

THAT BIG SCARY E-WORD (EVOLUTION)

Grade Level & Special Area: 7th Grade Science

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Length of Unit: 3 – 4 weeks

I. ABSTRACT

This unit tries to present a positive and non-controversial view of the theory of biological evolution. Through journal activity, writing, lecture, and other activities, students are exposed to Darwin's theory of evolution. As the culminating activity of this unit, students will have the opportunity to use critical thinking skills to examine other aspects of the theory of biological evolution.

II. OVERVIEW

A. Concept Objectives

1. Students will understand that the concept of evolutionary theory is the change of organisms over time.
2. Students will understand that natural selection is a mechanism of evolution.

B. Content from the *Core Knowledge Sequence*

1. EVOLUTION

- a. Evolution is the change in a population over time caused by both genetic change and environmental factors.
 - i. Adaptation and mutation
- b. Charles Darwin: *Voyages of the Beagle; On the Origin of Species* (1859)

2. NATURAL SELECTION

- a. Natural selection as the mechanism of evolution: Darwin's theory that life forms better adapted to their current environments have a better chance of surviving and will pass on their traits to their offspring.
 - i. Trait variation and change from generation to generation
- b. Evidence for the theory of evolution includes comparative anatomy, geology, fossils, and DNA research.

3. EXTINCTION AND SPECIATION

- a. Extinction occurs when an environment changes and a species is no longer adapted to it.
- b. New species can develop from simple organisms in oceans through amphibians to higher forms such as primates.
- c. Life forms have evolved from simple organisms in oceans through amphibians to higher forms such as primates.

C. Skill Objectives

1. Students will define, compare and contrast, and give examples of laws, theories, and facts.
2. Students will comprehend evolution as a gradual change of a species over time and be able to communicate that idea to others.
3. Students will review geography and map skills.
4. Students will research information about the places Darwin visited.
5. Students will make an oral presentation of research.
6. Students will research scientific evidences for the origin of life.
7. Students will draw conclusions based on scientific evidence.
8. Students will write a concise research essay with evidence to support a theory.
9. Students will organize information in outline form.
10. Students will use a graph to show results of an investigation.
11. Students will compare examples of artificial selection to natural selection.

12. Students will correlate results of experiments with real life examples found in nature.
13. Students will be able to identify what causes extinction and speciation.
14. Website navigation

III. BACKGROUND KNOWLEDGE

- A. For Teachers
 1. *Eyewitness Science: Evolution*, by Linda Gamlin
 2. *Charles Darwin and Evolution*, Steve Parker
 3. *Evolution Change over Time*, Prentice Hall teacher edition
- B. For Students
 1. Seventh grade Science Core Knowledge Sequence ©1999: Cell Division and Genetics Unit needs to be taught prior to teaching this unit.
 2. Students will need to know how to research a scientific topic and write a research paper.

IV. RESOURCES

- A. Prentice Hall Science Text, Teacher's Edition, *Evolution Change over Time*
- B. Linda Gamlin's *Eyewitness Science: Evolution*
- C. Steve Parker's *Charles Darwin and Evolution*

V. LESSONS

Pre Unit Letter (See Appendix A)

Origin of species is a sensitive topic for many people. With this in mind, it is wise to inform parents that students will be studying Darwin's evolutionary theory prior to beginning this unit. Parents should be reminded that evolution is included in the *Core Knowledge Sequence* seventh grade science section. It is recommended that this or a similar letter be sent home at least one week prior to starting this unit. It might be beneficial to have a signed copy returned for your records to ensure that parents have seen the letter.

Lesson One: Theories, Facts, and Laws

- A. *Daily Objectives*
 1. Concept Objective(s)
 - a. Students will understand the concept of evolutionary theory is the change of organisms over time.
 2. Lesson Content
 - a. Review laws, facts, and theories.
 1. Skill Objective(s)
 - a. Students will define, compare and contrast, and give examples of laws, theories, and facts.
- B. *Materials*
 1. Appendix B (see directions below)
 2. Three large pieces of paper
- C. *Key Vocabulary*
 1. Fact: something having, real demonstrable existence
 2. Theory: the set of facts, based on separate but related hypotheses, explaining the behavior of a particular phenomenon
 3. Law: a summarizing statement of observed experiments that has been tested many times and is generally accepted as true by the scientific community
- D. *Procedures/Activities*
 1. Appendix B contains a list of theories, facts, and laws. Make enough copies of Appendix B so that you have one copy for each group of two in your class. Cut these

- ideas out into pieces and laminate. Insert the laminated pieces into an envelope for each group.
2. Divide the class into groups of two. Give each group an envelope containing the laminated pieces. Ask the students to combine like ideas and place their pieces into categories. Ask the students to come up with category titles.
 3. Discuss how and why the students have decided to group their pieces the way they have.
 4. Discuss the definitions and basic differences between scientific facts, laws and theories.
 5. Ask students to make any adjustments they need to arrange their pieces into categories with titles of theories, facts, and laws.
 6. Hang three large pieces of paper in the room. Label one THEORIES; one FACTS; and one LAWS. As students finish categorizing their items, have each group contribute portions of their category groupings to a classroom list.
- E. *Evaluation/Assessment*
1. Group discussion on validity of placement of envelope pieces in theory, fact, or law categories.

