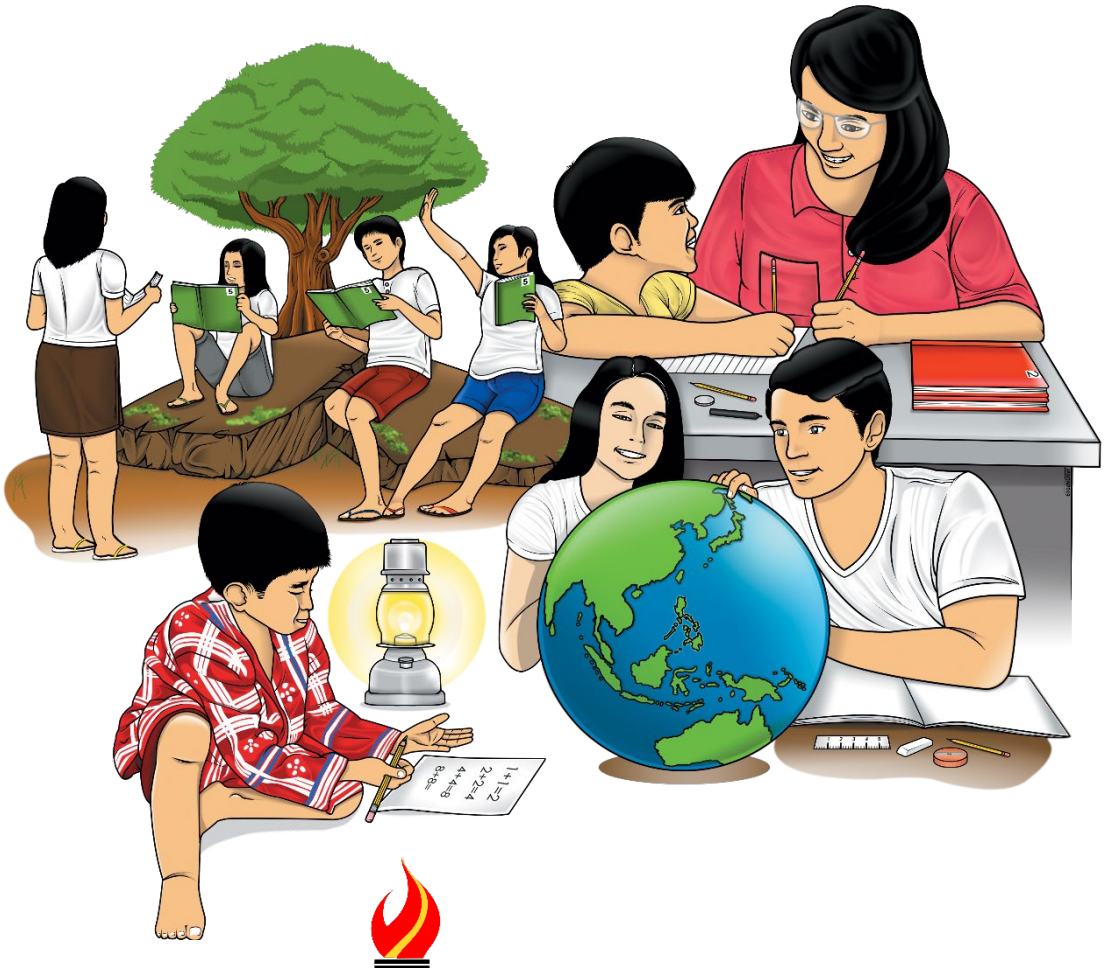
Senior High School

DepED
DEPARTMENT OF EDUCATION

Earth and Life Science

Quarter 2 – Module 8:
The Process of Evolution



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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

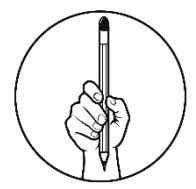
This module was designed and written with you in mind. It is here to help you master the nature of Biology. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

The module covers:

- Lesson 8 – The Process of Evolution

After going through this module, you are expected to:

1. Explain how populations of organisms have changed and continue to change over time showing patterns of descent with modification from common ancestors to produce the organismal diversity observed today;
2. Explain the process of evolution.
3. Identify some scientists who contributed to the historical developments of evolutionary thoughts.
4. Compare Lamarckian and Darwinian Evolution;
5. Design a poster tracing the evolutionary changes in a crop plant (e.g., rice or corn) that occurred through domestication.



