

Educator guidance and sample responses

Sharks in Balance | discussion, explanations and learning checks

Use these notes with the matching Sharks in Balance lesson and student PDF. The samples illustrate defensible reasoning. Students can give other sound answers, especially in predictions, artwork and discussion.

Find the matching notes

Page 2: Grades K-2, Meet two different sharks (student pages 1-2).

Page 3: Grades 3-5, Build a web of connections (student pages 1-2).

Page 4: Grades 6-8, What can a shark change? (student pages 1-2).

Pages 5-6: Grades 9-12, data comparisons, claims and visual argument (student pages 1-3).

Use a small set of learning checks

Look for: a connection to the supplied evidence, an explanation the student can give in their own words, and a revision when a claim or image misleads. Accept spoken responses, pointing, dictation, labeled drawings and other agreed ways of showing understanding.

Revisit: a factual error, an unexplained arrow, a calculation with incompatible values, or a claim that goes beyond the evidence. Ask a question that helps the student find the problem before supplying a correction.

Artistic polish, access to expensive materials and agreement with a preferred slogan are not learning criteria. These notes are not a contest judging rubric. Teachers may adapt assessment to their curriculum.

If a student has read these notes

Educator notes published on an open website can be found by students. A label, separate PDF, hidden menu or collapsed panel does not make them confidential. These tasks are designed for supported learning, not a secure test.

Ask the student to explain a connection, defend a source choice, respond to a new example, or show how a first sketch changed. Credit understanding they can demonstrate. For an independent assessment, prepare an unseen transfer question and follow your school's rules on permitted assistance.

Lead discussion without closing it too early

Give students time to notice, then ask: "What supports that?" "What else could happen?" "What would help us decide?" Allow disagreement about a prediction while checking factual claims. A student can revise a claim without changing their opinion about which question matters most.

Student readings provide the information needed for these lessons offline. The linked science sources offer further background and are not endorsements of the BTS materials. Classroom work can continue independently of poster-contest participation.

Grades K-2

Meet two different sharks | student handout pages 1-2

Page 1: read and talk together

Read every card and prompt aloud, one question at a time. Children may speak, point or dictate; an adult can use the writing lines. Independent reading and writing are optional. Children ready to write may add a label or short sentence.

Similarities: both are sharks, live in the ocean and need food. **Differences:** light spots or dark marks; tiny drifting animals or foods such as crabs and worms. Read the cards again as needed. Ask how the sharks are alike before asking how they differ.

"Something I learned" sample: "A big whale shark eats tiny animals." Accept one accurate idea supported by either card. Help children separate what a photograph shows from information they learned by reading.

"Something I wonder" sample: "How does a whale shark catch such small food?" This is a question, so it does not need a correct factual answer yet. Invite the child to suggest where they might find out.

Page 2: draw a discovery

Look for a recognizable intention and an explanation. A child might draw spots, a leopard shark near the bottom, or small food around a whale shark. Ask them to point to the detail and explain it. Drawing skill does not determine whether the connection is understood.

Sample explanation: "I chose a leopard shark. These are worms near the bottom because the reading says it eats worms." The animal, food and setting need not look realistic if the child can explain the visual choices.

Questions that open the discussion

Begin with "Show me one thing you learned." For children ready for more, ask, "Must a big animal eat big food?" or "How are these sharks different?" Take one question at a time and allow a spoken or pointed response.

Likely difficulties and a useful response

"All sharks eat the same food." Read the two food descriptions again and ask the child to match one food to each shark.

A guess presented as an observation. Ask, "Did we see that, read it, or do we still wonder?"

A drawing with no explained connection. Offer pointing, an adult scribe or a spoken response before asking for more writing.

Check before moving on

The child can identify one supported feature or food connection and explain a detail in the drawing. For a further challenge, ask for one similarity and one difference. Split the session if the reading and drawing together exceed the group's attention span.

Science background: Georgia Aquarium: whale shark

Science background: Monterey Bay Aquarium: leopard shark

Grades 3-5

Build a web of connections | student handout pages 1-2

Page 1: the seven supported feeding links

Every arrow runs from the food to the animal eating it. The model should show:

clam, worm, crab and fish each pointing to **leopard shark** (four links);

crab, fish and leopard shark each pointing to **broadnose sevengill shark** (three links).