Lesson Two: Evolution is Change

- A. *Daily Objectives*
1. Concept Objective(s)
 - a. Students will understand the concept of evolutionary theory is the change of organisms over time.
 2. Lesson Content
 - a. Evolution is the change in a population of organisms over time caused by both genetic change and environmental factors.
 3. Skill Objective(s)
 - a. Students will comprehend evolution as a gradual change of a species over time and be able to communicate that idea to others.
- B. *Materials*
1. Appendix C
- C. *Key Vocabulary*
1. Evolution: gradual change over time
- D. *Procedures/Activities*
1. Review theory, fact and law definitions.
 2. Give students the definition of evolution (gradual change over time).
 3. Discuss the evolution of something that the students are familiar with. For example, school dress code, discipline policies, language, etc.
 4. Some helpful websites:
 - a. <http://165.29.91.7/classes/humanities/amstud/97-98/helicptr/webpage.htm> (evolution of helicopter)
 - b. <http://library.thinkquest.org/26451/frames/html> (evolution of communication)
 5. Talk with the students about the meaning of evolutionary theory in biology, the change in *species* over time. Evolutionary biologist say that organisms undergo small changes or mutations that enable the organism to be better suited for life in its environment. It is thought that some organisms can undergo so much change that they become a whole new species.
 6. Have the student write a short essay on the evolution of the “quronk.” Their essays must contain a clear picture of evolution, illustrate gradual change over time, and incorporate theories, facts, and laws. The theories, facts, and laws included may be imaginary and related to the evolution of the quronk or anything else dealing with a quronk. Hand out rubric to students so they have a clear picture of the grading scale. A sample student instruction sheet and rubric has been included in Appendix C.

E. *Evaluation/Assessment*

1. Use the rubric provided in Appendix C to grade the student essays.

Lesson Three: Charles Darwin

A. *Daily Objectives*

1. Concept Objective(s)
 - a. Students will understand the concept that evolutionary theory is the change of organisms over time.
2. Lesson Content
 - a. Charles Darwin: *Voyages of the Beagle; On the Origin of Species* (1859)
3. Skill Objective(s)
 - a. Students will review geography and map skills.
 - b. Students will research information about the places Darwin visited.
 - c. Students will make an oral presentation of a field journal (research).

B. *Materials*

1. Group destination to locate (Appendix D1)
2. World map with latitude and longitude lines and destinations for students to plot Darwin's entire voyage
3. Enlarged sections of world map detailing portions of the voyage
4. Reference map for student's use showing ocean currents and climates
5. Overhead transparency of the world map with latitude and longitude lines
6. Answer sheets for the map activity covering Darwin's voyage and latitude and longitude
7. Field notes sheets (Appendix D2)

C. *Key Vocabulary*

1. Absolute location: the exact location in terms of latitude and longitude of a place
2. Equator: an imaginary line that circles the globe in an east-west direction exactly half way between the North and South poles
3. Latitude: imaginary lines drawn in an east-west direction around the globe that measure the distance north and south of the equator in degrees of a circle
4. Longitude: imaginary lines drawn in a north-south direction around the globe that measure the distance east and west of the Prime Meridian in degrees of a circle
5. Oceans of the world: Atlantic, Arctic, Indian, and Pacific
6. Northern hemisphere: the half of the earth north of the equator
7. Continents of the world: Africa, Antarctica, Asia, Australia, Europe, North America and South America
8. Southern hemisphere: the half of the earth south of the equator

D. *Procedures/Activities*

1. Prepare an activity packet for each group of 2 students. Each packet should consist of destinations to locate (Appendix D1) and a map of the corresponding region. Two groups will be working on each portion of the voyage. Therefore, two activity group packets will be needed for each portion of the journey. Prepare 24 copies of the Field Notes handout (Appendix D2).
2. Give students a brief history on Charles Darwin. He was an English scientist who set sail in 1831 for a five-year voyage on a ship called the *Beagle*. As the ship's naturalist, Darwin studied animals and plants at every stop along the way. Tell the students that in this activity they will "go" to the same places Darwin traveled to and will observe the same things he observed.
3. Divide students into group of two. Pass out activity packets (from procedure 2) to each group. Each group of students should have access to a world atlas with latitude and longitude and the destinations the students are investigating.

