

Module One – The Horseshoe Crab

The Horseshoe Crab module is the foundation of this project, the subject of which the subsequent modules build upon. The module lessons guide students to learn the biology and natural history of this wonderful creature.

CRAB MOON - ELEMENTARY & EARLY MIDDLE SCHOOL

Students listen to a story written by a local author about the horseshoe crab spawning phenomenon & predict the next spawning cycle.

Reading//Language Arts	Social Studies	Science	Mathematics
<p>1.0 General Reading Processes: Vocabulary D. Vocabulary. Develop & apply vocabulary via a variety of texts.</p> <p>2.0 A. Comprehension of Informational Text. 1. Develop comprehension skills by reading a variety of info. text; 2. ID & use text features to facilitate understanding (graphic aids e.g. charts, drawings, maps).</p> <p>Grade 3-4</p> <p>2.0 A. Comprehension of Informational Text: 5. Identify & explain author’s use of language (similes & metaphors).</p> <p>Grade 5</p> <p>4.0 Writing 2. Compose oral, written, and visual presentations that express personal ideas, inform, and persuade;</p> <p>6.0 Listening: attend & respond to the speaker; ask questions; summarize; follow a set of directions.</p>	<p>Grade 3-4</p> <p>3.0 Geography: A. Using Geographic Tools.</p>	<p>1.0 Skills & Processes: A. Constructing Knowledge; B. Applying Evidence and Reasoning; C. Communicate Scientific Information.</p> <p>Grade 2</p> <p>2.0 Earth & Space: D. Astronomy 1. b. Identify and record the apparent visible changes in the shape of the moon over two months of observations.</p> <p>Grade 5</p> <p>2.0 Earth & Space: D. Astronomy 2. Recognize and describe the causes of the repeating patterns of celestial events. b. (the apparent movement of the sun, moon, planets, and stars).</p>	<p>None</p>

LIFE STAGES OF THE HORSESHOE CRAB - ELEMENTARY & EARLY MIDDLE SCHOOL

Students learn to identify the stages that *Limulus polyphemus* must pass through before becoming an adult and the length of time it takes.

<p>1.0 General Reading Processes: Vocabulary D. Vocabulary. Develop & apply vocabulary via a variety of texts.</p> <p>2.0 A. Comprehension of Informational Text. 1. Develop comprehension skills by reading a variety of info. text; 2. ID & use text features to facilitate understanding (graphic aids e.g. charts, drawings, maps).</p>	<p>None</p>	<p>Kindergarten & Grade 2</p> <p>3.0 Life Science: Genetics: 1. Stages in the life cycles (growth; reproduction and death) of plants & animals.</p>	<p>7.0 Processes of Math</p> <p>A. Problem Solving; B. Reasoning; C. Communication; D. Connections: 1. Relate or apply mathematics within the discipline, to other disciplines, & to life (a-d). [addition]</p>
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¹ Activities meet learning outcomes as noted; meets all grades unless otherwise noted.

RAISING HORSESHOE CRABS IN THE CLASSROOM & EXPERIMENTS

Students learn all about horseshoe crabs - their physical needs and interactions with abiotic factors as well as how they behave by raising HSC them selves in the classroom.

Reading//Language Arts	Social Studies	Science	Mathematics
None	None	<p>1.0 Skills & Processes: A. Constructing Knowledge; B. Applying Evidence and Reasoning; C. Communicate Scientific Information.</p> <p>Kindergarten & Grade 2</p> <p>3.0 Life Science: Genetics: 1. Stages in the life cycles (growth; reproduction and death) of plants & animals</p>	<p>Grade 3</p> <p>3.0 Knowledge of Measurement: A. Measurement Units: a. estimate & determine length (centimeter & inch); d. estimate & read temperature; e. estimate & determine weight. B. Measurement Tools: 1. Measure in customary & metric units b. measure capacity to the nearest cup, pint, quart, gallon, milliliter, & liter using graduated containers.</p> <p>All grades</p> <p>7.0 Processes of Math</p> <p>A. Problem Solving; B. Reasoning; C. Communication; D. Connections: 1. Relate or apply mathematics within the discipline, to other disciplines, & to life (a-d).</p>

Module Four Managing a Resource

This module focuses on bringing the complexities of managing a multi-use natural resource. Students learn: (1) the different points of view of multiple stakeholders, (2) the challenges faced by natural resource managers seeking to balance the needs of these user groups, (3) the importance of gathering rigorous scientific data upon which to base management decisions, and (4) the importance of sequentially telling the story of the harvesting controversy (1997-2002) while also proving the “real-world data” for many of the exercises. Throughout the module, students are asked to apply critical thinking skills to discover how science, media, and politics can be used and misused in the natural resource regulatory process.

