World Language-STEM MODULE COVERSHEET
The Chesapeake Bay – A Home for Many

**Target Language:** English as a Second Language

**Grade Level:** 4 and 5

**Proficiency Level:** Junior Novice Low – Junior Novice Mid

**Enduring Understanding:**
A body of water is an ecosystem affected by many factors, including human activity.

**Essential Question:**
How do our actions harm or help a body of water such as the Chesapeake Bay?

**Module Duration and Lessons:**
The module is designed for three to five 30-minute class periods per week over three to five weeks. Instructional time will depend on students’ previous knowledge of content and vocabulary, as well as their language proficiency. Other factors include program type and whether the module is used as the main core of instruction or as a supplementary resource.

Five lessons
Lesson 1: A walk along the bay
Lesson 2: The ecosystem of the bay
Lesson 3: Dead zones in the bay
Lesson 4: Taking action to protect the bay
Lesson 5: Final performance assessment

**Suggestions to teachers:**
You may want to consider using this module after using *Water Water Everywhere* and/or *From Seeds to Table* modules. The content from these two modules may serve as prior knowledge for this module on ecology.

This module includes a story about Danny and his grandpa, Jim, who grew up on the Chesapeake Bay. The story is called “Chesapeake Bay: Home for Many”. There is a separate PowerPoint of the book to accompany the module. A chapter of the book is included near the end of each lesson. However, another approach is to show the images for each chapter at the BEGINNING of the lesson and talk with the students about what they see as a previewing step to the lesson. Then at the end of the lesson, the teacher can read the chapter to the students, allowing them to add to the story based on what they have learned in the lesson about Chesapeake Bay.

**Context and Storyline:**
Jim lives along the Chesapeake Bay. Danny, his grandson, is visiting his grandfather on the Bay. As they walk together along the shore, Jim tells Danny about Chesapeake Bay.

**Standards Targeted**

| 5C’s – World-Readiness Standards for Learning Languages | 5E – STEM Standards |
**World Language-STEM MODULE COVERSHEET**
**The Chesapeake Bay – A Home for Many**

<table>
<thead>
<tr>
<th>Communication:</th>
<th>SS: NGSS 3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.</th>
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</thead>
<tbody>
<tr>
<td>Communicate effectively in more than one language in order to function in a variety of situations and for multiple purposes</td>
<td><strong>STEM:</strong></td>
</tr>
<tr>
<td>● Learners interact and negotiate meaning in spoken, signed, or written conversations to share information, reactions, feelings, and opinions.</td>
<td>• Learn and apply rigorous science, technology, engineering, and mathematics content</td>
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<tr>
<td>● Learners understand, interpret, and analyze what is heard, read, or viewed on a variety of topics.</td>
<td>• Interpret and communicate information from science, technology, engineering, and mathematics</td>
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<tr>
<td>● Learners present information, concepts, and ideas to inform, explain, persuade, and narrate on a variety of topics using appropriate media and adapting to various audiences of listeners, readers, or viewers.</td>
<td>• Engage in inquiry</td>
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<tr>
<th>Cultures:</th>
<th><strong>Comparisons</strong></th>
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<tbody>
<tr>
<td>Interact with cultural competence and understanding</td>
<td>● Students demonstrate understanding of the nature of language through comparisons of the language studied and their own (names of plants, animals, etc.).</td>
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<tr>
<td>● Learners use the language to investigate, explain, and reflect on the relationship between the practices and perspectives of the cultures studied.</td>
<td>● Students demonstrate understanding of the concept of culture through comparisons of the cultures studied and their own (importance of protecting the environment).</td>
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<tr>
<td>● Learners use the language to investigate, explain, and reflect on the relationship between the products and perspectives of the cultures studied.</td>
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### Communities

- Students use the language both within and beyond the school setting (share information about Chesapeake Bay restoration with people in the community).

### Knowledge: Students will know...

**Content-obligatory language:**

- Organisms of the Bay:
  - grandfather
  - grandson
  - bird
  - duck
  - fish
  - blue crab
  - bull shark
  - Canadian goose
  - cownose ray
  - Eastern oyster
  - eelgrass
  - grass shrimp
  - mallard
  - menhaden
  - osprey
  - phytoplankton
  - red fox
  - seahorse
  - softshell clam
  - toadfish
  - widgeon grass
  - zooplankton
  - food chain
  - food web
  - predator
  - prey
  - algae
  - ecosystem
  - watershed
  - pollution
  - nitrogen
  - estuary
  - freshwater

### Skills: Students can...

- Identify Chesapeake Bay organisms
- Show how organisms within an ecosystem depend on one another within food chains and food webs.
- Predict an ecosystem’s stability when one factor (abiotic or biotic) is changed.
- Identify pollutants that affect water quality in the Chesapeake Bay.
- Explain the relationship between healthy food chains and healthy ecosystems.
- Propose solutions, which could improve the water quality in the Chesapeake Bay.
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- seawater
- land
- water
- food

Content-compatible language:
Expressions and patterns
- Do you like __?
- I like____.
- This is a _____
- It eats____; it is eaten by_______
- My favorite animal is__________
- Is it large or small?
- To live
- Does it live on land or water?
- Does it swim or fly?

