Explain: Survival of the Sorters: Mechanisms of Natural Selection



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Learning Objective

By the end of this activity, you will be able to match real-life examples of evolutionary changes to the correct mechanisms, explain your reasoning, and understand how organisms change over time through these processes.

Background Information

Evolution is the way living things change over time. These changes can happen because of four main mechanisms:

- **1. Mutation**: A mutation is a random change in an organism's DNA. Sometimes this change gives the organism a new trait, like a different color or the ability to survive better in its environment.
- 2. Gene Flow: Gene flow happens when genes move from one population to another. For example, when animals or plants from one place breed with those in another, their offspring have a mix of traits.
- **3. Genetic Drift**: Genetic drift happens by chance. In small groups of organisms, random events, like a storm or a disease, can change which traits are passed on.
- **4. Recombination**: Recombination is when DNA gets shuffled to create new combinations of traits. This happens during reproduction, and it's one reason why no two siblings look exactly the same.

Understanding these mechanisms helps us learn how species survive, adapt, or even disappear over time.

Materials Needed

- Mechanism Cards: One for each mechanism (Mutation, Gene Flow, Genetic Drift, Recombination).
- Example Cards: 19 cards with real-world examples (see below).
- Hint Sheet: Definitions and pictures for each mechanism to guide your thinking.
- Scaffolded Chart: A data table for recording matches and explanations.

Name: _____

Date: _____

• Pencils and erasers

Instructions

- 1. **Prepare Your Cards**: Lay out the Mechanism Cards (Mutation, Gene Flow, Genetic Drift, Recombination).
- 2. Sort the Examples: Work with your partner or group to match each Example Card to the correct Mechanism Card. Use the hint sheet to help.
- 3. Record Your Answers: For each match, fill out your data table with the following:
 - A description of the Example Card.
 - Your reasoning for why you chose the mechanism.
- 4. Compare with Peers: Share your answers with another group. Discuss and adjust your thinking if needed.
- 5. Reflect on Your Learning: Answer the post-activity reflection questions to summarize what you learned.

Pre-Activity Questions

- 1. What do you think causes living things to change over time?
 - I think living things change over time because...
 - One reason animals and plants change is...

- 2. Have you ever seen an animal or plant that looked different from others of the same kind? Why do you think that happens?
 - I saw a ___ that looked different, and I think it was because...
 - I think plants or animals look different sometimes because...

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3. What do you think "mutation" means?

- I think a mutation is when...
- Maybe mutation means...

- 4. How do you think genes move from one group of animals or plants to another?
 - I think genes move between groups when...
 - One way genes might move is...

Data Table

Mechanism	Example Description	Why This Mechanism Fits
Mutation		

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Date: _____

Gene Flow	
Genetic Drift	
Recombination	

Name: _____

Date: _____

Post-Activity Reflection

1. What surprised you the most about today's activity?

• Sentence stem: I was surprised to learn that...

2. Which example was the hardest to match and why?

• Sentence stem: The hardest example to match was... because...

3. How do the four mechanisms work together to change species?

• Sentence stem: The mechanisms work together by...

4. What questions do you still have about evolution?

• Sentence stem: One question I still have is...

Name: _

Date: _____

Card Descriptions:

- A frog develops a new skin color due to a change in its DNA sequence.
- A bacterium gains resistance to an antibiotic after a random genetic change.
- A moth species shows a new wing pattern not seen before
- A crop plant produces a fruit with an unusual shape
- A single-celled organism mutates to metabolize a new food source.
- A wolf pack migrates to a new region and breeds with the local wolves, introducing new traits.
- Pollen from one population of flowers fertilizes another population downwind.
- A group of migratory birds joins a new flock, sharing genetic traits through breeding.
- Fish released from an aquarium breed with a wild population in a nearby river.
- Human populations mix through migration, blending genetic traits.
- A small population of squirrels loses a fur color variation due to random chance.
- A volcanic eruption isolates a group of insects on an island, leading to random changes in traits.
- A rare allele is lost when a small population of birds decreases in size after a harsh winter.
- A flood separates a group of frogs, and one group randomly becomes less diverse over time.
- A disease wipes out most individuals in a small deer population, and the survivors' traits dominate.
- Crossing over during meiosis leads to a new combination of eye and hair color genes in humans.
- Two bacterial cells exchange genetic material, creating a new strain.
- During sexual reproduction, a new variety of wheat combines traits for drought resistance and high yield.
- Genetic shuffling in fruit flies leads to offspring with unique wing patterns.

