching these two words prior to reading the text, using a student-friendly definition, and an example shown in an illustration on the smartboard or posted in the room.

If students have familiarity with the words based on prior teaching: Prompt students to give a definition of each term in their own words to their partner.

adaptations that help them hunt. A shark's powerful, torpedo-shaped tailfin and sharp teeth are two adaptations.

Other animals have adaptations that provide protection from predators. These animals may be fast enough to escape predators. Or they might use camouflage, special patterns or colors that help them hide in their environment.



Can you find the flounder?



Porcupines have long sharp spines that protect them.

But some animals don't run or hide. They have bodies that are hard to eat. Just picture the sharp spines of a porcupine, hedgehog, or sea urchin. Few predators are large or tough enough to make a meal of those animals!

Some toads and snakes have their own way to discourage predators. They puff themselves up to look larger. The bigger an animal, the harder it is to catch and eat. Puffer fish combine both of these adaptations. They puff up AND they have long, sharp spines.

Swimming along, a pufferfish looks like any other fish. But when it is threatened, it swells up suddenly like a big balloon. When this happens, it's easy to see why some people call it balloonfish. But this fish is no soft, squishy balloon. Its skin becomes rigid, with sharp spines sticking out in all directions. Usually these spines lie flat against the side of the fish. When the fish puffs up, the outer skin stretches out and pulls the spines up.



A pufferfish's skin is hard and covered with sharp spines.

This section gives definitions of the two important terms introduced in the previous paragraph, and offers examples for each.

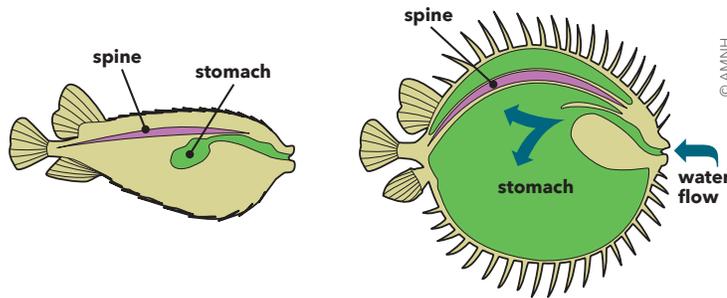
To provide scaffolding, construct a chart with students' help (**shared writing**) that includes these definitions and examples.

To provide more independence, ask students to create the chart in their notes with their partner (give template for blank web that students copy and complete in their notebooks). Provide time for a brief whole group discussion to clarify the meanings of these two terms.

This section is all about protective adaptations, narrowing the focus away from adaptations in general. After reading this paragraph, students should understand two types of protective adaptations. To ensure that they do, ask students to **think/pair/share** with a partner to answer the question, "What is this paragraph teaching us?" Listen in to student conversations and pre-select a student to explain the main idea of this paragraph. If clarity is needed, **think aloud**, demonstrating how you are able to determine the main idea of the paragraph.

It is important that students visualize this description of the spiny puffer making this change that helps ward off predators. Have students discuss the differences of the pufferfish before and after. You may want to ask them to refer to the two photos of the pufferfish on the first page of the article.

How does the pufferfish make this amazing transformation? Despite its nickname, it doesn't blow itself up with air like a balloon. Instead, it fills up with water. The fish pumps a huge amount of water through its mouth into its stomach. Filled with water, its stomach becomes almost one hundred times larger. The stomach can expand like this because it's usually crumpled into many tiny folds. As water rushes in, the stomach unfolds. To make room for the swelling stomach, other



organs like the liver and intestines are pushed to the side. A spiny puffer can change from an ordinary-looking fish into a menacing spiny ball in a few seconds. Then only the biggest animals dare to eat it. The ocean may be full of dangers, but adaptations like sharp spines and puffing up help keep the puffer safe.

Article adapted from "A Fish Story" by Adam Summers, *Natural History* magazine, October 2001.

This paragraph explains the mechanics of how the spiny puffer makes this transformation. Pause after reading the first sentence, and think aloud about how when we read informational texts and the author poses a question, we can usually expect that what follows will be an answer to that question. Say: *As I read the rest of this paragraph, listen very carefully for the answer to this question. I'd really like to know how this fish does this to its body! After I read, you will describe how this transformation happens, and I am hoping one of you will come up and describe it to the class.*

After you have prompted students to **think/pair/share**, select one student to describe the process to the class. They can refer to specific lines in the text and explain them in their own words.

Formative Assessment: After finishing the article, ask students to complete a **3-2-1** exit slip:

List three (3) important facts that you learned from this article.