Integrated Performance Assessments

Interpretive Task
Students will demonstrate an understanding of an infographic about pollution in Chesapeake Bay by responding to questions related to information contained in the infographic. (Worksheet 5.1)

Presentational Task
Students will present their poster on ways to help make our waterways clean. (Completed during lesson 4). (Worksheet 5.2 rubric)

Interpersonal Task
Students will share a collage of animals from the Chesapeake Bay. They will ask and respond to simple questions: What is that? Do you like (animal)? Is it a predator or prey? Does it live on land or water or in the air? (Worksheet 5.3 scoring guide and sample collage)

Materials/Resources:
- PowerPoint presentation: A Home for Many
- Map of the United States posted on a wall
- Basket for slips of paper with pictures of animals
- Index cards for drawings of animals
- Flipchart paper and markers to make food webs
- Index cards or construction paper for drawing animals from the Bay
- Markers
- Large piece of paper approximately 36” x 42” or larger with a beach drawn on it to represent
Chesapeake Bay
- A ball of yarn or string to use to create a web among all the members of the class
- Aluminum baking pans (22cm wide x 33 cm long x 6 cm deep) – one for each group of 4 students
- Newspapers (2 pages for each group)
- One sheet of thin plastic that is 20cm larger than the pan – one for each group of 4 students
- Spray bottle (one for each group)
- One book at least 2 inches thick (one for each group)
- Green and orange gelatin mix
- Blue food coloring
- Map of the United States
- Tape or glue
- Scissors
- Resource 1a: Images for small group activity
- Resource 1b: Flashcards for partner activity
- Worksheet 1a: My Bay Book
- Worksheet 1b: The Chesapeake Bay (one per student and one enlarged copy for class display)
- Worksheet 1c: Visuals to accompany Worksheet 1b (one set per student and one enlarged set for class display)
- Worksheet 2a: My Food Chain
- Resources 3a
- Resources 3b
- Worksheet 3a: Watershed Experiment
- Worksheet 3b: Watershed Pollution
- Worksheet 4a
- Worksheet 4b

STEM Background for Teachers:
Most of the background information needed can be easily found on MPT’s “Bayville” website, where many of the activities and resources for this module are also housed:

Biodiversity: The connection of living things to each other. Plants and animals depend on each other to survive.
Ecosystem: “Ecosystem” is short for “ecological system” and includes all the living organisms existing together in a particular area. These plants and animals within an area interact with each other and with the non-living elements of the area such as climate, water, soil, etc. An ecosystem can be very small such as a puddle or an area under a large rock, or it can be vast like Chesapeake Bay or the Atlantic Ocean. The balance of an ecosystem is delicate, and a disruption such as the introduction of a new element can damage it. Scientists group ecosystems that are similar into biomes. When we talk about the entire ecosystem of the whole planet, we call it the biosphere. (Sydenham, S. & Thomas, R. What is an ecosystem? [Online] www.kidcyber.com.au [2009]).

Each spring and summer in the Chesapeake Bay region, low-oxygen “dead zones” and harmful algae blooms appear in various parts of the Bay and its creeks and rivers. The size and severity of algae blooms and dead zones in the Bay depend on the amount of water that flows into the Bay. That water brings excess nutrients and sediment from the land. Combined with high temperatures, the excess pollutants can fuel the growth of algae blooms and cause the water to become clouded and discolored.
The water condition is called a mahogany tide, which can cause the water to appear reddish brown. Mahogany tides may also deplete the water of oxygen, which may be why Jim and Danny saw dead fish. Algae blooms make conditions difficult for much of the aquatic life in the Chesapeake Bay. Algae blooms can be very detrimental to the health of the Bay. Some are considered harmful algae blooms (HABs) and can be toxic to aquatic life such as fish, oysters and crabs. They can also cause skin irritation or other sickness to people who come into contact with them. Even if algae blooms aren’t toxic, they can still be harmful to the Bay. When algae blooms get dense enough, they block sunlight from reaching bay grasses growing at the bottom of the Bay. Of course, bay grasses are vital to the Bay's health, so when fewer bay grasses grow, the cycle of poor Bay health continues. When algae blooms die they create more problems, as the decomposition process sucks up most of the oxygen that fish, oysters and crabs needs to survive. Since algae blooms are fueled by excess nutrients, you can do your part to help prevent algae blooms in your local waterway by taking small steps to decrease polluted runoff. Small steps such as not fertilizing your lawn, picking up your pet’s waste and planting more trees in your yard can make a difference. (Source: Chesapeake Bay News).
### Lesson 1 of 5

**A Walk Along the Bay**

| **Objectives** | **I Can:**  
|---------------|-------------------|
| Oral language: | - Identify animals that live on the Chesapeake Bay.  
|               | - Tell if an animal lives on land or water or both.  
|               | - Say if I like certain animals.  
|               | - Use pictures, map and simple words to tell what a “watershed is”  
| Literacy:     | - Recognize and label some of the names of animals found on the Chesapeake Bay  
| STEM and Other Subject Areas: | - Express a basic understanding of predators and prey.  

| **Vocabulary and Expressions** | **Prior Knowledge:**  
|-------------------------------|-------------------|
|                               | - colors  
|                               | - numbers  
|                               | - physical description such as large/small, pretty/ugly, long/short  
|                               | **Content obligatory language:**  
|                               | - grandfather  
|                               | - grandson  
|                               | - bird  
|                               | - duck  
|                               | - fish  
|                               | - bald eagle  
|                               | - blue crab  
|                               | - bull shark  
|                               | - Canadian goose  
|                               | - cownose ray  
|                               | - Eastern oyster  
|                               | - eelgrass  
|                               | - grass shrimp  
|                               | - mallard  
|                               | - menhaden  
|                               | - osprey  
|                               | - phytoplankton  
|                               | - red fox  
|                               | - seahorse  
|                               | - softshell clam  

**Key Elements**

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<thead>
<tr>
<th>Engagement</th>
<th>Lesson 1: A Walk Along the Bay</th>
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| *Object, event or question used to engage students.* | **Introduction to the Chesapeake Bay**
| *Connections facilitated between what students know* | **NOTE:** For this module, students will create *My Bay Book*, in which they will assemble the worksheets that they complete in these lessons. Duplicate one copy of *Worksheet 1a* (book cover) and *Worksheet 1b* (poster). In addition, duplicate a larger version of *Worksheet 1b* to be displayed on the board. 