Cards:





































Name: _____

Date: _____

Teacher Instructions

Preparation (Before Class)

1. Print Materials:

- Print one set of Mechanism Cards (Mutation, Gene Flow, Genetic Drift, Recombination) for each group.
- Print and cut out Example Cards (19 total) for each group. Use cardstock or laminate for durability.
- Prepare enough Hint Sheets with definitions and visuals for each group or pair.

2. Prepare the Scaffolded Charts:

- Create copies of the data table for each student or group to fill out.
- Ensure the table has spaces for: Mechanism, Example Description, and Explanation.

3. Visual Aids:

- Display large posters or slides with key terms and visuals (e.g., broken DNA strand for mutation, arrows between populations for gene flow).
- Have these visible throughout the activity for reference.

4. Plan Student Pairings:

 Pair students thoughtfully to ensure peer support. Consider mixing ability levels, pairing English learners with bilingual peers, or assigning peer mentors for students with learning gaps.

Activity Procedure

Step 1: Introduction (10 minutes)

- Use simple language to introduce the four evolutionary mechanisms: Mutation, Gene Flow, Genetic Drift, and Recombination.
- Show visual aids while explaining each mechanism. For example:
 - **Mutation:** "Sometimes DNA changes randomly, like adding a new color to an animal's body."
 - **Gene Flow:** "Genes move when animals or plants from one place mix with another group."

- Genetic Drift: "In small groups, random events can change which traits are passed on."
- *Recombination*: "When parents pass on genes, the DNA can mix to make new combinations of traits."
- Highlight the importance of these processes in helping species adapt and survive.

Step 2: Pre-Activity Questions (10 minutes)

- Distribute the pre-activity questions and guide students through them. Use sentence stems to scaffold their thinking.
- Encourage partner or group discussions for brainstorming.
- Example guidance:
 - "Turn and talk to your partner about what you think causes animals or plants to change over time."
 - \circ "Use the sentence stem on your paper to help you explain your idea."

Step 3: Sorting Game (25 minutes)

- Distribute Materials:
 - Give each group a set of Mechanism Cards, Example Cards, Hint Sheets, and a Scaffolded Chart.
 - Ensure students understand that their goal is to match each example with a mechanism and explain their reasoning.
- Explain the Process:
 - Students pick an Example Card, read it aloud, and discuss as a group which mechanism it belongs to.
 - Use the Hint Sheet and visual aids as support.
 - Place the card under the corresponding Mechanism Card.
 - Record their reasoning in the Scaffolded Chart.
- Check In:
 - Move between groups to monitor progress and provide support.
 - Ask guiding questions if groups are unsure:
 - "What does the hint sheet say about this mechanism?"
 - "Does this example involve random chance or movement of genes?"

Step 4: Peer Comparison (10 minutes)

- After groups complete their sorting, pair groups together to compare answers.
- Encourage them to explain their reasoning and adjust their answers if necessary.
- Example prompt:
 - "Group A, explain why you matched this example to Mutation. Group B, do you agree? Why or why not?"

Step 5: Reflection (15 minutes)

- Hand out the Post-Activity Reflection sheet.
- Encourage students to write thoughtful answers using sentence stems.
- Example teacher script:
 - "Think about what surprised you today. Use the stem, I was surprised to learn that... to start your answer."

Support for Diverse Learners

- 1. Special Education:
 - Use larger fonts and highly simplified language on Hint Sheets and cards.
 - Provide one-on-one support or assign an aide to groups with students needing additional help.

2. English Learners:

- Pair students with bilingual peers or provide translations of key terms in their native language.
- Use visuals extensively to support comprehension.

3. Students with Learning Gaps:

- Focus on fewer examples per mechanism if needed.
- Break the activity into smaller steps, checking in after each section.

Post-Class Follow-Up

- Review Answers:
 - Collect and review the Scaffolded Charts to check understanding.
 - Use examples from the activity to clarify any common misunderstandings in the next lesson.

• Extend Learning:

- Assign a creative writing task: "Write a short story about an animal that changes over time using one of the mechanisms."
- Or, use real-world news articles about evolution for discussion.

These detailed instructions ensure smooth activity execution while meeting the needs of all learners.