4. When the students have finished mapping their portion of Darwin's journey, have the A and B group of each group of locations compare maps.
 5. When they have reached agreement, have each group write their portion of Darwin's voyage on a class master world map.
 6. The A & B group for each voyage portion will combine and work together on the field journal portion of this activity.
 7. Give each group four field note sheets (Appendix D2). Each member of the group should research a separate location of their navigation portion of the activity. The first four destinations each group plotted during the map portion will be used for the naturalist portion of the activity. For example, Group 1 members will fill out Field Notes sheets for the British Isles, the Canary Islands, the Cape Verde Islands, and Bahia. To complete their Field Notes, the students will need access to a set of encyclopedias, magazines, or the Internet. Students will research what Charles Darwin discovered at each location on his journey. This will result in one sheet for each of the 24 locations.
 8. Students will present each of their findings, as a group or individually, to the class.
 9. Field notes can then be compiled into a chronological order and displayed in an area containing research materials, background information and other student work completed in the unit.
- E. *Evaluation/Assessment*
1. Self-assessment of mapping skills using latitude and longitude. Students will compare their latitude and longitude results with another group doing the same section of the voyage. Student will be able to locate and draw their portion of Darwin's journey on the complete world map (an overhead transparency would work nicely).
 2. Oral presentation of field study.

Lesson Four: Scientific Evidence (Part 1)

A. *Daily Objectives*

1. Concept Objective(s)
 - a. Students will understand the concept of evolutionary theory is the change of organisms over time.
2. Lesson Content
 - a. Evidence for the theory of evolution includes comparative anatomy, geology, fossils, and DNA research.
 - b. Life forms have evolved from simple organisms in oceans through amphibians to higher forms such as primates.
3. Skill Objective(s)
 - a. Students will research scientific evidences for the origin of life.
 - b. Students will draw conclusions based on scientific evidence.
 - c. Students will write a concise research essay with evidence to support a theory.

B. *Materials*

1. Copies of Appendix E for each student

C. *Key Vocabulary*

None

D. *Procedures/Activities*

1. Pass out assignment sheet (Appendix E).
2. Discuss the assignment. Answer any questions the students may have.
3. Take the students to the library or computer lab to do research. It would be nice to have one day scheduled for research for the students. You may have some references available in your classroom (some of the resources found in the bibliography of the unit would be helpful) for students to use.
4. The students will be required to present their findings orally to the class.

5. Tell the students that their assignment sheet with rubric should serve as a cover sheet to their finished essay.
 6. You may want to allow two days for this lesson to allow students to do more research or to start writing their papers in class.
 7. These essays will be due for Lesson Eight. That is when class presentations will occur.
- E. *Evaluation/Assessment*
1. There is a rubric included with the student assignment in Appendix E.

Lesson Five: Natural Selection/Trait Variation (Part 1)

- A. *Daily Objectives*
1. Concept Objective(s)
 - a. Students will understand that natural selection is a mechanism of evolution.
 2. Lesson Content
 - a. Natural selection as the mechanism of evolution: Darwin's theory that life forms better adapted to their current environment have a better chance of surviving and will pass on their traits to their offspring.
 - b. Trait variation and change occur from generation to generation.
 3. Skill Objective(s)
 - a. Students will organize information in outline form.
- B. *Materials*
1. Teacher notes: Appendix F1
 2. Student outline: Appendix F2
- C. *Key Vocabulary*
1. Natural selection: survival and reproduction of those organisms best adapted to their surroundings
- D. *Procedures/Activities*
1. Review teacher lecture outline (Appendix F1).
 2. Hand out student Natural Selection outline (Appendix F2).
 3. Using Appendix F1, discuss Natural Selection as a class in lecture format. Help students to fill out outline correctly.
- E. *Evaluation/Assessment*
1. Check students' outlines for accuracy.

Lesson Six: Natural Selection/Trait Variation (Part 2)

- A. *Daily Objectives*
1. Concept Objective(s)
 - a. Students will understand that natural selection is a mechanism of evolution.
 2. Lesson Content
 - a. Natural selection is a mechanism for evolution.
 - b. Trait variation and change occur from generation to generation.
 3. Skill Objective(s)
 - a. Students will use a graph to show results of an investigation.
 - b. Students will compare examples of artificial selection to natural selection.
 - c. Students will correlate results of experiments with real life examples found in nature.
- B. *Materials*
1. Appendices G1 - G3
 2. Graph paper (This is not provided in the appendices. Students will need enough graph paper to make to bar graph with 10 entries each.)
 3. Hole punch (one per group)

4. Colored construction paper (one sheet each of the following colors: black, blue, brown, green, orange, purple, red, white, yellow, tan (any 10 colors will do) for each group)
 5. 10 sealable plastic bags (per group)
 6. 80 cm x 80 cm piece of colored cloth (one per group)
- C. *Key Vocabulary*
1. Natural selection: survival and reproduction of those organisms best adapted to their surroundings
- D. *Procedures/Activities*
1. Make enough copies of lab *Does Camouflage Really Work?* (Appendix G1 – G3) for entire class.
 2. Review concept of Natural Selection.
 3. Assign student to groups of four.
 4. Pass out lab packet, Appendices G1 – G3.
 5. Ask students to read over lab sheet. Discuss the lab activity and answer any questions the students may have.
 6. Proceed with lab. If time is a concern, step 1 of part 1 may be done ahead of time.
 7. Allow students to complete the lab as found on the sheet.
 8. Be sure to check progress on the student's graphs in part 2, procedure steps 16 and 17.
 9. Students may turn in completed lab sheet that day if there is time, or the next day if they do not finish in class.
- E. *Evaluation/Assessment*
1. Check student graphs for accuracy and consistency with results.
 2. Check answers to student questions.