T: *Good morning, students! Today we are starting on a new adventure. We’re going to take a trip across the Bay Bridge with our friend, Danny to visit his grandfather, Jim. Jim has lived on the shores of the Chesapeake Bay his*
and can do entire life. We will learn all about life along the bay from Jim.

**PPT 1-4**

T: *Where do we live?* (Point out Baltimore. Talk about the western vs. the eastern shore.)

T: *We live on the Western shore. Danny’s grandfather lives on the Eastern Shore.*

T: *How do we go from one shore to the other?*

Students respond.

(Engage students in a conversation about their experiences on the Eastern Shore.)

T: *Have you ever traveling across the bay on the bridge? Where did you go? Who did you visit? What did you do? What did you see?*

Students respond.

T: *We’re going to take a trip across the Bay Bridge with our friend, Danny to visit his grandfather, Jim. Jim has lived on the shores of the Chesapeake Bay his entire life. We will learn all about life along the bay from Jim. Let’s listen as Jim talks about the world of the Chesapeake Bay.*

**PPT 5**

T: *Who likes animals?*

Teacher gestures to the image of the heart on the screen, points to all the images of the animals, and nods head “yes” and raises hand to signal that he/she likes animals. Teacher signals students to raise hands if they like animals. Teacher asks:

T: *Do you like animals? Yes or no? Let’s look at some of the animals that Danny’s grandfather will show us that live along the Chesapeake Bay.*

Display images of the birds and ducks. Chorally repeat while asking students the following questions. Encourage students to use multiple animals in their sentences and to use the negative response, such as “I do not like ducks.”

- Do you like animals?
- Do you like...?
- Does it live on land or in water?
- Does it fly/swim/walk?
- Which is your favorite – the duck or the bird?

Continue until all four animals have been practiced.

**PPT 6**

Introduce the eagle.

T: *Here is a bird that lives in the Chesapeake Bay. But it is a very special bird. It is the national symbol of the United States.*

Engage students in a discussion about the eagle using familiar vocabulary and expressions, such as size, color, and other physical descriptions. Chorally repeat each vocabulary word in context:

- This is called the bald eagle.
- What color is it?
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- Is it large or small?
- What do you think it eats?
- It eats fish and small animals, such as ducks.
- The bald eagle eats fish.
- The fish is eaten by the bald eagle.

Point to each image and ask students, What does it eat?

Click on the osprey.

T: Here is another important bird that lives along the Bay. It is called an osprey.

Engage students in a discussion about the osprey using familiar vocabulary and expressions, such as size, color, and other physical descriptions.

- This is called the osprey.
- What color is it?
- Is it large or small?
- What do you think it eats?
- It eats fish and small animals, such as ducks.
- The osprey eats fish.
- The fish is eaten by the osprey.

Point to each image and ask students, What does it eat?

T: The bald eagle lives in the Chesapeake Bay region year-round. The osprey migrates south from August to March. Here are two more birds (or waterfowl) that also migrate. They come to the bay in winter.

- The Canada goose migrates to the Bay from September until March.
- The mallard migrates to the Bay from September until March also.

Engage students in questions such as:

- the color
- the size

T: What do you think they eat?

- They eat only plants.
- Do you think they are eaten by other animals?

T: Right! They are eaten by other animals.

T: All these birds live in the Chesapeake Bay region.

### Exploration

- Objects and phenomena are explored.
- Hands-on activities, with guidance.

### Danny learns about a predator of the birds of the Chesapeake Bay.

**PPT 6**

(Review the bald eagle, osprey, Canada goose, and mallard.)

T: Here is a predator of the Canada goose and mallard, the red fox.

Engage students in questions such as:

- the color
- the size
- what they eat
Divide students into groups of six. Distribute one flashcard from Resource 1a to each student. Direct students to form an inside and an outside circle. Each student will ask a variety of questions to their face partner. Encourage students to use a different question for each turn. Display the questions for reference. For example:

- Do you like _____?
- Where does it live?
- Does it fly/swim/walk?
- What color is it?
- Is it big or small?
- What does it eat?
- What is its predator?

After each pair has asked and answered their questions. Direct students to exchange cards. Then direct the outside circle to move one student to the right. Continue in this manner until students meet their original partner.

PPT 7
T: This is the Chesapeake Bay. What kinds of animals live in the region? (Review the bald eagle, osprey, Canada goose, mallard, and red fox.)

Distribute Worksheet 1b and one set of visuals from Worksheet 1c to each student. (Part 1 ONLY)

T: Let's add all the animals we learned today on our poster.

- Model one of the animals using the classroom poster.
  - Write the names of the animals upside down on the reverse side of the visuals.
  - Invite one student to place one of the visuals in the appropriate location on the poster. (land or water)
- Distribute the visuals for Part 1 only to the students.
- On the reverse side of each visual, instruct students to flip the flashcard upside down and write the name of the animal.
- Instruct students decide where the animal should be placed on the poster (on land or in the water.)
- Instruct students to glue or tape the visuals along the top edge only, so that the visual can be flipped up to reveal the name of the animal on the reverse side.
- Assist students as needed.

