

# Evolution (Grade 10) – 30-minute Blend Lesson

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## Lesson Overview

A 30-minute, low-material, collaborative lesson introducing natural selection and evidence-based explanations of evolution. Launches with a discrepant event to surface prior ideas, uses short multimedia mini-lessons, and asks students to iteratively test simple simulations in rotating roles (engineer, data analyst, journalist). Anchored to mastery threads: phenomena observation, evidence and reasoning, models and systems, cause and effect.

## Learning Targets (Measurable)

- Explain how natural selection produces change in populations over time using evidence (e.g., differential survival/reproduction).
- Use simple models/data to make a claim supported by evidence and reasoning about adaptation and selection pressures.
- Describe a real-world example of evolution and identify cause-and-effect relationships between environmental change and allele/phenotype frequency.

## Materials (Low)

- Printed image-pair or short 30–60 sec video (peppered moths, antibiotic-resistant bacteria graph, or Galápagos finches) shown on projector or tablet.
- Sets of 20 counters per group (two colors to represent two phenotypes), 1 printed habitat background per iteration (light and dark), 1 die or spinner (optional).
- Sticky notes, pens, 1 timer.
- One quick infographic slide or 60–90 sec animation clip (hosted on device) explaining variation and selection.
- Optional: clipboard/worksheet with claim–evidence–reasoning (CER) template.

## Grouping and Roles

- Groups of 3 students. Roles: Engineer (designs simple setup/model), Data Analyst (records and interprets counts), Journalist (reports group explanation).
- Role rotation: two iterations of the simulation – each student rotates so every student serves at least once as Data Analyst and Journalist or Engineer across the activity.

## Time Plan and Teacher Moves

### 0:00–03 – Launch: Discrepant Event (Phenomena observation)

Teacher shows discrepant event (1 image pair or 30–60 sec clip) — e.g., dark peppered moths highly visible on a light tree yet found alive in greater numbers in polluted areas. Students silently note immediate explanation (1 sticky note).

Teacher prompt: "What surprised you? Give one sentence hypothesis about why one form survives better."

- Teacher move: circulate, read 2–3 hypotheses aloud to class (no teacher explanation), collect hypotheses.

Pulse Check 1 (at 3 min)

- Task: Each group selects one hypothesis that best explains the phenomenon.
- Success criteria: Group chooses a hypothesis and lists one piece of evidence they would need to test it (1 sentence). Teacher confirms by scanning groups (target: 4/4 groups meet criteria in class of up to 12 groups).

### **03–07 — Mini-micro-lesson (multimedia: models and evidence)**

Play a 60–90 sec animation/infographic explaining: variation exists in populations; selection pressure favors phenotypes with higher survival/reproduction; consequence is change in population composition over generations. No long lecture — pause once to highlight key terms: variation, selection pressure, adaptation, allele frequency.

Teacher move: model a 20-second example tying back to the discrepant event (no extended direct instruction).

### **07–18 — Iterative Simulation (Evidence & experimentation; Cause and effect)**

Structure:

- Iteration 1 (07–12): Set habitat A (light background). Groups: Engineer arranges 20 counters across habitat; Data Analyst records the number of “visible” counters based on simple rule (e.g., light counters are less visible on light background; roll die to simulate predation chance); Journalist notes predicted outcome.
- Quick debrief (12–13): Share one data point per group.
- Rotate roles clockwise.
- Iteration 2 (13–18): Set habitat B (dark background) and repeat simulation for 3–4 rounds to generate counts showing change in phenotype frequency.

Teacher moves:

- Provide a concise procedure card. Circulate to ensure fidelity and to prompt evidence-focused notes (encourage noting trends).
- Use a 1-minute mini-targeted teaching point if multiple groups misapply the rule (targeted mini-lesson woven into iteration).

### Pulse Check 2 (at ~15 min)

- Task: Data Analyst presents a 30-second summary of the trend and one numerical comparison (e.g., phenotype A went from 12/20 to 6/20).
- Success criteria: Data Analyst correctly states the direction of change and at least one numerical comparison (teacher marks groups that meet both criteria; target: 80% of groups).

## 18–24 – Evidence-driven Explanation and Model Co-construction (Evidence & reasoning; Models and systems)

Groups co-construct a brief evidence-based explanation using CER:

- Claim: e.g., "Dark phenotype increased in frequency in dark habitat."
- Evidence: two pieces from simulation (counts, trend).
- Reasoning: link selection pressure (visibility -> predation) to change in frequency.

Role tasking:

- Engineer draws a simple model/diagram showing habitat + phenotype shift.
- Data Analyst finalizes numeric evidence.
- Journalist prepares a 45–60 sec report with claim, evidence, reasoning.

Teacher move: circulate, ask probing questions to push stronger causal links (Why did frequency change? What was the mechanism?).

### Pulse Check 3 (at 23–24 min)

- Task: Journalist delivers the 45–60 sec report to another group (paired-share).
- Success criteria: Report includes a clear claim, at least one data point, and a causal explanation (e.g., visibility -> predation -> frequency change). Teacher listens to two reports; aim for 75% meeting criteria.