For students new to food webs, read aloud and build crab to leopard shark to sevengill together. Add the other links one at a time. Prewritten labels reduce copying. Crossed lines are acceptable if arrows can be followed.

Predator and prey: the leopard shark is a predator of animals such as crabs and is also prey for the sevengill. The labels describe a relationship, not a permanent category that an animal can occupy only once.

Page 2: fewer crabs

Directly involved links: crab to leopard shark and crab to sevengill. Do not require students to remove either shark or predict a population crash.

Support with a known link: "Leopard sharks eat crabs and worms. If crabs become scarce, what else might they eat?" Then ask, "What would we need to check to find out whether that food is available?"

Example: "A leopard shark might eat more worms. We would need to check whether there are enough worms where it feeds." The feeding link is known; the diet change is a prediction. Other possibilities include moving or getting less food. Students ready for more can compare outcomes.

Model limits: many living things are missing. Arrows do not show how much food is eaten or how many animals live there. One explained limit is enough; naming producers or decomposers is unnecessary unless already taught.

Artwork and discussion

Ask a partner to trace a relationship and describe it. A shared setting or a decorative arrow alone may be ambiguous; the artist can add a label or explain the visual choice. Ask, "Which detail comes from the evidence, and which did you invent to help communicate it?"

If an arrow is reversed: have the student finish "Food energy moves from ____ to ____."

If one outcome is called certain: ask what else could affect the animals and replace certainty with a testable prediction.

Transfer prompt: suppose worms become less available. Which link changes directly, and what remains unknown?

Check before moving on

The student can read two arrows, identify the leopard shark as both predator and prey, and state a prediction with a relevant information need. Provide prewritten labels or take a dictated explanation if handwriting masks the reasoning.

Science background: Monterey Bay Aquarium: leopard shark

Science background: Monterey Bay Aquarium: broadnose sevengill shark

Grades 6-8

What can a shark change? | student handout pages 1-2

Page 1: distinguish the kinds of evidence

Observation: card A reports changes in where dugongs and turtles fed when tiger sharks were present.

Investigation method: card B describes large-grazer exclusions, then a later experiment with smaller fish-proof cages and partly open controls.

Interpretation: card C connects shark presence, grazing behavior and seagrass through a proposed indirect pathway.

Why a cage control? A cage might alter water flow, light or other conditions as well as access by grazers. Controls help investigate these alternative effects. They do not guarantee that every other influence has been removed.

Page 2: explain the pathway

One useful sequence: shark presence *changes where or how grazers feed*; grazing behavior *changes the pressure on seagrass*. The labels should state an effect. The handout does not establish one universal increase or decrease in seagrass everywhere.

Separate feeding link: seagrass *is eaten by* a dugong or green turtle. This link describes feeding; the shark-presence pathway describes a behavioral effect. Words must distinguish the arrow meanings even on a black-and-white printout.

Overstatement: "the whole habitat will collapse" asserts an inevitable, ecosystem-wide outcome. The cards do not establish that prediction or describe removing all sharks.

Sample revised claim: "In Shark Bay, tiger sharks can influence seagrass through changes in where and how grazers feed." Other claims are acceptable if their scope and mechanism fit the evidence.

Support and limits: A reports behavior; B describes a comparison but omits the seagrass results; C reports an interpretation. Students explain that pathway, not independently evaluate the missing results. The cards do not prove every link in one experiment or establish the same result elsewhere.

Discussion and revision

Ask, "What was observed?" "What did the cages test?" "What would you study in another habitat?" Students may investigate weather, light or other grazers if they explain why these matter.

Use separate paper for artwork; the handout box holds the pathway. After partner feedback, students revise the sketch or caption and describe the change. Narrowing a caption to Shark Bay is one way to improve accuracy.

Check before moving on

Model card A before students identify method and interpretation in B and C. Offer three pathway boxes. Begin: "When tiger sharks are present, grazers may change ____." Ask how that could affect seagrass and which card supports the explanation. The term "trophic cascade" is optional.