Lesson Seven: Extinction & Speciation

- A. *Daily Objectives*
1. Concept Objective(s)
 - a. Students will understand the concept of evolutionary theory is the change of organisms over time.
 - b. Students will understand that natural selection is a mechanism of evolution.
 2. Lesson Content
 - a. Extinction occurs when an environment changes, and a species is no longer adapted to it.
 - b. New species can develop when part of the population becomes separated and evolves in isolation.
 3. Skill Objective(s)
 - a. Students will be able to identify what causes extinction and speciation.
- B. *Materials*
- None
- C. *Key Vocabulary*
1. Niche: combination of an organism's needs and its habitat
 2. Pangaea: a single landmass that many scientists believe split apart to give us our modern land formations
 3. Theory of continental drift: large convection currents can move the continents away from each other
 4. Extinction: when the last individual of a species has died
 5. Speciation: the formation of a new species
 6. Adaptive Radiation: process by which a species evolves into several species, each of which fills a different niche
- D. *Procedures/Activities*
1. Collect labs that are still out from yesterday.

2. Give the students the definition of a niche. Ask your students to then write brief autobiographies that describe their own personal niche.
3. Ask a couple of students to share their stories. Discuss how no two niches are exactly the same. This is true for people and for all species. Each species has its own unique needs and habitat.
4. Ask the students to name a species. As a class discuss the niche of that species. For example, if a student suggests a lion, you could talk about what lions eat, where they live, how they kill their food, etc.
5. Depending on the species being discussed, ask the students what they think would happen if an animal's niche were changed. Change could occur in a niche by introducing or eliminating predators or prey of the animal or because of changes in the environment.
6. Tell the students that if two organisms occupy the same niche, there is generally competition between the two for food, shelter and water. Ask the students what kinds of problems do they think this could create. Competition sometimes causes species to move into a new or empty niche. Ask them what they think those ways are; they are (1) migration (2) isolation. Discuss these two possibilities with the students.
7. Briefly discuss the theory of continental drift that split Pangaea apart.
8. Discuss what happened when Pangaea split up. Some animals became isolated and had to adapt to their new niche. Good examples to talk about are the animals of Australia. Many Australian animals are found only there. Sometimes when part of a species becomes separated from the rest of the species in a new and unfamiliar niche it adapts to it new surrounding so much that it forms a new species. This is how speciation occurs. Some scientists believe that this is what may have happened with the animals of Australia.
9. Ask the students what happens to an animal when it becomes extinct. What can cause extinction? Can one species cause another species to become extinct? Discuss the passenger pigeon and how man caused its extinction by over hunting the animal. Remind the students that sometimes extinction occurs because animals cannot adapt quickly enough to a changing niche.

E. *Evaluation/Assessment*

1. Ask the students the following questions in the form of an oral quiz.
 - a. What is a niche?
 - b. Name two ways that an animal can become extinct were discussed in class.
 - c. How do scientists believe that speciation occurs?

Lesson Eight: Scientific Evidence (Part 2)

A. *Daily Objectives*

1. Concept Objective(s)
 - a. Students will understand the concept of evolutionary theory is the change of organisms over time.
2. Lesson Content
 - a. Evidence for the theory of evolution includes comparative anatomy, geology, fossils, and DNA research.
 - b. Life forms have evolved from simple organisms in oceans through amphibians to higher forms such as primates.
3. Skill Objective(s)
 - a. Students will draw conclusions based on scientific evidence.
 - b. Students will give an oral presentation of research.

B. *Materials*

1. Student essays from Lesson Four.

- C. *Key Vocabulary*
None
- D. *Procedures/Activities*
 1. Have each class member present his or her findings to the class.
 2. Collect the essays with rubric intact.
- E. *Evaluation/Assessment*
 1. Use rubric included with the student assignment in Appendix F to grade the students' essays.

VI. CULMINATING ACTIVITY

We have designed a number of centers to set up in the classroom. These centers are designed to reinforce ideas students have learned in this unit. Some of these centers will give the students the opportunity to explore other areas of evolution. These are only suggested ideas.

- A. Human Evolution
 1. Have students explore the following website:
http://www.wsu.edu:8001/vwsu/gened/learn-modules/top_longfor/overview/Overvw1.html.
 2. Appendix H1 contains a list of questions for the students to complete while navigating this website.
- B. Fossils
 1. Web site: <http://www.rom.on.ca/quiz/fossil/>
 2. Appendix H1 contains questions to guide the students on in their navigation of this website.
- C. Appendix H2 contains a key terms word search (Appendix H3 contains a key).
- D. Biochemistry: is it for or against evolution? You decide!
 1. At this station, students will be asked to examine information that discusses how a protein intended for use in the lysosome is made and travels to the lysosome.
- E. Plant Evolution
 1. Website: <http://www.treeguide.com/treeguide/index.htm>. Once you get to this site, click on the *Biology* section. There is supposed to be a part on the *Evolutionary History of Trees* available as of 6/1/00. When researching this unit (6/00) it was still in progress and unavailable. I would check this site and see if it is up and running when you are ready to use this unit.
- F. Other possible station ideas: Have copies of a few books for the students to read and summarize. Some good ones are Piero Ventura's *Darwin Nature Reinterpreted*, and Steve Parker's *Charles Darwin and Evolution*.