## 24–28 – Gallery Share and Peer Feedback

Quick gallery walk or paired reports for 30–45 seconds per group. Peers leave one sticky-note: one strength (evidence) and one question (challenge the reasoning).

Teacher move: collect one exemplary report to highlight fidelity to evidence and causal logic.

## 28–30 – Exit Pulse and Metacognition

Exit poll (written, 90 seconds): Each student answers both prompts on sticky note.

- Metacognition prompt 1: "Describe one way this strategy (role rotation + quick model experiments) helps you evaluate real-world claims about evolution (1–2 sentences)."
- Metacognition prompt 2: "Give one real-world example where selection causes allele/phenotype frequency to change (1 sentence)."

Teacher collects sticky notes for quick formative analysis.

## Role Rotation Plan (explicit)

- Start: Assign roles Engineer, Data Analyst, Journalist.
- After Iteration 1, rotate roles clockwise so each student performs at least two different roles (over 30 minutes each student will perform two roles; with longer lessons, ensure full rotation).
- Expectations for each role (on procedure card):
  - Engineer: sets up simulation, sketches model, ensures rules followed.
  - Data Analyst: records counts, computes simple change (difference or %), summarizes trend.
  - Journalist: prepares/voices the CER report and gathers peer feedback.

## Pulse Checks (2–3 embedded) – Summary

- Pulse 1 (after discrepant event, 3 min): Group selects hypothesis + identifies one testable evidence need. Success: group lists hypothesis + one evidence item.
- Pulse 2 (during simulation, ~15 min): Data Analyst summarizes trend with one numerical comparison. Success: correct direction + numerical comparison.
- Pulse 3 (reporting, ~23 min): Journalist gives CER report to peer. Success: contains claim, at least one datum, and causal reasoning.

## 10 Quiz-style Checkpoints (brief; aligned to mastery threads)

Each item can be used as rapid exit items or quick formative checks. Success criteria are explicit.

1. Define "natural selection" in one sentence.
  - Success: Statement links variation + differential survival/reproduction leading to change in population composition.
2. Identify which of two given scenarios shows directional selection (two short scenarios provided).
  - Success: Correctly pick scenario and give 1-sentence justification referencing phenotype change.

3. Given two counts (e.g., Light 14/20 -> 6/20 in dark habitat), calculate the change in frequency.
  - Success: Correct numerical change (e.g., decrease of 8 individuals or 40%).
4. From a short fossil sequence image, select evidence that supports descent with modification.
  - Success: Pick at least one valid morphological change across layers and state it in one sentence.
5. Explain how a change in environment (e.g., pollution darkening trees) causes phenotype frequency change.
  - Success: Causal link stated connecting environment -> altered predation/fitness -> frequency change.
6. Match terms to definitions: variation, adaptation, allele frequency, selection pressure.
  - Success: At least 4/4 correct matches.
7. Interpret a simple graph of bacteria counts showing antibiotic resistance across time. State the trend and a likely cause.
  - Success: Correctly identifies increase in resistant strain and cites antibiotic selection as cause.
8. Choose the best model (diagram) that shows how individual phenotype survival affects population-level change.
  - Success: Selects diagram that shows differential survival leading to proportion change.
9. Short answer: Give one real-world example of rapid evolution and identify the selection pressure.
  - Success: Example named and selection pressure identified (e.g., pesticide -> resistant insects).
10. Evaluate a peer claim: "If predators are removed, no evolution will occur." Agree/disagree with 1-sentence reasoning.
  - Success: Disagree with reasoning that other pressures (competition, mate choice, environment) can cause selection; or agree with explanation if contextualized.

Use these as individual quick checks or combined into a 5–10 minute follow-up quiz if desired. Each checkpoint maps to one or more mastery threads (noted inline if needed).

## Metacognition Prompts (embedded)

- During exit (28–30 min): "Describe one way this role-based, iterative testing strategy helps you evaluate claims about evolution outside class" (1–2 sentences).
- In groups during synthesis: "How might the model we created differ from real populations? What assumptions did we make?" (1–2 sentences recorded on sticky note).

## Differentiation and Accessibility

- Provide role-specific scaffolds: sentence starters for Journalist (Claim: ... Evidence: ... Reasoning: ...), numeric templates for Data Analyst, diagram frames for Engineer.
- Mixed-ability grouping ensures peer support; quieter students can be journalists if they prefer writing over speaking.
- Offer visuals and short captioned video for EAL learners.

## Assessment and Evidence of Mastery

- Formative: Pulse checks, gallery feedback sticky-notes, exit sticky-note responses.
- Summative options (outside this 30-minute lesson): use the 10 checkpoint quiz as a formal short assessment or a homework extension where students answer 5 selected items with explanations.

## Inclusion, Bias-Awareness, and Real-World Relevance

- Use diverse real-world examples (peppered moths, antibiotic resistance, pesticide resistance, finch beaks) and note human impacts (pollution, antibiotics) without assigning blame.
- Prompt students to consider ethical and societal implications when discussing human-driven selection (optional follow-up).

## Quick Teacher Checklist Before Lesson

- Prepare discrepant event media and 60–90 sec infographic.
- Print procedure cards and CER templates, prepare two habitat backgrounds, counters, and role cards.
- Arrange seating for groups of 3 and set timer.

End of lesson plan.