Think of two (2) questions you have after reading the article.

Name the one (1) most interesting thing you learned from the article (this can be one of the 3 facts you listed above), and tell why you think it is interesting.

In addition to saying the above instructions to students, you should have the questions posted. Students will not find information to answer questions about puffer fish during the Museum visit, but if some questions require more than revisiting article content or classroom discussion, you can find more information on this webpage:

<http://animals.nationalgeographic.com/animals/fish/pufferfish/>

STUDENT WORKSHEET: Part 1

Name: _____ **ANSWER KEY**

Draw a spiny pufferfish before and after it puffs up. **Label** one structure that helps the pufferfish survive.

Before	After
Species Name: Spiny Pufferfish	

Describe the structure. **Explain** how it helps the pufferfish survive.

When it is attacked, the pufferfish fills its stomach with water and gets much larger than normal.

It is also covered in sharp spines and when it puffs up, its spines stick out. The spines protect the pufferfish from predators.

STUDENT WORKSHEET: Part 2

Name: _____ **ANSWER KEY**

In the exhibition, **pick** two animals and **draw** them in the boxes. For each animal, **label** one structure that helps it perform a function, such as breathing, moving, sensing, eating, and avoiding predators.

species name:
Answers will vary.

Describe one structure. **Explain** how it helps the animal survive.

Answers will vary.

species name:
Answers will vary.

Describe one structure. **Explain** how it helps the animal survive.

Answers will vary.

ESSAY SCORING RUBRIC: TEACHER VERSION - page 1

Scoring Criteria		Exceeds	Meets	Approaches	Needs Additional Support
		4	3	2	1
RESEARCH (worth 1/3)	Article: "Who Wants a Spiny Snack?"	Accurately presents information relevant to all parts of the prompt with effective paraphrased details from the article	Presents paraphrased information from the article relevant to the prompt with accuracy and sufficient detail	Presents information from the article relevant to the purpose of the prompt with minor lapses in accuracy or completeness AND/OR information is copied from the text	Attempts to present information in response to the prompt, but lacks connections to the article or relevance to the purpose of the prompt
	Museum Exhibition: Life at the Limits	Accurately presents information relevant to all parts of the prompt with effective paraphrased details from the exhibition	Presents paraphrased information from the exhibition relevant to the prompt with accuracy and sufficient detail	Presents information from the exhibition relevant to the purpose of the prompt with minor lapses in accuracy or completeness AND/OR information is copied from the text	Attempts to present information in response to the prompt, but lacks connections to the exhibition content or relevance to the purpose of the prompt
SCIENCE (worth 1/3)	Science Explanations	Integrates relevant and accurate science content with thorough explanations that demonstrate in-depth understanding of animal body parts and their functions	Accurately presents science content relevant to the prompt with sufficient explanations that demonstrate understanding of animal body parts and their functions	Briefly notes science content relevant to the prompt; shows basic or uneven understanding of animal body parts and their functions; minor errors in explanation	Attempts to include science content in explanations, but understanding of animal body parts is weak; content is irrelevant, inappropriate, or inaccurate
		Uses labeled illustrations of the spiny pufferfish and two other animals to accurately communicate relevant information	Includes labeled illustrations of the spiny pufferfish and two other animals	Illustrations are unlabeled OR fewer than three illustrations are included	No illustrations
WRITING (worth 1/3)	Focus	Maintains a strongly developed focus on the writing prompt for the entire essay	Maintains focus on the writing prompt for the majority of the essay	Addresses the prompt but is off-task some of the time	Does not address the prompt for most or all of the essay
		Clearly introduces the topic of animal body parts and how these parts help animals survive	Introduces the topic of animal body parts and explains how these parts help animals survive; introduction may lack detail	Attempts to introduce animal body parts and how these body parts help animals survive; introduction is inaccurate or incomplete	Does not introduce animal body parts
		Provides a relevant concluding paragraph	Provides a relevant concluding section	Provides a concluding statement	Provides no sense of closure
		Accurately introduces the spiny pufferfish and two other animals	Introduces the spiny pufferfish and one other animal	Introduces only one animal	Does not introduce any animals