VII. HANDOUTS/WORKSHEETS

- A. Appendix A: Parent Letter
- B. Appendix B: Theories, Facts, and Laws
- C. Appendix C: The Quronk Instruction Sheet
- D. Appendix D1: Group Destinations to Locate
- E. Appendix D2: Field Notes Sheet
- F. Appendix E: Origins of Life Research Paper
- G. Appendix F1: Natural Selection Teacher Lecture Outline
- H. Appendix F2: Natural Selection Student Outline
- I. Appendices G1-3: "Does Camouflage Really Work?" Lab
- J. Appendix H1: Website Questions
- K. Appendix H2: Key Terms Word Search
- L. Appendix H2: Key Terms Word Search Answer Key

VIII. BIBLIOGRAPHY

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- H. "Evolution of Communication" [On-line] Available URL:
<http://library.thinkquest.org/26451/frames/html>
- I. "Evolutionary History of Trees" [On-line] Available URL:
<http://www.treeguide.com/treeguide/index.htm>
- J. "History of the Helicopter" [On-line] Available URL:
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- K. "Overview of Human Evolution web site" [On-line] Available URL:
http://www.wsu.edu:8001/vwsu/gened/learn-modules/top_longfor/overview/Overvw1.html
- L. "Royal Ontario Museum web site" [On-line] Available URL:
<http://www.rom.on.ca/quiz/fossil/>

Appendix A – That BIG SCARY E-Word

Dear Parents,

I am writing to tell you about one of the units we will be covering in seventh grade Science this year. Science is made up of many ideas, theories, and laws. Many of these ideas have gone through many changes throughout the years. Our job as life-long learners is to examine all the evidence concerning a particular topic. Evolution is part of the Core Knowledge curriculum for seventh grade science. This topic appears in the *Core Knowledge Sequence* ©1999 under seventh grade Science as follows:

V. Evolution

A. EVOLUTION

- Evolution is the change in a population over time caused by both genetic change and environmental factors.
Adaptation and mutation
- Charles Darwin: *Voyages of the Beagle; Origin of Species* (1859)

B. NATURAL SELECTION

- Natural selection as the mechanism of evolution: Darwin's theory that life forms better adapted to their current environments have a better chance of surviving and will pass on their traits to their offspring.
Trait variation and change from generation to generation
- Evidence for the theory of evolution includes comparative anatomy, geology, fossils, and DNA research.

C. EXTINCTION AND SPECIATION

- Extinction occurs when an environment changes and a species is no longer adapted to it.
- New species can develop from simple organisms in oceans through amphibians to higher forms such as primates.
- Life forms have evolved from simple organisms in oceans through amphibians to higher forms such as primates.

I know that the origin of life is a sensitive subject for many people. There are many theories concerning the change in things over time. If you hold a different view than what will be presented as part of the Core Knowledge curriculum, please remember to discuss your viewpoint with your children in the coming weeks.

If you have any questions regarding what will be discussed in class, feel free to contact me at the school.

Sincerely,

Appendix B – That BIG SCARY E-Word

Theories	Facts	Laws
The earth is flat.	$2456 / 62 = 38$	Objects at rest tend to stay at rest, objects in motion tend to stay in motion unless acted on by an outside force.
Paul Bunyan and Babe the Blue Ox created all the lakes in Minnesota.	There are 50 states in the United States of America.	Force is equal to an object's mass times its acceleration.
Everything is made of 4 elements: fire, air, earth, and water.	There are seven continents in the world.	Objects in motion tend to stay in motion.
The moon is made of green cheese.	Denver is the capital of Colorado.	Law of Universal Gravitation
Earthquakes are caused by trapped air escaping from underground pockets.	Vincent van Gogh painted <i>The Starry Night</i> .	Bicycle safety in Illinois requires you to wear a helmet.
Step on a crack, break your mother's back.	The bombing of Pearl Harbor occurred on December 7, 1941.	The Emancipation Proclamation
Rain is tears from heaven, and when it thunders, God is bowling.	London is a city in England.	Thermodynamics says: everything tends to go from a state of order to one of disorder.
Beneath the Bermuda Triangle, there is a magnetic source that sinks ships.	George Washington was the first president of the United States of America.	In the United States, we have the right to freedom of speech, religion, and the press.
Four leaf clovers are lucky.	The symbol for Tungsten is W.	Jim Crow laws
Flies come from dead meat.	An obtuse angle is more than 90° .	$a^2 + b^2 = c^2$
It is impossible for man to travel faster than the speed of sound	The 2000 Summer Olympics will take place in Sydney, Australia.	You have be to sixteen years old to receive your drivers license.
The earth is in the center of the universe	The ancient Egyptian pyramids are found in Egypt.	You have the right to remain silent. You have the right to have an attorney....

