Academic English: Intermediate

Natural selection

- Darwin: Species from common ancestor?
- Controversy: Spontaneous change seems unlikely

- Evolution of species by natural selection:
  - Variation within each generation
  - Each change gives some advantage (at least no disadvantage)
  - Over generations, new species develop

Natural selection

- Hypothesis: Step-by-step selection is more likely than spontaneous evolution.
- Procedure:
  - Take 1 paper & 13 cards.
  - Play the selection game for your letter.
  - Goal achieved? Report how many rounds
- Discuss the questions in Part 2.

How does natural selection lead to evolution?

Part 1: Selection games

Group A, B, C, and D: Spontaneous evolution game

1. Take 13 playing cards of one suit.
2. Your goal is to have a stack ordered A, 2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K.
3. One member of your group should be the recorder. This person will keep track of how many rounds you play. Increase the count by one each time the cards are shuffled.
4. Without looking at the faces of the cards, shuffle them thoroughly to mix them.
5. Look at the faces of the cards. Are they in order: A, 2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K?

   If they are in order, you win! Tell the instructor and the class how many rounds you played.

   If they are not in order, play another round. Repeat steps 3-5.

Group E, F, G, and H: Selection and evolution game

1. Take 13 playing cards of one suit.
2. Your goal is to have a stack ordered A, 2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K.
3. One member of your group should be the recorder. This person will keep track of how many rounds you play. Increase the count by one each time the cards are shuffled.
4. Without looking at the faces of the cards, shuffle them thoroughly to mix them.
5. Look at the top card. Is it the next card you need? For example, during the first round, is it A? If you already have A on your stack, is it 2?

   If it is, take the card from the deck and add it to your stack. Then look at the next card. Is it the next card you need?

   If the card on top is not the next card you need, play another round. Repeat steps 3-5.

6. When all the cards are on the stack in order, you win! Tell the instructor and the class how many rounds you played.

Part 2: Discussion

1. What is the main difference between the “selection and evolution game” and the “spontaneous evolution game”?
2. In the games, how were cards selected?
3. What was the average number of rounds needed to win the “selection and evolution game”? Did anyone win the “spontaneous evolution game”? How many rounds did it take?
4. ★ How is shuffling cards similar to mutation (突然変異), which can cause differences between parents and offspring? How is it different?
5. ★ In nature, how are genes or organisms selected? (自然淘汰)
6. Did playing this game help you understand the process of natural selection? Why do you think so?

Natural selection

1. Main difference?

   select step-by-step versus all at once

2. How were cards selected?

   Both: shuffled randomly

   Spontaneous: 13 at once; Selection: 1 (or more) at a time

3. Average number of rounds required

   Selection: Should be around 90

   Spontaneous: Should be around six billion (6×10^{10})

Odds of spontaneous selection:
1 / 6,227,020,800

Writing process

- Don’t focus on the end product.
  - Blank page syndrome

- Divide the process into steps

Writing process

- Thinking
  - Thesis statement
  - Supporting information
- Organizing
  - Choose good ideas
  - Make an outline
- Writing

- Revising

Writing process

- Thinking about the thesis statement
  - Start with a general topic.
  - Narrow this to a specific focus.
  - Write a thesis statement.

Writing process

- Thesis statement
  1. Start with a key word.
  2. Turn the word into a sentence.
  3. Turn the sentence into a question.
  4. Answer the question in one sentence.

Writing process

- Thesis statement
  1. Monarch butterflies
  2. Monarch butterflies migrate over a large area.
  3. Why do monarch butterflies migrate over a large area?
  4. Monarch butterflies migrate over a large area so they can eat milkweed during summer but stay warm in winter.

Writing process

- Thinking: Brainstorming support
  - Note everything that could support your thesis.
  - In the next step, you will choose the best ideas.

Writing process

- Thinking: Brainstorming support

monarch butterfly migration

Canada	milkweed	Great Lakes
United States	California	larvae
Mexico	October-hibernate	February-wake up
many generations	farms	pine trees
hairy balls	caterpillars	butterflies
chrysalis		

Writing process

- Step 2: Organizing
  - Choose the ideas that support the topic sentence.
  - Choose ideas that all fit together.
  - Decide what order to write about these ideas.
  - Make an outline.