As a summary, invite students to come to the class poster and place the remaining visuals of the animals in the appropriate locations on the poster.

**Explanation**
- Students explain their understanding of concepts and processes.

Danny learns about the food chain.
Show a video of either a bald eagle or an osprey catching a fish.

T: What happened in the video? Who ate the fish?

PPT 8
T: What is Danny asking his grandfather?
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A student reads the text on the slide.

PPT 9
T: Here are some important fish that are food for eagles, osprey, and other birds. (Introduce Striped bass, menhaden, cownose ray, oyster toadfish, and bull shark.)
Chorally repeat in context: [needs more research.]
- The striped bass is gray and big.
- The menhaden eats...
- They eat...
- They are the prey of...
- colors and sizes

T: Let’s go fishing in the Bay.
Distribute a picture or word cards to each student from Resource 1b.
Instruct students to find their matching card and practice one sentence about their picture to share with the class.
Students repeat their sentence(s) to the class.

T: Let’s add all the animals we learned today on our poster.
Instruct students to continue with Worksheet 1b and the flashcards from Worksheet 1c. (Part 2 ONLY)
- On the reverse side of each visual, instruct students to flip the flashcard upside down and write the name of the animal.
- Instruct students decide where the animal should be placed on the poster (on land or in the water.)
- Instruct students to glue or tape the visuals along the top edge only, so that the visual can be flipped up to reveal the name of the animal on the reverse side.
Assist students as needed.

Elaboration
- Activities allow students to apply concepts in contexts, and build on or extend understanding and skill.

Danny learns how a watershed supports various types of plants and animals along the Bay.
Vocabulary introduced: eelgrass, widgeon grass, phytoplankton, zooplankton, blue crab, Eastern oyster, soft shell clam, seahorse, grass shrimp

T: Let’s walk along the shore with Danny and his grandfather, Jim so that we can learn more about these animals and how they live together in the Chesapeake Bay.
Show a brief of a blue crab or seahorse.

PPT 10
T: What does Danny see?
Invite a student to read the text on the slide.

PPT 11-12
T: Here is Jim describing eelgrass and Widgeon grass.
Chorally repeat in context:
- *Eelgrass (Widgeon) grass is green.*
- *It lives in the water.*
- *Fish eat eel (Widgeon) grass. (Substitute menhaden, striped bass, etc.)*

**T:** *But there are other plants and animals that we cannot see.*
- *Zooplankton are very small animals that live in the water.*
- *Phytoplankton are very small plants that live in the water.*
- *Some are...[size and color]*
- *They are very important food for many animals like the blue crab.*

### PPT 13

Engage students in meaningful conversation and choral repetition as you introduce the animals. For example:
- *The blue crab is very important to Maryland.*
- *Do you like to eat crabs?*
- *They live on the bottom of the Bay.*
- *The oyster ( clam ) is gray.*
- *The oyster and the clam eat zooplankton and phytoplankton.*
- *Clams and oyster help keep the water clean.*
- *They are the prey of crabs, ducks, and fish.*
- *The seahorse floats among the grasses.*
- *The grass shrimp is small and transparent.*

**T:** *Let's add all the animals and plants we learned today on our poster.*
Instruct students to complete Worksheet 1b with the remaining flashcards from Worksheet 1c. (Part 3 and 4) as completed previously.

### Evaluation
- Students assess their knowledge, skills and abilities. Activities permit evaluation of student development and lesson effectiveness.

### Interpretative and Presentation Performance Assessment: Who am I?

Write the names of the animals learned in this lesson in a container. Each student will select one name.

**NOTE:**
- Depending on the ability levels of your students, provide prompts/sentence starters as needed.
- Without naming the animal, students will write a description of their animal using as many sentences as possible, including size, color, where it lives, what it eats, etc.
- Allow 10-15 minutes for students to prepare their presentation.
- Each student will then present and finish their presentation with the statement - *Who am I?*"
- The students will state, "You are the _____!"
### Teacher Reflection Lesson 1 - Jim and Danny walk along Chesapeake Bay

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<tbody>
<tr>
<td><strong>What worked well?</strong></td>
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<td><strong>What did not work well?</strong></td>
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<td><strong>What would I do differently?</strong></td>
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<td><strong>Other comments or notes</strong></td>
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**Lesson 2- The Ecosystem of the Bay**

<table>
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<tr>
<th>Lesson 2 of 5</th>
<th>The Ecosystem of the Bay</th>
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<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>I Can:</strong></td>
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<td></td>
<td><strong>Oral language:</strong></td>
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<td></td>
<td>• Name animals in a food chain</td>
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<td>• Use pictures and simple words to tell what an “estuary” is and give examples</td>
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<td><strong>Literacy:</strong></td>
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<td>• Recognize names of animals in a food web</td>
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<td>• Recognize the word <em>estuary</em> and label examples on a map</td>
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<td>• Recognize the word <em>watershed</em> and label examples on a map</td>
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<td>• Use pictures, map and simple words to explain a watershed</td>
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<td><strong>STEM and Other Subject Areas:</strong></td>
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<td></td>
<td>• Explain how food chains and food webs are interrelated and how they support ecosystems</td>
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<td>• Express a basic understanding of an estuary and a watershed</td>
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<tr>
<td><strong>Vocabulary and Expressions</strong></td>
<td><strong>Content obligatory language:</strong></td>
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<td>• ecosystem</td>
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<td>• What happens?</td>
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<td>• Let’s find out!</td>
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| **Materials/Resources** | o PowerPoint slides 13 – 22 |
### Lesson Storyline and Core Text
Jim explains how the plants and animals are part of an ecosystem and depend on each other. He explains the food web found in the Chesapeake Bay:

**The Chesapeake Bay is an ecosystem.**

An ecosystem includes the plants and animals that are found in the Chesapeake Bay area. These plants and animals depend on each other to survive. All the plants and animals in an ecosystem interact with each other. Some plants and animals are food for other plants and animals. They form a food chain. The animals that eat other animals and plants are predators. The plants and animals that others eat are prey. In one food chain example, blue crabs eat zooplankton. And you and I eat blue crabs! We are part of the ecosystem and food chain! In another food chain, clams eat zooplankton. Birds eat clams. A red fox eats birds. Many food chains together form a food web.