ESSAY SCORING RUBRIC: TEACHER VERSION - page 2

Scoring Criteria		Exceeds	Meets	Approaches	Needs Additional Support
		4	3	2	1
WRITING (worth 1/3)	Development	Clearly and accurately describes how each body part helps each of the three animals survive	Describes how two body parts help two different animals survive	Describes how one body part helps an animal survive OR attempts to describe how two body parts help two animals survive in a manner that is inaccurate or incomplete	Does not describe how any animal body part helps an animal survive
	Clarity	Consistent use of precise and domain-specific language where appropriate	Some use of precise and domain-specific language	Little use of precise and domain-specific language	No use of precise and domain-specific language
		Demonstrates and maintains a well-developed command of standard English conventions and cohesion, with few errors; response includes language and tone consistently appropriate to the purpose and specific requirements of the prompt	Demonstrates a command of standard English conventions and cohesion, with few errors; response includes language and tone appropriate to the purpose and specific requirements of the prompt	Demonstrates an uneven command of standard English conventions and cohesion; uses language and tone with some inaccurate, inappropriate, or uneven features	Attempts to demonstrate standard English conventions, but lacks cohesion and control of grammar, usage, and mechanics

STUDENT READING

Who wants a spiny snack?

Not many animals! How the spiny puffer stays safe in the ocean

A shark glides through the warm water, searching for its next meal. It spots an ordinary brown fish swimming slowly in the clear waters ahead.



© iStock Photo/GlobalIP

But as the shark approaches, PUFF-PUFF-PUFF! The fish puffs out into a round, spiny ball. The startled shark swims away. The pufferfish is safe for now — at least until the next shark or big fish swims by.



© iStock Photo/FiLaudGirl

The ocean can be a dangerous place for small fish like the puffer. Its waters are full of predators like sharks, squid, and bigger fish that eat small fish. But pufferfish have adaptations that protect them from predators.

All animals have adaptations to stay alive. An adaptation is a body part or behavior that helps an animal live in its environment. Predators have



© NOAA

A shark uses its sharp teeth to catch and eat prey.

adaptations that help them hunt. A shark's powerful, torpedo-shaped tailfin and sharp teeth are two adaptations.

Other animals have adaptations that provide protection from predators. These animals may be fast enough to escape predators. Or they might use camouflage, special patterns or colors that help them hide in their environment.



Can you find the flounder?



Porcupines have long sharp spines that protect them.

But some animals don't run or hide. They have bodies that are hard to eat. Just picture the sharp spines of a porcupine, hedgehog, or sea urchin. Few predators are large or tough enough to make a meal of those animals!

Some toads and snakes have their own way to discourage predators. They puff themselves up to look larger. The bigger an animal, the harder it is to catch and eat. Puffer fish combine both of these adaptations. They puff up AND they have long, sharp spines.

Swimming along, a pufferfish looks like any other fish. But when it is threatened, it swells up suddenly like a big balloon. When this happens, it's easy to see why some people call it balloonfish. But this fish is no soft, squishy balloon. Its skin becomes rigid, with sharp spines sticking out in all directions. Usually these spines lie flat against the side of the fish. When the fish puffs up, the outer skin stretches out and pulls the spines up.

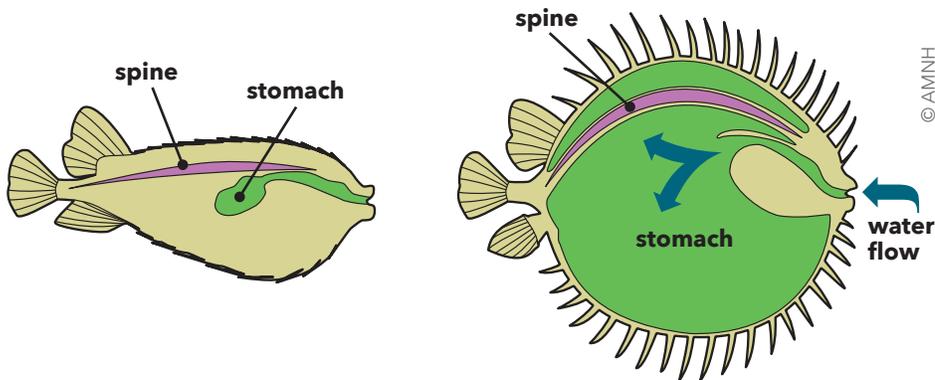


© iStock Photo/GlobalIP

A pufferfish's skin is hard and covered with sharp spines.

How does the pufferfish make this amazing transformation?

Despite its nickname, it doesn't blow itself up with air like a balloon. Instead, it fills up with water. The fish pumps a huge amount of water through its mouth into its stomach. Filled with water, its stomach becomes almost one hundred times larger. The stomach can expand like this because it's usually crumpled into many tiny folds. As water rushes



in, the stomach unfolds. To make room for the swelling stomach, other organs like the liver and intestines are pushed to the side.