Appendix C – That BIG SCARY E-Word

The Quronk

You are scientists out to discover something. **Something, anything**, you really don't care what!! You have always wanted to go down in history as that great human who discovered the _____! Then low and behold, one night while taking your dog Pookie for a walk you discover it! That one **something** you'll be remembered for until the end of time! You quickly give it the first name that pops into your head. "By Golly Gee!!" you say. "Look Pookie! It's a **QURONK!!**" You are nearly beside yourself with glee, but all your darling Pookie can do is turn his sweet little head and give you that ever-precious confused look. You know that you have to study the quronk. You take it home and spend the next few months totally absorbed in examining the quronk. (You become **so** absorbed that your darling Pookie leaves you for the neighbor!) After a few months time, you come to a point where you are ready to tell the world your findings. You know how a quronk came to be and even a great deal about the quronk. You decide to write down your findings and submit it to your favorite magazine, *How You Too Can Be Famous*, right away. So....what are you waiting for?!?!?!?!?! Get going!!!!!! Your eternal remembrance is on the line! But remember! *How You Too Can Be Famous* only takes original works that use good, solid, paragraphs, and correct grammar, punctuation, and spelling! Don't forget an illustration is also required.

GOOD LUCK!

Name: _____

**Points
possible**

**Points
received**

Language Arts Component		
Complete paragraphs.	5	
Use of complete sentences, grammar, punctuation, and spelling	5	
Originality	5	
Illustration	5	
Science Component		
Clearly communicates the idea of evolution	15	
Demonstrates gradual change over time in a quronk	10	
Incorporates a theory fact or law for the evolution of the quronk	10	
Total	50	

Appendix D1 – That BIG SCARY E-Word

Group 1

	Location	Latitude	Longitude
1	British Isles		
2	Canary Islands		
3	Cape Verde Islands		
4	Bahia		
5	Rio de Janeiro		

Group 2

	Location	Latitude	Longitude
1	Rio de Janeiro		
2	Montevideo		
3	Port Desire		
4	Falkland Islands		
5	Straits of Magellan		

Group 3

	Location	Latitude	Longitude
1	Straits of Magellan		
2	Falkland Islands		
3	Cape Horn		
4	Galapagos Islands		
5	Tahiti		

Group 4

	Location	Latitude	Longitude
1	Tahiti		
2	New Zealand		
3	Australia		
4	Tasmania		
5	Keeling Islands		

Group 5

	Location	Latitude	Longitude
1	Keeling Islands		
2	Mauritius/ Boubon Islands		
3	Madagascar		
4	Cape of Good Hope		
5	St. Helena		

Group 6

	Location	Latitude	Longitude
1	St. Helena		
2	Ascension Islands		
3	Bahia		
4	Cape Verde Islands		
5	British Isles		

Appendix D2 – That BIG SCARY E-Word

This packet is to be completed by all students who plotted a particular part of the journey. Label the destination, draw one or more of the unusual animals or geologic features seen, and comment about the area.

Field Notes

Destination: _____

Latitude: _____ **Longitude:** _____

Physical Land Features (Be sure to include sketches and descriptions):

Climate:

Unusual Animal or Plant species (be sure to include descriptions and sketches):

Appendix E – That BIG SCARY E-Word

Origins of Life Research Paper

In this paper, you are to discuss one theory on the origins of life. Your paper must include three pieces of scientific evidence that supports the theory you have chosen to research. You will include at least three sources (at least one source must not be the Internet). You will present your finding to the class on _____. Your paper must include at least five paragraphs consisting of an introduction, three supporting paragraphs, and a conclusion. Be sure to include a bibliography with your paper. You may chose to do research with a classmate, but you must each write your own original paper.

Name: _____

**Points
possible**

**Points
received**

Language Arts Component		
Complete paragraphs	5	
Use of complete sentences, grammar, punctuation, and spelling	5	
Science Component		
Evidence 1	10	
Evidence 2	10	
Evidence 3	10	
Evidence supports theory	10	
Oral Component		
Clearly communicates ideas presented in research paper	10	
Total	60	
Percentage	100%	

Appendix F1 – That BIG SCARY E-Word

I. Introduction

After his visit to the Galapagos Islands, 1835, Charles Darwin developed his theory of natural selection. This theory explained how evolution could take place.

II. Natural Selection

Definition: survival and reproduction of those organisms best adapted to their surroundings.

- A. In each species of animals, a large number of young are produced. Not all the young survive. This indicates that there must be a struggle for survival among the animals.
- B. Within a species of animal there is a large amount of variability. Some of these differences may be related to the animal's ability to survive. Species that are best adapted to their environments will survive.
- C. Heredity causes offspring to resemble their parents. This indicates that genetically well-adapted organisms will have genetically well-adapted offspring. Traits that lead to survival of a species will be passed down, while traits that do not lead to survival of a species will eventually disappear.
- D. Environmental changes may lead to selection of different traits. Variation among organisms determines whether an organism will be able to survive.