5. THE ART OF ARGUMENT – UPPER ELEMENTARY, MIDDLE & HIGH SCHOOL (SOME READINGS TOO ADVANCED FOR UPPER ELEMENTARY)

This activity engages students in exploring the art of argument. Throughout a series of 12 lessons, students read and write about the horseshoe crab and shorebird controversy in Delaware, Maryland, and New Jersey. Students will learn the concepts of “point of view, bias, and tone” as well as learn to discriminate facts from opinions as they read current and past articles on the subject. Students will complete journal activities, develop article reports on primary sources and write a five paragraph persuasive essay. Since there are multiple lessons here, you will need to repeatedly return to the handout menu to pull up the lessons you wish to use.

***This series of lessons focus on English and Language Arts skills, and the Social Studies and Science learning outcomes are “supported and reinforced” through the readings. If taught in a self-contained classroom or collaboratively with other subject teachers, the listed SS and Science standards could be more directly taught. No Mathematics learning outcomes are met.**

Lesson	English/Language Arts	Social Studies*	Science*
Lesson One	2.0 Comprehension of Informational Text A.1.a. Id characteristics of non-fiction materials to gain knowledge (reference materials; historical	W/regard to Mid-Atlantic Commission policies: Grade 4 - 1.0 Political Science A. Foundations & Functions of Government 3.	1.0 Skills & Processes: A- C. 6.0 Environ. Science: [Interpret the following as: “How resource management relies on science”

	documents; newspapers; articles); 3.a Id & analyze organizational patterns (main idea; 4.b. Id & explain author’s opinion.	Analyze the role of MD government regarding public issues (a-b Chesapeake Bay; land use).	Grade 5 - 6.0 Environ Science: B. Environ Issues: 1. Decisions influencing use of natural resources may have benefits, drawbacks, unexpected consequences, & tradeoffs; 2. Consequences may occur when Earth’s resources are used: a. positive consequences on natural environ; b. habitat destruction air, water, pollution, may have negative consequence on environ; c. Id environ issue that affects different individuals & groups.
Lesson Two	2.0 Comprehension of Informational Text A.1.a. Id characteristics of non-fiction materials to gain knowledge (reference materials; historical documents; newspapers; articles); 3.a Id & analyze organizational patterns (main idea; supporting details).	Teacher should discuss how Mid-Atlantic Commission policies help conserve HSC: Grade 4 - 1.0 Political Science A. Foundations & Functions of Government 3. Analyze the role of MD government regarding public issues (a-b Chesapeake Bay; land use).	1.0 Skills & Processes: A- C. See Science learning outcomes in Lesson One: Teacher will need to discuss authors’ details about science in mgt.
Lesson Three:	2.0 Comprehension of Informational Text A.1.a. Id characteristics of non-fiction materials to gain knowledge (reference materials; historical documents; newspapers; articles); 3.a Id & analyze organizational patterns (main idea; 4.b. Id & explain author’s opinion. 6.c. Id & explain what makes the text a reliable source of information.	Grade 4 - 4.0 Economics A. Scarcity & Economic Decision-making 1. Limited resources; 2. limited economic resources used to produce goods; 3. (technology).	1.0 Skills & Processes: A- C.
Lesson Four	2.0 Comprehension of Informational Text A.1.a. Id characteristics of non-fiction materials to gain knowledge (reference materials; historical documents; newspapers; articles); 4.b. Id & explain author’s opinion; 4.h. Distinguish between fact & opinion.	See lesson three SS: this lesson builds upon prior lesson.	1.0 Skills & Processes: A- C.
Lesson Five	2.0 Comprehension of Informational Text A.1.a. Id characteristics of non-fiction materials to gain knowledge (reference materials; historical documents; newspapers; articles); 4.b. Id & explain author’s opinion; 4.d. Summarize or paraphrase; 4.h. Distinguish between fact & opinion; Grade 3-6: 2.0A. 6.d. Determine &	None	1.0 Skills & Processes: A- C. Grade 4 - 3.0 Life Science: F. Ecology 1. Individuals & groups of organisms interact w/each other & environ: a. competition for habitat; c. roles within food chains & webs: scavengers, decomposers, etc.; d. changes in habitat are sometimes beneficial or harmful. Grade 5 - 3.0 Life Science: A. Diversity