A spiny puffer can change from an ordinary-looking fish into a menacing spiny ball in a few seconds. Then only the biggest animals dare to eat it. The ocean may be full of dangers, but adaptations like sharp spines and puffing up help keep the puffer safe.

Article adapted from "A Fish Story" by Adam Summers, *Natural History* magazine, October 2001.

STUDENT WORKSHEET: Part 1

Name: _____

Draw a spiny pufferfish before and after it puffs up. **Label** one structure that helps the pufferfish survive.

Before	After
<p>Species Name: Spiny Pufferfish</p>	

Describe the structure. **Explain** how it helps the pufferfish survive.

STUDENT WORKSHEET: Part 2

Name: _____

In the exhibition, **pick** two animals and **draw** them in the boxes. For each animal, **label** one structure that helps it perform a function, such as breathing, moving, sensing, eating, and avoiding predators.

species name:

Describe one structure. **Explain** how it helps the animal survive.

species name:

Describe one structure. **Explain** how it helps the animal survive.

STUDENT WRITING TASK

Now that you have studied three animals and the structures that help them survive, write an illustrated essay to teach others what you have learned.

You will write about three different animals. The first will be the spiny pufferfish. Use the information from the article “Who Wants a Spiny Snack?” to draw the spiny pufferfish, label one structure, and explain how it helps the spiny pufferfish survive.

Next, you will do the same thing for two animals that you saw in the *Life at the Limits* exhibition at the Museum.

ESSAY SCORING RUBRIC: STUDENT VERSION - page 1

Scoring Criteria		Exceeds	Meets	Approaches	Needs Additional Support
		4	3	2	1
RESEARCH (worth 1/3)	Article: "Who Wants a Spiny Snack?"	I have used information correctly from the article to write my essay; I have given a lot of detail to explain the information in my own words	I have used information correctly from the article to write my essay in my own words	I have used information from the article to write my essay, but not all of my information is correct AND/OR I didn't use my own words	I did not use information from the article to write my essay
	Museum Exhibition: <i>Life at the Limits</i>	I have used information correctly from the exhibition to write my essay; I have given a lot of detail to explain the information in my own words	I have used information correctly from the exhibition to write my essay in my own words	I have used information from the exhibition to write my essay, but not all of my information is correct AND/OR I didn't use my own words	I did not use information from the exhibition to write my essay
SCIENCE (worth 1/3)	Science Explanations	All of the information I included about animal body parts and their functions is correct	Most of the information I included about animal body parts and their functions is correct	Some of the information I included about animal body parts and their functions is correct	None of the information I included about animal body parts and their functions is correct
		I included labeled illustrations of the spiny pufferfish and two other animals that helps the reader understand how their body parts work	I included labeled illustrations of the spiny pufferfish and two other animals	I included labeled illustrations of fewer than three animals or my illustrations are not labeled	I did not include any illustrations
WRITING (worth 1/3)	Focus	My entire essay is about animal body parts	Most of my essay is about animal body parts	Some of my essay is about animal body parts	None of my essay is about animal body parts
		I included a clear introductory paragraph on animal body parts	I included an introductory paragraph in the essay	I included an introductory sentence in the essay	I did not include an introduction
		I wrote a concluding paragraph that relates to the information in my essay	I wrote a concluding section that relates to the information in my essay	I wrote a concluding sentence at the end of the essay	I did not write a concluding sentence at the end of the essay
		I accurately introduced the spiny pufferfish and two other animals	I introduced the spiny pufferfish and two other animals	I introduced only one animal	I did not introduce any animals
	Development	I thoroughly described how more than three body parts help more than three animals survive	I correctly described how three body parts help three different animals survive	Describes how one body part helps an animal survive	I did not describe how any animal body part helps an animal survive
		I used all appropriate science vocabulary words correctly	I used most science vocabulary words correctly	I used some science vocabulary words correctly	I did not use any science vocabulary words

ESSAY SCORING RUBRIC: STUDENT VERSION - page 2

Scoring Criteria		Exceeds	Meets	Approaches	Needs Additional Support
		4	3	2	1
WRITING (worth 1/3)	Clarity	I edited my essay for spelling, punctuation, and grammar; there are no errors	I edited my essay for spelling, punctuation, and grammar; there are some minor errors but the reader can still understand my writing	I did not carefully edit my essay for spelling, punctuation, and grammar; there are errors that may make the essay hard for readers to understand	I did not edit my essay for spelling, punctuation, and grammar; there are many errors that make the essay hard for readers to understand