III. Examples

- A. Peppered moths of Manchester England
 - 1. Moths have the ability to be white, gray, or black in color.
 - a. In the 1850s most peppered moths were gray in color.
 - b. Black and white moths were easily seen on the gray tree bark and were easily eaten by predators.
 - c. Because gray moths were "hidden" from predators the species was able to survive.
 - 2. Soot from factories built in the area turned tree trunks black.
 - 3. Black moths are now able to survive better than gray moths.
 - 4. Surviving moths tend to be black and not gray. (Prentice Hall *Evolution Change Over Time*.)
 - 5. It is interesting to note that when the air was cleaned up, the dominant color of moths changed again to gray and white
- B. Mice at the White Sands National Monument in New Mexico
 - 1. Mice in the area are normally brown.
 - a. Mice can be brown or white.
 - b. Brown mice blend in.
 - c. White mice are easily seen by predators.
 - 2. At White Sands Monument the sand is white
 - a. Brown mice are easily seen by predators.
 - b. Mice that are white blend in with the sand.
 - c. Mice that live at the Monument are mostly white.
- C. Himalayan Cats
 - 1. Cross breed between Siamese and Persian cat
 - 2. Humans have "naturally selected" the gene makeup of a Himalayan cat

IV. Definition of Natural Selection

- A. Natural selection is the survival and reproduction of those organisms best adapted to their surroundings.

Appendix F2 – That BIG SCARY E-Word

Student Outline

- I.** Introduction
- A.** Charles Darwin visited _____ in _____.
- B.** His observations lead him to develop his _____.
- II.** Natural _____
- A.** Many young are produced in all species.
- _____.
 - _____ for survival among the species.
- B.** _____ amount of _____ with a species.
- May be related to ability to _____.
 - a.** Species that are _____ will survive.
- C.** _____ causes offspring to resemble their parents.
- _____ parents will have _____ offspring.
 - Traits that are not helpful will disappear.
- D.** _____ may lead to selection of different traits.
- III.** Examples
- A.** _____ of Manchester, England.
- They can be _____, _____, or _____.
 - a.** In the _____ most moths were _____.
 - b.** Many _____ and _____ moths were easily seen and eaten by predators.
 - c.** _____ moths _____.
 - Soot from factories turned the tree trunks _____.
 - a.** _____ moths now were able to hide the best.
 - _____ moths are now predominate.
- B.** _____ at _____
- Mice of the area can be _____ or _____.
 - a.** _____ mice normally blend in
 - b.** _____ mice are easily _____ and _____ by predators.
 - White Sands Monument, the sand is _____.
 - a.** _____ mice blend in
 - b.** _____ mice are easily _____ and _____ by predators.
 - Mice at _____ are normally _____.
- C.** _____ cats
- Cross breed between _____ and _____ cat
 - Humans have _____ the genes of a _____ cat.

III. Natural Selection:

Appendix G1 – That BIG SCARY E-Word

Does camouflage really work?

Introduction

Natural selection is the survival of things that are best fitted for their environments. Camouflage is one way that organisms escape their predators. In this experiment, we will look at the ability of things to blend in with their surroundings.

Materials

- Hole punch/ Scissors
- Colored construction paper (1 sheet each of the following colors: black, blue, brown, green, orange, purple, red, white, yellow, tan))
- 10 sealable plastic bags
- 80 cm x 80 cm piece of colored cloth
- graph paper

Procedures

Part 1

1. Punch out or cut 20 dots of each sheet of colored paper and to place each color in a separate sealable bag.
2. Spread the colored cloth out on a flat surface.
3. Spread 10 of each color of dots out randomly on the cloth.
4. Select one member of the group to choose dots. That member should turn with their back to the cloth. Turn back toward the cloth and pick up the first dot you see.
5. Repeat step 4 until you pick up 10 dots. Be sure to look away before you pick up each dot.
6. Record how many of each color of dots you pick up in **Data Table 1**.

Part 2

Let's pretend that the dots represent organisms and that you are a hungry animal on the look out to eat the first thing you see.

7. What do you think will happen if dots are continually eaten (picked up) from the cloth but are not returned. The dots that remain on the cloth represent organisms that survive the attack of the hungry predator and go on to have families and live happily ever after. Write your hypothesis in the space provided.
-
-

8. Select one group member to pick up 20 dots following the method in step 4. Place each dot into its proper container.
 9. Each group member needs to repeat step 8.
 10. Shake the remaining dots off the cloth and onto the table.
 11. Count and record in **Data Table 2** the number of dots of each color remaining.
 12. Spread out the cloth on a flat surface.
 13. Randomly scatter the surviving dots on the cloth.
-

Appendix G2 – That BIG SCARY E-Word

14. For each “surviving” dot, add 4 more dots of that color. These additional dots will represent offspring of the survivors. You may have to punch more dots of certain colors.
15. Repeat steps 8 – 14 three more times. Continue to record your results in **Data Table 2**.
16. Make a bar graph that represents the number of dots of each color that were on the cloth on the beginning of **Part 2**. Label the horizontal axis with the color of the dots. Label the vertical axis with the number of dots.
17. Make a second bar graph that represents the number of dots of each color that were on the cloth on the end of **Part 2**. Label axes as in the first graph.