What I Know

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. What refers to the change in the gene pool of population due to chance?
   A. bottleneck effect
   B. founder effect
   C. gene flow
   D. genetic drift

2. Which of the following happens when a small population of organisms separates from the larger group to invade a new area?
   A. bottleneck effect
   B. founder effect
   C. gene flow
   D. genetic drift

3. What refers to any movement of genes from one population to another?
   A. gene flow
   B. genetic shuffling
   C. genetic variation
   D. mutation

4. Who is the Father of Evolution?
   A. Alfred Russel Wallace
   B. Carolus Linnaeus
   C. Charles Darwin
   D. Jean Baptiste de Lamarck

5. Who proposed the theory of use and disuse?
   A. Alfred Russel Wallace
   B. Carolus Linnaeus
   C. Charles Darwin
   D. Jean Baptiste de Lamarck

6. Who believed that when populations grow geometrically, resources slowly increase leading to competition?
   A. Alfred Russel Wallace
   B. Carolus Linnaeus
   C. Jean Baptiste de Lamarck
   D. Thomas Malthus

7. Who is the Father of Taxonomy?
   A. Alfred Russel Wallace
   B. Carolus Linnaeus
   C. Jean Baptiste de Lamarck
   D. Thomas Malthus

8. According to his theory of evolution, organisms change during their lifetime to survive, then pass these changes to their offspring. Who is the scientist credited for this theory?
    A. Carolus Linnaeus
    B. Charles Darwin
    C. Jean Baptiste de Lamarck
    D. Thomas Malthus

9. Who proposed the theory that involves natural selection?
    A. Carolus Linnaeus
    B. Charles Darwin
    C. Jean Baptiste de Lamarck
    D. Thomas Malthus

10. Which of the following is also called migration?
    A. gene flow
    B. genetic shuffling
    C. genetic variation
    D. mutation

11. Differences among individuals of a species are referred to?
    A. adaptation
    B. fitness
    C. natural selection
    D. natural variation

12. Which of the following refers to a change over time in the characteristics of a species?
    A. evolution
    B. gradualism
    C. migration
    D. mutation

13. Each living species has descended, with changes, from other species over time and as a result species today look different from their ancestors. Which theory describes this phenomenon?
    A. Theory of Descent with Modification
    B. Theory of Modification
    C. Theory of Natural Selection
    D. Theory of Survival

14. Which of the following explains the difference in survival of individuals that reproduce in a particular environment?
    A. evolution
    B. gene flow
    C. gradualism
    D. natural selection

15. Which of the following occurs when there is a change in genetic makeup of organism?
    A. gene flow
    B. genetic drift
    C. mutation
    D. natural selection

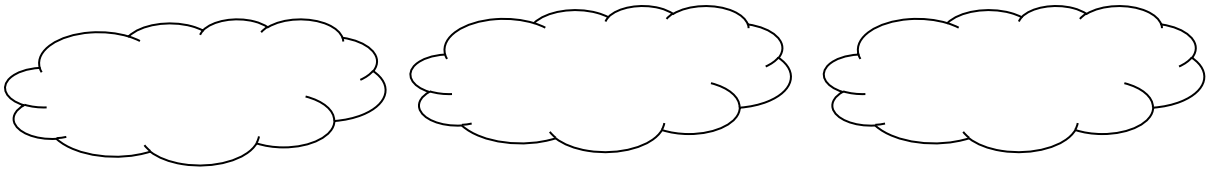
Lesson 1 The Process of Evolution

Charles Darwin formulated the theory of evolution by natural selection in his book "On the Origin of Species" in 1859. According to Darwin, Theory of Evolution refers to a change over time and the process by which modern organisms have descended from ancient organisms.