A healthy ecosystem is one with a balanced food web. There are not too many predators or preys. Look at the top of this food web, Danny. That’s you and me! When we catch fish for supper, we are part of the food web!

### Key Elements

#### Lesson 2 Procedures

**Is it a predator or a prey? Introducing a food chain**

Distribute one set of flashcards from **Resource 2a** to each pair of students.

**PPT 13**

T: *Think about the animals in the Chesapeake Bay. Who can name an animal found in the Chesapeake Bay?*

- Call on students to name an animal.
- Point to the animal on **PPT 13** or on the poster.
- Then ask the students to hold up the flashcards of this animal.
- Ask; *is it a predator or a prey of_____?*
- Continue in this manner, asking students to hold up the appropriate flashcards as students answer and chorally repeat.

Ask additional questions such as:

T: *Do you think that an animal can be both a predator and a prey?*

T: *Which animal is the predator?*

T: *Which animal is the prey?*

**PPT 14**

Invite students to ask each other the questions on the slide.

**PPT 15**

Introduce a food chain.
T: When one animal eats another animal, we call this a food chain. Look at this one. Who can start the food chain? The _____eats the_______. Then the______eats the_______. etc.

Instruct each student to arrange four different flashcards into a food chain on their desks.

Conduct a Gallery Walk in which students look at several other food chains and discuss the food chains using the pattern, The______eats the______, the______eats the______, etc.

Distribute Worksheet 2a and instruct students to draw a food chain with different animals and plants.

Collect the flashcards to be used in the following segment.

---

**Exploration**

- Objects and phenomena are explored.
- Hands-on activities, with guidance.

---

**Experiencing a food web**

Distribute the flashcards from Resource 2a.

**PPT 15**

T: We noticed from out food chains that plants and animals depend on each other to live. Sometimes more than one predator can have the same prey in order to live. Can someone give an example?

Students respond.

T: What else eats blue crabs besides humans?

**PPT 16**

T: Right! Just like this slide, an animal may have more than one predator.

T: When food chains affect each other, we call this a food web.

**PPT 17**

Discuss and chorally repeat examples of predators and prey using the animals on the slide.

Making food webs.

- Divide students into groups of 3-5. Distribute the arrows from Resource 2a.
- Instruct each student to create his/her own food chain using four of the flashcards. The different food chains should be arranged side by side on their tables.
- Then, instruct students to connect their own food chain to their partners at their table using the arrows, and to explain their webs. For example: My bald eagle also eats your menhaden, as the student places the arrow next to the bald eagle, pointing to the menhaden in the adjoining food chain.
- Conduct a Gallery Walk so that each group can review and check for accuracy of the food webs of the other groups.
- Collect the flashcards.
Hold up the ball of string. Instruct students to form a circle.

T: Let’s pretend that we are the animals in our food chains. Let’s make a food web using this string.

- First, I will name one of the animals in the Bay.
- Second, I will toss this ball of string to one of you. You will name another animal, hold the string, and toss the ball to another person.
- We will continue like this until each of you has named an animal.
- As you will see, we will all be connected to each other with the string, just like in a food web!

After all students are connected with the string:

T: Do you see? We are all connected to each other by the string. What have we made?

Students respond.

T: Now, what happens if one of the animals is removed from the food web? (Instruct one student to drop his/her string, and to step back from the circle.)

T: Do we still have a food web?

Students respond.

Instruct two more students to drop the string and step back from the circle.

T: What happens when two people drop their string?

Students respond.

Instruct three people to drop the string and step back from the circle.

T: What happens after three more people drop the string?

Students respond.

T: Right! The web is not as strong. As more and more animals are removed from the food web, fewer animals can survive.

T: Now everyone, drop the string. No animals are connected so they cannot live. That is called a dead zone. (Chorally repeat.)

---

### Explanation

- **Students explain their understanding of concepts and processes.**
- **New concepts and skills are introduced as conceptual clarity and cohesion are sought.**

---

### Explaining an ecosystem

**PPT 18 and 19**

T: Let’s listen to Jim explaining the food web in the Bay.

Invite students to read the text on the slide.

Chorally repeat ecosystem in context.

Engage students in a conversation using the images on the slides.

- What is the prey of the bald eagle/Mallard duck/etc.
- What animal is the predator of zooplankton and phytoplankton?
- (Point to two animals.) Which is the prey? Which is the predator?
- Why do you think an ecosystem needs a balance of predators and prey?
- Why did Jim say, “We are part of the food web?” Students respond.