Science background: Shark Bay Ecosystem Research Project: indirect effects

Grades 9-12: evidence and calculations

Student handout pages 1-2

Page 1: compare the headlines

Headline A is misleading: 76 million is the 2012 value in the reported comparison; 101 million is the broader 2019 estimate with an additional adjustment. Combining them treats different coverage as a comparable time series.

Headline B is consistent with the reported 2019 estimate. Useful context includes that it is an estimated global annual total associated with fishing, reported in a study published in 2024. Mention the 2012-2019 study period if discussing a trend, and distinguish the broader adjusted estimate when relevant.

Fishing deaths are not a count of living sharks. The evidence does not directly give a percentage change in the living shark population or a current annual total.

Page 2: worked calculation

Absolute change: 80 million - 76 million = **4 million**.

Percentage change: $(4 / 76) \times 100 = 5.263...\%$, or approximately **5.3%**.

Accept sensible rounding with the method shown. These inputs are already rounded estimates; extra decimal places do not add accuracy.

Check table reading and percentage change first. If needed, model 10 to 12: $2 / 10 \times 100 = 20\%$. Allow calculators. In this task, use 76 as the starting value. The result is a relative percentage change, not percentage points.

What the comparison supports

It supports an estimated increase in annual fishing mortality under the reported comparison during 2012-2019. It does not establish the status of every species, a present-day total, or why mortality changed. The 101 million figure belongs to a separate estimate, not another measured year.

Examine the finning claim

The statement "A ban on finning solves shark overfishing" exceeds the evidence. Restricting the practice of removing fins and discarding the animal does not necessarily reduce all fishing deaths. The summary reports that anti-finning measures did not reduce total mortality overall in the study period, while outcomes varied.

Avoid the opposite overclaim that every conservation measure fails. The study identified measures associated with lower mortality. Association alone does not establish that a particular rule caused a change or will work identically in every fishery.

Discussion prompts

"What changed: the year, the method, or both?" "What would we need to estimate a population trend?" "What outcome is a proposed rule intended to change?" Students can support different policy choices while using the same numerical evidence accurately.

Science background: Dalhousie University: January 11, 2024 research summary

Grades 9-12: discussion and artwork

Student handout pages 2-3

Page 2: affected people and evidence of an effect

Hypothetical example: close one fishing area for part of the year to try to reduce shark deaths. Who uses it? Might fishing move elsewhere? Compare deaths before and during the closure, including nearby areas. This is not a proven or endorsed solution; groups may choose another action.

Consider one question at a time: who is affected, what makes implementation difficult, and what could be measured? Include fishers, enforcement staff and seafood businesses without assuming a community has one shared interest. Comparing two actions is an extension.

Possible checks include compliance, fishing effort, catch and bycatch, species and livelihood effects. Students should name an outcome to measure and a complication in interpreting it.

Page 3: central claim and two compositions

Start the claim, source and limitation at the end of the first period. Return to page 3 in the second period for compositions, feedback and revision.

Sample claim: "A global study estimated annual shark fishing mortality at 76 million in 2012 and 80 million in 2019." A caption should retain "estimated" and the dates. A source note can identify Dalhousie's 2024 summary and the research it describes.

Two compositions might compare an annotated bar chart with an illustrated explanation of what the estimate counts. Students may choose other visual approaches. Assess whether both communicate the same defensible idea and whether the visual treatment implies more than the evidence supports.

Graph check: label years and units; use a clearly marked scale. For a bar chart, a zero baseline is the usual starting choice because bar length encodes magnitude. If students choose another format or scale, ask them to explain it and check for exaggeration.

Metaphor check: a symbol can communicate an idea, but it may imply uniform impacts across species or a current crisis count. Ask, "Which parts are evidence, and which parts are a visual analogy?"

Peer feedback and the revision response

Let the partner describe the central claim before the artist explains it and name a possible misreading. The artist then revises one composition and describes the completed change in the final response.

Sample revision: "I added the dates and the word estimated because my first version looked like a count for this year." Other sound revisions include correcting a scale, narrowing a claim or replacing an unsupported image. A purely decorative change needs an explanation of how it improves communication.

Check before moving on

Look for a comparable calculation, a scoped claim and source, a relevant uncertainty, and a reasoned revision. Students may disagree about a proposed response. Assess how they use evidence and consider effects, rather than whether they choose a particular policy.