What's In

Activity 1

Inside the clouds, write your own thoughts about Darwin's Theory of Evolution.



What's New

The basis for the modern theory of evolution was laid during 1700s and 1800s. Charles Darwin sets sail on the H.M.S. Beagle, a voyage that would provide him with vast amounts of evidence that led to his theory of evolution. Alfred Wallace writes Darwin, speculating on evolution by natural selection, based on his studies of the distribution of plants and animals. The French naturalist Jean-Baptiste Lamarck was among the first scientists to recognize that living things have changed over time and that all species were descended from other species. Other scientists who contributed to evolutionary thought were Carolus Linnaeus who formalized the binomial nomenclature and Thomas Malthus who believed that populations grow geometrically while resources slowly decrease, leading to competition.

Activity 2 The Who?

Identify the scientists who contributed to the historical developments of evolutionary thoughts by arranging the letters inside the box.

A	H	M	U	T	L	S

1._____Believed that populations grow geometrically while resources slowly increase or not at all, leading to competition

A	N	D	W	R	I

2. _____Thought the idea of descent modification

N	I	L	E	N	A	S	U

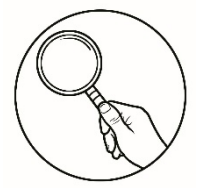
3. _____ Father of Taxonomy

W	L	E	L	C	A	A

4. _____ Realized that species evolved because fittest individuals survived and reproduced passing their advantageous characters

A	A	C	R	L	K	M

5. _____ Proposed the Theory of Inheritance of Acquired Traits and Theory of Use and Disuse



What is It

Mechanisms of Evolutionary Changes

Mechanisms of evolutionary changes include genetic drift, migration or gene flow, mutation, natural selection, and nonrandom mating.

Genetic drift is a change in the gene pool of a population due to chance. Examples of genetic drift are bottleneck effect and founder effect. Bottleneck effect takes place when population decreases due to various environmental factors such as fires, earthquakes, and floods. The founder effect happens when a small population of organisms separates from the larger group to invade a new area.

Gene flow is described as the movement of genes from one population to another. When this happens, there is a tendency to increase the gene diversity in the populations.

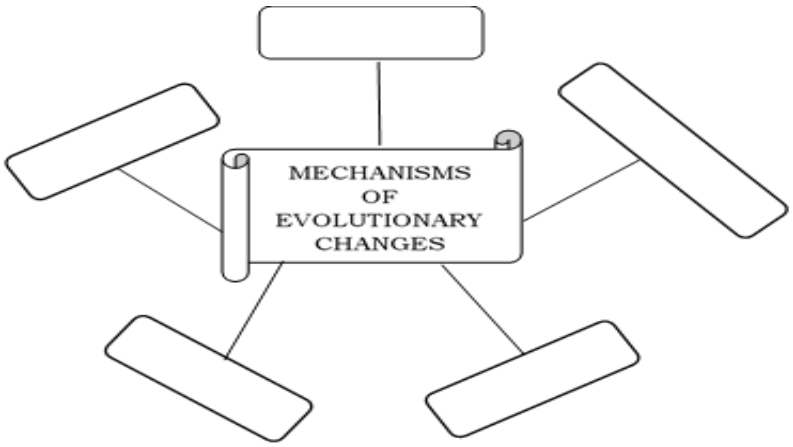
Mutation occurs when there is a change in the genetic makeup caused by environmental stressors. This process expands the diversity of organisms.

Natural selection explains the difference in survival of an individual and reproduction in a particular environment.

Nonrandom mating increases the frequency of animals with desirable traits. It causes evolution because it intrudes the natural pool of gene variations.