Re-distribute **Worksheet 1b.**

Direct students to draw arrows from the predator to the prey, connecting as many animals as possible. Model one example.
Then direct students to write, *The ecosystem of...* in front of the title *The Chesapeake Bay.*

Instruct students to discuss their choices with several partners, using a different set of animals each time. Model sentences:
- *The ___________ is the predator of the ________________.*
- *The ___________ is the prey of the ________________.*

Summarize the activity by asking students to explain *ecosystem.*

Right! *The ecosystem of the Chesapeake Bay is part of a watershed.* Let’s listen to Jim explain what this means.

### Elaboration
Activities allow students to apply concepts in contexts, and build on or extend understanding and skill.

<table>
<thead>
<tr>
<th>PPT 20-22</th>
</tr>
</thead>
<tbody>
<tr>
<td>T: <em>Let’s continue the story of Jim and Danny and Chesapeake Bay.</em> Invite students to read the text on the slide. Chorally repeat the states on the map and the Atlantic Ocean. Engage students in conversation about the states and their abbreviations; and about how the rivers flow into the Chesapeake, and the Bay into the Atlantic Ocean. Distribute <em>Worksheet 2b.</em> Assist students in labeling the watershed map.</td>
</tr>
</tbody>
</table>

### Evaluation
Students assess their knowledge, skills and abilities. Activities permit evaluation of student development and lesson effectiveness.

<table>
<thead>
<tr>
<th>Interpretative, Interpersonal and Presentational Performance Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students complete a postcard to send to a friend. NOTE: Cut out one postcard per student from <em>Worksheet 2c.</em> If possible, use cardstock paper. You may wish to display the word bank, depending on the ability level of your students. Use the following word bank. (Not all words will be used, depending on your students’ choices for some of the animals.) Distribute <em>Worksheet 2c.</em></td>
</tr>
</tbody>
</table>

### Teacher Reflections on Lesson 2 - *The Ecosystem of the Bay*

<table>
<thead>
<tr>
<th>What worked well?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What did not work well?</td>
</tr>
<tr>
<td>What would I do differently?</td>
</tr>
<tr>
<td>Other comments or notes</td>
</tr>
</tbody>
</table>
### Lesson 3: Dead Zones in the Bay

#### Objectives

**I Can:**
- **Oral language:**
  - Identify algae blooms on Chesapeake Bay
  - List what pollutes the water in Chesapeake Bay

**Literacy:**
- Read an infographic showing causes of pollution in Chesapeake Bay

**STEM and Other Subject Areas:**
- Give examples of how the watershed brings pollution to Chesapeake Bay
- Show how nutrification from excess nitrogen and phosphorus can cause loss of habitat for Chesapeake Bay organisms

#### Vocabulary and Expressions

**Content obligatory language**
- agriculture
- fertilizer
- run-off
- nitrogen
- pollution
- nutrient
- nutrification
- watershed
- oxygen
- algae blooms
- dead zones

**Content compatible language:**
- green slime
- farm
- farmer
- chicken
- people
- homes
- factories
- cities
- dead
- to die
- to hurt
- What is wrong?

#### Materials/Resources
- PowerPoint Slides 23 - 42
- Resources 3a
### World Language-STEM MODULE COVERSHEET
The Chesapeake Bay – A Home for Many

<table>
<thead>
<tr>
<th>Key Elements</th>
<th>Lesson 3 Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engagement</strong></td>
<td>Creating a watershed and testing the effects of pollution</td>
</tr>
<tr>
<td><strong>Object or question used to engage students.</strong></td>
<td>Today, we will make our own watersheds.</td>
</tr>
<tr>
<td><strong>Connections facilitated between what students know and can do.</strong></td>
<td>Distribute the materials to each group (as listed on Resource 3a) and one Worksheet 3a per group.</td>
</tr>
<tr>
<td><strong>PPT 23-24</strong></td>
<td>Model the experiment.</td>
</tr>
<tr>
<td></td>
<td>• Introduce the vocabulary pollution, fertilizer, and agriculture (that are represented by the orange gelatin mix, green gelatin mix, and cocoa mix, respectively.)</td>
</tr>
<tr>
<td></td>
<td>• Assist groups as needed.</td>
</tr>
<tr>
<td></td>
<td>• Discuss results.</td>
</tr>
<tr>
<td></td>
<td>T: What do you think happens to the grasses, the fish, and other animals in a polluted watershed?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exploration</th>
<th>How pollution affects a watershed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objects and phenomena are explored.</strong></td>
<td>PPT 25-26</td>
</tr>
<tr>
<td><strong>Hands-on activities, with</strong></td>
<td>Invite a student to read the text.</td>
</tr>
<tr>
<td></td>
<td>T: Jim tells us that more people and businesses have moved here. Is that good or bad? Engage students in conversation using familiar vocabulary,</td>
</tr>
</tbody>
</table>

Resources 3b
- Worksheet 3a: Watershed Experiment
- Worksheet 3b: Watershed Pollution
- ball of string or yarn
- one large roasting pan (one per group) (such as a disposable aluminum pan, 16” x 12” x 3”)
- sheets of newspaper
- plastic wrap
- aluminum foil
- spray bottle (one per group)
- large book (one per group)
- green and orange gelatin mix
- hot cocoa mix
- blue food coloring
- paper