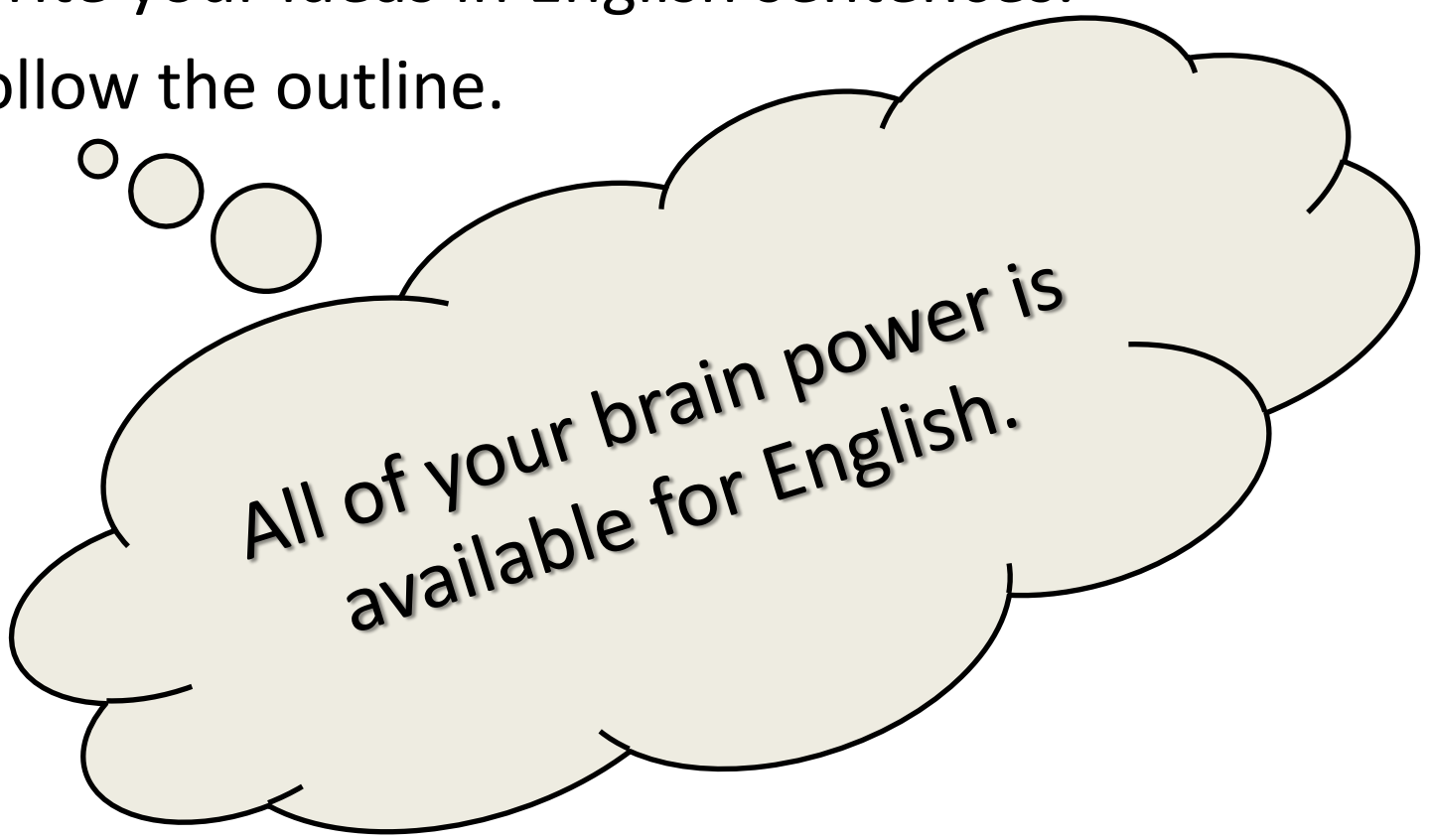
Use an outline!

Monarch butterflies migrate over a large area so they can eat milkweed during summer but stay warm in winter.

1. Mexico and California
   A. Hibernate in October
   B. Wake up in February
2. Southern, central United States
   A. Eat milkweed
   B. Live three generations
3. Northern US and Canada
   A. More milkweed in summer
   B. Too cold in winter

Writing process

- Step 3: Writing
  - Write your ideas in English sentences.
  - Follow the outline.



Writing process

- Step 4: Revising
  - Read what you wrote.
  - Think how it could be even better.
  - Write it again with those changes.

Revising and editing

- Minor revisions: fix mistakes or add information
- Major revisions: go back to thinking, organizing
- After you revise, read it again.
- Grammar is ***least*** important
  - *But do fix mistakes if you notice them.*

Writing process

- Divide the process into smaller steps
  - each step becomes easier
- *Easier*, not necessarily *easy*
- Concentrate on the current step.
  Don’t worry about the other steps yet.