Activity 3

On a sheet of paper, copy and complete the concept map by supplying the mechanism of evolutionary changes.



What's More

Lamarckian vs. Darwinian Evolution

According to Lamarck's Theory of Evolution, organisms change during their lifetime to survive then pass these changes to their offspring. On the other hand, Darwin's theory involves natural selection and struggle for existence. When an organism is fit and can adapt to its environment, it has a better chance to survive and more chance to reproduce.

Activity 4

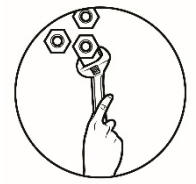
Compare Lamarckian vs. Darwinian Evolution through Venn Diagram.

What I Have Learned

Activity 5

Complete the sentences.

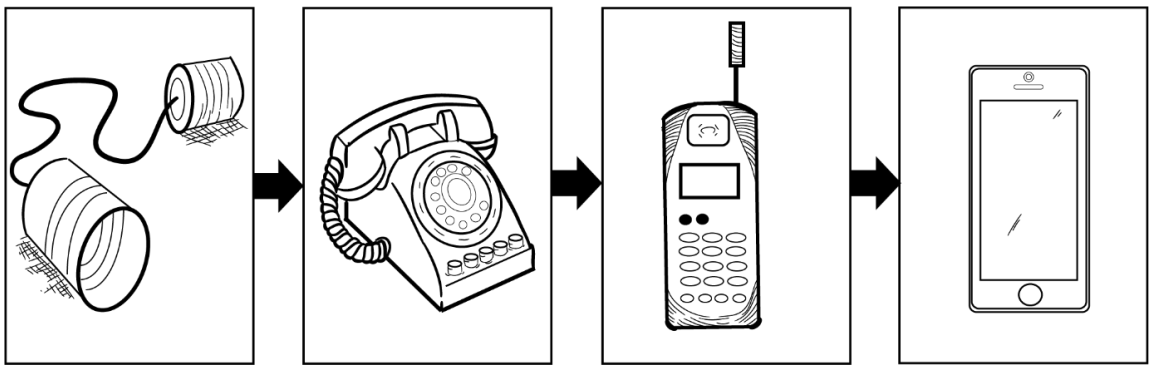
1. _____ refers to a change over time.
2. _____ is the Father of Evolution.
3. _____ is considered the Father of Taxonomy.
4. Thomas Malthus believed that populations grow geometrically while resources slowly increase leading to _____.
5. _____ proposed the Theory of Use and Disuse.
6. _____ explains the difference in survival of individuals and how they reproduce in a particular environment.
7. Gene flow is the movement of _____ from one population to another.
8. _____ occurs when there is a change in the genetic makeup caused by environmental stressors.
9. The _____ happens when a small population of organisms separates from the larger group to invade a new area.
10. _____ takes place when population decreases due to various environmental factors such as fires, earthquakes and floods.



What I Can Do

Activity 6

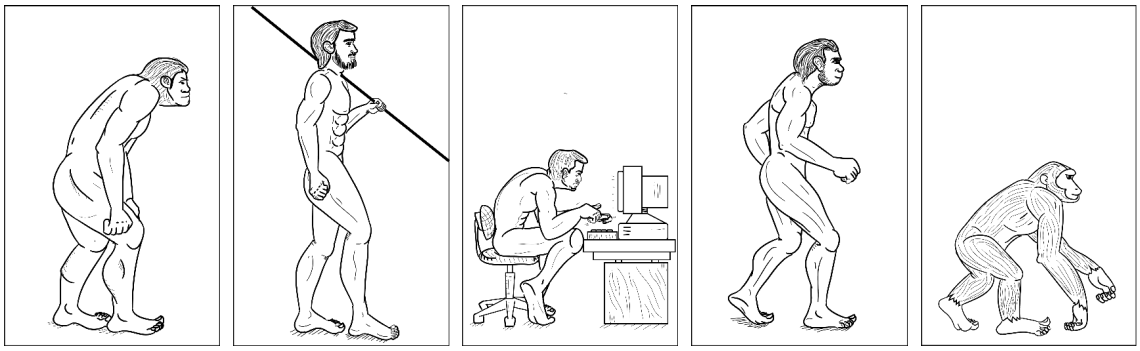
Look at the picture below. This illustrates the evolution of phone. Describe each stage and tell the changes that occur in every phase. Write your answer on a sheet of paper.