Lesson Storyline and Core Text

Jim shows Danny dead zones in Chesapeake Bay.
Jim and Danny continue exploring the Chesapeake Bay. They stop and look at the water and notice a green slime on the surface. Jim explains how algae affect the food web of the Bay. They further investigate other pollution and dead zones. Later, Jim explains to Danny that the rivers from all of the states of the Chesapeake Bay Watershed bring pollution. Danny says, “Grandpa, what can we do to help the animals in the Bay?”
World Language-STEM MODULE COVERSHEET  
The Chesapeake Bay – A Home for Many

| guidance. | such as the animals they have learned and types of pollution. Provide Internet access for students to explore various types of pollution in the Chesapeake Bay watershed.  
- Students should either print or draw a picture of their choice to be included in a class collage entitled, *Pollution That Affects the Chesapeake Bay Watershed.*  
- Have students label their picture.  
- Encourage students to share their choice with partners. |
|---|---|
| **Explanation**  
- Students explain their understanding of concepts and processes.  
- New concepts and skills are introduced as conceptual clarity and cohesion are sought. | **Defining dead zones**  
**PPT 27-32**  
T: *Let’s hear Jim’s explanation of a dead zone.*  
Invite students to read the text on the slides. Chorally repeat *algae, green slime, mahogany tide, nitrogen,* and *pollution* in context. Engage students in conversation using questions such as:  
- What color is mahogany tide/algae?  
- Where does pollution come from?  
- What happens when fish cannot breathe?  
T: *Do you remember how big the watershed is?*  
**PPT 33-35**  
T: *Let’s hear how Grandpa explains the problem.*  
Invite students to read the text on the slides. Chorally repeat the vocabulary in context. |
| **Elaboration**  
- Activities allow students to apply concepts in contexts, and build on or extend understanding and skill. | **Why the Chesapeake Bay is polluted?**  
**PPT 36-41**  
T: *Although people don’t try to hurt the ecosystem of the Bay, many things that we use and need can hurt the Bay.*  
Invite students to read the text on the slide. Engage students in conversation and use choral repetition for each slide.  
- *chicken (chicken) farms*  
- *storm water runoff*  
- *factories*  
- *houses and city development*  
Distribute Part 1 of *Worksheet 3b*  
T: *Here’s what the scientists has discovered about nitrogen pollution in the Bay.*  
Discuss the percentages of each type of pollution listed in the inside of the infographic.  
T: *Where does the pollution come from?*  
**PPT 42** |
Show a picture of cars crossing the Bay Bridge.  
T: *Which type of pollution is caused by cars?*

Distribute flash cards to each student. *(Resource 3b)*  
T: *Can you match more examples of pollution to the infographic?*

### Evaluation
- Students assess their knowledge, skills and abilities. Activities permit evaluation of student development and lesson effectiveness.

### Identifying Cause of Chesapeake Bay Pollution
Instruct students to engage in conversation with partners as they glue the flashcards to the correct section of the infographic.

- Model one or two examples.
  - Air pollution is caused by factories
  - A chicken farm contributes (makes) _________.

Instruct students to write one sentence in Part 2 of *Worksheet 3b* in which they summarize their chart. Assist students as needed.

Option: Make a larger version of the graph and pictures and invite students to label the graph.

In small groups, instruct students to share their sentences.

### Teacher Reflection Lesson 3 - Dead Zones in the Bay

<table>
<thead>
<tr>
<th>What worked well?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
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</table>
## Lesson 4 of 5

<table>
<thead>
<tr>
<th><strong>Lesson 4 of 5</strong></th>
<th><strong>Taking Action to Protect the Bay</strong></th>
</tr>
</thead>
</table>

### Objectives

**I Can:**
- **Oral language:**
  - Identify reasons for the pollution in the Bay
- **Literacy:**
  - Write short sentences, phrases about the ecosystem of the Chesapeake Bay
- **STEM and Other Subject Areas:**
  - I can describe the ecosystem of Chesapeake Bay
  - I can describe what makes Chesapeake Bay healthy

### Vocabulary and Expressions

**Content obligatory language:**
- stormwater runoff

**Content compatible language:**
- cars: drive or walk
- outdoors: swim, boat, kayak
- bikes: paths not pavement
- paper: reuse
- rainwater: make gardens
- trees: plant trees and plants
- camping: throw away garbage

### Materials/Resources

**PPT 42:**
- Images of pollution and solutions that students made in the last session; these should be posted around the room
- Star stickers to vote for the best solution drawing
- Poster paper and markers, crayons
- Map of the world posted in the classroom
- **Worksheet 4a**
- Video camera
- Internet access for e-presentations
- Chart paper and materials
- Magazines

### Lesson Storyline and Core Text

Danny and Jim visit farms and a housing development. They talk about the pollution that they contribute to the Bay. Danny and Jim discuss a plan to help Chesapeake Bay. Danny will ask his friends for help.

### Key Elements

<table>
<thead>
<tr>
<th><strong>Engagement</strong></th>
<th><strong>Lesson 4 Procedures</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Object, event</strong></td>
<td><strong>Solution...not pollution</strong></td>
</tr>
</tbody>
</table>
World Language-STEM MODULE COVERSHEET
The Chesapeake Bay – A Home for Many

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<tr>
<td>Connections facilitated between what students know and can do</td>
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</table>

Students will watch 1:25 minutes of the following video as a summary of previous lessons:
https://www.youtube.com/watch?v=o7kB7-UN7m4&list=PL33o4n6ClM9jcTSBNe7nj1QuBqZp-X8I2

Before viewing:
- Brainstorm a list of reasons that the Bay is polluted.
- Write students responses on the board.
- Examples: chicken farming, factories, housing and city development, air pollution
  Invite one or two students to the front of the room. They will check off the items on the list as they occur in the video.

During viewing:
- Invite the class to raise their hands when one of their reasons is shown in the video.
- The student(s) in the front of the room will check off the reasons as their classmates raise their hands.

After viewing:
- Review the list of reasons.
- Add any additional reasons from the video.
- Prompt students to suggest solutions.
- Write the solutions on the board.