Data and Observations

Data Table 1

Selection of Dots	
Color	Number of dots Selected
Purple	
Brown	
Blue	
Green	
Tan	
Black	
Orange	
Red	
Yellow	
White	

Data Table 2

Number of Dots Remaining After Each Generation				
Color	Number remaining after generation			
	1	2	3	4
Purple				
Brown				
Blue				
Green				
Tan				
Black				
Orange				
Red				
Yellow				
White				

Analysis and Conclusions

1. Which colors of dots were picked up? _____

2. Which colors of dots, if any, were not picked up? Explain why they were not picked up.

3. Compare your results to those of a classmate. Are your results the same? different? Explain your answer. _____

Appendix G3 – That BIG SCARY E-Word

Critical Thinking

4. If the colored dots represented food to a predator, why is camouflage important?

5. What did you notice about the dots remaining after each “generation” in part 2? How would you explain what you noticed? _____

6. Give at least two examples of organisms that use camouflage in nature and how camouflage is helpful to each organism. _____

7. How could the artificial environments be changed to represent changes in a natural environment? Provide at least two examples. _____

8. Discuss at least two ways in which organisms protect themselves from predators besides camouflage? _____

9. Was your hypothesis supported by your data? Why or why not? _____

Appendix H1 – That BIG SCARY E-Word

Human Evolution

1. When was the pigmy chimp identified as a separate species? (*1930's*)
2. How many chromosomes do chimps and gorillas have? (*28*)
3. What is the species name of humans? (*Homo Sapiens*)
4. Who was the first to present a coherent scientific theory of human origin? (*Charles Darwin*)
5. Darwin essentially said that new species changed because of what two things? (*variation and natural selection*)
6. What is the name of Darwin's second book? (*The Descent of Man*)
7. Where was Homo erectus found? (*Java*)
8. How far back does the human family tree go back? (*4.4 to 5 million years*)
9. Who says that the "missing link" is still to be found? (*Richard Leakey*)
10. What are the names of the two main theories of where modern humans evolved from? (*radiation theory and parallel evolution theory*)

Fossils!

1. In your own words, briefly describe how fossils are formed. (*For an ocean snail: 1 – It lives in the ocean. 2- The snail dies. 3 – The snail is buried in the ocean floor. 4 – The soft body of he snail decays. 5 – After millions of years, the sand around the shell hardens to rock and the shell or its imprint is preserved as a fossil.*)
2. In what are almost all fossils preserved? (*sedimentary rock*)
3. How are fossils cleaned? (*They can be scrubbed with soap and water o may be coated with a consolidant to prevent the rock from falling apart.*)
4. Where are fossils found? (*Anywhere there is exposed sedimentary rock.*)
5. Do the fossil game. Write your answers in the space below. (*Fossil 1; Fossil 2; Fossil 3; Fossil 4; Fossil 5*)

Appendix H2 – That BIG SCARY E-Word

E V O L U T I O N

A X E X T I N C T I O N E W T G
 D A R W I N I C H E O B S N S O
 A L M A X C C H E I X L E A E A
 P G I L E L B A T U M M I T L R
 T Y N A T U R A L R N U C U E C
 I E N N O I T U L O V E E R C P
 V L O E D P Y Z R Y A D P A T A
 E G I N A B E I B F R M S L I R
 R A T D D I V E R S I T Y I O C
 A E A U O N R T O M A R U S N H
 D B T R E X U G I R T V O T Y I
 I S U D F Q S C A C I U R E L P
 A M M I J O R U A O O N D P R E
 T H E O R Y Z F I T N E S S E L
 I S O L A T I O N Q S K V U D A
 O I S L A N D S O G A P A L A G
 N O I T A I C E P S V C V O B O
 S L U K C A M O U F L A G E D M
 O Q S I S E H T O P Y H N H Y P

Word list

Adaptation	Environment	HSM Beagle	Mimicry	Speciation
Adaptive radiation	Evolution	Hypothesis	Mutation	Species
Camouflage	Extinction	Immutable	Natural	Survey
Archipelago	Fact	Islands	Naturalist	Theory
Darwin	Fitness	Isolation	Niche	Variations

Appendix H3 – That BIG SCARY E-Word

EVOLUTION – Word Search Key

A E X T I N C T I O N T
 D A R W I N I C H E O S N S
 A A I E A E
 P L E L B A T U M M H T L
 T N A T U R A L N C U E
 I E N N O I T U L O V E E R C
 V L O P Y R A P A T A
 E G I A E I R M S L I R
 R A T D D I V E R S I T Y I O C
 A E A N R M A A S N H
 D B T E U I T T I P
 I S U S C C I E
 A M M R A O
 T H E O R Y F I T N E S S L
 I S O L A T I O N S A
 O I S L A N D S O G A P A L A G
 N O I T A I C E P S O
 C A M O U F L A G E
 S I S E H T O P Y H