The Evolution of the Phone

Activity 7

Arrange the following pictures from ancient to modern based on your understanding about the Theory of Evolution. (Use numbers 1 to 5)



_____ _____ _____ _____ _____

Assessment

Multiple Choice. Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Refers to a change over time
   A. evolution
   B. gradualism
   C. migration
   D. mutation

2. Each living species has descended, with changes, from other species over time and as a result species today look different from their ancestors
   A. Theory of Descent with Modification
   B. Theory of Modification
   C. Theory of Natural Selection
   D. Theory of Survival

3. Explains the difference in survival of individuals and how they reproduce in a particular environment
   A. evolution
   B. gene flow
   C. gradualism
   D. natural selection

4. Takes place when population decreases due to various environmental factors such as fires, earthquakes and floods
   A. bottleneck effect
   B. founder effect
   C. genetic flow
   D. natural selection

5. The process the movement of genes from one population to another
    A. evolution
    B. gene flow
    C. gradualism
    D. natural selection

6. Which of the following is considered as mechanisms of change?
    A. genetic drift
    B. migration
    C. natural selection
    D. a, b and c

7. Changes in the DNA
    A. gene flow
    B. genetic shuffling
    C. genetic variation
    D. mutation

8. This is also called migration
    A. gene flow
    B. genetic shuffling
    C. genetic variation
    D. mutation

9. Differences among individuals of a s species are referred to as _____.
    A. adaptation
    B. fitness
    C. natural selection
    D. natural variation

10. Father of Evolution
    A. Alfred Russel Wallace
    B. Carolus Linnaeus
    C. Charles Darwin
    D. Jean Baptiste de Lamarck

11. Proposed the Theory of Use and Disuse.
    A. Alfred Russel Wallace
    B. Carolus Linnaeus
    C. Charles Darwin
    D. Jean Baptiste de Lamarck

12. Believed that populations grow geometrically while resources slowly increase leading to competition
    A. Alfred Russel Wallace
    B. Carolus Linnaeus
    C. Jean Baptiste de Lamarck
    D. Thomas Malthus

13. Father of Taxonomy
    A. Alfred Russel Wallace
    B. Carolus Linnaeus
    C. Jean Baptiste de Lamarck
    D. Thomas Malthus

14. According to his Theory of Evolution, organisms change during their lifetime to survive then pass these changes to their offspring
    A. Carolus Linnaeus
    B. Charles Darwin
    C. Jean Baptiste de Lamarck
    D. Thomas Malthus

15. His theory involves natural selection
    A. Carolus Linnaeus
    B. Charles Darwin
    C. Jean Baptiste de Lamarck
    D. Thomas Malthus

Additional Activities

Activity 8

A. Read the article of Sue Ann Zollinger posted last June 23, 2009 in Moment of Science. Then design a poster tracing the evolutionary changes occurred in domestic corn.