Finish the second part of the video, starting at 1.25 minutes.

T: The video says, “We need YOU.” But before we explore the solutions, let’s look at the problems in more detail.

Exploration
- Objects and phenomena are explored.
- Hands-on activities, with guidance.

Exploring the problems

Arrange four stations for this small group activity. The stations will need a computer with speakers so that students can view short videos. Each station should have an updated video (ideally 3 minutes or less) about one of the following topics. (If computers and/or videos are not available, provide a set of photographs for each topic.) See Resource 4a.

Students will use Worksheet 4a for taking notes at each station. The four stations are:
- farming
- air
- housing and factories
- stormwater runoff

T: Let’s explore the four major problems that cause the Bay’s pollution. You will visit each station and watch a short video (or look at photographs.) You will take notes about what you see and hear, and then discuss with your team. Use the worksheet to take notes.

Assign students to teams of three or four.
Allow approximately five to seven minutes for each station, and then rotate the teams to the next station. Continue until each team has visited each station. Assist as needed.

Discuss their findings.

T: What is the biggest problem for the Bay?
Students respond.
T: Right! It’s farming. And the Bay area is famous for its chicken farms. Did you know that Maryland is the seventh largest chicken producer in the United States? So let’s visit one!

### Down on the chicken farm

NOTE: If possible, take students to a chicken farm, or invite a chicken farmer to the class. If these options are not possible, show a video of a typical day at a chicken farm.

T: We have learned a lot about Today, we’re going to visit a chicken farm. Before we go, what questions should we ask the farmers?
Model questions:
- How many chickens do you have?
- How big is your chicken farm?
- What do the chickens eat?
- Do they eat a lot?
- How long does it take the chickens to grow up?
- Where do they live?
- What happens to their waste?

Write the questions on the board.
After the visit or video, discuss the answers to the questions. Display PPT 37-38 as a review, inviting students to read the text of the slides.

T: We’ve learned so much about pollution! Now it’s time to take action!

### Choice Board: PSA: Be Part of the Solution, not the Pollution
- skit
- movie/PPT presentation with narration/music
- collage/poster
- Get back with group come up with solutions

T: Jim and Danny are going to make a plan to tell people about the Chesapeake Bay. Let’s help them. Remember the drawings you made about the pollution and solutions? Now that you know more about the causes of pollution in Chesapeake Bay, you can make a poster to show people how they can help clean up Chesapeake Bay and waterways around the world. After you finish your poster, you are going to share it with the class. Practice what you will say when you show your poster to others.
NOTE: Students work in groups to design posters about helping keep our waterways clean. Depending on time and resources, students may be given the option of other ways to present the information. Worksheet 5.2 is a suggested rubric for evaluating the poster and presentation of the poster to the class.

**Evaluation**
- **Students assess their knowledge, skills and abilities.**
- Activities permit evaluation of student development and lesson effectiveness.

<table>
<thead>
<tr>
<th>Share group solutions with classmates (other groups), including posters</th>
</tr>
</thead>
<tbody>
<tr>
<td>As students leave class, each person says one way to help keep the rivers clean.</td>
</tr>
</tbody>
</table>

### Teacher Reflections on Lesson 4 - Taking Action to Protect the Bay

<table>
<thead>
<tr>
<th>What worked well?</th>
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</thead>
<tbody>
<tr>
<td>What did not work well?</td>
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</tbody>
</table>
Lesson 5 - Assessment

**Save the Bay**

<table>
<thead>
<tr>
<th>Lesson 5 of 5</th>
<th>Final performance assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td>Students will be able to discuss effects of human behavior on the health of the Chesapeake Bay.</td>
</tr>
</tbody>
</table>
| **Materials/Resources** | o **Worksheet 5a**: Interpretive task  
   o **Worksheet 5b**: Presentational rubric  
   o **Worksheet 5c**: Interpersonal scoring guide and collage  
   o Poster made in Session 4 |

**Integrated Performance Assessment (Modes of Communication Assessed)**

### Interpretive Task

**Students will demonstrate an understanding of an infographic about pollution in Chesapeake Bay by responding to questions related to information contained in the infographic. (Worksheet 5a)**

**NOTE:** Make a copy of Worksheet 5 for each student. The students will complete the questions on the worksheet individually to assess the students’ ability to interpret a graph about pollution in the Chesapeake Bay. The responses are marked correct or incorrect. No rubric is needed.

### Presentational Task

**Students will present their poster on ways to help make our waterways clean completed during lesson 4. (Worksheet 5b rubric)**

Instructions to Teacher: Students make their posters as part of lesson 4. They may need extra time to complete the posters and practice what they will say to the class about their poster. Worksheet 5.2 gives a suggested rubric for the presentation. The students should have a copy of the rubric as they work on their poster and presentation so they know how they will be assessed.

### Interpersonal Task

**Students will share a collage of animals from the Chesapeake Bay.** They will ask and respond to simple questions: What is that? Do you like (animal)? Is it a predator or prey? Does it live on land or water or in the air?

**Instructions to Teacher:** Students should have a copy of the scoring guide (Worksheet 5.3) as they
practice talking about the animals in the Chesapeake Bay. The collage is page 2 of Worksheet 5.3. This collage should be given to the students at the time that they will be assessed on their ability to ask and respond to questions about the animals in the Chesapeake Bay.

<table>
<thead>
<tr>
<th>Teacher Reflections on Lesson 5 – Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>What worked well?</td>
</tr>
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<td>What did not work well?</td>
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