	distinguish whether or not the author's opinion is presented fairly.		of Life 1. Some plants & animals survive well, some less well, & some not at all (adaptations & environmental conditions: e.g., MD blue crab; sunflower; population dynamics due to sudden (flood) or slow (global warming; pollution); 6.0 Environ Science: B. Environ Issues: 1. Decisions influencing the use of natural resources may have benefits, drawbacks, unexpected consequences, & tradeoffs; 2. Consequences may occur when Earth's natural resources are used: a. positive consequences on the natural environ; b. habitat destruction air, water, pollution, may have a negative consequence on the natural environ; c. Id environ issues that affects different individuals & groups.
Lesson Six:	2.0 Comprehension of Informational Text A.1.a. Id characteristics of non-fiction materials to gain knowledge (reference materials; historical documents; newspapers; articles); 4.b. Id & explain author's opinion; 4.h. Distinguish between fact & opinion; Grade 3-6: 2.0A. 6.d. Determine & distinguish whether or not the author's opinion is presented fairly.	Grade 4 - 4.0 Economics A. Scarcity & Economic Decision-making 1. Limited resources; 2. limited economic resources used to produce goods; 3. (technology).	1.0 Skills & Processes: A- C. Grade 5 4.0 Chemistry: C. States of Matter 1. Processes used to change materials from one state of matter to another.
Lesson Seven	2.0 Comprehension of Informational Text A.1.a. Id characteristics of non-fiction materials to gain knowledge (reference materials; historical documents; newspapers; articles); 4.b. Id & explain author's opinion; 4.h. Distinguish between fact & opinion; 6.c. Id & explain what makes the text a reliable source of information.	Grade 4 - 3.0 Geography D. Modifying & Adapting to the Environment 1. a-c (consequences; land use/growth of suburbia/pollution; governmental decisions); 4.0 Economics A. Scarcity & Economic Decision-making 1. Limited resources; 2. limited economic resources used to produce goods; 3. (technology).	1.0 Skills & Processes: A- C.
Lesson Eight	2.0 Comprehension of Informational Text A.1.a. Id characteristics of non-fiction materials to gain knowledge (reference materials; historical documents; newspapers; articles); 4.b. Id & explain author's opinion; 4.h. Distinguish between fact & opinion.	Grade 4- 3.0 Geography D. Modifying & Adapting to the Environment 1. a-c (consequences; land use/growth of suburbia/pollution; governmental decisions); 4.0 Economics A. Scarcity & Economic Decision-making 1. Limited resources; 2. limited economic resources	1.0 Skills & Processes: A- C. Grade 4 - 3.0 Life Science: F. Ecology 1. Individuals & groups of organisms interact w/each other & environ: a. habitat competition; c. roles w/n food chains & webs: scavengers, decomposers, etc.; d. habitat changes are sometimes beneficial,

		used to produce goods; 3. (technology).	sometimes harmful. Grade 5 - 3.0 Life Science: A. Diversity of Life 1. Some plants & animals survive well, some less well, & some not at all (adaptations & environmental conditions: e.g., MD blue crab; population dynamics due to sudden/ slow (global warming; pollution) changes.
Lesson Nine	2.0 Comprehension of Informational Text A.1.a. Id characteristics of non-fiction materials to gain knowledge (reference materials; historical documents; newspapers; articles); 6.c. Id & explain what makes the text a reliable source of information; 6.f Id or explain language & other techniques intended to persuade the reader.	Grade 4 - 4.0 Economics A. Scarcity & Economic Decision-making 1. Limited resources; 2. limited economic resources used to produce goods; 3. (technology).	1.0 Skills & Processes: A- C. Grade 4 - 3.0 Life Science: F. Ecology 1. Individuals & groups of organisms interact w/each other & environ: a. habitat competition; c. roles w/n food chains & webs: scavengers, decomposers, etc.; d. habitat changes are sometimes beneficial, sometimes harmful. Grade 5 - 3.0 Life Science: A. Diversity of Life 1. Some plants & animals survive well, some less well, & some not at all (adaptations & environmental conditions: e.g., MD blue crab; sunflower; population dynamics due to sudden or slow.
Lesson Ten	2.0 Comprehension of Informational Text A.1.a. Id characteristics of non-fiction materials to gain knowledge (reference materials; historical documents; newspapers; articles); 4.b. Id & explain author’s opinion; 4.h. Distinguish between fact & opinion.	Grade 4 - 3.0 Geography D. Modifying & Adapting to the Environment 1. a-c (consequences; land use/growth of suburbia/pollution; governmental decisions); 4.0 Economics A. Scarcity & Economic Decision-making 1. Limited resources; 2. limited economic resources used to produce goods; 3. (technology).	1.0 Skills & Processes: A- C.
Lesson Eleven	6.c. Id & explain what makes the text a reliable source of information; 4.d. Summarize or paraphrase; 6.c. Id & explain what makes the text a reliable source of information; 4.0 2.a&c. Compose oral, written or visual presentations that express personal ideas, inform and persuade; 7.a. Id, evaluate & use sources of info. on a given topic.	Depends on study focus: any of above learning outcomes might be supported.	1.0 Skills & Processes: A- C.
Lesson Twelve	4.0 2.a&c. Compose oral, written or visual presentations that express personal ideas inform and persuade.	Depends on study focus: any of above learning outcomes might be supported.	1.0 Skills & Processes: A- C.