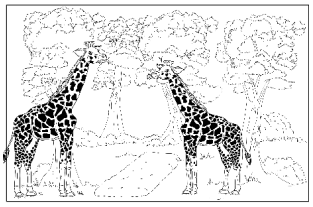
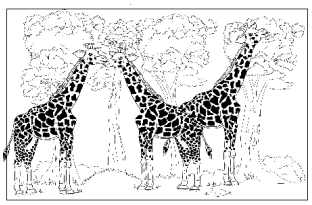
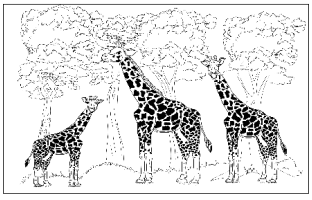
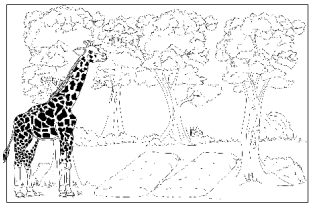
Have you ever wondered how corn evolved? After all, the seeds are all crammed together on the cob and wrapped tightly inside the thick husks. Seems impossible for the seeds to disperse without a human to peel the husks and separate the kernels.

Come to find out, corn, or maize, only exists in its modern form because of humans. Evidence from archaeological and genetic studies suggests that maize was bred and cultivated by early inhabitants of Mexico as early as ten thousand years ago. The early Mesoamericans managed to develop corn from its grassy ancestor by selective breeding. Maize was bred from a wild grain called teosinte.

Teosinte is so unlike modern corn that originally botanists didn't think the two were even related. An ear of teosinte is only about three inches long, with just five to twelve kernels. Compare that to the corn we eat today, which can have over five-hundred kernels!

Teosinte kernels also have a "tooth-crackingly" hard shell. But through many generations, ancient Americans selectively bred plants with larger and larger ears, and softer and softer kernels. Now all that is left of that hard shell is the thin tissue that gets stuck between your teeth when munching a cob of corn

B. Match column A with the label in column B. Draw a line from column A with the corresponding answer in column B.

A			B
1.		● ●	A. There was a variety of neck lengths of giraffes.
2.		● ●	B. Small-necked and medium-necked giraffes cannot reach the food so they die.
3.		● ●	C.Small-necked giraffe cannot reach the food so it dies.
4.		● ●	D. Long-necked giraffe survived and pass the traits to its offspring.

Answer Key

What I Know

1. D	9. B
2. B	10. A
3. A	11. D
4. C	12. A
5. D	13. A
6. D	14. D
7. B	15. C
8. C	

What's in

Activity 1

1. fossil records
2. comparative anatomy
3.comparative embryology
4.comparative biochemistry
5. molecular biology

What's New

Activity 2

1. MALTHUS
2. DARWIN
3. LINNAEUS
4. WALLACE
5. LAMARCK

Whats It

Activity 3

genetic drift
mutation
gene flow
natural selection
nonrandom mating

What's More

Activity 4

Sample illustration of Lamarck and Darwin's theory of evolution

What I Have Learned

Activity 5

1. evolution
2. Charles Darwin
3. taxonomy
4. competition
5. Jean Baptiste de Lamarck
6. natural selection
7. gene
8. mutation
9. founder effect
10. bottleneck effect

What I Can Do

Activity 6

First stage – Human used cans with strings to pass the message.
Second stage – Human developed wired telephone.
Third stage – Human used wireless telephone.
Fourth stage – People able to see the caller's image using smartphones

What can I do

Activity 7

1. 2
2. 4
3. 5
4. 3
5. 1

Additional Activity

Activity 8

1. C
2. D
3. A
4. B

Assessment

1. A	9. D
2. A	10. C
3. D	11. D
4. A	12. D
5. B	13. B
6. D	14. C
7. D	15. B
8. A	

References

Miller, K. R. & Levine, J. (2004). *Prentice Hall: Biology.* New Jersey, Pearson Education Inc.

Salandanan, G.G., Faltado, R.E., & Lopez, M.B. (2016). Earth and Life Sciences for Senior High School. Quezon City, Lorimar Publishing, Inc.

Sia, S. & Cortez, L. (2016). Science in Today's World for Senior High School

Hancock, K. (2015, March 24). *The Evolution of the Phone.* Retrieved from

http://thelcbridge.com/the-evolution-of-the-phone/

https://evolution.berkeley.edu/evolibrary

https://indianapublicmedia.org/amomentofscience/corn-evolve.php

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